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ESSAYS ON ECONOMIC ANALYSIS OF FOOD PRICES IN TURKEY

Ph.D. DISSERTATION

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THE ECONOMICS DEPARTMENT

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PLAGIARISM PAGE

I hereby declare that all information in this thesis has been obtained and presented by academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work; otherwise, I accept all legal responsibility. 18.09.2020

Sefa IŞIK

To my parents

and

To my wife Fatma and our son Taha

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ABSTRACT

Essays on Economic Analysis of Food Prices in Turkey

Turkey is one of the countries facing high food price inflation in the world, especially in the last period. The thesis consists of three studies related to food prices in Turkey. In the first study, we aim to contribute to the ongoing discussion on the drivers of food prices with an in-depth-interview approach. The experts who have studied the issue in-depth or have worked in the industry for many years are included in the study, and a software package programme is employed to analyse the data obtained from semi-structured interviews. The qualitative study concluded that supply-side drivers are more decisive than demand-side drivers for food prices in Turkey. In particular, agricultural input costs play a fundamental role since most agricultural inputs are highly dependent on imports. Moreover, many problems are stated from mafia-like structures to the lack of competition in the food supply chain.

The second study aims to examine the linkage between agricultural input prices and food prices in Turkey by using quantitative methods for the period from January 2015 to January 2020. Using various estimation techniques, we obtain robust results which state that there is a long-running relationship between agricultural input prices and retail food prices. Most strikingly, the long-run agricultural input price elasticities are found to be in the range of 1.30-1.36. In other words, a percentage increase in agricultural input prices increases food prices between 1.30 percent and 1.36 percent.

In the third and final study, we investigate the impact of tax cut on agricultural input prices. In 2016, the Value Added Tax rate in fertilizer, which was 18 percent in fertilizer, was reduced to 1 percent. Then, fertilizer was included in the scope of the exemption. Using the difference-in-differences method, this study examines whether the decisions reduce fertilizer prices. Although there are limitations on data availability, the results of this analysis provide some hints that consumers received benefits from the tax reduction decisions.

Keywords: ARDL, difference-in-differences, FMOLS, food prices, in-depth-interview

ÖZET

Türkiye'deki Gıda Fiyatlarının Ekonomik Analizi Üzerine Denemeler

Türkiye yüksek gıda enflasyonu ile karşı karşıya kalan ülkelerden biridir. Bu tez, Türkiye'deki gıda fiyatlarının ekonomik analizi üzerine üç çalışmadan oluşmaktadır. Birinci çalışma, derinlemesine mülakat yaklaşımıyla gıda fiyatlarının belirleyicileri üzerine devam eden tartışmaya katkı sağlamayı amaçlamaktadır. Konuyu derinlemesine inceleyen veya yıllardır sektörde çalışmış olan uzmanlar çalışmaya dâhil edilmiş ve yarı yapılandırılmış görüşmelerden elde edilen verileri analiz etmek için bir yazılım paketi programı kullanılmıştır. Bu nitel çalışma sonucunda, ise Türkiye'deki gıda fiyatları için arz yönlü faktörlerin talep yönlü faktörlerden daha önemli olduğu sonucuna varılmıştır. Özellikle, büyük oranda ithalata bağımlı olan tarımsal girdi maliyetleri temel bir rol oynamaktadır. Ayrıca, mafya benzeri yapılardan gıda tedarik zincirindeki rekabet eksikliğine kadar birçok sorun ortaya koyulmuştur.

İkinci çalışma ise Türkiye'deki tarımsal girdi fiyatları ile gıda fiyatları arasındaki ilişkiyi, Ocak 2015'ten Ocak 2020'ye kadar olan dönem için nicel yöntemler kullanarak incelemeyi amaçlamaktadır. Çeşitli ekonometrik metotlarla, tarımsal girdi fiyatları ile perakende gıda fiyatları arasında uzun dönemli bir ilişkinin olduğu sonucuna varılmıştır. Ayrıca, uzun dönemli tarımsal girdi fiyat esnekliklerinin 1.30-1.36 aralığında olduğu bulunmuştur. Diğer bir ifadeyle, tarımsal girdi fiyatlarındaki yüzde 1'lik bir artış, gıda fiyatlarını yüzde 1.30 ile yüzde 1.36 arasında artırmaktadır.

Üçüncü ve son çalışma ise vergi indiriminin tarımsal girdi fiyatları üzerindeki etkisini araştırmaktadır. 2016'da gübreden alınan katma değer vergisi yüzde 18'den yüzde 1'e indirilmiştir. Daha sonra ise gübre, KDV istisnası kapsamına alınmıştır. Böylelikle son çalışmada, farkların farkı metoduyla bu vergi indirimlerinin gübre fiyatlarını düşürüp düşürmediği incelenmektedir. Veri konusunda kısıtlar olsa da tüketicilerin bu indirimlerden faydalandığı sonucuna ulaşılmıştır.

Anahtar Kelimeler: ARDL, derinlemesine mülakat, farkların farkı, FMOLS, gıda fiyatları

TABLE OF CONTENTS

ABSTRACT i

ÖZET ii

TABLE OF CONTENTS iii

LIST OF ABBREVIATIONS v

LIST OF FIGURES vi

LIST OF TABLES vii

1. INTRODUCTION 1

2. LITERATURE REVIEW 6

2.1. Determinants of Food Prices 6

2.2. Taxes and Food Prices 10

3. UNDERSTANDING FOOD PRICES in TURKEY with an IN-DEPTH INTERVIEW APPROACH 12

3.1. Food Prices in Turkey 13

3.2. Study Methods 19

3.2.1. In-Depth Interviews Approach 20

3.2.2. Data Collection 20

3.2.3. Data Analysis 22

3.2.4. Ethical Approval 23

3.3. Findings of the Research 23

3.3.1. Supply-Side Food Price Determinants 25

3.3.2. Demand-Side Food Price Determinants 46

3.4. Concluding Remarks 50

4. THE IMPACT of AGRICULTURAL INPUT COSTS on FOOD PRICES in TURKEY 57

4.1. Data Model Specification and Methods 57

4.1.1. Data 57

4.1.2. Model Specification 58
4.1.3. Methods 58
4.2. Empirical Results 61
4.3. Concluding Remarks 67
5. THE ROLE of TAX CUTS on AGRICULTURAL INPUT PRICES in TURKEY 69
5.1. Empirical Strategy and Data 69
5.1.1 Methodology 69
5.1.2. Data 72
5.2. Empirical Results 72
5.2.1. Main Results 72
5.2.2 Robustness Checks 74
5.3. Concluding Remarks 74
6. CONCLUSIONS 76
7. REFERENCES 80
8. APPENDIX 91
8.1 Appendix 1. ETHICS COMMITTEE APPROVAL FOR RESEARCH 91
8.2 Appendix 2. CURRICULUM VITAE 92

LIST OF ABBREVIATIONS

ARDL	Autoregressive Distributed Lag Model
C-VAR	Co-integrated vector autoregressive
CAQDAS	Computer-Assisted Qualitative Data Analysis
CBRT	Central Bank of The Republic of Turkey
CCR	Canonical Cointegrating Regression
COMCEC	Standing Committee for Economic and Commercial Cooperation of the Organization of Islamic Cooperation
CPI	Consumer Price Index
DID	Difference-in-differences
DOLS	Dynamic Ordinary Least Squares
FAO	The Food and Agriculture Organization
FMOLS	Fully Modified Ordinary Least Square
Food-CPI	Food and Non-Alcoholic Beverages Group in Consumer Price Index
IFPRI	International Food Policy Research Institute
ILO	International Labour Organization
IMF	International Monetary Fund
TurkStat	Turkish Statistical Institute
TÜSİAD	Turkish Industry and Business Association
UNHCR	United Nations Refugee Agency
VAR	Vector auto-regression
VEC	Vector error-correction

LIST OF FIGURES

Figure 3.1. Major groups and their shares in CPI, 2019 (%) 13
Figure 3.2. CPI and Food-CPI (2003-2018, 2003=100) 14
Figure 3.3. CPI and Food Contribution to CPI* 15
Figure 3.4. Unprocessed Food-CPI and Processed Food-CPI (2003-2018, 2003=100) 16
Figure 3.5. Sub-indices of Unprocessed Food-CPI (2003-2018, 2003=100) 16
Figure 3.6. Food-CPI in European Union and Turkey (2003=100) 18
Figure 3.7. Food-CPI in the world and Turkey (2003=100) 19
Figure 3.8. Themes and emergent subthemes identified in interviewees' responses 24
Figure 4.1. Results of CUSUM and CUSUM-squared tests 66
Figure 5.1. The movement of prices (2015=100) 70

LIST OF TABLES

Table 3.1. Items with the highest weight in food and non-alcoholic beverages group in CPI 17
Table 3.2. Details of participants 21
Table 4.1. The result of Kapetanios (2005) Unit Root Test with endogenous structural breaks 62
Table 4.2. The result of Maki (2012) Cointegration Test with endogenous structural breaks 62
Table 4.3. The results of Bounds Test for cointegration 64
Table 4.4. Results of Short-run and Long-run Coefficients from the ARDL Model 65
Table 4.5. Results of alternative approaches (FMOLS, DOLS, and CCR) 66
Table 5.1. The illustration of Difference-in-Differences Estimation 71
Table 5.2. Descriptive statistics 72
Table 5.3. The Results for the Difference-in-Differences Estimations 73
Table 5.4. Falsification tests for robustness checks 74

1. INTRODUCTION

Almost all food prices across the world increased in the 2006-08 global food crisis. According to the United Nations' Food and Agricultural Organization (FAO), world food price index increased by 37.7 percent on average in the second half of 2007 compared to the same month of the previous period and reached its highest annual increase by 58 percent in March 2008 (FAOSTAT, 2019). Four main driving forces in food prices were generally accepted by academics and researchers as the causes of the global food price crisis. These are rapid economic growth, biofuel production, fluctuations in exchange rate, and energy price increases (Hochman, Rajagopal, Timilsina, & Zilberman, 2011, p. 54). Following these historical increases, world food prices entered a downward trend.

In contrast to the global downward trend, food prices have continued to rise in Turkey. In particular, it recorded a dramatic increase in 2018. It increased by 29.26 percent in October of that year. The leap in food prices focused attention on reasons and impacts of high food prices. Government executives announced that the sharp rise in food prices was due to behavioural issues by intermediaries such as deliberately decreasing food supply to the market. On the other hand, some economists and researchers said that structural problems such as import dependency of agricultural inputs or lack of planning played a crucial role in this increase.

The effects of the increase in food prices were deeply felt country-wide. In the literature, there are a lot of economic impacts of high food prices. Firstly, the real income and welfare of consumers are negatively affected, particularly for low-income households (Holmes, Jones, & Wiggins, 2008). All other things being equal, rising food prices decrease the real incomes of people. They can purchase less food compared to the previous period due to their falling purchasing power.

The other effect of higher food prices is seen on the consumer price index (CPI). CPI consists of several sub-components, one of which is food prices. Thus, an alteration in food prices causes CPI to change. For instance, in October 2018, when the annual inflation reached to 25.24 percent in Turkey, food prices contributed to it 6.74 points.

Increasing Turkish food prices have generated many questions. This thesis aims to understand better the answers to the following questions: Why have food prices gone up so much in Turkey? What are the main drivers of Turkish food prices? What is the impact of agricultural input costs on food prices in Turkey? What is the impact of tax cuts on agricultural input prices in Turkey?

In doing so, the thesis uses qualitative and quantitative methods to make a contribution to the existing literature on food prices. In the literature, there are many papers that are summarized in the next part. A significant majority of them have used quantitative methods. However, before the quantitative analysis, we prefer to begin with qualitative analysis due to its advantages.

Qualitative methods stimulate more profound thought by providing rich, thick explanations of real phenomena and examples of action (Doz, 2011, p. 584). Also, there are solid examples that use qualitative methods in economics (Delaney, 2017). Starr (2014) surveys the growing use of qualitative methods in economics. For instance, Bewley's impressive study (1999) is one of the most important examples in economics. In his book titled "Why Wages Don't Fall During a Recession," he used the following statement:

> *Despite negative attitudes in economics toward direct microeconomic investigations, a few economists have sought information about the causes of wage rigidity and unemployment by interviewing employers, and I have done the same, going further than previous investigators* (p. 13).

After the 1990–91 recession, Bewley interviewed employers in Connecticut and nearby states to understand why they did not make wage cuts despite unfavourable economic conditions. He concluded that the employers did not cut wages due to psychological factors rather than economic factors: fairness and employee morale (Starr, 2014, p. 244). Good morale has a positive impact on productivity, creativity, effort, cooperativeness, and customer services (Howitt, 2002, p. 126). Thus, firms can increase their profitability by not reducing workers' wages.

The article "Qualitative Methods in Health Economics," written by Coast and De Allegri (2018), explains why to use qualitative methods in health economics. The study

emphasized that the method increasingly employed over the last 20 years to better understand issues surrounding resource allocation in the health economy.

These examples demonstrate that studies using qualitative methods can contribute to the existing economic literature by providing scientifically valuable results. The critical point is that qualitative methods should be well prepared, as with quantitative methods (Starr, 2014).

In the first study, we employ an in-depth-interview method as a qualitative research method to arrive at an in-depth understanding of the determinants of food prices in Turkey. In doing so, a semi-structured interview method is applied with nine experts who have an average of experience of 22 years. Open-ended questions are asked to each interviewee, and the data obtained are interpreted with NVivo 12.

This qualitative study has concluded that the supply-side effects are more decisive for food prices in Turkey. In particular, input costs play a fundamental role since agricultural inputs such as energy, fertilizers, and pesticides are highly dependent on imports. In an exchange rate shock, like the one in 2018, an increase in input costs increases food prices. Also, the study contributes to the existing literature by providing more striking results as well as general structural problems. First, Turkey's agricultural sector has structural problems that cannot be solved for many years. These are migration and ageing rural population, low technology and productivity, fragmented and abandoned agricultural areas, weather conditions and climate change, the level of education, small-scale farming, non-modern greenhouses, financing, and irrigation problems. Second, Turkey does not have complete and well-classified agricultural data. Thus, it cannot implement effective and strategic agricultural policies. Also, the Ministry of Agriculture and Forestry has some troubles, such as the lack of skilled human capital, and the frequent replacement of ministers. Third, import decisions damage domestic production. Fourth, mafia-like structures and competition challenges across the entire food supply chain prevent a healthy price formation. Fifth, the tastes and preferences of the Turkish people change and affect food demand, as in the case of veal. Finally, other demand-side drivers such as export, population growth, income growth, increasing number of tourists and refugees, and food waste are also significant drivers affecting food prices in Turkey.

Since the qualitative method in the first study indicate that agricultural input costs play a significant role in food prices, the second study is an attempt to understand the linkage between agricultural input prices and food prices in Turkey by using several quantitative methods. To this end, a cointegration analysis is performed using the autoregressive-distributed lag (ARDL) Bounds Test approach and Maki (2012) cointegration test with structural breaks for the January 2015-January 2020 period. Additionally, the fully modified ordinary least square (FMOLS), dynamic ordinary least squares (DOLS), and canonical cointegrating regression (CCR) are applied to verify the results of the ARDL approach. The analysis demonstrates a significant, long-running relationship between agricultural input prices and food prices in Turkey. The long-run agricultural input price elasticities are found to be in the range of 1.30-1.36. In other words, a percentage increase in agricultural input prices increases food prices between 1.30 percent and 1.36 percent.

The second study contributes to the existing literature in three ways. First, the study is unique to explore the role of agricultural input costs on food prices using the agricultural input price index data published for the first time in March 2020 by TurkStat (Turkish Statistical Institute). Second, we provide robust results by using various estimation techniques. Finally, the study finding the long-running relationship between the variables states that retail food prices increase more than agricultural input prices in Turkey.

The first two studies clearly show that agricultural input costs have a major impact on food prices in Turkey. In this context, a decrease in agricultural input costs can play a significant role in reducing food inflation. On January 1st, 2016, the Value Added Tax (VAT) rate in fertilizer, which was 18 percent in fertilizer, was reduced to 1 percent with the decision of the Council of Ministers numbered 2015/8353. Then, on February 10th, 2016, fertilizer was included in the scope of the exception. As these tax reduction decisions exogenously affect the fertilizer prices, there is an opportunity to conduct a natural experiment. Using the difference-in-differences (DID) method, the third and final study examines whether the decisions reduce fertilizer prices. Although there are limitations on data availability, the results of the analysis provide some hints that consumers received benefits from the tax reduction decisions.

This thesis is structured as follows. In section 2, a literature review for three essays is presented. Section 3 provides the first essay which tries to understand food prices in Turkey

with a qualitative analysis. In section 4, the second essay investigates the relationship between agricultural input costs and retail food prices in Turkey. Section 5 presents the third essay examining the impact of tax cuts on agricultural input prices via a difference-in-differences approach. Finally, the conclusion is presented in Section 6.

2. LITERATURE REVIEW

2.1. Determinants of Food Prices

2006-2008 global food price crisis has raised concerns about the determinants of food prices for academics, researchers, institutions, and other concerned people, because the Food and Agriculture Organization of the United Nations (FAO) food price index increased by 37.7 percent on average in the second half of 2007 compared to the same month of the previous period and reached its highest annual increase by 58 percent in March 2008 (FAOSTAT, 2019). Numerous factors behind this crisis have been extensively analyzed in the literature. The temporary imbalance between demand and supply has been generally seen as the cause of these increases (Bukeviciute, Dierx, & Ilzkovitz, 2009, p. 3).

Rosegrant (2008) examined the role of biofuels production in causing food price inflation using a partial equilibrium model, which was the International Food Policy Research Institute's (IFPRI) IMPACT model (International Model for Policy Analysis of Agricultural Commodities and Trade). He concluded that although rapidly growing demand and slowing supply growth contributed to the rapid price increases, biofuels production was the major contributor. Trostle (2008) stressed the imbalance of global supply and demand as the cause of high food prices. The declining value of the dollar and the rapidly expanding biofuel production were considered as demand factors that explain high food prices. On the other hand, increasing production costs (mostly due to rising energy prices) and adverse weather conditions were evaluated as supply factors. Abbott et al. (2008) reviewed many reports, studies, and articles and provided a critical assessment. They emphasized that global changes in production and consumption of key commodities, the depreciation of the US dollar, and growth in the production of biofuels were the factors driving food price increases over the period of 2006-2008. Mitchell (2008) conducted a study to determine the factors behind global food price increases. He displayed that the increase in biofuels production in the U.S. and the EU was the most important factor to explain increases in food prices. Higher energy prices and weak dollar were other factors. Timmer (2008) stated that there are three main factors driving up international food prices: (i) rapid economic growth (especially in India and China), (ii) a sustained depreciation in the dollar, (iii) high and rising fuel prices and legal requirements to increase biofuel production. Cooke and Robles (2009) used a time

series analysis, and the time range was from 2002 to early 2009. Also, their paper focused on four agricultural commodities: corn, wheat, rice, and soybeans. They showed that financial activity in futures markets and/or speculation in these markets could explain the change in international food prices.

Piesse and Thirtle (2009) reviewed the causes of food commodity price increases in 2007-2008 based on some important studies. In this study, low stock to utilisation ratios, policy changes to reduce supply and stocks, policy changes to increase demand, harvest failures, spot, and futures commodity market factors, the decline in the value of the US $ were examined as the short term forces. For the long-run forces, they focused on prices of fertilizer and fuel, lack of investment in agricultural R&D, and climate change as supply-side factors, while they focused on population, income growth, ethanol, and biodiesel as demand-side factors. They also stated that there was a broad consensus on most of the causes, yet much less on the effect of the depreciation of the US Dollar. Gilbert (2010) carried out Granger causality tests in order to determine the factors that explain food price movements between 1970 and 2008. His paper stated that world GDP growth, monetary expansion, exchange rate changes, and the oil price were important determinants of food price rises. He also showed that rapid economic growth in China and dollar depreciation were the main drivers of the 2006–2008 commodity price boom. Hochman et al. (2011) focused on the four main factors, including biofuel expansion, economic growth, exchange rate fluctuations, and energy price inflation. They concluded that the prices of corn, soybean, wheat, and rice were explained, respectively, 70, 55, 54, and 47 percent by these four factors. Nazlioglu and Soytas (2012) investigate the relationship between the US Dollar, oil prices, and twenty-four world agricultural commodity prices by using a panel cointegration and Granger causality methods with monthly data from January 1980 to February 2010. They conclude that world oil prices and a weak dollar have a critical role in the prices of various agricultural commodities.

In the literature, there are also country-based studies that investigate the rises in food prices, Davidson et al. (2011) discuss the determinants of U.K. food inflation in a study. The paper uses a co-integrated vector autoregressive (C-VAR) model over the period 1990-2010. They conclude that world raw food prices and the exchange rate are responsible for U.K. food price inflation. Also, unemployment, earnings, and manufacturing costs are less important. On the other hand, oil prices are indirectly important due to their impact on world agricultural commodity prices. Zhang and Law (2010) study the determinants of food price

inflation for China using a triangle model with quarterly data of 1996–2009. They state that demand pressures had been more critical than supply-side shocks from a medium-term perspective. Demand pressures include output gap and excess money, while supply-side factors consist of natural disasters, food production costs, and food yields. Using a cointegration analysis and a vector error-correction (VEC) model, Baek and Koo (2010) investigate the impacts of the exchange rate, prices of agricultural commodities and energy prices on U.S. food prices throughout 1989-2008. They conclude that the food prices in the U.S. are affected by agricultural commodity prices and exchange rates in both the short- and long-term. Moreover, energy prices have a significant impact on U.S. food prices in the long run. Lambert and Miljkovic (2010) also analyze the main drivers of U.S. food prices using a VAR model and monthly data for January 1970-February 2009. Their findings indicate that farm prices and manufacturing wages are the main determinants of food prices, rather than consumers' income or the price of other inputs like energy. Rangasamy (2011) examines the food price movements in South Africa for the period 1980 to 2008. The study uses a VAR modeling framework and concludes that domestic influences play an important role in South African food price movements. According to the authors, this means that national policy can reduce the food price inflation in South Africa. Ahsan (2011) conducts a study to examine the determinants of food prices in Pakistan using the Autoregressive Distributed Lag Model (ARDL) for 1970-2008. Their study finds that supply-side factors such as subsidies and world food prices and demand-side factors such as money supply have a significant impact on food prices in Pakistan. Using a block vector auto-regression (VAR), Huh and Park (2013) investigate the determinants of food prices in developing Asian countries. In the study, 10 variables classified into three blocks as global, regional, and country are used. It is shown that regional shocks play a key role in determining domestic food prices, especially in the medium and long term, and global shocks do not contribute much to the domestic food prices in developing Asia. The study also claims that the country's own shock largely explains the short-term movements of domestic food prices. Irz et al. (2013) examine the short-term and long-term dynamics of food price formation in Finland by using the VEC model and monthly data throughout 1995-2010. Their results indicate that the main determinants of food prices are farm prices, wages in food retail, and the price of energy. Using a time series analysis, Sasmal (2015) conducts a study examining price rise in India. While the study showed that an increase in per capita income and shortage in supply are the essential drivers of food price inflation in the long-run, it cannot find a relationship between money supply and agricultural prices in the long-run. Norazman et al. (2018) use a

VEC model and monthly data from 1991 to 2013 to investigate the main drivers of food inflation in Malaysia. They state that world food commodity prices and real effective exchange rates are the major determinants of food prices.

As far as Turkey is concerned, structural factors, exports, producer prices, and climate conditions are the main drivers of food price increases. Using a vector autoregressive (VAR) model, Çıplak and Yücel (2004) investigate the relationship between the exchange rate, total CPI, and agriculture, and food price inflation. They find that increases in agricultural prices have a significant role in food price inflation and total CPI inflation. Başkaya et al. (2008) examine the determinants of processed food prices in Turkey using the least-squares method over the period of 2002 and 2007. The study concludes that supply-side shocks caused by drought and increases in international food prices are responsible for the increases in processed food prices. Adopting a qualitative approach, Orman et al. (2010) interview 16 experts in the food industry and ask open-ended questions to determine the structural factors of unprocessed food prices in Turkey. They conclude that the main structural factors are the dependence of production on climate conditions, insufficient know-how, the high number of intermediaries in the supply chain, uncertainties about public support for the agriculture sector, inadequacy in regulation and supervision structure, the concentration of agricultural production in some regions, and fluctuations in external demand. Nazlioglu and Soytas (2011) empirically assess the relationship between oil prices, exchange rates, and agricultural commodity prices for the January 1994–March 2010 period in Turkey. Using the Toda–Yamamoto causality approach and generalized impulse-response analysis, they find that oil prices and exchange rates had a neutral impact on agricultural commodity prices. Using a difference-in-differences model, Balkan et al. (2015) examine the impact of fuel prices on fresh fruit and vegetable prices. They indicate that fuel prices increase wholesale fresh fruit and vegetable prices through transportation costs. Eren et al. (2017) examine the main factors of food inflation in Turkey using a panel VAR model, focusing on 35 items with yearly data for 1994 and 2016. They show that producer prices and the quantity of production are the main drivers of consumer food prices.

The literature on the determinants of food prices at both global and country-level shows that the academics and the researchers have mostly used quantitative methods. On the other hand, very few studies employed qualitative methods. Four major factors leading to food price increases on the global level were generally agreed: (i) economic growth, (ii)

biofuel production, (iii) fluctuations in exchange rate, (iv) energy price increases (Hochman, Rajagopal, Timilsina, & Zilberman, 2011, p. 54). At the country level, the determinants of food prices varied from country to country as demand-side factors and supply-side factors. Demand-side factors generally consist of the output gap and money supply, whereas supply-side factors generally consist of production costs (such as energy prices, wages), exchange rates, world commodity prices, and weather conditions.

2.2. Taxes and Food Prices

One of the aims of the thesis is to investigate the impact of tax cuts on agricultural input prices in Turkey with a natural experiment. The effect of taxation on market price has always been one of the issues under discussion in the literature. It has been investigated whether a reduction or increase in taxation has passed to consumers. According to the theoretical literature, the tax is passed through to prices depending on the relative elasticities of demand and supply. (Berardi, Sevestre, Tépaut, & Vigneron, 2016). If the supply curve is perfectly elastic or the demand curve is perfectly inelastic, the tax is fully passed through to prices (Fullerton & Metcalf, 2002). Studies investigating the impact of taxation on prices have found a wide range of results from under-shifting to over-shifting.

Besley and Rosen (1998) conduct a study examining the relationship between sales taxes and prices using quarterly data for 12 commodities (such as eggs, milk, soda, bananas, and shampoo) and 155 cities during 1982–1990. They estimate that taxes were entirely or under-shifted for some commodities, while commodity taxes were over-shifted for others. Kenkel (2005) assesses the impact of an alcohol tax hike on Alaska prices using primary data. The paper provides evidence that taxes were more than fully passed through to alcohol beverage prices. Doyle and Samphantharak (2008) investigate the impact of a gas tax on retail gasoline prices in Illinois and Indiana using daily prices at the gas-station level and a difference-in-differences approach. They estimate that 80–100 percent of the tax reinstatement was passed through to consumers, while 70 percent of the sales tax reduction was passed through to consumers. Hanson and Sullivan (2009) evaluate the effect of a tobacco tax on retail prices using an increase in Wisconsin's tobacco tax. They find that a $1 tobacco tax increase was over-shifted to Wisconsin consumers via a difference-in-differences approach. The consumers paid a premium of between 8-17 cents per pack of

cigarettes as well as the full tax. Alm et al. (2009) investigate the incidence of state gasoline excise taxes using monthly data for all 50 U.S. states for the period 1984–1999. They find that gasoline taxes was entirely shifted to the final consumer. Chiou and Muehlegger (2010) examine the impact of cigarette excise taxes in the Chicago area. The paper finds that the tax was under-shifted to prices. They estimate price elasticities of approximately -0.4. Berardi et al. (2016) investigate the impact of the 'soda tax' introduced in January 2012 on consumer prices in France. Using a difference-in-differences approach, the study concludes that the tax gradually affected the prices of taxed beverages and entirely shifted to the prices after six months. They also state that the impact was heterogeneous across retail groups and brands.

3. UNDERSTANDING FOOD PRICES in TURKEY with an IN-DEPTH INTERVIEW APPROACH

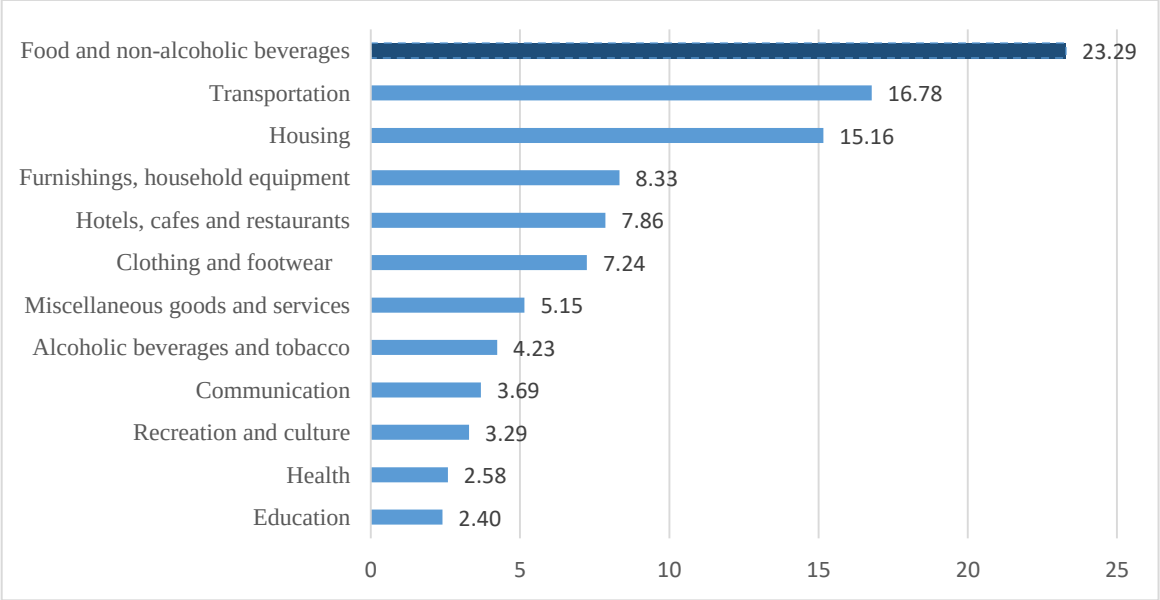
Turkey is one of the countries suffering from food price inflation in recent years, especially in 2018. This study aims to determine the drivers of food prices in Turkey by using an in-depth interview approach as a qualitative method. Within the scope of this study, experts in agriculture and food sectors are interviewed, and the data obtained are interpreted with the NVivo 12 qualitative data analysis program.

This study contributes to the existing literature in several ways. First, the qualitative analysis confirms the main results of existing studies that also emphasized production costs, weather conditions, producer organizations, or exports. The most conspicuous factor found to be associated with food price increases in this study is input costs due to their dependent structure to import entries. Thus, significant depreciation of the Turkish lira in 2018 increased food prices through input costs. Second, the study is stated that there are structural problems that have not been solved in the agricultural sector for years: migration and ageing rural population, low technology and productivity, fragmented and abandoned agricultural areas, weather conditions and climate change, the level of education, small-scale farming, non-modern greenhouses, financing, and irrigation problems. Third, the study underlines the importance of agricultural data and agricultural policies. The data are missing and not well classified. Thus, effective policies and strategies cannot be developed. In addition, the Ministry of Agriculture and Forestry is unable to balance the supply and demand due to various problems such as the lack of skilled human capital, and the frequent replacement of ministers, as well as data problems. Fourth, we draw attention to the fact that import decisions damage the industry in the long term. Although agricultural imports decrease food prices in the short term, the structure that becomes dependent on imports in the long term is vulnerable to shocks like the coronavirus pandemic. Countries responding to the coronavirus pandemic by closing their borders show that import opportunities are not always possible, and self-sufficiency in food is critical. It is a fact that import decisions that are not evaluated well discourage Turkish farmers, who cannot obtain enough profits from production. Fifth, we emphasize that competition challenges across the entire food supply chain prevent a healthy price formation. Moreover, mafia-like structures affect the market negatively. Sixth, the analysis states that the change in Turkish people's tastes and preferences has an impact

on food demand, as in demand for veal. Finally, other demand-side drivers such as population growth, income growth, an increasing number of tourists and refugees, and food waste are also significant factors in terms of food price increases in Turkey.

3.1. Food Prices in Turkey

Consumer Price Index (CPI) in Turkey is measured by the changes in the current retail prices of items in 12 main groups over a certain period of time. These major groups and items are determined by using many indicators which, are household consumption patterns, the institutional population in Turkey, and foreign visitors. Also, item baskets and their weights are updated every year in December by the Turkish Statistical Institute (TurkStat). These main groups and their shares in CPI for 2019 are shown in Figure 3.1.

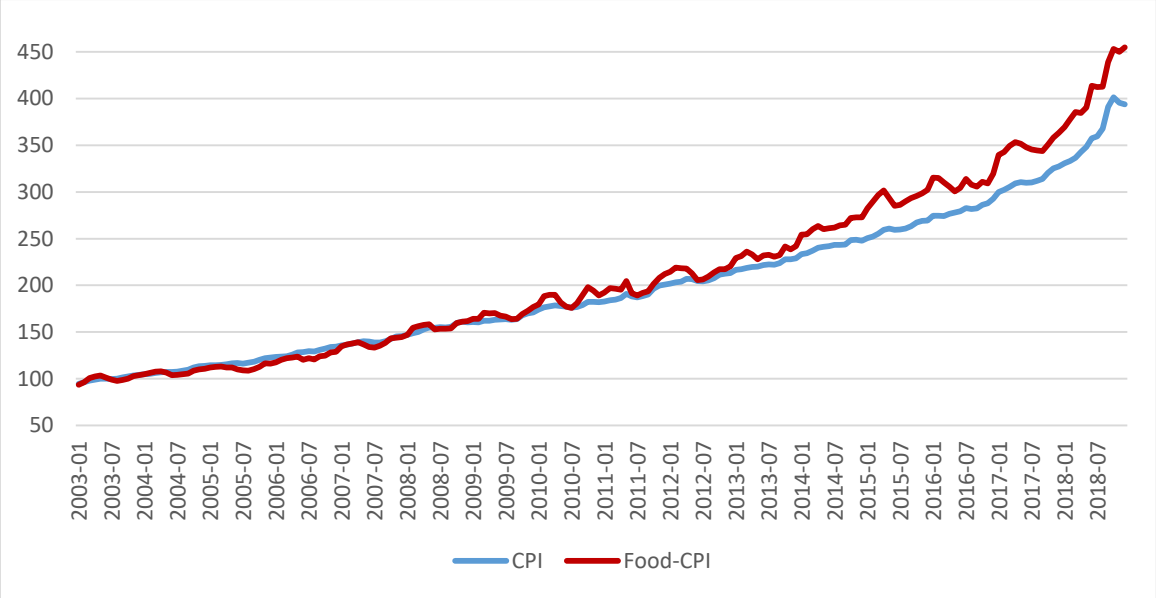


Source: TURKSTAT, 2019C

Figure 3.1. Major groups and their shares in CPI, 2019 (%)

Looking at Figure 3.1, education has the lowest weight in CPI. It is followed by health, recreation and culture, and communication, respectively. On the other hand, the highest weight in the CPI belongs to food and non-alcoholic beverages (food-CPI) with 23.29 percent. Therefore, an increase in food-CPI significantly affects the CPI.

The Central Bank of The Republic of Turkey (CBRT) often refers to food prices in its inflation reports. Food prices are generally shown as scapegoats for the rise in CPI. The following statement can be shown as an example: “Driven by fresh vegetable products, the unprocessed food group stood out as the highest contributor to consumer inflation in the first half of 2018 (CBRT, 2018).” When the CPI and food-CPI in Figure 3.2 are compared, the CBRT seems to be right in its reviews. The figure indicates that both indices have similar trends, but different magnitudes. Both CPI and food-CPI have generally increased between 2003 and 2018, yet food-CPI has stayed higher than the CPI, especially since August 2010.



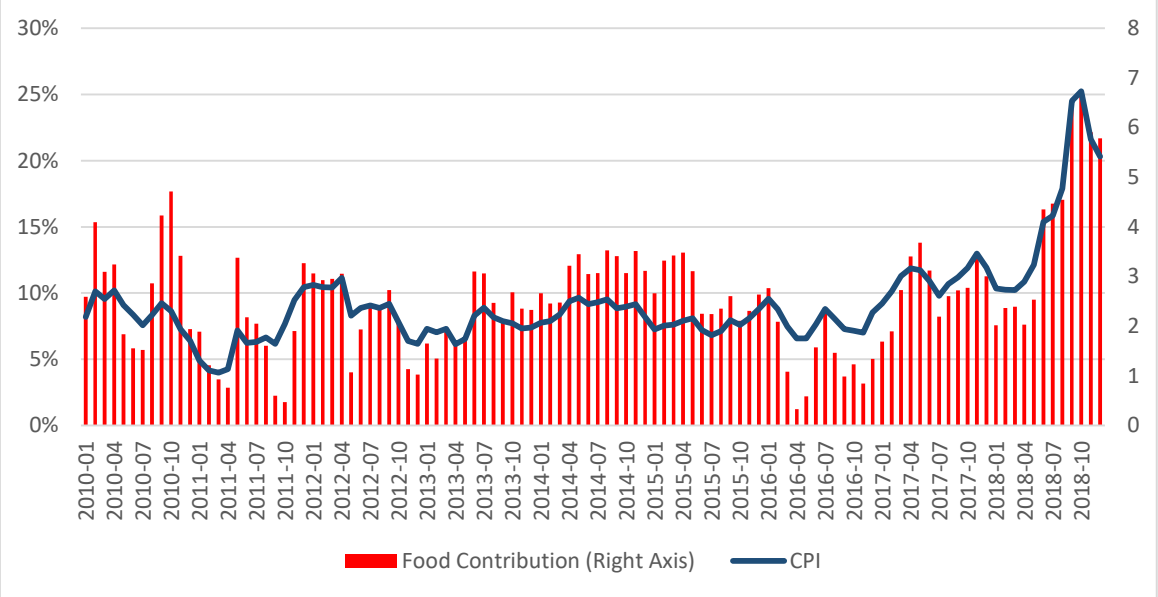
Source: TURKSTAT, 2019C

Figure 3.2. CPI and Food-CPI (2003-2018, 2003=100)

In October 2018, CPI reached its peak level of 401.27. Consumer price inflation, which is calculated using CPI, increased by 25.24 percent compared to the same month of the previous year. This was recorded as the highest rate since August 2003. On the other hand, annual food inflation was calculated as 29.26 percent by using food-CPI in October 2018. This means that food prices increased faster than general prices in that month.

The importance of food prices on CPI can also be seen from Figure 3.3, which demonstrates the food contribution to CPI. In October 2018, when the annual percentage change in overall CPI reached to 25.24, food-CPI contributed 6.74 points to overall CPI. In

other words, food inflation explained 26.7 percent of the overall inflation. This ratio can reach high levels from time to time. For instance, this rate was almost 55 percent in October 2010.

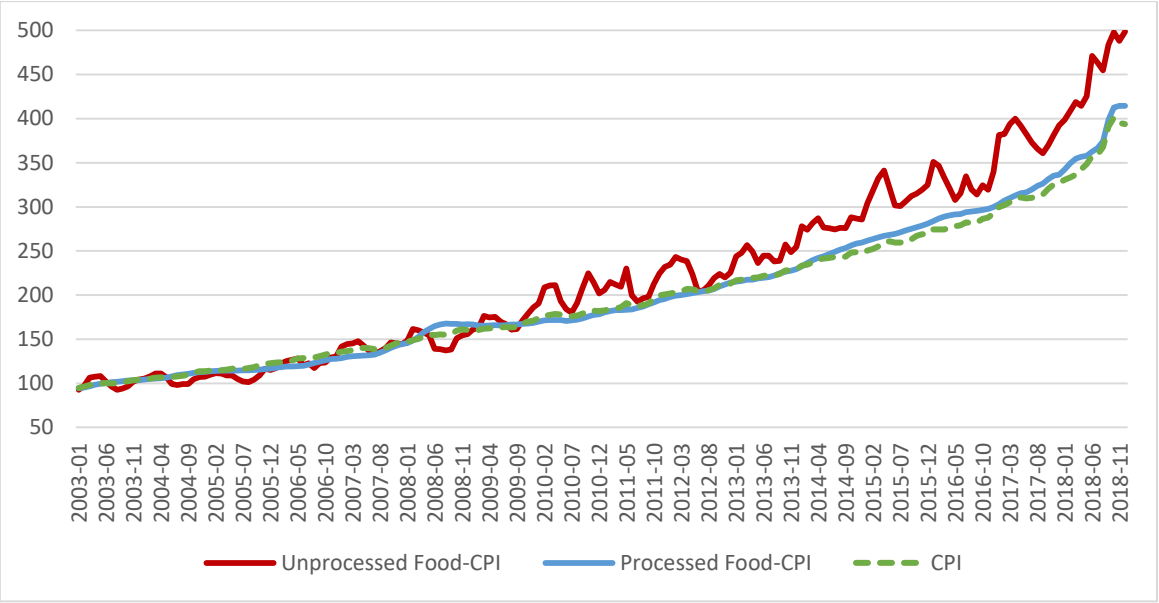


Source: TURKSTAT, 2019C and Author's Calculations

Figure 3.3. CPI and Food Contribution to CPI*

*The contribution to CPI was achieved by directly multiplying the annual rate of increase in Food-CPI by the current weight of that product.

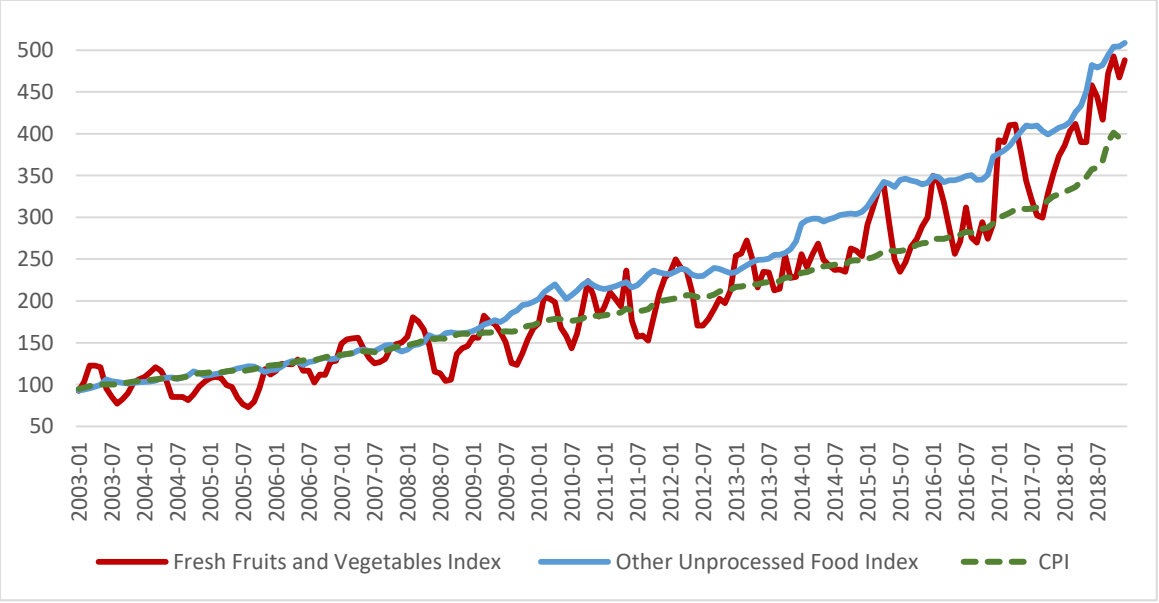
Returning to Figure 3.2, another striking factor in the figure is that Food-CPI is more volatile than CPI. Food groups can be divided into two groups: processed food (bread, meat products, etc.) and unprocessed food (fresh fruits and vegetables, fish, meat, etc.). Figure 3.4 shows the trends of indices of these food groups in Turkey between 2003 and 2018. Whereas unprocessed food-CPI is highly volatile, processed food-CPI is relatively smooth. Also, unprocessed food-CPI has a higher level than processed food-CPI. Therefore, it can be said that unprocessed food-CPI was more important than the processed food-CPI in explaining overall CPI during that period.



Source: TURKSTAT, 2019C

Figure 3.4. Unprocessed Food-CPI and Processed Food-CPI (2003-2018, 2003=100)

The unprocessed food group, which is ready to eat, is divided into two groups as fresh fruits and vegetables and other unprocessed food by TurkStat. The trends of these sub-indices are demonstrated in Figure 3.5.



Source: TURKSTAT, 2019C

Figure 3.5. Sub-indices of Unprocessed Food-CPI (2003-2018, 2003=100)

As is clear from Figure 3.5, the reason for the volatility of unprocessed food comes mostly from fresh fruits and vegetables, while the height of the level of unprocessed food is mostly due to other unprocessed food such as red meat. In addition to other unprocessed food, fresh fruits and vegetables have been observed to contribute significantly to the level of the unprocessed food price index, especially last years.

Considering the weight of all items in the food and non-alcoholic beverages group of CPI, although there are 134 items in the food group, 14 products constitute half of the total group weight (Table 3.1). Bread, milk, and milk products and different types of meat (red meat and poultry) explain a large share of the variance of food inflation and, thus, CPI.

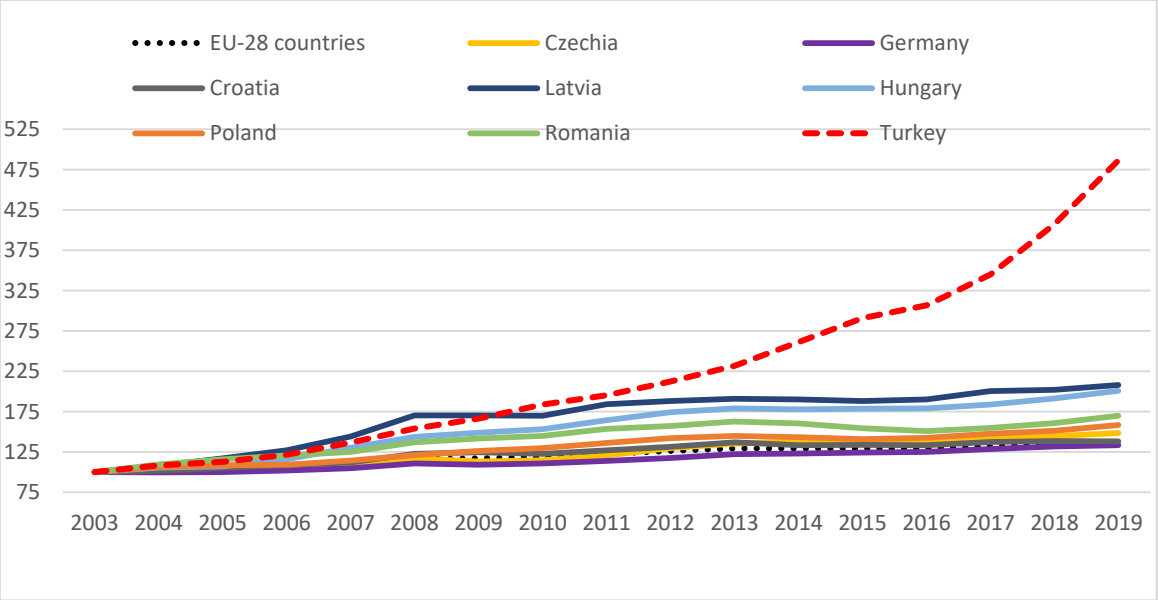
Table 3.1. Items with the highest weight in food and non-alcoholic beverages group in CPI

	Items	**Weight (%)**	**Annual average price changes in the period of 2004-2018 (%)**
1	Bread	2.11	10.22
2	Veal	1.81	10.78
3	Lamb	1.01	12.24
4	Poultry	0.88	8.55
5	White cheese	0.82	14.53
6	Tomato	0.82	11.11
7	Egg	0.68	11.36
8	Milk	0.67	7.76
9	Yogurt	0.53	7.36
10	Sun-flower oil	0.52	8.75
11	Potato	0.51	14.66
12	Tea	0.49	10.67
13	Olive	0.48	10.99
14	Wheat flour	0.40	8.53
	Total	**11.73**	

Source: TURKSTAT, 2019C

Between 2004 and 2018, the annual average price change of 9 out of 14 products, which have the highest share in the food basket, was more than the annual average price change of the total food group (9.95 percent). This shows that these products play a crucial role in explaining the change in food price inflation.

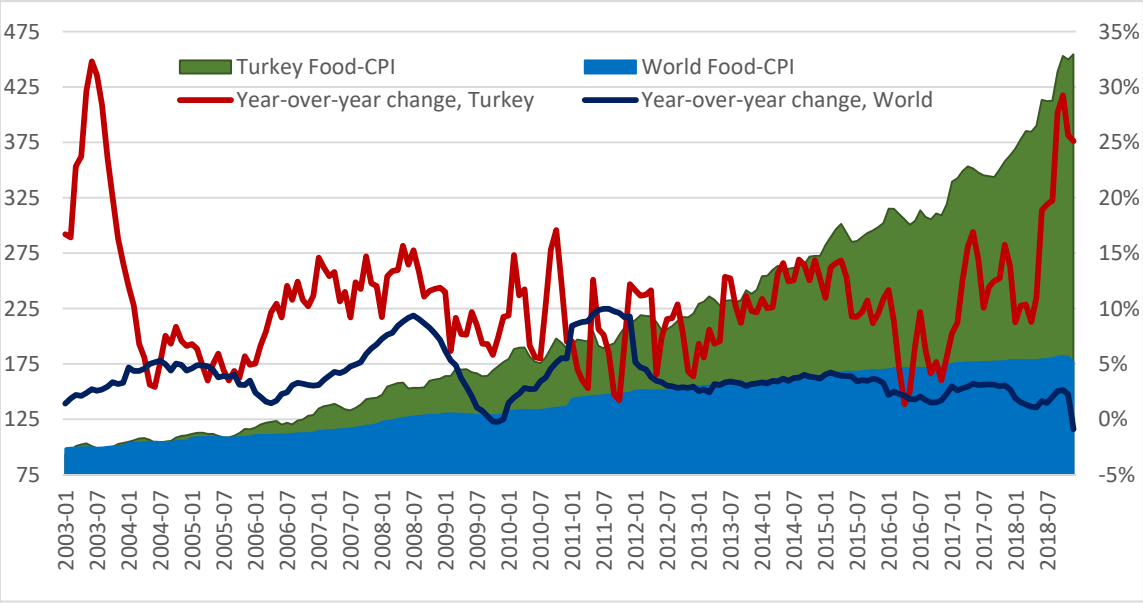
Food price inflation in Turkey is also high with respect to international levels. Figure 3.6 indicates a negative divergence of the levels of Food-CPI in Turkey from European countries. The difference has become more evident, especially in recent years. For instance, food-CPI in Turkey increased by 18 percent in 2018 and 19.5 percent in 2019 compared to the previous year. In the same years, the increase in Food-CPI was just 1.9 percent and 2 percent in the European Union (28 countries), respectively.



Source: EUROSTAT (online Data Code: prc_hicp_aind), 2019

Figure 3.6. Food-CPI in European Union and Turkey (2003=100)

Moreover, food inflation in Turkey remains relatively high compared to the world (Figure 3.7). For instance, annual food inflation in Turkey reached 29.3 percent in October 2018, whereas annual food inflation in the world was only 2.7 percent.



Note: Left vertical axis represents food-CPI levels; the right vertical axis shows the year-over-year percentage changes in the indices.

Source: FAOSTAT, 2020

Figure 3.7. Food-CPI in the world and Turkey (2003=100)

The high level of food inflation seen in recent years has attracted the attention of the Turkish authorities. Accordingly, The Food and Agricultural Product Markets Monitoring and Evaluation Committee, called the Food committee for short, was established with the participation of many institutions on 9 December 2014. Its secretariat has been carried out by the CBRT since 27 December 2016. The task of the committee is to monitor developments in agricultural and food markets, and to set priorities and offers proposals for policies to be implemented (CBRT, 2019).

3.2. Study Methods

The thesis used both qualitative and quantitative methods to understand the food price inflation deeply in Turkey. In this framework, the qualitative method was chosen in this chapter of this thesis in order to utilize from the opinions of specialists in the agriculture and food market.

In doing so, an in-depth-interview method was used, and data obtained from interviews are analyzed by using Computer-Assisted Qualitative Data Analysis (CAQDAS).

3.2.1. In-Depth Interviews Approach

In-depth interviewing is a process including asking questions, saving the answers, and then adding additional questions to expand or clarify a matter. Interviews can be done in person or by phone (Harrell & Bradley, 2009). There are three basic approaches of interviews: the informal conversational interview, the semi-structured interview, and the standardized open-ended interview (Yan, 2005).

The informal conversational interview relies "…entirely on the spontaneous generation of questions in natural interaction, typically one that occurs as part of ongoing participant observation fieldwork (Gall, Gall, & Borg, 2003, p. 239)". In this approach, the interviews are conducted without a number of pre-determined structural questions to obtain detailed information on a particular subject.

Second, the semi-structured interviews are carried out in questions whose majority is not predetermined. Such interviews usually begin with more general questions or subjects and continue with questions of how or why. Information obtained from interviews provides not only answers but also reasons for the answers (Case, 1990).

The third and final approach is the standardized open-ended interview, which is highly structured in expressing the questions. Questions asked to participants are always identical, open-ended, and arranged in advance (Gall, Gall, & Borg, 2003).

3.2.2. Data Collection

For an in-depth understanding, the semi-structured interviews were considered the most convenient method in data collection. This approach has a significant advantage for the emergence of previously unknown information. When there are sufficient opportunities to allow participants to speak freely, new information can arise (O'Keeffe, Buytaert, Mijic, Brozovic, & Sinha, 2016).

In the first step, comprehensive research was carried out for recruitment: an internet search was made to identify participants and obtain their contact information. Each expert

was also asked to propose other qualified individuals who may be willing to interview. Potential interviewees were contacted by e-mail and social media and asked whether they would participate in an in-depth interview.

The number of participants was determined according to the "saturation point." The saturation point is that the researcher makes the subjective decision that new data will not provide any further information or insight into the developing categories (Creswell, 2012, p. 433).

When the data received from the participants repeated each other, the researchers concluded that the data reached the level of saturation and stopped collecting data. In this context, nine participants were interviewed and asked broad questions on topics, for example, supply-side and demand-side factors that determine food prices in Turkey, and policy recommendations.

Table 3.2 shows the information on participants. The study was carried out with four academics, three senior executives, an agricultural engineer, and a president of a non-governmental organization in Ankara. They have an average of 22 years of experience.

Table 3.2. Details of participants

Participant	**Years of Professional Experience**	**Position**	**Corporation**
Participant 1	19 Years	Academic Staff	Private Foundation University
Participant 2	20 Years	Senior Executive	Ministry
Participant 3	30 Years	Academic Staff	State University
Participant 4	16 Years	Academic Staff	Private Foundation University
Participant 5	26 Years	Senior Executive	Public Corporation
Participant 6	17 Years	Academic Staff	State University
Participant 7	20 Years	Agricultural Engineer	Ministry
Participant 8	29 Years	President of Foundation	Nongovernmental Organization in Ankara
Participant 9	22 Years	Senior Executive	Public Corporation

The interviews with experts were held between January and March of 2020. Each interview occurred in the Turkish language and at the place requested by the participant. At the request of the participants, three of the interviews were conducted by phone. All interviews lasted from 29 minutes to 1 hour and 11 minutes. The average duration of the interviews was 50 minutes.

At the beginning of the interview, the participants were informed about audio recording, and their permission was received by the researcher. Participants also received assurances that their names and answers would not be associated with the study.

Questions asked were general and open-ended. Answers were deepened with questions from general to specific. Also, responses were received without directing the participants.

All interviews except one were recorded. Notes were taken for the participant who did not want to record audio during the interview. The recorded interviews were transcribed verbally and checked against the tape-recorded material.

3.2.3. Data Analysis

Yin (2011) states that the analysis of qualitative data usually consists of five stages: (I) Compiling data, (II) Dissembling data, (III) Reassembling data, (IV) Interpreting data, and (V) Concluding (p. 177).

The first step in the qualitative analysis is to constitute the database, as previously described in subsection 2.2. After completing data collection, the second phase is a disassembling procedure that requires dividing the compiled data into smaller pieces or fragments. This process can be called *coding*. After that, the disassembled pieces are readjusted by using themes, which can be called a reassembling procedure. The last two phases are the processes of interpreting the reassembled data and concluding the entire study (Yin, 2011, pp. 178-179).

The coding process is one of the most critical phases in qualitative data analysis. According to Charmaz (2006), coding is the pivotal link between data collection and explaining the meaning of the data (p. 46). Theron (2015) also describes coding as an

interpretive activity; this means that two researchers can evaluate the data in two different codes (p. 4). A similar pattern between the codes may lead to categories (Theron, 2015, p. 4).

A software package is not a prerequisite for the qualitative data analysis. Coding with CAQDAS is one of the coding methods (Maher, Hadfield, Hutchings, & de Eyto, 2018). Nevertheless, since such a program would be helpful for the study, interviews with participants were analysed with the NVivo 12, which is a professional CAQDAS.

3.2.4. Ethical Approval

Ethical approval is granted by the Ankara Yıldırım Beyazıt University, Social and Humanities Ethics Committee (Appendix A).

3.3. Findings of the Research

Figure 3.8 demonstrates themes and emergent subthemes identified by analysis of the answers given by the experts to the interview questions. The factors affecting food prices in Turkey are divided into two main themes: Supply-side impacts and demand-side impacts. However, the experts generally state that supply-side effects are more decisive than demand-side forces in Turkey.

The findings of the study are explained by providing quotes from the research participants. However, in order not to repeat, all quotations are not included.

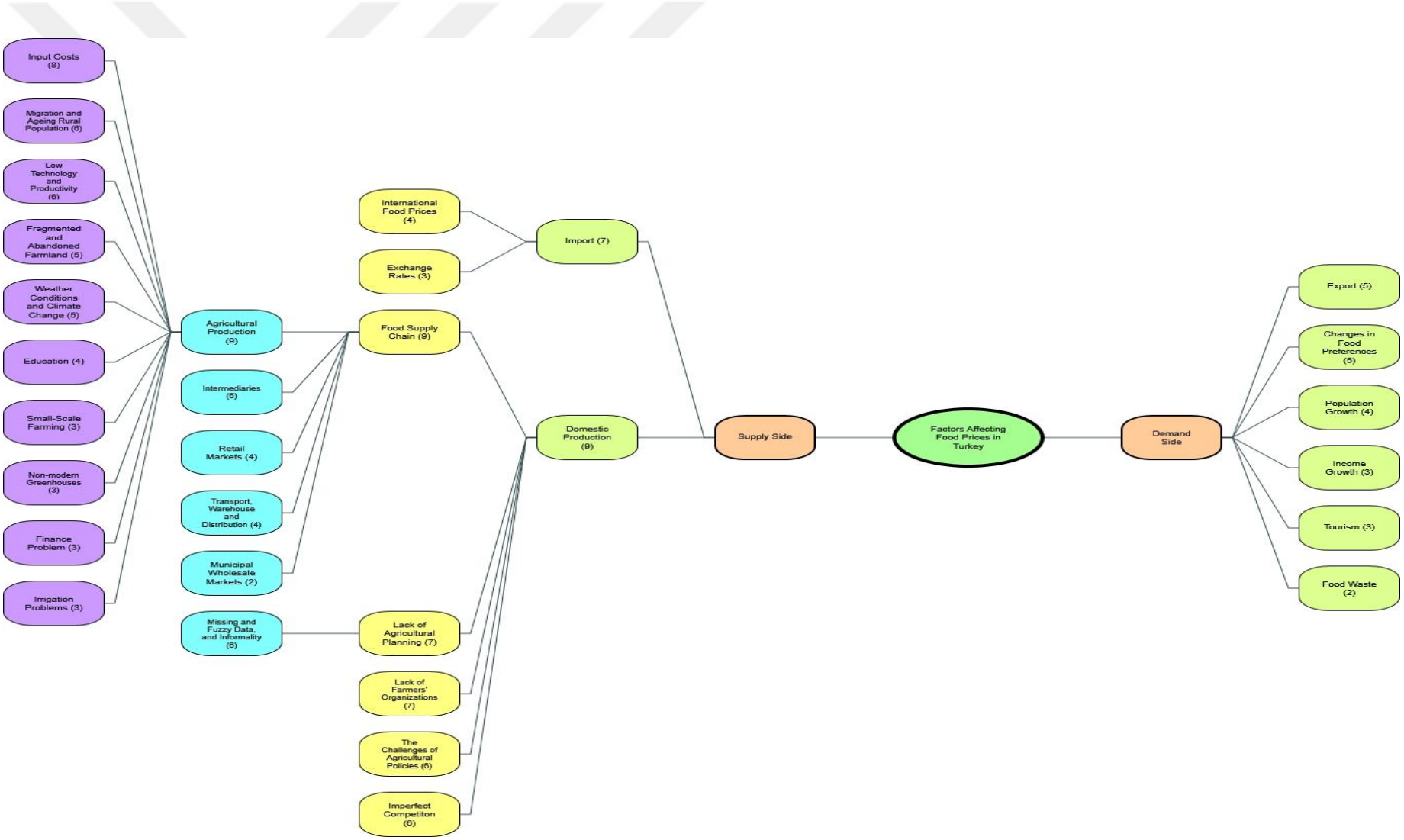


Figure 3.8. Themes and emergent subthemes identified in interviewees' responses

Note: The number shown in parenthesis is the number of experts who think this factor is important in determining food prices in Turkey.

3.3.1. Supply-Side Food Price Determinants

The total supply consists of the sum of imports and domestic production. Seven out of the nine experts interviewed believe that imports have an impact on Turkish food prices, while all of them view domestic production as necessary.

3.3.1.1. Import

According to seven experts, imports affect food prices through international food prices and exchange rates.

> 'Looking at the supply side, some of them are imports. When we look at the import side, the exchange rate is fluctuating. World prices are fluctuating. If both of them rise simultaneously, it will have a very high impact on our prices.' **(Participant 7, Agricultural Engineer)**

Economic theory states that if demand is constant, increasing supply will lower the price. Experts, however, emphasized that since import discourages the farmer from production, the price of imported goods will become dependent on imports in the long run. In particular, the level of the exchange rate becomes more important for domestic prices. In such an industry, an increase in international food prices or exchange rates can raise food prices.

> 'Unfortunately, imports also affect food prices very seriously. It affects two ways. First, it discourages the farmer from production. However, that is another story. Second, for example, if I import the weight of chickpea from 1 dollar and today the dollar is 3 liras, its price is 3 liras. If the dollar rises to 6 liras, the price will be 6 liras. I am directly affected by the import price.' **(Participant 1, Academic Staff)**

> 'Now, when you allow imports, you also negatively affect the domestic producer. For example, consider meat coming from abroad. Even the ground meat prices in Turkey have reached the level of 50-60 liras, but it can be produced more cheaply abroad. This, of course, leads the domestic producer to a negative position. Because, if the price of meat is 60 liras and you are importing it from abroad with the price of 40-45 liras, the domestic producers will send the animal to the slaughterhouse since it cannot meet the costs. Now there are queues in slaughterhouses. Therefore, since you cannot solve the basic structural problems, you view imports as a solution. It is not a solution.' **(Participant 6, Academic Staff)**

3.3.1.2. Domestic Production

Five main factors affecting food prices stood out in terms of domestic production. Firstly, all interviewees claimed that there are major problems in the food supply chain. Seven experts said lack of agricultural planning and lack of organization as second and third factors, respectively. The challenges of agricultural policies indicated by six people were the fourth determinant. Finally, six experts pointed out the imperfect competition as a determinant affecting food prices in Turkey.

3.3.1.2.1. The Food Supply Chain

The food supply chain is composed of sectors at all levels, from the agricultural sector down to the retail sector (Bukeviciute, Dierx, & Ilzkovitz, 2009, p. 4). Experts focused especially on six issues related to the food supply chain. Agricultural production, which was stated by all participants, is the most critical issue. This is followed by intermediaries, retail markets, transport-warehouse and distribution, and municipal wholesale markets, respectively.

3.3.1.2.1.1. Agricultural Production

The agricultural sector is considered as the first sector in the food supply chain (Bukeviciute, Dierx, & Ilzkovitz, 2009, p. 4). Two experts mentioned that problems in the agricultural sector continue for many years in Turkey.

> 'In my 26 years of experience, not much has actually changed. Problems or the structure of agriculture is not much changed in Turkey.' **(Participant 5, Senior Executive)**

One expert stated that problems in the Turkish agricultural sector are similar to those in other countries in the world.

> 'The problems experienced in Turkish agriculture are not different from the global problems in agriculture. As of my past duties, I have met with agriculture ministers and officials of nearly 70 countries up to now. In all meetings and bilateral dialogues, I always ask the following question to compare their problems with ours and find a solution: "what are your problems in agriculture?" Let me give you a few simple examples. A few years ago, the German

agriculture minister came to visit Antalya[1] for Expo[2]. We had a meeting with him, and I asked him the following question: what are your problems in agriculture? He said to us the following; firstly, young people move away from agriculture; secondly, the rural population is aging, and thirdly, the prices of agricultural products are volatile. These are not problems we are not familiar with, right? So no matter where they are, the problems are about the same, but the severity of the problems is different.' **(Participant 2, Senior Executive)**

Also, an expert said that some of the problems in the agricultural sector are similar problems in other sectors in Turkey.

'As I said, there is a problem wherever you look. This is not only true for Turkish agriculture. I also do business with other sectors… So whether you look at the ministry of culture or look at engineering, there are similar problems. There are similar problems in almost every industry.' **(Participant 6, Academic Staff)**

The study identified ten sub-themes related to the factors determining the food prices in the Turkish agricultural sector. These sub-themes were input costs, migration and ageing rural population, low technology and productivity, fragmented and abandoned farmland, weather conditions and climate change, education, small scale farming, non-modern greenhouses, finance problems, and irrigation problems.

Input Costs

In this qualitative analysis, input costs are shown as one of the most crucial issues. Eight out of nine experts emphasized that rising input costs are crucial in determining food prices, especially in the last period. The fact that the inputs depend on imports is one of the most critical structural reasons for Turkish agricultural production, they emphasized. Prices of imported inputs, such as oil prices, have two impacts on food prices: direct and indirect (Nazlioglu & Soytas, 2011, p. 488). The direct effect is that increases in prices of imported inputs affect food prices through production costs. The indirect effect is also that prices of imported input affect food prices through exchange rates. Many experts interviewed claimed that energy, fertilizer, pesticide, and feed become very sensitive to fluctuations in exchange rates.

[1] A city in southern Turkey.
[2] Expo is the third largest organization in the world after the FIFA World Cup and Olympic Games.

'When we look at the production side, we have not been talking so far, but the costs of the inputs have become a fundamental problem. This is mainly because we produce by importing. You import energy. Whether it is oil, diesel, or electricity, it is imported. You import seeds. You import pesticides. You import fertilizer. Agriculture becomes a very fragile sector as you import almost everything except labour. In other words, the movements in the exchange rates, for example, since the beginning of 2018, have affected the costs very strongly, and that has also affected your production.' **(Participant 6, Academic Staff)**

'…what affects our food prices is that we have steady shocks on inputs directly through exchange rates. The story of this is always exchange rates.' **(Participant 1, Academic Staff)**

'You have to use diesel; you get the liter of diesel from 5 liras. You use fertilizers; there is dependence on imports. I do not even need to say the effect of foreign exchange prices. As foreign exchange rates increase, the prices start to fluctuate. You use fertilizers; their prices are very high. You use pesticides; their prices are very high. These are not the inputs that agriculture itself produces and uses (like seeds). These items increase the cost of tomato or wheat.' **(Participant 7, Agricultural Engineer)**

On the other hand, refugees like Syrians and family businesses decrease labour costs, one of them said.

'The big greenhouse producers here say that if Syrians did not come, we would have suffered financially. Labor costs are expensive… There is an exporter friend who has a flower greenhouse here. He says, "I will give up this production, and buy it from producers. I cannot compete with them in terms of labor cost." We need to consider this.' **(Participant 3, Academic Staff)**

Migration and Ageing Rural Population

As in the rest of the world, the majority of Turkish people live in cities. As of 2018, while 44.7 percent of the total population lives in rural areas in the world, only 24.9 percent of the total population lives in rural areas in Turkey. It was 66.4 percent and 68.5 percent in 1960, respectively (The World Bank, 2019). This shows that rural-to-urban migration in Turkey is faster than the rest of the world.

Urbanization is taught as one of the causes of higher food prices by researchers, policymakers, and others (Stage, Stage, & Mcgranahan, 2010). Six out of nine experts

interviewed state that migration and ageing rural population play an essential role in food prices in Turkey.

> 'Go to a typical village of Ankara. What kind of farmer profile will you see when you enter the village? They are 65-70 years old, literate, maybe primary school or middle school graduate. You will not be able to see even the middle school graduate. There is no young person. Nobody wants to work there because of the migration from rural to urban areas. So it is not an attractive sector either. For example, what are the most talented people doing in Turkey? They are either in the financial sector or the information technology (IT) sector. They either work at Telekom or become bankers. They work in the financial sector. They also have the highest university scores. Economics, business, computer engineering, electronics, industrial engineering, or medicine. These are the best departments. They go to these departments. You do not see someone with a high score in any agricultural sector. Therefore, you continue such a vicious circle.' **(Participant 6, Academic Staff)**

> 'I think producer income is of primary importance. If people fail to meet their expectations, they leave. They cut their trees and leave their belongings. One reason to go to the cities is not getting enough income. Rural development in Turkey has been too late. Since the issues are not approached with this understanding, the environment in cities and villages is very different. People migrate to districts which have good environmental standards, and from the district to metropolitan cities. If the district is attractive and sufficient, they may not prefer to go to the big city. Thus, these people do not disconnect themselves from their villages and make some production. They are also people in their 50s and 60s. The average age is a serious problem right now in agriculture. It has reached the age range of 55-60. This is a serious risk. That is why I just said that companies with capital should come and grow the business. We cannot do this business with these people. All of them will be retired after 5 years. Who will produce?' **(Participant 5, Senior Executive)**

According to the experts, farmers are not like farmers as in other countries. They are not productive.

> 'Young people have left the countryside. Older people living in the countryside are a generation that is not an entrepreneur, cannot use technology, and no longer invest in modernization. This is another structural problem.' **(Participant 3, Academic Staff)**

> 'We have demographic trends. There is a really serious return to urban life. These dynamics move people with the potential to produce efficiently on the rural side towards the cities. For this reason, people producing in rural areas are people who could produce a maximum of 4 units with the input of three units. On the other hand, the other outgoing, productive people are people who can produce 7-8 units with that 3 unit input. There is something called 'ability

bias' in classical microeconometrics. For example, I want to examine how much university education has an effect on wages. To do this, I compare the average wages of high school and university education. I find a difference. Then I state that this is the return of the university. No, it is not. Because if the person who went to university did not go to university, she (or he) probably would have remained a high school graduate, she (or he) would get more wage than people as a high school graduate at the moment. Because those people are talented, they pass the university exam. The same story is true for agriculture. Now the remaining people in the countryside, we call them farmers; I do not want to say anything wrong, but unfortunately, they are inefficient people for the urban side. Inefficient people, uneducated people, people who cannot follow innovations. So we have to start an agricultural entrepreneurship move. Actually, we are slowly getting the news. I have friends who are engaged in many agricultural works. Those are people who try to do agriculture efficiently and try to make money. Moreover, they have experienced many of the duties of managers in various sectors, such as the financial sector, the public sector. We need to spread this. Our productive people have to deal with agriculture.' **(Participant 1, Academic Staff)**

Farming is not an attractive and prestigious profession in Turkey, they claimed.

'I went to a meeting on animal husbandry. I was trying to find a suitable word for animal feces to speak politely. A lady working there. She works in the company. She said, "Sir, it is feces." So farmers somehow live with it. Consider an animal stable. The animals defecate there. It also has a smell. If you ask a question to a university graduate or a high school graduate: Would you like to work in this stable with these feces, and this smell? How would you get an answer? I ask everyone this question. Do you want to work in a stable? I do not want to work. You do not want to work either. Your wife will not want to work in such an environment. Know what I mean. It is said that robots will do this job, but there are people who do it. For example, I talked to the general manager of a company. He said we went to England on a farm trip. He said that the owner of the farm came with Jaguar. He wore his boots, then entered the barn and worked, the general manager said. He adopted his job. However, people in Turkey do not adopt it. In other words, everybody wants to see himself (or herself) in the profile of people who travel, walk, have fun, and shop in big cities, as in TV series and movies. They do not want to deal with herbs and animals in a barn or field. So we have to make agriculture attractive.' **(Participant 6, Academic Staff)**

Low Technology and Productivity

Especially as agricultural land and water resources decrease, the growth in agricultural supply mainly results from the increase in agricultural productivity (Alston & Beddow,

2009, p. 1209). According to six out of nine people interviewed, low technology and productivity are the third most important factor affecting food prices in the agriculture sector.

> 'No need to reinvent the wheel. The agriculture sector has similar problems all over the world. There is an aging population; rural to urban immigration is everywhere. Unfortunately, Turkey is producing in a very inefficient manner. They were talking about the numbers on social media for a day or two. Turkey is Europe's largest agricultural producer. That is right. Production is huge in volume, but it is also a disaster in efficiency levels. In other words, we are one of the ten largest producers in the world and the biggest in Europe, but we are at the 28th, 29th, 30th ranks in efficiency levels. It is a very inefficient sector. How will you overcome that inefficiency? The first is science, industry, technology. So, this sector has to do research and development that can compete with other sectors. This does not have to be a robot or artificial intelligence. However, even if it is very simple, we have to use technology there.' **(Participant 6, Academic Staff)**

> 'Animal husbandry in Turkey has low feed conversion efficiency due to the lack of improved breeds. In other words, how much milk does a cow produce from a kg feed? This amount is low in Turkey. This is about technology. The lack of improved breeds means a kind of old technology.' **(Participant 4, Academic Staff)**

> 'We have been planting potatoes in the same area for years, for example, for 40 years now. There is nothing left in the soil anymore; we try to grow crops by force. We try to grow crops by pesticides and fertilizers.' **(Participant 8, President of Foundation)**

Fragmented and Abandoned Farmland

According to Simons (1985), production on fragmented lands is more costly than production on contiguous lands. There are two sources of this: (i) costs of additional land and labour; (ii) some cost-cutting or more efficient techniques are not feasible. As a result, land fragmentation may have some costs by negatively affecting output. This means lower productivity and higher food prices (Shuhao, 2005, p. 19).

In Turkey, total agricultural land, excluding meadows and pastures, decreased by 12 percent in the last 17 years to 23.2 million hectares (TurkStat, 2019A). According to interviewed 5 experts, one issue affecting productivity, costs, and therefore food prices in agricultural enterprises in Turkey, is fragmented and abandoned agricultural areas.

Our land structure is fragmented, so the average amount of land per farmer in Turkey is 5.9 hectares, but development in agriculture starts with at least 15-20 hectares. So, we have to reach these levels. Our state has prepared the legal infrastructure for this. The ministry has prepared a law on the non-division of land. However, their implementation is not so easy due to past problems. Therefore, the fragmentation of land is a significant problem. It is necessary to solve this with land consolidation, laws, and awareness.' **(Participant 2, Senior Executive)**

'We also have a fragmented land structure. It has been divided due to inheritance, and the fields have been turned into construction sites. Our cities are always located on the plains. The plains are our most fertile agricultural areas, and we have opened them to zoning for construction. See the situation of the Elazig[3] plain. Malatya[*] plain is the same. For this reason, the fact that policies regarding land are troublesome and they are not designed as an agriculture priority is the second feature of our agriculture sector.' **(Participant 1, Academic Staff)**

'One of the structural problems is that the business scales are relatively small and not composed of a single parcel of land. In this context, although the land consolidation efforts in Turkey have been carried out for the last 15 years, it has not been completed. There are no statistics at the moment, but 50 percent may have been made. Maybe half is still waiting to be done. **(Participant 3, Academic Staff)**

Weather Conditions and Climate Change

In the last decades, Turkey is adversely affected by changes in rainfall patterns (extreme high and extreme low rains) and temperatures (especially the highest and lowest temperatures per day) (Turkes, 2012). Given the number of changes over the years of extreme weather events reported in Turkey has increased in recent years. It is also stated that it may lead to adverse effects of climate change on agriculture and water resources in Turkey in the 21st century (Kadıoğlu, 2012, pp. 14-17).

Changes in rainfall patterns and temperatures can be beneficial for some crops and in some locations, while in other cases, they may be harmful (Quiggin, 2007, p. 5). Also, harsh weather conditions that affect the cost of agricultural production may increase food prices (Kansas State University, 2019).

[3] A city in eastern Turkey.

Five of the nine experts state that weather conditions and climate change are one of the pivotal factors that affect food prices in Turkey.

> 'There are few products in certain periods of the year, especially in times when sunbathing is low, heavy rainfalls, the cold takes a long time, and wintering is high. We have to take precautions for this.' **(Participant 2, Senior Executive)**

> 'There is a climate change issue. This is a very important fact. Simultaneously, excessive snowfall, extreme icing, and extreme temperatures can hit agriculture all over the world.' **(Participant 3, Academic Staff**)

An expert mentions that global climate change has increased demand for Turkish products.

> 'It becomes very difficult to grow crops. Due to changing climate conditions and changing weather conditions, especially the Iran-Iraq-Syria region in Central Asia cannot produce productively as in the past. Now they import products from Turkey.' **(Participant 8, President of Foundation)**

Education

In the literature, studies examining the impact of education on agricultural productivity started many years ago (Kılıç & Kıymaz, 2014, p. 54). Lockheed et al. (1980) conducted a study examining the findings of 18 studies investigating the relationship between farmer education and farm productivity. They concluded that education generally increases farm productivity. This positive association between education and productivity in the agriculture sector is emphasized by many studies: Ali and Flinn (1989), Bravo-Ureta and Pinheiro (1993); Kalirajan and Flinn (1983); Phillips and Marble (1986).

4 out of 9 interviewees focused on the low level of education in the Turkish agriculture sector. This led to a low level of agricultural productivity.

> 'I say education (as a critical factor affecting food prices in Turkey). Even the Nobel laureate economists say the countries that are the most productive in agriculture are the countries that have the most talented, best educated, and the best-qualified producers. In other words, the more qualified your manufacturer, the healthier the industry. On the other hand, the less qualified your manufacturer is, the more problems you have. I examined a study conducted in Germany.

It surveyed 200 people. There are people with a doctorate degree among them. There are people who are at least university graduates. So they work in the agricultural sector. In addition, I received my Ph.D. from the department of agricultural economics. There were children of farmers in my department. They receive a university education in the field of agriculture. After graduating from university, they return to their family business. So education, education, education. If you provide education in Turkey, it is tough to increase productivity.' **(Participant 6, Academic Staff)**

'The information needs of farmers are not adequately met. We call it an agricultural extension. We have a consultancy service. In agricultural extension service, farmer's problems are conveyed to research institutions or universities. These institutions produce solutions for these problems, transmit them to farmers, and show the innovations and technological developments to farmers. This system does not work well in Turkey. The information flow to agricultural producers cannot be met adequately. Their problems cannot be solved.' **(Participant 3, Academic Staff)**

Small-Scale Farming

It is not clear whether small-scale farming is productive. In a significant part of the literature, small-scale farmers (especially in developing countries in Asia, Latin America, and Africa) are thought to be more productive than large-scale farmers. Many studies provided that as farm size increases, productivity decreases since family labour has higher efficiency than non-family labour (Kirsten & Zyl, 1998, pp. 555-6). On the other hand, some studies illustrate that there is no negative relationship between farm size and productivity (Feder (1985); Gollin (2018))

In our study, there is no consensus among the experts as in the literature. An expert states that small-scale farming (family businesses) has an adverse impact on productivity, while others do not consider it as completely negative. They only state that family businesses operate at less than the optimal scale.

'When you look at the European countries or America, there is an organization or a large company in the industry. There are structures that provide efficiency, direct products to the market, eliminate intermediaries. Even if this company is a single one, there will be a chance to supply it to the market much cheaper because it is a single structure. Turkey should be evolved into this structure, I think. **(Participant 5, Senior Executive)**

'The first thing that comes to my mind is the small scale production. This does not always mean inefficiency. There is high efficiency in some sectors and some product groups. Because these are labor-intensive products. So the scale is not so important.' **(Participant 4, Academic Staff)**

'One of the structural problems is that business scales are relatively small. However, there is an advantage as small businesses are family businesses. Therefore, you can say that we grow the businesses, we can minimize the small businesses. This is very natural. You can apply a policy by giving low-interest loans to businesses over 20 decares. You eliminate the little ones in 5-6 years, but it does not reduce production costs as labor costs increase. Working in the greenhouse requires knowledge. So those small business structures are important to us… Let me give you an example. The scales of livestock holdings in Hungary were 20 in dairy farming before entering the EU. It was under 3 in Poland. When they entered the EU, it was predicted that livestock would develop in Hungary and collapse in Poland. However, the opposite happened after membership. Hungary could not fill its milk quota. On the other hand, Poland has fulfilled its milk quota. Costs decreased as the scale in the Polish livestock industry scaled up to 4-5. Second, labor was cheaper in Poland. It had pastures. The Polish livestock industry turned out to be more competitive. That is, a large scale does not refer to a cost advantage. **(Participant 3, Academic Staff)**

Other Factors in Agriculture Sector

Greenhouse plants have increased worldwide in the last decade, especially for vegetable growing (Castilla & Baeza, 2013, p. 21). Non-modern greenhouse plants are considered to affect productivity and, thus, food prices, according to three experts.

'Greenhouse technologies are not good, either. Greenhouses are made of nylon, and all sides are full of holes. These are not such technological greenhouses. Therefore, prices are rising due to greenhouse-field transitions, seasonality, exacerbation of exports during these periods, and unplanned organization.' **(Participant 1, Academic Staff)**

Furthermore, three interviewees point out that financing problems in agricultural production are another factor affecting food prices.

'Since the scale is so small, it becomes very difficult to get assurance when they apply for a loan to a bank. If they cannot get the official loan from the bank, they will get in an informal way. How? They are going to the merchants, which are mostly gas station owners. Providing credits to manufacturers is the second job of gas station owners in Turkey. Informal loans...

When the farmers are short of money, they get 10 thousand liras from them. Gas station owner or trader, that is, the input supplier who gives pesticides, seeds, and fertilizers says that "I will give you 10 thousand liras, but you will bring me whatever you produce at the end of the season." The producer cannot get what he deserves here because his hopes are broken. In other words, he cannot price his own product 3 liras or 4 liras. Because he has to transfer that product to that merchant in exchange for the debt he received. This is a problem.' **(Participant 6, Academic Staff)**

The other factor is the irrigation problems. Turkey has a total arable area of 28 million hectares, which is 1/3 of the total area. However, as a result of the land surveys carried out, the amount of irrigable land economically has been determined as 8.5 million hectares. Within this area, 5.9 million hectares (69 percent) have presently irrigated. (General Directorate of State Hydraulic Works, 2019). Three experts state that being the non-irrigated area and inefficient irrigation have an impact on food prices in Turkey.

'Irrigation potential is not to be used sufficiently in agriculture. We still have fields that need to be opened for irrigation. Dams need to be built. Existing irrigation systems are not used effectively. Sprinkler and drip irrigation, which are more advanced irrigation methods, are not used sufficiently. Traditional flood irrigation is generally used. One reason for this is the lack of public irrigation investments. The water transmission and distribution system are very old and in the form of open irrigation canals. These waters disappear on the roads by evaporation and leakage. There is no water reaching the farmer's field from a dam. Water resources are not well managed. This is one of the structural problems of agriculture. **(Participant 3, Academic Staff)**

3.3.1.2.1.2. Intermediaries

One of the challenges farmers face is that they do not have much choice on where to sell their crops (Ferreira, Goh, & Valavi, 2017, p. 2). They usually sell their products to middlemen or local markets. Nevertheless, the intermediaries are often accused of exploiting farmers.

The issue of intermediaries in the Turkish agricultural sector is an ongoing debate. Some people, including government executives, blame intermediaries for raising food prices and think they should be removed. On the other hand, some people in the sector share the opinion that intermediaries are necessary for the delivery of food to consumers, but the food chain length is long.

Six of the nine experts interviewed argue that intermediaries play a critical role in determining food prices in the food supply chain.

> 'It is necessary to follow the flow diagram of a product. For example, I am a manufacturer; I must sell this to someone. How will I sell it? There are many ways to do this. One, I can sell it directly. Two, you are a merchant; I will give it to you. The merchant gives it to the second merchant or the wholesaler. There is a different flow diagram for each product. It continues that way. The problem there is this; the number of intermediaries is many. So, in general, this acceptance is true, and the number of intermediaries is many. So, each is a cost item. Everyone sets the price of the final product by putting the profit margin on their own cost.' **(Participant 7, Agricultural Engineer)**

> 'In the past, manufacturers were a little stronger. The scale was smaller. They had more potential to sell directly. Over time, the number of intermediaries has increased with more industrialization of the process. On the other hand, producers have become weaker due to costs and financing. Producers have weakened, while intermediaries have become stronger. The increase in the number of intermediaries and the relative bargaining power of intermediaries may have brought additional profits. It may have accelerated price increases a little more. **(Participant 1, Academic Staff)**

> 'When I look, I see that the intermediaries meddle a little bit in prices. When the producer price drops, they do not immediately decrease their own sales price. Nevertheless, they cannot keep that price high for a year. A maximum of two months… So, they do short term. Because none of them are big. Because they need to bear the cost of inventory for manipulation. They also take the risk of product deterioration in this process. So, they cannot do this for a year. They cannot sustain too much, and they give the product to the market.' **(Participant 4, Academic Staff)**

3.3.1.2.1.3. Retail Markets

One of the sectors in the food production chain is food retailers. The share of supermarkets (large retail stores) are proliferating in developing countries (Minten & Reardon, 2008, p. 480). Rapid urbanization, population growth, and similar factors have affected this growth in both Turkey and the world (PwC, 2016).

According to Arda (2006), there is a difference between developed and developing countries in terms of food prices in supermarkets and small shops. Food prices in supermarkets in developed countries are considerably lower than in neighbourhood markets,

while food prices in supermarkets in developing countries are higher. This is more pronounced in the price of fresh fruits and vegetables.

On the other hand, supermarkets can be potential price leaders. “Price leadership refers to a situation where prices and price changes established by a dominant firm, or a firm are accepted by others as the leader, and which other firms in the industry adopt and follow," the OECD defines (OECD, 2002). As an example, Seaton and Waterson (2013) examine the pricing behaviour of Tesco and Asda in the British supermarket industry and find considerable evidence that leadership exists.

In Turkey, the first five supermarket chains are A101, BİM, ŞOK, Migros, and Ekomini in terms of the total number of branches (Ortakalan, 2019). These dominant firms play the role of price leadership in the industry by preventing price competitiveness, the four experts claim.

> ‘There are intermediaries, but I think the retail side is more important than intermediaries. Especially because of the concentration of 3 or 4 firms in Turkey’s retail sector, it is becoming much more difficult to know what is happening. Now, the president has been stressing them for a couple of weeks or more. “On the retail side, these friends do not make any sacrifices or support.” This is the case all over the world. So, whether you look at Europe, America, or England, retailers really make good money from this business. In the UK, for example, a significant part of the apple production, a significant part of the meat production, a significant part of the bread production is released to the market via retailers. People always do their shopping from retailers. Where is shopping done in Turkey? Now even in the village, chain markets are open. Besides, you can see the same chain stores in the town, every neighbourhood, even next to each other. You can even see 3-4 chain stores side by side. People also shop a lot in these markets. So intermediaries are significant, but I think retailers are more significant in the formation of food prices. I examined a research paper yesterday. The researchers say the same thing in America. “Retailers cause prices to rise strongly.” In America, retailers get the lion’s share. There are around twenty thousand markets in Turkey. Two-thirds belong to A101, Bim, Şok. I also shop at the street market. When I ask about how they determine prices, they say they look at the chain markets. There is a wholesale market price, but if the product is sold for 8 liras at Migros, the seller in the street market does not sell it for 5 liras. For instance, it sells for 7 liras. Well, there is a margin between the chain market and the street market, but he is always watching the chain market. Because the difference in the margins is not too high, either.’ **(Participant 6, Academic Staff)**

‘Although there are very large intermediaries against farmers, most intermediaries are very small against supermarkets. Sütaş is a very large company compared to farmers, but it is also a small company compared to BİM or Migros. So think like an hourglass. There are over a hundred thousand farmers. Then there are intermediaries in a slightly narrower part. There is the narrowest point. Then there are consumers. What is in the narrowest part? I think, there are supermarkets for most products in Turkey. So the most power is in supermarkets… Studies carried out abroad show that what supermarkets do varies from country to country. So there is no clear answer. The results are different, even within Europe. In some countries, supermarkets buy from farmers and intermediaries at a low price and reflect the low price to the consumer. They do not do it in other countries. However, in every country, supermarkets buy goods from farmers and producers at very low prices. **(Participant 4, Academic Staff)**

‘Let me give you an example. What percentage of the total vegetables and fruits produced come to municipal wholesale markets? It is around 25%. Approximately 55% of these fruits and vegetables go directly to big market chains. Market chains buy them directly from the farmers’ field. Where do stall holders buy? For example, a stallholder in Ankara buys it from the Ankara Municipal Market. Where does the seller at the Ankara Municipal Market buy? He buys from a municipal market in Antalya or Mersin. Where does the seller at the Mersin Municipal Market buy? He buys from intermediaries or farmers. So, goods change hands 4-5 times and come to street markets, right? On the other hand, market chains buy directly from the farmers’ field. Which one is expensive? Supermarket. It is necessary to determine this well. **(Participant 2, Senior Executive)**

3.3.1.2.1.4. Transport, Warehouse, and Distribution

After the production phase, food products need to go through some stages, including packaging, storage, distribution, and transportation to urban areas. All these services need to be efficiently provided and managed. Otherwise, the various costs for each of the above stages will be higher than necessary. Also, food losses will increase (Aragrande & Argenti, 2001).

According to four interviewees, inefficient processes in transportation, warehouse, and distribution can lead to higher food prices in Turkey.

‘I can say distribution channels. We have an ineffective transport system that leads to losses. It is a problem.’ **(Participant 5, Senior Executive)**

'Actually, we have 20-25% wastage. We produce 50 million tons of products annually. 12 million 500 thousand tons of this production is wasted. This amount meets the needs of a country of 50 million. However, conditions, environment, shipping difficulties, lack of cold chain, lack of licensed warehouses, lack of modern municipal wholesale markets, and lack of modern packaging facilities in production areas cause this waste.' **(Participant 8, President of Foundation)**

'Wastage rate is high. It varies between 25 percent and 45 percent according to products. Product losses reach significant amounts when collecting, classifying, and transportation.' **(Participant 9, Senior Executive)**

3.3.1.2.1.5. Municipal Wholesale Markets

Although improved efficiency in the food distribution pipeline is the primary purpose of the wholesale markets, the following five functions are expected to be performed by them: (i) physical exchange of product, (ii) classification of products according to standard criteria (weights, measures, and quality), (iii) formation of an equilibrium price for produce, (iv) information exchange between buyers and suppliers; and (v) risk management and hedging against price fluctuation risks (Tollens, 1997, p. 5).

In Turkey, in recent years, the municipal wholesale market has become one of the most hotly debated issues. Two experts consider that municipal wholesale markets in Turkey do not work effectively.

'They always say that the municipal wholesale markets do not work very effectively; there are even mafia-like structures in some. These are sources of trouble. They are not written everywhere, but we know more or less between us that it occurs. For example, a manufacturer that enters a municipal wholesale market has its own right to sell. At least a certain amount of area should be reserved for the producer. That place cannot be reserved. Even if the place is reserved, the producer is sent. The producer-side is restricted in entering the municipal wholesale market. These are always due to ineffective structures.' **(Participant 5, Senior Executive)**

'There are approximately 180 municipal wholesale markets in Turkey. They are very local, and the transaction volume of the market is shallow. So, I think this may affect food prices. In more central locations in the middle of cities, there may be markets with much better infrastructure. In the current markets, the infrastructure is fragile. No cold storage, no forklift facilities... Since there are no plastic or wooden crates facilities, 10-15 percent additional waste occurs depending on the product type. Apricot, tomato, is smashed directly. Because there is no

cold storage. Even if vegetables come to the market from the truck with a cold air system, they deteriorate within two days. From there, they are put on another truck with a cold air system, but the products come out of the cold chain in the meantime.' **(Participant 1, Academic Staff)**

3.3.1.2.2. Lack of Agricultural Planning

Crop planning (or farm planning, or agricultural planning) is considered as an effective tool in the use of scarce agricultural resources such as land, labour. However, farmers in Turkey make production decisions based on their intuitions and their past experiences (Isin & Miran, 2005). Many factors can explain this situation. One of them can be the characteristics of the farmers.

Isin and Miran (2005) conducted a survey with 120 farmers in two provinces of Turkey (Manisa and Izmir) throughout 1998-99 to investigate the impact of socio-economic factors on farmers' attitudes toward crop planning by experts. Eighty-seven out of the 120 farmers accepted the guidance of experts in crop planning, although thirty-three farmers did not accept it. The general characteristics of the farmers who accepted crop planning were younger, more educated, and less experienced than others in agriculture. Also, the farmers who did not accept crop planning stated that they did not need such guidance and that they prepared their own crop plans based on their past experiences.

In our study, seven experts out of nine mainly point out that the authority (such as ministry or food committee) does not lead the sector. They complain about the lack of agricultural planning.

'The Ministry of Agriculture does not have agricultural policy planning for the sector of fruits and vegetables in Turkey. This leads to excessive increases and decreases in food prices at the end of the season, in transition phases of seasons, in bad weather conditions or the selection of a wrong seed or pesticide.' **(Participant 8, President of Foundation)**

'I need to know how much wheat do I need per year, how much wheat can I produce per year? Is the difference between my annual production and annual consumption negative or positive? If it is negative, I must import it; if it is positive, I will export the rest or use it in another way.' **(Participant 7, Agricultural Engineer)**.

In addition, some experts emphasize the lack of stock management as well as the lack of agricultural planning.

> ‘Agricultural planning is already under discussion, but there are other things. For example, stock management for grain is carried out. Because grains are something that can be stocked, but tomatoes cannot be stocked. They do not even have a 10-day life. In this context, imports play a critical role. For instance, if the data you have obtained is good, you know precisely the wheat yield of that year. Also, you know the demand. So you know the market price. Therefore, you need to import some wheat. For example, if that year is a bad year in terms of production, there may be 2 million tons of supply deficit. What should you do? You should make contacts for import now. After 9 months, when wheat is completely consumed in September, you will need to find imported wheat. Make your connection now. Won't you need it? You cannot receive the product. This is just a connection. This is stock management. If you do not import wheat in time, the price of bread increases immediately. If you try to import the wheat at that time, it will come two months later. It comes from the port of Crimea, Ukraine, by ship. It takes 20 days for the good to arrive at the port. Then, it arrives at a port in Turkey. Of course, since the price has increased, the mafia wants to buy it. Not everyone can import. One company can import. The company gives the wheat what it wants. Since these are unplanned, we cannot manage stock either. **(Participant 1, Academic Staff)**

> ‘It should be monitored how much goods enter warehouses and how much goods come out of the warehouses every month. The Ministry of Trade says it monitors them via a system. It cannot monitor. This must be monitored by the agriculture ministry. Because if we know how much product has entered the warehouse during the harvesting period, and know how much demand there is every month, we can predict whether that year's production will meet our needs. So we can take our precautions according to the situation. When the product is abundant, we need to take measures to support exports so that the price does not decrease. The important thing is price stability. **(Participant 3, Academic Staff)**

Six experts mention that agricultural planning and stock management cannot be done due to the problems in agricultural data in Turkey.

> ‘The animal population is also unclear. The numbers are not clear. Actually, the main problem is the lack of data. You cannot manage when there is no data in agriculture. I think livestock data is also included. Crop production data can be a little better, but there are distorted numbers in livestock data. Some numbers are not well-monitored.’ **(Participant 5, Senior Executive)**

'The ministry of agriculture is the ministry that should make the most of technologies such as big data, machine learning, and artificial intelligence. Because it has great data sources such as meteorology, soil, precipitation, or crop. However, there is not even a bit of data. This is the case, unfortunately. In addition, we see the apple and pear as almost a single product. There is a problem if you consider cocktail tomatoes, tomatoes of Ayaş, and standard tomatoes of Antalya as the same tomatoes. Their markets are different. There is no measurement. We do not know the supply. We do not know anything about who produces what and where. Since the measurement side is not clear, what do we see as inflation, and what are we talking about? This issue should be seriously discussed. TURKSTAT and the Ministry of Agriculture need to invest heavily in this business. For instance, there are European Commission classifications in Europe. I am not exaggerating, but there are 60 different eggs. The commission classified them according to their colour and size. They can follow the market over 60 products. When we say eggs, one kind comes to mind.' **(Participant 1, Academic Staff)**

'Agricultural sector is the sector where has the highest informality in Turkey. Informality in all sectors in Turkey is very high, but the agriculture sector has the highest level of informality.' **(Participant 6, Academic Staff)**

'With the Municipal wholesale markets registration system (Hal Kayıt Sistemi), illegal sales outside wholesale markets increased, that is the point… After the registration system is activated, you only register products you purchased on the system, these products appear to be registered in the system of the Ministry of Trade. The record on the system looks like the following: "the trader named Ahmet received 25 tons of tomatoes from Antalya for 0.5 liras with the document numbered". He actually bought the tomato for 5 liras, but it seems that he bought it for 0.5 liras. He tries the lowest price in the system and enters it. However, there is no requirement for an official document related to this. A waybill arrangement is required, a price must be written there, and it must be checked at city entrances and exits. Since the Ministry of Trade said we recorded everything, the Ministry of Treasury and Finance lifted the financial controls at the entrance of the cities. So, traders have begun to trade undocumented way to every part of Turkey.' **(Participant 8, President of Foundation)**

3.3.1.2.3. Lack of Farmers' Organizations

As a farmer's organization, cooperatives have some advantages for the agriculture sector. They can reduce transaction costs by distributing inputs or credits, aggregating crops, coordinating transport, and increasing bargaining power (COMCEC, 2017, p. 21). At the same time, they can contribute to the reduction of inflationary trends created by speculative traders and provide a continuous supply of food (ILO, 2001).

The lack of farmers' organizations is regarded as one of the determinants of the food prices in Turkey by seven out of nine experts.

> 'On the organization side, we cannot develop a producer organization. We have very good examples such as Tar-iş or Tire cooperative or Marmara Union, but their number does not exceed 10. Therefore, we have serious problems in farmers' organizations. We must somehow build a producer organization system in agriculture. While trying to do this, we put a spanner in the works. We encourage cooperative organizations, but we also prevent producer associations from marketing. A producer union is established as a producer union, but the producer union cannot sell products. We already have problems in cooperatives, we bring producers' associations as an alternative, but we also prevent them from functioning effectively. Looking at the European Union today, 90% of marketing functions in some agricultural or food products are carried out by cooperatives. 60-80-90% on some products… Most of them are in the form of producer unions, and a cooperative is a kind of producer union, but the mechanism of a cooperative and a producer union is different. Producer unions or cooperatives function effectively in the EU. Turkey cannot build an effective organization system.' **(Participant 7, Agricultural Engineer)**

3.3.1.2.4. The Challenges of Agricultural Policies

The private sector has some limitations to raise agricultural productivity and to modernize the agricultural sector. Difficulties such as high transaction costs or poor infrastructure limit the functioning of the private sector. Thus, the importance of government intervention in the agricultural sector is recognized by all governments around the world (COMCEC, 2017, p. 1). However, the entire agricultural policy in Turkey is criticized by six experts and is seen as one of the determinants of food prices.

> 'We are not able to manage the entire agricultural policy. With rural to urban migration, the average human capital of the farmer fell. The better of the farmers always come to the city. In parallel with this, unfortunately, there are serious decreases in human capital in agriculture-related policies and institutions. For instance, the Ministry of Agriculture and the Ministry of Forestry have merged, and now it has become one huge institution with 150,000 employees. It cannot manage itself. People spend all their efforts on internal correspondence and similar work. The ministry is self-governing. They do not have the energy to look outside. Everything is done gropingly. There is no data. There is no crop estimate. Their capacity to utilize information technologies is zero. They did a project called TARBiL (Agricultural Monitoring and Information System). Millions of dollars spent. This project changed 4-5 ministers. They poured money into companies. There is no such thing as TARBİL now. They cancelled. Let me tell you that at least 200-300 million dollars were spent on this project.' **(Participant 1, Academic Staff)**

‘There are also some problems in the policy-making process. Unfortunately, the public administration does not work very effectively. The policies it produces are also not very effective. They are not long-term, always short-term. Policies change when the minister changes. Ministries are restructured.’ **(Participant 6, Academic Staff)**

‘While giving agricultural subsidies for tomatoes, it is given to standard tomatoes. It is not given to a local seed. I do not know why, but we try to destroy local seeds. Every region has such beautiful tomatoes. There are green tomatoes, pink tomatoes, and fragrant tomatoes. Unfortunately, the agriculture ministry is trying to standardize. Producers ask, for example, what seed should we plant? The ministry proposes a standard tomato seed. It does not even give agricultural subsidies if you do not plant it. There are stories like this. Naturally, the added value goes to zero.’ **(Participant 1, Academic Staff)**

3.3.1.2.5. Imperfect Competiton

The concept of competition has an essential role in economics. Perfect competition, which is the opposite of a monopoly, is considered an ideal market type. Economists generally give the agriculture sector as an example of perfect competition (Sykuta, 2013). However, six experts mentioned that there is a failure in competition at almost every stage of the food supply chain in Turkey. In other words, they stated that the price leadership issue mentioned above in the retail industry is valid in the Turkish food system.

‘In the agriculture sector, producers face monopolies and oligopolies while receiving inputs. Also, when selling their products, they often face local oligopolies and local monopolies. This is not always true; it depends on the location and product.’ **(Participant 3, Academic Staff)**

‘…For example, we can give the example of livestock. I researched it before. The people we call cattle dealer, while bringing animals from east to west, can significantly increase prices. These are not too many people. In addition, intermediaries in the fruit and vegetable market can set very high prices over their costs. This is the price leadership issue. For example, if the supply of a product is low and its price increases by 2 liras, it may increase by 3 liras under the influence of these people. They can cause some increasing effects. Therefore, it is important to reduce the number of intermediaries. Even if one of them does not, the other does this manipulation. **(Participant 5, Senior Executive)**

‘There is also a system amongst traders with no municipal to restrict their activities that they set up to increase the price in the market by placing hundreds of thousands of tons of goods

into the warehouse. Let me give an example of this. 4-5 large companies are engaged in potatoes and onion businesses in Turkey. I also told about them to the ministry. Each of these companies places fifty thousand or one hundred thousand tons of products in the warehouse, and it costs 1 TL/kg. Then, by giving 3 TL/kg to the small producers in that region, they buy 5 tons, 7 tons, or 10 tons of goods each. Look, the market price is automatically 3 TL/kg. All the producers there do not want to give their goods down at this price and do not. They say the market price is 3 liras. In doing so, traders launch one hundred thousand tons of goods, which cost 1 lira, from 2.25 to 3 liras. Until they sell all the goods in the warehouse, villagers cannot sell their goods. Because they cannot sell their goods for 3 liras. That is, traders are raising the market price.' **(Participant 8, President of Foundation)**

'Another problem is that in some regions, buyers of products have become monopolized. For instance, in some regions of Antalya, one or two people buy all tomatoes grown. In this case, small producers cannot offer these people to sell their tomatoes for 3 liras or 4 liras. They have to sell their products at whatever price these buyers give. Because there are no other people to sell.' **(Participant 6, Academic Staff)**

'We know mafia-like structures in flour transportation. When they come together in their wholesale markets, they immediately act like mafia-type groups. We know the regional truck mafia very well, especially in the food chain. There are many flour producers in Central Anatolia, for example, in Aksaray and Kırşehir. Truck mafia groups destroy producers and factories there. They say you have to transport your products with their truck. They charge 500 liras while the market value is 200 liras. They allow neither flour factories nor flour producers to transport with their truck. There are such things.' **(Participant 1, Academic Staff)**

3.3.2. Demand-Side Food Price Determinants

In 2006-08 global food prices crisis, demand-side factors such as rising demand for biofuels, and the change in food consumption patterns in fast-growing developing countries like China and India were closely linked to soaring food prices (see the LITERATURE REVIEW for details). Although the experts interviewed primarily focused on supply-side factors as the most important determinants of food prices in Turkey, demand-side factors are mentioned as important. According to these experts, export, changes in food preferences, population growth, income growth, tourism, and food waste are the main demand-side factors driving the food prices in Turkey.

3.3.2.1. Export

Although food-exporting countries implemented export restrictions to prevent the domestic food price increases from 2007 to 2011, the results of these practices were not successful in limiting rising domestic food prices (FAO, 2017). In the literature, the effects of these export restrictions on changes in food prices vary depending on where it is applied and on which product it applies (Deuss, 2017, pp. 7-8).

The five experts interviewed state that export has a role in the food prices in Turkey.

> 'There is also an unexpected export on the demand side. Every now and then, an unexpected demand is coming from a country. As the prices are higher, we immediately turn to exports. We do not take into account what price is, what supply is. I think that if the increasing export in those periods raises the prices seriously, precautions should be taken there. From time to time, exports cause the prices to go up in the country. Sometimes the price of chicken meat or eggs rises in a week. Why? Egg demand is coming from Iran. There is a demand for chicken meat from Iraq. You export it, but this increases the domestic market price. It causes food inflation.' **(Participant 3, Academic Staff)**

3.3.2.2. Changes in Food Preferences and Growth in Income

Faster growing income in countries like China and India was also mentioned as one of the causes of the global 2006-08 food price crisis by researchers (Timmer, 2008; Gilbert, 2010; Hochman et al. 2011). Growing income can be effective on food prices by increasing food demand. It can also shift the food preferences (Muhammad, D'Souza, Meade, Micha, & Mozaffarian, 2017).

According to the International Monetary Fund (IMF) database, gross domestic product (GDP) per capita has more than doubled over the last two decades in Turkey. Also, this increase corresponds to almost a triple in terms of purchasing power parity (IMF, 2019). This shows that the purchasing power of Turkish citizens has increased in recent periods.

Five experts interviewed mentioned that the changes in Turkish consumers' preferences for food led to changes in food demand and food prices, especially for red meat. Moreover, three experts also highlight the increase in income as a demand-side factor affecting the food prices.

'Different habits form in Turkish society. For example, the restaurant habit did not exist before. Nobody would go. Now a restaurant culture has started to settle. Various demands began to develop for different types of products. As an example, we can give beef. While the taste of our society was prone to lamb, we are now consuming more beef. In the past, our consumption was 70 percent lamb, 30 percent beef. Now, this has changed to 90 percent beef and 10 percent lamb. So there are some dynamics on the demand side. We are not a cattle-breeding country. When demand shifts to beef, naturally, cattle deficit starts to emerge. For example, there is the Unity Project in Agriculture on the agenda. In this regard, we are now subsidizing lamb. However, lamb is not demanded. For instance, my wife does not eat lamb. She says it smells bad.' **(Participant 1, Academic Staff)**

'Household income increases in Turkey. Income for all income groups increases. In my work on poverty, I see that income increases in all groups. In fact, the rate of increase in the income of the lowest group is higher than the others. The increase in the income of an academic like me does not change the demand for food. I can eat what I want. However, increasing the income of lower-income groups changes food demand. Food demand increases.' **(Participant 4, Academic Staff)**

3.3.2.3. Population Growth and Tourism

The literature refers to Thomas Robert Malthus (1798) for the best-known explanation examining the relationship between population growth and food supply. According to his view, population growth always tends to exceed food supply (MacRae, 2019). This pessimism (called Malthusian pessimism) has not been justified by history (Sen & Sen, 1982, p. 448). Worldwide, food production has met food demand (Sadik, 1991, p. 2).

In Turkey, the population has reached from 71.5 million to 82 million people in the last decade (Turkstat, 2019B). In addition, Turkey hosted the largest number of refugees worldwide, with 3.7 million people (UNHCR, 2018). This number was negligible (14 thousand people) in 2011, when the Syrian civil war began (UNHCR, 2011).

Furthermore, the number of tourists visiting Turkey increased by 22 percent to 46 million in 2018, and thus Turkey became the sixth most visited country in the world (World Tourism Organization, 2019, p. 9).

In this context, population growth (by four experts) and the increasing number of tourists (by three experts) are shown as the demand-side factors affecting food prices in Turkey by experts interviewed.

> 'Other factors which influence demand for food are tourism and Syrian refugees. These should be taken into consideration. In fact, one of the reasons why these price shocks suddenly increased after 2010 is the increase in the number of people. Maybe we could not pay regard the increase in these demands.' **(Participant 5, Senior Executive)**

> 'The population side is not spoken too much, but it is important. Our population is growing steadily. There are also Syrian refugees, Iraqis, and Afghans. In addition to our population, more than 4 million people as refugees or immigrants from these countries are putting pressure on the demand side. That is, this is one of the reasons for the increase in prices.' **(Participant 6, Academic Staff)**

> 'Another determining factor on the demand side is tourism. The number of tourists visiting our country is increasing every year. This increases the demand for food.' **(Participant 9, Senior Executive)**

3.3.2.4. Food Waste

Roughly one-third of all food is lost or wasted every year in the world (FAO, 2019). Food waste is a problem in Turkey as well as a problem all over the world. Turkish consumers throw 26 million tons of food out of 115 million tons of food produced every year (Federation of Food & Drink Industry Associations of Turkey, 2018).

Two out of nine experts draw attention to food waste due to its impact on food prices.

> 'There is unnecessary consumption. People buy apples, onions, potatoes, or other foods, put them in the kitchen cabinet, rot, and throw it away. Consumer awareness should be increased. They should buy as much as needed. Campaigns frequently implemented by supermarkets lead consumers to act irrationally. For example, "buy one, get one free,"; "buy 3, pay 2,"; "buy 1, get 1 50% off". I think such campaigns have an impact on food waste. The international literature supports my view.' **(Participant 3, Academic Staff)**

3.4. Concluding Remarks

Food prices in Turkey dramatically increased in 2018. While the food price inflation was 9.8 percent on average between 2008 and 2017, it reached about 30 percent on an annual basis in October 2018. This chapter aims to determine the drivers of food prices in Turkey by using qualitative data analysis. Nine experts are interviewed, and the data obtained in the interviews are analysed with NVivo 12, a qualitative data analysis software.

Previewing results, we find that the input costs in the agricultural sector have a leading role in food prices because many agricultural inputs are imported from abroad. The depreciation of the Turkish Lira in the last period has caused an increase in production costs and food prices.

Migration and aging rural population, low productivity, and agricultural education are considered as remarkable sources of food price increases. Finance problems cause unofficial solutions that harm producers. Moreover, other problems in the food supply chain (the number of intermediaries, inefficiency in municipal wholesale markets, or low competition in retail markets) have a considerable effect on the food prices.

Most strikingly, 7 out of 9 experts emphasize the lack of agricultural planning. Ministry of Agriculture and Forestry is unable to design the sector and establish the supply-demand balance. Also, there are crucial problems with agricultural data. When the data is not sufficient and accurate, it is difficult to manage the entire industry. Agricultural policies generally do not meet the expectations of the experts. Import decisions harm the farmer and the domestic production in the long run, as the producers have not earned enough to continue production. Moreover, agricultural supports cannot lead the industry.

Even though the supply-side drivers are more decisive, the demand-side factors have an impact on food prices. Exports, changes in food preferences, growth in income, population growth, and tourism are factors influencing food prices in Turkey.

The study presents the following policy suggestions based on the qualitative analysis given in this chapter:

1. Since the problems in the agriculture and food sectors in Turkey are mostly structural problems, the solutions should be long-term. However, short-time solutions such as import can be used due to the high sensitivity of agriculture to weather conditions. Great care must be taken when making import decisions. These decisions should not discourage Turkish farmers from production.

> 'We need about 20 years. We cannot solve our problems from today to tomorrow… I am also worried about the abolition of the ministry. It would be wrong to ignore the existing know-how in the Ministry of Agriculture as it could not do its business. The ministry needs to be modernized with fine-tuning and over time.' **(Participant 1, Academic Staff)**

> 'There may be short-term solutions. An early warning system can be constructed, especially for some products. For example, when the onion prices are likely to increase, an intervention can be made. Why do onion intermediaries manipulate onion prices? Because they predicted that the price of onion would rise. How did they predict? Because at the time of harvest, onion growing fields in Ankara were flooded. If intermediaries can predict, you can too. In such cases, we can take measures before onion prices increase instead of allowing imports after prices increase. So, you can take short-term measures in addition to long-term measures.

2. Agricultural planning and stock management should be done effectively. Also, a model suggestion applied in many countries is presented below.

> 'The model of agricultural observatory in Spain is necessary to adapt to Turkey. These developments in the world started after the world food crisis in 2007-2008. These studies were carried out at the European Union level, at the level of the United Nations and in many countries. However, the Spanish started this system in 2001. It works very well. … Technical studies are carried out in the lower ranks of an agricultural observatory. Reports are being prepared. Decision-makers listen to presentations and make decisions. Such an observatory model needs to be established within the ministry of agriculture. The Ministry should examine the system in Spain and establish it in Turkey… The system in Spain works as follows. Experts identify 34 products that contribute to inflation. They monitor their prices on three levels. First, what are the producer prices of these products? Or what are import prices if they are imported products? Second, what are wholesale prices? Third, what are retail prices? They monitor these prices weekly. Then they calculate the profit margins of 40 products step by step. What are the producers' costs and profits? Then what is the cost of this product to the manufacturer, and what is the profit? Then they calculate costs and profits for wholesalers and retailers. They calculate transparently. Experts of the observatory are preparing in advance. They send their questionnaires. These are done in a transparent and scientific way. Answers are being consolidated. Then regular meetings are held. So if there is a sudden increase in a price in the value chain, they are seeking answers to the

following questions: Who is responsible? What is the reason? This not only creates a more effective value chain but also supports the emergence of a more fair and transparent value chain. In this sense, it is a very useful and effective system.' **(Participant 3, Academic Staff)**

3. Policies to reduce agricultural input costs should be developed.

4. Land consolidation and irrigation efforts should be accelerated.

5. Strategies should be developed to increase the education level of farmers. In addition, educated people should be encouraged to agricultural production. An expert emphasizes the importance of "Agricultural Demonstration":

> 'There is a basic principle in the sociology of the village. I share this from time to time. Farmers and producers do not believe in anything they do not see except Allah. If you say, "I found a productive type of wheat, I found a productive type of barley," farmers do not listen to you. However, if you rent a part of farmers' land, and try there for a year or two years, and show farmers how efficient that barley type or wheat type, then farmers listen to you. Do you know what the reason for this is? Look, farmers cannot go on an adventure. Imagine that you are a farmer, someone comes to you and says that this type of wheat gives more yield. It takes a year to harvest it and earn money. A farmer does not easily take a yearly risk; this is not a daily risk. So, it is essential for farmers to see and experience.' **(Participant 2, Senior Executive)**

6. The system of agricultural supports should be revised, and efficiency analysis of these supports should be done.

> 'Impact assessment of the agricultural supports should be done. Significant agricultural support is provided in Turkey. How much of these transforms into production and productivity? These subsidies should be monitored after they are given. According to the result, it is important to re-evaluate agricultural supports.' **(Participant 9, Senior Executive)**

> 'The ministry should support producers as much as they produce and should not provide agricultural subsidy without producing. The grant should not be given to those who do not produce. Area-based agricultural subsidies should not be given. Do you know what is done with support? They change their car or buy a house. Production-based incentives should be given. You should reward them for producing.' **(Participant 8, President of Foundation)**

7. Agricultural statistics should be improved. Also, informality in the agricultural sector

should be prevented.

8. Product-based policies should be developed by evaluating all relevant sectors and products.

'There should be a shorter, fairer, more effective, and more collaborative value chain for each product. For instance, the value chain of hazelnut, value chain of tea, value chain of pistachios, value chain of olive oil, dairy value chain, meat value chain. In these value chains based on collaboration and increasing effectiveness, we need value chain models that consider producers, manufacturers, input suppliers, wholesalers, and retailers together. We cannot achieve this through law or policy. Because tea is different, hazelnut is different, sunflower is different, and olive oil is different.' **(Participant 3, Academic Staff)**

'I divide the products into 3 categories. The first is strategic products for the world such as cotton, wheat, and eggs. Products in this category are strategic for every country such as Africa, South America, Turkey. The second is strategic products for the country. They are also products that the country has an advantage over the world. What are the products that we have an advantage in the world? Hazelnut, apricot, fig, cherry. Turkey is a world leader in the production of these products. The third is strategic products for the region. These products change. For example, now there is an embargo in Iran, right? Iran has trouble accessing basic food. Therefore, strategic products on a regional basis vary for Turkey. So, you have to grow these important strategic products.

'We have trees that produce about 3 million tons of apples a year. This amount can sometimes decrease to 2.5 million tons, or increase 4 million tons. However, apples are produced all over the world. After two years, we will not be able to export them anywhere. Russia produces apples in Azerbaijan with less cost from Turkey in terms of land, electricity, water. At the same time, Russia grows apples in its own country. Therefore, we should not encourage the production of apples in Turkey. The products that we can gain an advantage in the world are products such as tomatoes, carrots, potatoes, onions, grapes, apricots, and cherries. We should produce these products, not apples, citrus fruits… It is necessary to encourage the production of products that we need or are competitive (such as grapes) instead of products that are surplus and not competitive (such as apples).' **(Participant 8, President of Foundation)**

'There are few products in certain periods of the year, especially in times when sunbathing is low, heavy rainfalls, the cold takes a long time, and wintering is high. We have to take precautions for this. Therefore, we should create alternative fields of cultivation in order not to limit the production within a specific area. This enables us to relocate the production to alternative regions in case of extreme weather conditions like heavy rainfall.' **(Participant 2, Senior Executive)**

9. Cooperatives and producer organizations should be expanded in harmony with the urban sociology, the lifestyle of the producer, and the expectations of the producer.

> 'We need to find the right cooperative modeling that suits farmers' lifestyle and rural sociology. We must struggle to find it. If we find that, the problem is over. What is the biggest cooperative in the world now? It is a cooperative named Zenkyoren in Japan. They have an annual turnover of about 45 billion dollars. It is a cooperative fully compatible with Japanese culture and lifestyle, and is successful. From a commercial perspective, it focuses on sales and profit, not production. Germany is the EU's most successful country in terms of cooperatives, right? They are developing a model that suits them. We should do it too. The Agricultural Credit Cooperatives of Turkey is currently doing new works. We have successful models. There is a dairy cooperative in Tire. There is a cooperative named Torku in Konya. There is a sugar cooperative in Kayseri. Since the declaration of the Republic, we will examine our successful examples and say that this is the right model.' **(Participant 2, Senior Executive)**

10. Proposal for a new model of municipality markets and producer organizations:

> 'There should be 30-40 hub in Turkey. Each of these should serve several cities. It should be in accessible areas. Trucks should have easy entry and exit. Their land should be wide. Its infrastructure should be excellent. Producer organisations should also own a shop here. They should get a share from here. Thus, they have sustainability. Perhaps logistics should be done through organisations. The products come to the producers' organisations first. Then the producer organisations sell from there. That is the only way to create a sustainable and permanent incentive. However, the ministry of agriculture and the state must monitor these producer organizations. If not, structures like mafia will reappear.' **(Participant 1, Academic Staff)**

11. The number of greengrocers should be expanded to increase competition in the retail industry:

> 'Greengrocers should become prevalent. Because product loss and cost are lower. Since products are bought from municipal wholesale markets, it is also easy to monitor. Moreover, it increases competition.' **(Participant 8, President of Foundation)**

12. Efforts to rent agricultural land abroad can be continued after an effective evaluation of agricultural areas within the country. These efforts should not harm domestic producers. These should be carried out within the framework of an agricultural plan.

'As of August 2018, China bought a total of 55 billion dollars of land from Africa. The United Arab Emirates bought 1 million hectares of land from Sudan. Qatar bought 1 million hectares of land. Saudi Arabia, I do not remember the amount, bought land. India bought land. America bought land. Countries implement this policy. There is another example from Ukraine. Currently, one-third of the Ukrainian land is rented by European countries and cultivated. This is a method that the world uses. We have such an effort. Some people criticize it as follows: "Even though you do not use your own land, you rent land from other countries." If we do not considerably benefit from our own land, that criticism is correct. However, we should both make use of our land and rent it from other countries. **(Participant 2, Senior Executive)**

'There is a demand-driven change in the composition of food consumption. Production capacity is not sufficient to meet this change. What can be done about it? For instance, it leads to options like meat imports. We need effective solutions to this. You might build your own cattle farms in other countries with large pastures. Our big companies can rent land in these countries. They can breed cattle. It would be a strategic solution that they would ensure a steady supply of livestock with a lower cost to Turkey.' **(Participant 1, Academic Staff)**

13. The number of modern greenhouses should be increased, and existing greenhouses should be modernized.

'We do not have professional greenhouses. The Ministry of Agriculture should make a program related to this, determine where tomato should grow and make new greenhouses. We believe that incentives should be given to them; that is what it should be.' **(Participant 8, President of Foundation)**

14. The use of technologies that increase productivity should be expanded by protecting small family businesses.

'I am in favour of gradually growing and modernizing small business structures. It allows the scale to grow. However, this does not mean that we have completely increased the size of the greenhouses above 20 decares and eliminated the small ones. Dual market structure has already formed in greenhouse cultivation. There are a few large businesses. Others are too small. Most of them are greenhouses with old technology. On the one hand, we should modernize the infrastructure of our greenhouses. We should enlarge the scales. On the other hand, we should protect family businesses, medium-sized businesses.' **(Participant 3, Academic Staff)**

In brief, this analysis, which confirms the results of previous studies for Turkey, extends the existing literature by using the qualitative data analysis method. Also, it provides

specific policy recommendations. These suggestions can lead to low food price inflation and thus eliminate the adverse impacts of high food price increases on the economy and society.

4. THE IMPACT of AGRICULTURAL INPUT COSTS on FOOD PRICES in TURKEY

In the first essay, the qualitative method concludes that supply-side factors are the most important factor explaining the food prices in Turkey, especially input costs depending on imports. This chapter examines the linkage between agricultural input prices and food prices in Turkey by using quantitative method approaches with the monthly data spanning from 2015-M1 to 2020-M1. To this end, a cointegration analysis is performed using the autoregressive-distributed lag (ARDL) Bounds Test approach and Maki (2012) cointegration test with structural breaks. Additionally, the fully modified ordinary least square (FMOLS), dynamic ordinary least squares (DOLS), and canonical cointegrating regression (CCR) are applied to verify the results of the ARDL approach. The analysis demonstrates a significant, long-running relationship between agricultural input prices and food prices in Turkey. The long-run agricultural input price elasticities are found to be in the range of 1.30-1.36.

This present study contributes to the existing literature in three ways. First, the study is unique to explore the role of agricultural input costs on food prices using the agricultural input price index data published for the first time in March 2020 by TurkStat (Turkish Statistical Institute). Second, we provide robust results by using various estimation techniques. Finally, the study finding the long-running relationship between the variables states that retail food prices increase more than agricultural input prices in Turkey.

4.1. Data Model Specification and Methods

4.1.1. Data

The monthly data employed in this study consists of agricultural input price index (AIP) and food and non-alcoholic beverages price index in consumer prices index (FP). Both data were extracted from the Turkish Statistical Institute (TurkStat) from January 2015 to January 2020. The variables were used in logarithmic form and seasonally adjusted with the X-13 ARIMA method developed by the U.S. Bureau of the Census.

The Agricultural Input Price Index with the base year 2015 = 100 was published for the first time by TurkStat in March 2020. Prior to this index, there was no index that shows input prices paid by farmers. This index measured by the Laspeyres formula was prepared according to Eurostat's methodology and regulations and is also suitable for international comparisons.

The Agricultural Input Price Index consists of the goods and services (diesel, electricity, fertilizers, pesticides, animal feedingstuffs etc.) purchased by farmers for use in agricultural production and the goods and services that contribute to agricultural investment (tractors, agricultural equipment, farm buildings (non-residential), etc.). On the other hand, wage and labor costs, rent, interest payment, and land purchase are not included in the index.

In this context, the study is presumably the first to employ the Agricultural Input Price Index. Therefore, the results of this study can be expected to make significant contributions to the related literature.

4.1.2. Model Specification

This study aims to investigate the impact of agricultural input costs on food prices in Turkey. For this aim, the study estimates the bivariate framework, as expressed in equation (1).

$$lnFP_t = \alpha_0 + \alpha_1 lnAIP_t + \varepsilon_t \quad (1)$$

where ln denotes the natural logarithm of the variables. FP represents the food prices, AIP is the agricultural input prices, and ε_t represents the equation's white noise error term. According to the existing literature, the expected sign of α_1 is positive.

4.1.3. Methods

A time-series analysis usually begins with unit root tests to investigate the variables' order of integration. Unit root tests that do not take into account structural breaks, such as Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP), are usually used in empirical studies. However, conducting these traditional unit root tests, which do not take into account structural breaks, may cause the loss of their power to determine the order of integration of

variables in the presence of structural breaks in time series (Perron, 1989). Looking at the Turkish economy's development, we can conclude that potential structural breaks occurred in the period 2015-2020. Some examples to those structural breaks include failed coup attempt on July 15, 2016; tensions between Turkey and the United States because of military operations in Syria, detained American pastor in Turkey, Turkey's purchase of the S-400 weapons system developed by Russia, and accusing Turkey's Halkbank to violate U.S. sanctions against Iran; the threat of terrorism; 2017 Turkish constitutional referendum and new government system; and so on. Therefore, this study used the Kapetanios (2005) unit root test, which allows up to five structural breaks. Another advantage of the Kapetanios unit root test is that it determines the breakpoints endogenously.

The study examines the cointegration relationship between the variables by using the ARDL Bounds Test developed by Pesaran et al. (Pesaran, Shin, & Smith, 2001). However, the test does not determine the breakpoints endogenously, and we do not have a priori information about the number of structural breaks. Therefore, we used the Maki (2012) cointegration test allowing for an unknown number of breaks to determine breakpoints endogenously and to check the result of the ARDL Bounds Test.

In the Maki (2012) cointegration test, t statistics are calculated for all possible periods of the breakpoint in a time series. The minimum t-statistic determines the first breakpoint. Then, the test applies the estimated first breakpoint to the sample and searches for the second breakpoint in the same way. Following the above procedure, the process is repeated until k breakpoints have been estimated for each of Models 0, 1, 2, and 3 corresponding to Eqs. (2), (3), (4), and (5), respectively.

$$y_t = \mu + \sum_{i=1}^{k} \mu_i D_{i,t} + \beta' \boldsymbol{x}_t + u_t \tag{2}$$

$$y_t = \mu + \sum_{i=1}^{k} \mu_i D_{i,t} + \beta' \boldsymbol{x}_t + \sum_{i=1}^{k} \beta_i{}' \boldsymbol{x}_t D_{i,t} + u_t \tag{3}$$

$$y_t = \mu + \sum_{i=1}^{k} \mu_i D_{i,t} + \gamma t + \beta' \boldsymbol{x}_t + \sum_{i=1}^{k} \beta_i{}' \boldsymbol{x}_t D_{i,t} + u_t \tag{4}$$

$$y_t = \mu + \sum_{i=1}^{k} \mu_i D_{i,t} + \gamma t + \sum_{i=1}^{k} \gamma_i t D_{i,t} + \beta' \boldsymbol{x}_t + \sum_{i=1}^{k} \beta_i{}' \boldsymbol{x}_t D_{i,t} + u_t \quad (5)$$

where $t = 1,2, \dots, T$. y_t and $\boldsymbol{x_t} = (x_{1t}, \dots, x_{mt})$ represent observable I(1) variables, and u_t denote the equilibrium error. γ, γ_i, μ, μ_i, $\beta' = (\beta_1, \dots, \beta_m)$, and $\beta_i{}' = (\beta_{i1}, \dots, \beta_{im})$ are true parameters. Eq. (2) is the model (0) with level shifts. Eq. (3) denote model (1), which is called the regime-shifts model. Eq. (4) is the model (2) with a trend. Finally, Eq. (5) is the model (3), which constitutes structural breaks of levels, trends, and regressors. Maki's method bases on the Kapetanios unit root test (2005) with structural breaks. The null hypothesis is no cointegration, and the alternative hypothesis is cointegration with i breaks.

The study employs the ARDL Bounds Test developed by Pesaran et al. (2001) to test the long-run and short-run dynamics. In doing so, we estimate the ARDL equations as follow:

$$\Delta lnFP_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta lnFP_{t-i} + \sum_{i=1}^{n} \beta_{2i} \Delta lnAIP_{t-i} + \lambda_1 lnFP_{t-1} + \lambda_2 lnAIP_{t-1} + e_t \quad (6)$$

where Δ and e_t represent the first difference operator and the error term, respectively. The error term is assumed to be white noise, normally and identically distributed. Based on equation (6), the long-term relationship between agricultural input prices and food prices is investigated via the standard F- and t-statistics. The null hypothesis is no cointegration, and the alternative hypothesis is cointegration.

Additionally, if there is a long-run or cointegrating relationship between the variables, then the study estimates the short-run coefficients using the error correction model as follows:

$$\Delta lnFP_t = \gamma_0 + \sum_{j=1}^{n} \gamma_{1i} \Delta lnFP_{t-i} + \sum_{j=1}^{n} \gamma_{2i} \Delta lnAIP_{t-i} + \psi ECT_{t-1} + \vartheta t \quad (7)$$

In Eq. (7), ECT_{t-1} is the error correction variable that represents the speed of adjustment to converge back to the long-run equilibrium following a deviation from the short-run equilibrium. It should be between 0 and -1.

As alternatives to the ARDL model, the study employs three other estimation techniques to investigate the long-run elasticities for the variables. These are the fully modified ordinary least square (FMOLS) of Phillips and Hansen (1990), dynamic ordinary least squares (DOLS) of Stock and Watson (1993), and canonical cointegrating regression (CCR) of Park (1992).

The ARDL, FMOLS, DOLS, and CCR methods have significant advantages. For instance, these methods can provide efficient results when applied to small samples. In addition, the ARDL Bounds Test can be applied when the order of integration is purely I(0), purely I(1), or a mixture of both. Moreover, the FMOLS, DOLS, and CCR techniques overcome problems of endogeneity bias and serial correlation (Narayan & Narayan (2004); Alhassan & Fiador (2014); Abu & Staniewski (2019)). The FMOLS estimator employs a non-parametric correction for the endogeneity, while the DOLS estimator employs a parametric correction by adding the leads and lags for the endogeneity (Carlsson, Lyhagen, & Österholm, 2007, pp. 8-9). On the other hand, the CCR estimator, which is closely related to the FMOLS estimator, eliminates the endogeneity using a non-parametric correction.

4.2. Empirical Results

To investigate the variables' order of integration, the Kapetanios (2005) unit root test, which allows five structural breaks and determines the break dates endogenously, was employed. Under this unit root test, there are three models: Model A, Model B, and Model C. However, Sen (2003a) states that Model C should be preferred when the breakpoint is treated as unknown. In his other study, Sen (2003b) also shows that Model C provides more reliable results. Therefore, Model C was specified as appropriate in this study. The results of the Kapetanios (2005) unit root test are reported in Table 4.1.

Table 4.1. The result of Kapetanios (2005) Unit Root Test with endogenous structural breaks

Variable	τ_{min}-statistic	Critical Values			Break Dates
		1%	5%	10%	
lnFP	-7.688	-9.039	-8.343	-8.016	2017M08, 2016M06, 2019M04, 2018M02, 2016M12
lnAIP	-5.090	-7.401	-7.006	-6.686	2017M04, 2019M07, 2016M07
ΔlnFP	-8.848**	-9.039	-8.343	-8.016	2018M10, 2017M03, 2018M03, 2019M04, 2015M10
ΔlnAIP	-8.965***	-7.401	-7.006	-6.686	2018M06, 2017M06, 2016M10

Note: ***, ** indicate the significance level at 1% and 5%, respectively. Δ and ln represent the first difference and logarithm, respectively. Model C, which allows structural breaks in intercept and deterministic trend, is used. The critical values are obtained from Kapetanios (2005).

The test statistics clearly show that both FP and AIP have the same order of integration, which is I(1). Therefore, conducting the Maki (2012) cointegration test allowing for an unknown number of breaks has become possible to decide whether there is a long-term relationship between the variables. Table 4.2 summarizes the result of the Maki cointegration test.

Table 4.2. The result of Maki (2012) Cointegration Test with endogenous structural breaks

Model	Test-statistic	Critical Values			Break Dates
		1%	5%	10%	
Model 0	-5.261**	-5.776	-5.230	-4.982	2015M05, 2016M06, 2017M06, 2018M10
Model 1	-7.882***	-6.193	-5.699	-5.449	2016M07, 2017M10, 2018M03, 2018M10, 2019M08
Model 2	-4.866	-6.915	-6.357	-6.057	2017M06, 2018M05, 2018M09, 2018M12, 2019M07
Model 3	-7.072***	-6.620	-6.100	-5.845	2017M10, 2018M10

Note: ***, ** represent the presence of the cointegration relationship between the variables at the significance level of 1% and 5%, respectively. The critical values are obtained from Maki (2012).

According to the results in Table 4.2, there is a long-term relationship between food prices and agricultural input prices with structural breaks for Model 0, Model 1, and Model 3. Considering the break dates determined by the cointegration test, two dates come to the fore: October 2017 and October 2018. Therefore, these dates are included in subsequent models as dummy variables.

In October 2017, the deteriorating relationship between the U.S. and Turkey was decisive for the Turkish economy. Both the U.S. and Turkey mutually suspended visa applications on October 8, 2017, after the arrest of a U.S. consulate employee in Turkey. The rising tension led to adverse effects on the domestic markets in Turkey. In just one day (October 9), the Turkey Stock Market (BIST 100 Index) dropped by 2.73 percent. The U.S. dollar/Turkish lira exchange rate rose by 3.24 percent. Furthermore, the compound interest rate of the 2-year benchmark bond increased by 51 basis points.

Another important date for structural breaks is October 2018. 2018 was a challenging year for the Turkish economy. In the June 24 elections, the new government system called the "Presidential System of Government" came into effect. Moreover, the event of American Evangelical Pastor Andrew Brunson held in jail in Turkey led to one of the gravest crises in the history of Turkey-US relations. The pastor was indicted on charges of espionage and links to terror groups in Turkey. However, the U.S. asked for the pastor's release and announced that she would impose sanctions if not released. In August, the U.S. imposed sanctions on two Turkish ministers who had played a role in Brunson's detention and doubled tariffs on steel and aluminum imported from Turkey. Turkey responded with retaliatory sanctions to these sanctions. All of these caused a deterioration in the leading economic indicators in Turkey. In the first eight months of 2018, the Turkish lira depreciated by 41 percent. The Turkish economy, which grew by 7.4 percent in the first quarter of the year, contracted by 2.8 percent in the last quarter. CPI reached its peak in October 2018 with 25 percent. Also, food prices increased by about 30 percent in that month.

We re-examine the cointegration relationship between the variables with the ARDL Bounds Test using the dummy variables for 2017M10 and 2018M10. The results are reported in Table 4.3.

Table 4.3. The results of Bounds Test for cointegration

Optimal Lag Length (AIC)	(4, 0)		
Panel A: F-Bounds Test			
F-statistic	8.49***		
Critical Values	1%	5%	10%
Lower Bounds I(0)	6.84	4.94	4.04
Upper Bounds I(1)	7.84	5.73	4.78
Panel B: t-Bounds Test			
t-statistic	-3.54**		
Critical Values	1%	5%	10%
Lower Bounds I(0)	-3.43	-2.86	-2.57
Upper Bounds I(1)	-3.82	-3.22	-2.91
Panel C: Diagnostic Tests			
R-squared: 0.996		Jarque-Bera: 0.908 (0.64)	
Adj. R-squared: 0.9955		Breusch-Pagan-Godfrey for Heteroskedasticity: 1.677 (0.14)	
F-Statistic: 1771.1 (0.00)			
Breusch-Godfrey LM test: [1]: 1.730 (0.195), [2]: 0.853 (0.433); [3]: 0.741 (0.533) [4]: 0.550 (0.700) [5]: 0.457 (0.806) [6]: 0.539 (0.776) [7]: 0.508 (0.823)[8]: 0.462 (0.876) [9]: 0.705 (0.701) [10]: 0.620 (0.788) [11]: 0.552 (0.855) [12]: 0.791 (0.657)			

Note: ***, ** represent the presence of the cointegration relationship between the variables at the significance level of 1% and 5%, respectively. The optimal lag length for the ARDL model was chosen based on the Akaike information criterion. Case III: Unrestricted intercept and no trend (k = 1) critical values are obtained from Pesaran et al. (2001). Dummy variables are added for the 2017M10 and 2018M10. [ ] refer to the diagnostics tests order, and ( ) refer to the p-values.

The ARDL Bounds Test for cointegration involves the F-Bounds Test and t-Bounds Test. Both the calculated F-statistic and t-statistic are higher than upper bounds I(1) critical values at the significance level of 1% and 5%, respectively. These results clearly indicate that the food prices and agricultural input prices in Turkey have a long-run or cointegrating relationship over the analysis period of 2015M01 to 2020M01. Also, the results of the Bounds Test confirm the results of the Maki (2012) test. Since the cointegration relationship is determined between the variables used in the model, we can estimate the long-term coefficients and error correction terms from short-run dynamics. These are shown in Table 4.4.

Table 4.4. Results of Short-run and Long-run Coefficients from the ARDL Model

Dependent variable: lnFP				
Variables	**Coefficient**	**Standard Error**	**t-statistics**	**p-values**
Panel A: Short Run Results				
$\mathbf{\Delta lnFP_{t-1}}$	0.337***	0.116	2.913	0.005
$\mathbf{\Delta lnFP_{t-2}}$	-0.297**	0.114	-2.611	0.012
$\mathbf{\Delta lnFP_{t-3}}$	0.204*	0.112	1.824	0.074
ΔlnAIP	0.463***	0.115	4.042	0.000
ΔDum(2017M10)	-0.016	0.010	-1.670	0.101
ΔDum(2018M10)	-0.018*	0.009	-1.950	0.057
$\boldsymbol{ECT_{t-1}}$	-0.341***	0.096	-3.537	0.001
Panel B: Long Run Results				
lnAIP	1.359***	0.132	10.316	0.000
Dum(2017M10)	-0.047*	0.026	-1.830	0.073
Dum(2018M10)	-0.054	0.035	-1.534	0.131
Constant	-0.563	0.610	-0.923	0.360

Note: ***, **, and * refer to the significance level of 1%, 5%, and 10%, respectively. Δ and ln represent the first difference and logarithm, respectively. ECT_{t-1} is the error correction term.

Long term ARDL estimation results reveal that agricultural input prices are highly effective on food prices. In other words, a 1 percent increase in agricultural input prices increases food prices by 1.36 percent. Table 4.4 also indicates the error correction term, which is the speed of adjustment to converge back to the long-run equilibrium. As expected, this is between 0 and -1, and highly significant. A significant error correction term also indicates the existence of a long-run relationship between the variables. In the short-run, the system is converging to the long-run equilibrium at a rate of 34.1 percent.

Next, the study assesses the stability of the long-run relationship between the variables depending on CUSUM and CUSUM-squared tests proposed by Brown et al. (1975). These tests are based on the cumulative sum of recursive residuals. If the graphs of CUSUM and CUSUM-squared statistics stay within the critical bounds at a 5 percent significance level, we conclude that the estimates are stable. The results of these tests are shown in Figure 4.1.

Both CUSUM and CUSUM-squared tests do not indicate evidence of any significant structural instability for the estimated parameters of the ARDL (4, 0) model.

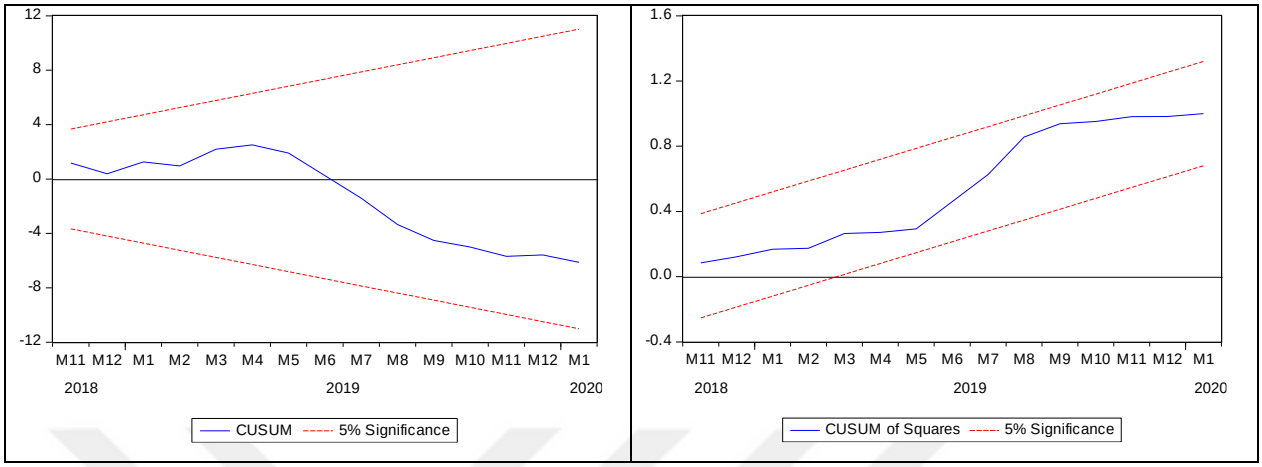


Figure 4.1. Results of CUSUM and CUSUM-squared tests

The FMOLS, DOLS, and CCR approaches were also used in the study to check the robustness of long-term elasticities obtained from the ARDL model. Table 4.5 reports the outcomes of these alternative techniques.

Table 4.5. Results of alternative approaches (FMOLS, DOLS, and CCR)

Dependent variable: lnFP				
Variables	**Coefficient**	**Standard Error**	**t-statistics**	**p-values**
Panel A: FMOLS (Fully Modified Least Squares)				
lnAIP	1.327***	0.071	18.741	0.000
Dum(2017M10)	-0.067***	0.017	-3.950	0.000
Dum(2018M10)	-0.022	0.017	-1.326	0.190
Constant	-0.421	0.329	-1.278	0.206
Jarque-Bera (JB): 1.364 (p-value: 0.506)				
Panel B: DOLS (Dynamic Least Squares)				
lnAIP	1.298***	0.087	14.943	0.000
Dum(2017M10)	-0.055***	0.020	-2.744	0.008
Dum(2018M10)	-0.022	0.024	0.919	0.362

Constant	-0.283	0.403	-0.703	0.485
Jarque-Bera (JB): 0.854 (p-value: 0.652)				
Panel C: CCR (Canonical Cointegrating Regression)				
lnAIP	1.325***	0.072	18.475	0.000
Dum(2017M10)	-0.066***	0.017	-3.974	0.000
Dum(2018M10)	-0.022	0.017	-1.254	0.215
Constant	-0.412	0.333	-1.236	0.222
Jarque-Bera (JB): 1.313 (p-value: 0.519)				

Note: ***, **, and * refer to the significance level of 1%, 5%, and 10%, respectively. ln represents logarithm. The Newey-West estimation method in our regressions is employed to obtain heteroskedasticity and autocorrelation (HAC)-consistent standard errors. The DOLS estimation does not include the lags and leads based on the Schwarz information criterion.

As seen in Table 4.5, the results of the FMOLS, DOLS, and CCR support the results of the ARDL long-run model. According to these alternative three approaches, a percentage increase in agricultural input prices increases food prices between 1.30 percent and 1.33 percent at the 1 percent level.

4.3. Concluding Remarks

The qualitative analysis in the first essay of this thesis has concluded that input cost in the agricultural sector is one of the most important factors in explaining food prices in Turkey. In this chapter, the thesis investigates the impact of agricultural input costs on retail food prices by using various quantitative methods. In doing so, we employ the agricultural input price index published for the first time in March 2020 by TurkStat and food price index in CPI for the period from January 2015 to January 2020.

The empirical analyses, taking into account the structural breaks, have clearly demonstrated that agricultural input costs have a significant impact on food prices. Moreover, the ARDL, FMOLS, DOLS, and CCR methods have presented robust results showing that a percentage increase in agricultural input prices increases food prices between 1.30 percent and 1.36 percent. This means that food prices increase more than agricultural input costs. This finding can be explained in three ways.

The first explanation can be related to competition in the food supply chain. As mentioned in the first essay, some experts state that there is a failure in competition at almost every stage of the food supply chain in Turkey. Mafia-like structures are observed among intermediaries and during transportation. On the other hand, the first five supermarket chains are A101, BİM, ŞOK, Migros, and Ekomini in terms of the total number of branches in Turkey (Ortakalan, 2019). These firms can play a dominant role in the industry by preventing price competitiveness. They can see an increase in input costs as an opportunity for a price increase.

The second reason can be related to the analysis's period. Our analysis time period is 5 years (61 months) because the data of the agricultural input price index published Turkstat is available from January 2015. The available data is sufficient for our analysis. However, in further studies with more data, the elasticity coefficient may decrease since the analysis period extends.

Finally, factors that increase agricultural input costs may also increase other costs in the supply chain. For instance, an increase in oil prices can cause increases in both agricultural production costs and transportation costs. Thus, retail food prices can increase more than agricultural input prices.

In short, this study with robust results states that agricultural input prices play a pivotal role in Turkey's food prices. Thus, food price stability can be achieved by preventing the increase in agricultural input costs. Also, the adverse impacts of high food prices on the economy and poor citizens can be eliminated with stable food prices.

5. THE ROLE of TAX CUTS on AGRICULTURAL INPUT PRICES in TURKEY

The previous chapters clearly show that agricultural input costs have a major impact on food prices in Turkey. In this context, a decrease in agricultural input costs can play a significant role in reducing food inflation. On January 1, 2016, the Value Added Tax (VAT) rate in fertilizer, which was 18 percent, was reduced to 1 percent with the Council of Ministers' decision numbered 2015/8353. Then, on February 10, 2016, fertilizer was included in the scope of the exception. As these tax reduction decisions exogenously affect fertilizer prices, there is an opportunity to conduct a natural experiment. Using the difference-in-differences (DID) method, this chapter examines whether the decisions reduce fertilizer prices. The analysis results provide some hints that consumers received benefits from the tax reduction decisions.

5.1. Empirical Strategy and Data

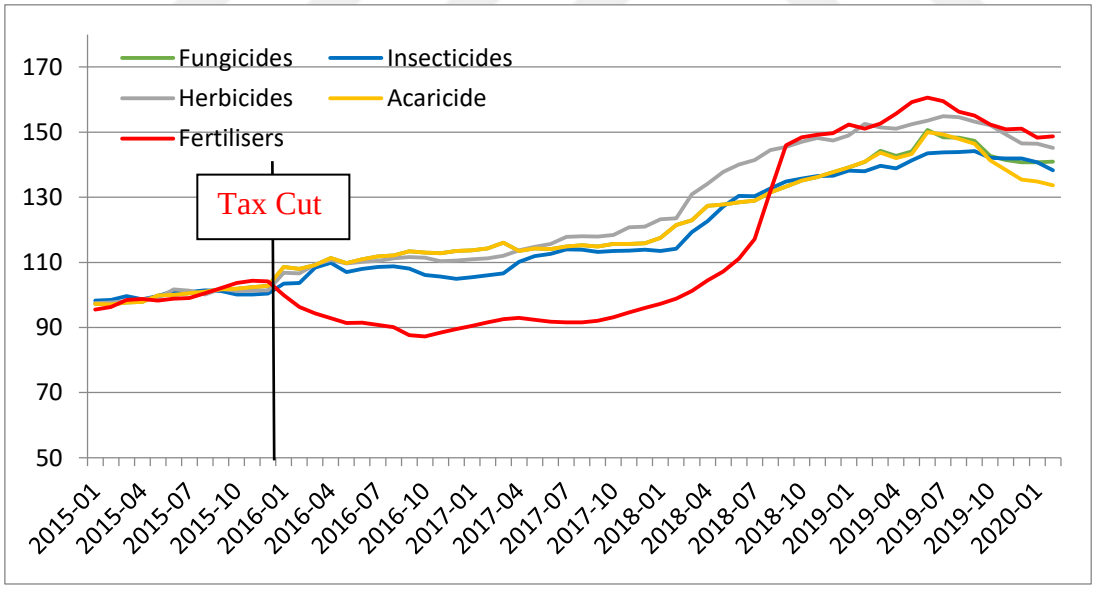
5.1.1 Methodology

The impact of tax cuts on fertilizer prices could be assessed in different ways. A standard econometric model consisting of a dummy variable for the taxation decision and other explanatory variables could be one way. The second way could be to obtain the impact of the tax reduction by subtracting the actual after-tax prices from the predicted after-tax prices. The predicted after-tax prices show what the prices would have been without the tax reduction decision. The third way could be a difference-in-differences (DID) approach which is frequently used to examine the effects of taxation decisions on economic variables such as prices, and consumption (Berardi et al. (2016); Hanson and Sullivan (2009); Doyle and Samphantharak (2008)).

In this chapter, we employ the DID approach due to two reasons. The first reason is that the fertilizer's tax reduction implementation is exogenous. Regulatory processes can be related to complex interactions between groups that lose or gain from regulations (Ozbugday & Nillesen, 2013, p. 370). In other words, the main variable of interest (TAXCUT) might be correlated with the error term. Nevertheless, the tax cut decision in January 2016 is the

realization of one of the new government's promises for the November 2015 elections. In the process of the election campaigns, the main opposition party promised to decrease diesel prices for farmers if she would be selected. On the contrary, the ruling party announced that it would make the VAT reduction on fertilizer. After the election, the ruling party, namely the AK Party, was re-elected and reduced the VAT on fertilizers on January 1, 2016. So, the change in fertilizer's tax was not affected by interest groups.

The second reason we prefer to use the DID method is the existence of a control group unaffected by the decision. For a DID estimation, a satisfactory control group that has a similar trend with the treated group as much as possible is required. As candidates for a control group, we consider four pesticide prices (fungicides, insecticides, herbicides, and acaricide). Figure 5.1 plots the nationally-representative trends in the price indices for both fertilizers and pesticides in Turkey between January 2015 and February 2020. As shown in the figure, the treated group (fertilizers) and the candidate control groups (pesticides) exhibit a similar trend before the decision of the taxation in January 2016. Therefore, these four pesticides are chosen as control groups.



Source: TURKSTAT, 2020

Figure 5.1. The movement of prices (2015=100)

The DID estimates for the real differential impact of the tax cut decisions on fertilizer prices can be shown in Table 5.1.

Table 5.1. The illustration of Difference-in-Differences Estimation

Prices	**Fertilizers (F)**	**Pesticides (P)**	**Difference**
T_0 = pre-tax cut period	$P_{0,F}$	$P_{0,P}$	$P_{0,F} - P_{0,P}$
T_1 = post-tax cut period	$P_{1,F}$	$P_{1,P}$	$P_{1,F} - P_{1,P}$
Change	$P_{1,F} - P_{0,F}$	$P_{1,P} - P_{0,P}$	$\hat{\delta} = (P_{1,F} - P_{0,F}) - (P_{1,P} - P_{0,P})$

An alternative regression-based estimator yields the same result in Table 5.1. More specifically, it can be shown that the estimate for δ in the regression equation below is equivalent to $\hat{\delta} = (P_{1,F} - P_{0,F}) - (P_{1,P} - P_{0,P})$:

$$lnPRICE_{it} = \beta_0 + \beta_1 TAXCUT_t + \delta(\text{TAXCUT}_t \text{ X TREATMENT}_i) + \varepsilon_{i,t} \quad (1)$$

where i indexes items, t indexes the period of observation. The dependent variable lnPRICE is the natural logarithm of the price indices for items. The variable TAXCUT is a dummy variable indicating the post-tax cut period. The variable TREATMENT captures possible differences between fertilizers and four pesticides. The variable TAXCUT X TREATMENT is an interaction term between these two binary variables. In this case, the main parameter of interest is δ.

For the data horizon in our main DID estimations, we focus on a two-month window, four-month window, and six-month window centered around the date of the tax cut, January 1, 2016. For instance, if the window size is two months, then the period of the analysis is December – January. We do not focus on larger window sizes due to the possibility of other exogenous factors that can affect fertilizer prices as the data window gets longer.

In order to test the robustness of the results, we perform the same DID approach as above, but with three different periods: (1) January 1, 2018, (2) January 1, 2019, and (3) January 1, 2020. In other words, we re-construct our baseline regressions as if the tax

reduction decision took place on the same day at different years. This assumption is known as the parallel-trends assumption. If these alternative regressions concluded that estimated effects are statistically insignificant and very small, we could say that our main results are robust. In other words, in the absence of the tax reduction decision, fertilizer prices (treatment group) and pesticides prices (control group) have a similar trend over time.

5.1.2. Data

In the study, a fertilizer price was used as a treatment variable, and four pesticide prices (fungicides, insecticides, herbicides, and acaricide) were used as control variables. We employed sub-indices of the Agricultural Input Price Index collected and published for the first time in March 2020 at the national level by the TurkStat. Also, all prices are monthly average prices and used in logarithmic form. The summary statistics on these variables are presented in Table 5.2.

Table 5.2. Descriptive statistics

	Pre-tax Cut Period (Three months)				**Post-tax Cut Period (Three months)**			
Variable*	**Mean**	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**
Fertilizer Prices	4.645	0.004	4.641	4.648	4.573	0.029	4.547	4.605
Pesticide Prices								
fungicides	4.629	0.004	4.624	4.632	4.688	0.006	4.682	4.693
insecticides	4.618	0.001	4.617	4.619	4.678	0.014	4.669	4.694
herbicides	4.607	0.002	4.606	4.609	4.656	0.026	4.640	4.686
acaricide	4.629	0.004	4.624	4.632	4.688	0.006	4.682	4.693

* All data are in logarithmic form.

5.2. Empirical Results

5.2.1. Main Results

The results seen in Table 5.3 display that the coefficient on TAXCUT X TREATMENT, which the parameter of interest, is negative and statistically significant at a

1 percent significance level in three different window sizes. For a 2-month window (the analysis period of December and January), the fertilizer prices decrease by 8.9 percent at a 1 percent significance level. Moreover, it is seen that the fall in fertilizer prices accelerates for 4- and 6- month windows. We can say that the fertilizer prices included VAT exemption on February 10 was also effective on these decreases. Thus, the magnitude of the coefficient is between -8.9 percent and -12.8 percent for three different window sizes.

Table 5.3. The Results for the Difference-in-Differences Estimations

Dependent Variable: LnPRICE						
	2-month window		4-month window		6-month window	
Variable	Coefficient	St. Error	Coefficient	St. Error	Coefficient	St. Error
Tax_cut	0.048***	0.006	0.048***	0.005	0.057***	0.005
TreatmentXtaxcut	-0.089***	0.013	-0.109***	0.010	-0.128***	0.012
Constant	4.628***	0.004	4.627***	0.003	4.626***	0.003
Fixed Effect	Yes		Yes		Yes	
R-squared	0.765		0.735		0.798	
Observations	10		20		30	

Note: *** refers to a 1% significance level. The window size describes the length of the period for the analysis. The starting day of policy implementation (January 1) is at the center of the window. For example, if the window size is 2 months, then the period of the analysis is December – January.

These results provide evidence that tax reduction decisions have a statistically significant effect on fertilizer prices. Also, the pass-through continues for three months from the date of the tax cut decision on January 1, 2016. However, a full pass-through rate was not observed as of the end of March 2016. A full pass-through of the tax reduction decisions would amount to a price decreases of 15.3 percent after the complete removal of the tax on fertilizer on February 10, 2016. Thus, the pass-through rate can be calculated as 83.7 percent for March 2016.

In this study, we focused on finding the short-term consequences of the tax cut decision because of the possibility of other exogenous factors that can affect our variables. For instance, if the analysis period were long to cover the year 2018, the exchange rate shock

resulting from the deterioration of Turkey-US relations would have been included in the analysis. In such a case, it would not be possible to see the effect of the tax reduction on fertilizer prices since the prices were also affected by the exchange rate shock. The impact of the exchange rate shock can be seen in Figure 2. As a result of the 41% deprecation of the Turkish Lira against the U.S. dollar, the price of fertilizers increased dramatically in the second half of 2018.

5.2.2 Robustness Checks

The actual tax cut date for the policy reform is January 1, 2016. As a robustness check described in Section I.I., we re-constructed our DID estimates based on three different dates: (1) January 1, 2018, (2) January 1, 2019, and (3) January 1, 2020. Table 5.4 presents the results of our robustness-check exercises. The results suggest that the estimated effects are very small and statistically insignificant. Therefore, we conclude that our original results are robust to using treatment dates.

Table 5.4. Falsification tests for robustness checks

Dependent Variable: Log Price		
	4-month window	
	Coefficient	**St. Error**
2017-2018	0.008	0.014
2018-2019	-0.004	0.008
2019-2020	-0.004	0.009
Fixed Effects	Yes	
Observations	20	

Note: ***, **, and * refer to 1%, 5%, and 10% significance levels, respectively. The 4-month window represents that the period of the analysis is November – February of the corresponding year.

5.3. Concluding Remarks

On January 1, 2016, the Turkish government reduced the VAT of fertilizer from 18 percent to 1 percent. In addition, by adding fertilizer to the list of VAT-exempt products on February 10, 2016, the tax on fertilizers was removed entirely. To investigate the impact of

the tax cut decisions on fertilizer prices, we use the difference-in-differences (DID) approach. Our findings state that the reduction in the tax was passed on to fertilizer prices. In the first month after the tax reduction, the fertilizer prices decreased by 8.9 percent. In the second and third months, the price decline reached 10.9 percent and 12.8 percent, respectively. If the fertilizer prices had dropped by 15.3 percent after the tax was removed entirely, a full pass-through would have been obtained. Thus, the pass-through rate is calculated as 83.7 percent for the end of March. Although a full pass-through was not obtained, the simple DID estimations provide some hints that consumers benefited significantly from the tax reduction decisions.

The study indicates that the tax cut decision decreases the fertilizer prices in the short term in Turkey. It does not focus on a larger period due to the possibility of other exogenous factors that can affect fertilizer prices as the data period gets longer. In the last period, the Turkish economy has faced a number of critical events such as elections, failed coup attempt on July 15, 2016, tensions between Turkey and the United States. Most of these events have caused the deterioration of many macroeconomic variables in Turkey, especially the depreciation of the Lira. Since agricultural inputs, including fertilizers, pesticides are mostly imported from abroad; they are very sensitive to exchange rate shocks. For instance, an American pastor who was detained in Turkey led to one of the gravest crises in the history of Turkey-US relations in 2018. The Turkish Lira depreciated by 41 percent in the first eight months of 2018. As can be seen from Figure 5.1, the prices of fertilizers and pesticides increased significantly in 2018. Thus, the study focused on the short term in this study in order to avoid the contaminating effects of these events on prices.

6. CONCLUSIONS

Turkey has experienced high food price increases in recent years, especially in 2018. While the food price inflation was 9.8 percent on average between 2008 and 2017, it reached about 30 percent on an annual basis in October 2018. This thesis consists of three essays on economic analysis of food prices in Turkey. The first essay aims to determine the drivers of food prices by using an in-depth interview approach as qualitative data analysis. Nine experts with an average of 22 years of experience in the agricultural sector are interviewed. The data obtained in the interviews are analysed with NVivo 12, a qualitative data analysis software.

Previewing results of the qualitative analysis, we find that the agricultural input costs have a critical role in food prices since many inputs used in agricultural production are imported from abroad. The depreciation of the Turkish Lira in the last period has caused an increase in production costs and food prices.

Migration and aging rural population, low technology and productivity, and agricultural education are considered as prominent difficulties of agricultural production. Finance problems cause unofficial solutions that harm farmers. Moreover, other problems in the food supply chain (the number of intermediaries, inefficiency in municipal wholesale markets, or low competition in retail markets) have a significant effect on the food prices. Mafia-like structures in the chain harm the domestic price formation.

Strikingly, many experts emphasize the lack of agricultural planning and stock management. The Ministry of Agriculture and Forestry is unable to design the industry and establish the supply-demand balance. Also, there are significant problems with agricultural data. When the data is not sufficient and accurate, it is challenging to manage the entire industry. Most experts state that agricultural policies do not meet their expectations. Import decisions harm the farmer and the domestic production in the long run, as the producers have not earned enough to continue production. Moreover, agricultural supports fail to lead the industry.

Even though the supply-side drivers are more determinative, the demand-side drivers have an impact on food prices. Exports, changes in food preferences, growth in income, population growth, and tourism come to the fore as the demand-side drivers.

The study presents the following policy suggestions based on the qualitative analysis given in the first essay:

1. Since the problems in the agriculture and food sectors in Turkey are mostly structural problems, the solutions should be long-term. However, short-time solutions such as import can be used due to the high sensitivity of agriculture to weather conditions. Great care must be taken when making import decisions. These decisions should not discourage Turkish farmers from production.

2. Agricultural planning and stock management should be done effectively.

3. Policies to reduce agricultural input costs should be developed.

4. Land consolidation and irrigation efforts should be accelerated.

5. Strategies should be developed to increase the education level of farmers. In addition, educated people should be encouraged to agricultural production.

6. The system of agricultural supports should be revised, and efficiency analysis of these supports should be done.

7. Agricultural statistics should be improved. Also, informality in the agricultural sector should be prevented.

8. Product-based policies should be developed by evaluating all relevant sectors and products.

9. Cooperatives and producer organizations should be expanded in harmony with the urban sociology, the lifestyle of the producer, and the expectations of the producer.

10. The number of greengrocers should be expanded to increase competition in the retail industry.

11. Efforts to rent agricultural land abroad can be continued after an effective evaluation of agricultural areas within the country. These efforts should not harm domestic producers. These should be carried out within the framework of an agricultural plan.

12. The number of modern greenhouses should be increased, and existing greenhouses should be modernized.

13. The use of technologies that increase productivity should be expanded by protecting small family businesses.

In the second essay, the thesis investigates the impact of agricultural input costs on retail food prices by using various quantitative methods. In doing so, we employ the Agricultural Input Price Index published for the first time in March 2020 by TurkStat and food price index in CPI for the period from January 2015 to January 2020. In this context, the study is the first to employ the Agricultural Input Price Index.

The empirical analyses, taking into account the structural breaks, have clearly indicated that agricultural input costs have a significant impact on food prices. Moreover, the ARDL, FMOLS, DOLS, and CCR methods have presented robust results showing that a percentage increase in agricultural input prices increases food prices between 1.30 percent and 1.36 percent. This means that food prices increase more than agricultural input costs. These results can be explained in three ways.

The first explanation can be related to competition in the food supply chain. As mentioned in the first essay, some experts state that there is a failure in competition at almost every stage of the food supply chain in Turkey. Mafia-like structures are observed among intermediaries and during transportation. On the other hand, the first five supermarket chains are A101, BİM, ŞOK, Migros, and Ekomini in terms of the total number of branches in Turkey (Ortakalan, 2019). These firms can play a dominant role in the industry by preventing price competitiveness. They can see an increase in input costs as an opportunity for a price increase. The second reason can be related to the analysis period. Our analysis period is five years (61

months) because the data of the agricultural input price index published Turkstat is available from January 2015. The available data is sufficient for our analysis. However, in further studies with more data, the elasticity coefficient may decrease since the analysis period extends. Finally, factors that increase agricultural input costs may also increase other costs in the supply chain. For instance, an increase in oil prices can cause increases in both agricultural production costs and transportation costs. Thus, retail food prices can increase more than agricultural input prices.

Results from the first and second essays also contribute to the debate on whether food prices are under the control of monetary policy by the Central Bank of the Republic of Turkey. Monetary policy decisions that may cause exchange rate increases also affect food prices through input costs. For instance, a policy rate set below the inflation expectation may lead to exchange rate increases. Increasing exchange rate can cause an increase in agricultural input costs such as diesel, fertilizers, pesticides, etc.

As a third and final essay, we examine the impact of a tax cut on agricultural input prices. On January 1st, 2016, the Turkish government reduced the VAT of fertilizer from 18 percent to 1 percent. In addition, by adding fertilizer to the list of VAT-exempt products on February 10th, 2016, the tax on fertilizers was removed entirely. In this chapter, we investigate the impact of the tax cut decisions on fertilizer prices. Using the difference-in-differences (DID) approach, our findings indicate that the reduction in the tax was passed on to fertilizer prices. In the first month after the tax reduction, the fertilizer prices decreased by 8.9 percent. In the second and third months, the price decline reached 10.9 percent and 12.8 percent, respectively. If the fertilizer prices had dropped by 15.3 percent after the tax was completely removed, a full pass-through would have been obtained. Thus, the pass-through rate is calculated as 83.7 percent for the end of March. Although a full pass-through was not obtained, the simple DID estimations provide some hints that consumers benefited significantly from the tax reduction decisions.

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