

Ramadan Effect on Prices and Production: Case of Turkey

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Abstract

The detection of seasonal effects is essential in economic forecasting. However, the lack of indicators produced referencing calendars other than the Gregorian system makes it hard to observe the impact of the cultural, national, and religious days that annually shift in the Gregorian calendar, on the economy. Ramadan, the ninth month of the lunar-based Hijri calendar, has an impact on many issues, namely the Ramadan effect, due to the changes in the daily practices of the fasting Muslim people. We checked the existence of the Ramadan effect on consumer prices and industrial production in Turkey by reconstructing the monthly indicators in the Hijri calendar and testing the significance of the differences between their increase rates in Ramadan and other months. We observed that the Food Price Index and prices of some goods increase, and production decrease in Ramadan, significantly more than in other months. Considering the Ramadan effect would improve the accuracy of the inflation forecasting and seasonal adjustment models.²

Keywords

Consumer prices, Hijri calendar, industrial production, Ramadan effect, seasonal adjustment

JEL code

C82, E31, E32, Z12

INTRODUCTION

Economic life depends on the calendar in various aspects. There are direct seasonal effects on economic indicators such as a decrease in food prices just after the harvest (Gilbert et al., 2017) and mostly in summer, or an increase in energy (Scott, 1995), specifically natural gas (Sailor and Muñoz, 1997; Aras and Aras, 2004) consumption in winter times. Besides, the cultural, national, and religious special days in many societies impact the economic behavior of the majority of the population; the expenditure booms (Scott, 1995; Tremblay and Tremblay, 1995; Al-Hajieh et al., 2011; Strielkowski, 2013) due to gifting, dining, etc. or passenger transportation intensified for increased home travelling (Birg and Goeddeke, 2016) during special days, religious festivals, and holidays.

The detection of seasonal effects is a developed issue in statistics. However, it is worked on much by referencing the Gregorian calendar. Although almost all countries use the Gregorian calendar, various Muslim, Jewish, Hindu, and Chinese societies follow distinct timelines in observing their

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religious and traditional days (Riazuddin and Khan, 2005). One of the difficulties in detecting the effects of such days is about the lack of indicators produced on the basis of these calendars or more broadly other than the Gregorian calendar. The lunar-based Hijri calendar that Islamic events follow, for example, includes 12 months of 29–30 days, forming a year of 355 or 356 days, while the Gregorian calendar is solar-based and comprises 365 or 366 days. Thus, the fixed lunar date of an event shifts to an earlier period in the solar calendar each year. Therefore, observing the impact of events moving in the Gregorian calendar requires the reconstruction of the solar calendar-based economic indicators.

Ramadan, the ninth month of the lunar-based Hijri calendar, is considered one of the periods that affect people's lives in many socio-economic aspects. In Ramadan, the expenditure and consumption behavior of Muslim people are expected to be changed due to fasting and related activities. The changes in this month, namely the *Ramadan effect*, may be observed in various fields of social and economic life, such as individual health (Leiper and Molla, 2003; Rouhani and Azadbakht, 2014; Moothadeth et al., 2020), social interactions (Gavriilidis et al., 2016; Haruvy et al., 2018), donation (Martens, 2014), and consumption and production patterns.

In economic aspects, the *Ramadan effect* on stock markets is the most studied issue (Husain, 1998; Oğuzsoy and Güven, 2004; Seyyed et al., 2005; Almudhaf, 2012; Shah and Ahmed, 2014; Küçüksille and Özmutaf, 2015; Sonjaya and Wahyudi, 2016; Gavriilidis et al., 2016; Wasiuzzaman and Al-Musehel, 2018; Iqbal et al., 2019). Ramadan effect on other economy-related fields such as the volatility of economic variables (Yavuz et al., 2008; Ra, 2016), the currency in circulation and deposits (Riazuddin and Khan, 2005; Bukhari et al., 2011), the volatility of deposits (Choudhary and Limodio, 2017), decision making in finance (Demiroglu et al., 2019), loan defaults (Baele et al., 2014), the consumer food expenditure and consumption (Aktaş and Yılmaz, 2012; Moayedi, 2012), demand forecasting (Karabag and Fadiloglu, 2016) and the economic growth and happiness (Campante and Yanagizawa-Drott, 2015) are also studied in the literature.

One of the mentioned effects of Ramadan is its impact on consumer prices, particularly food prices. Since forecasting inflation is essential in monetary policy, besides the regular seasonal effects, any regular “extraordinary” impact on the general price level may be worth considering.

It is widely, but mostly anecdotally, claimed that the food prices increase in Ramadan and in times closer to Ramadan (Yucel, 2005; Bokil and Schimmelpfennig, 2006; Akmal and Abbasi, 2010). If so, it may have various plausible reasons. For example, it is assumed that the demand for food, clothing, and gift items rise in Ramadan (Akmal and Abbasi, 2010). The additional demand gives rise to increase in prices of certain goods and services. Although a comprehensive consumption data is not available, some local works denote that demand for some goods is rising in Ramadan. Aktaş and Yılmaz (2012), for example, found by using a household survey, that the food expenditure in Mersin, a province in Turkey, increased by 10% in Ramadan 1432 (the year 2011 of the Gregorian calendar). Traditionally, people tend to spend more in Ramadan for some foods (e.g., meat) that not always consumed.

On the contrary, the suppliers may increase the prices of certain goods due to their previous years' experience, well before the emergence of the demand. However, when the increase in demand is predicted, it should be expected that the supply would also increase, repressing the rise of prices. Even the prices of some over-supplied goods may decrease in the second half of Ramadan.

On the other hand, Ramadan is expected to affect the industrial production of the related month. Like many other indicators, the production indices are also seasonally adjusted to enable periodical comparisons. Considering the effects of social, cultural, and religious events and periods in seasonal adjustment methodologies, besides the accustomed seasonal structure (Demirhan, 2011) based on the Gregorian calendar, may improve the accuracy of the adjustments. Such that, Demirhan (2011) found the production to decrease in Turkey in Ramadan.

In this paper, we evaluate the Ramadan effect on consumer prices and industrial production in Turkey by using official statistics. In Section 1, the methodology of the work is presented. The raw data and reconstructed price and production indicators for the Hijri calendar are introduced in Section 2. In Section 3, the outcomes of the analysis are summarized and discussed. Finally, the last section of the paper is the conclusion.

1 METHODOLOGY

As mentioned in the previous section, although there are well-developed seasonal effect detection methods, the lack of indicators produced grounding on non-Gregorian calendars prevents us from using some standard methods or decreases their efficiency. That's why researchers use modified or alternative approaches to observe the effect of the cultural or religious days shifting in the Gregorian calendar such as Ramadan.

In almost all works made for *Ramadan effect* analysis, time series methods, mostly the ARIMA model, are used. Riazuddin and Khan (2005), and Yuçel (2005) applied the ARIMA model to the Gregorian calendar based data by adding dummy variables for some Hijri months to observe their effect on the currency in circulation and consumer food prices, respectively. The approach obtained to detect the combined impact of seasonality in the Gregorian calendar and Ramadan of Hijri calendar. Yuçel (2005) applied the model not only to the data of the Gregorian calendar but to the indicators transformed into the Hijri system. Akmal and Abbasi (2010) also used the ARIMA model with dummy variables to evaluate the Ramadan effect on the consumer price index in addition to graphical and scenario analyses. Hossain, Bashar and Haque (2018) used ARIMA and the Unobserved Components Model (UCM) to investigate the Ramadan effect on the raw sugar price.

Karabağ and Fadıloğlu (2016) claimed that the existing methods, ARIMA, for example, were insufficient to concurrently detect the effects of the climates of the solar year and the cultural seasonality of the lunar year. Therefore, they applied the extended Winters' (1960) method to observe the Ramadan effect on beer demand. Özmen and Sarıkaya (2014) used a different methodology in the analysis of the Ramadan effect on food prices. They estimated monthly inflation equations of food price sub-indices and tested the significance of the variables defined as the number of the Ramadan days corresponding to each month. Demirhan (2011) utilized an alternative time series based model, TRAMO-SEATS, to observe the Ramadan effect on production.

However, the results of the analyses do not imply the same effect of Ramadan. In particular, the ARIMA model applied to consumer prices gave inconsistent results. Yuçel (2005), and Akmal and Abbasi (2010) did not observe any Ramadan effect in their works done by the use of data based on the Gregorian calendar. On the other hand, in his analysis of data transformed into the Hijri calendar, Yuçel (2005) found that there is a considerable increase in food prices in Ramadan.

The approach of our work is a quite different and less complicated than other methods used in the detection of the Ramadan effect on consumer prices and industrial production. The methodology is composed of the following steps:

- (i) The monthly price (3 indices and prices of 43 items) and production (3 indices) indicators that are constructed following the Gregorian calendar transformed to indicators of the months of Hijri calendar.
- (ii) The monthly increase rate of each indicator for Hijri months is calculated, and the mean of the increase rates of each indicator is calculated for 12 Hijri months.
- (iii) The mean of the increase rates in Ramadan months for each indicator is checked, whether it is the highest or lowest among the means of 12 months.
- (iv) The means of indicators in Ramadan months that seem higher than the means of the remaining 11 months are tested for significance by the use of hypothesis testing procedure with:

$$H_0: M_{\text{Ram}} > M_{\text{others}},$$

$$H_1: M_{\text{Ram}} \leq M_{\text{others}}.$$

Similarly, the means that seem lower are tested by:

$$H_0: M_{\text{Ram}} < M_{\text{others}},$$

$$H_1: M_{\text{Ram}} \geq M_{\text{others}},$$

where M_{Ram} is the mean of increase rates in Ramadan months and M_{others} is the mean of increase rates in the remaining 11 months.

- (v) The tests are repeated for price indicators of Shaban, the 8th month, Shawwal, the 10th month, and the combined three months, Shaban, Ramadan, and Shawwal.

2 DATA

The monthly price and production indicators transformed into the Hijri calendar from the officially produced and disseminated Gregorian calendar based series are used in the analyses.

The original price data is comprised of 3 indices and prices of 43 items (Table 1) disseminated by the Turkish Statistical Institute (TURKSTAT) used in the production of the consumer price index (CPI). The data is available from May 1994 to August 2019 that corresponds to the period from last month of 1414 to the last month of 1440 in the Hijri calendar and provides a series of monthly price increase rates of 26 complete Hijri years (1415–1440).

Table 1 The Indices and Items Included in the Analysis

The Consumer Price Index and Sub-Indices		
1	Consumer Price Index (Ind_CPI)	
2	Food Price Index (Ind_Food)	
3	Clothing and Footwear Price Index (Ind_Clothing-Footwear)	
	Selected Consumer Items* (Prices)	
<i>Food</i>	<i>Food</i>	<i>Alcoholic beverages</i>
4 Rice	20 Corn Oil	34 Raki
5 Wheat Flour	21 Tomato	35 Whisky
6 Bread	22 Onion	36 Wine
7 Dessert	23 Potato	37 Beer
8 Veal	24 Dry Bean	
9 Mutton	25 Chickpea	<i>Clothing and footwear</i>
10 Poultry	26 Lentils	38 Men's Trousers
11 Garlic-Flavored	27 Olive	39 Skirt
Sausage	28 Granulated Sugar	40 Women's Trousers
12 Milk	29 Cube Sugar	41 Men's Footwear
13 Yoghurt		42 Men's Sport Shoes
14 White Cheese	<i>Non-alcoholic beverages</i>	43 Women's Footwear
15 Kasar Cheese	30 Tea	44 Women's Sport Shoes
16 Egg	31 Carbonated Fruity	
17 Butter	<i>Beverages</i>	<i>Others</i>
18 Olive Oil	32 Coke	45 Bus Fare (Intra-Urban)
19 Sun-Flower Oil	33 Fruit Juice	46 Airplane Fare

Note: * The prices of some items were disseminated in breakdown of sub-items for the base year 1994 = 100. The sub-items that are used in linking the prices are listed in Table A1 in the Annex.

Source: Authors' selection from TURKSTAT data

The data is composed of two successive series: 1994 = 100 base year CPI for years 1994–2004 and 2003 = 100 base year CPI for years 2005–2019. Two series are linked by the use of the monthly increase rate in January 2004.

The production data includes three sub-indices of TURKSTAT’s Calendar Adjusted Industrial Production Index (IPI). The analyzed indices of one digit NACE Rev.2 (Statistical Classification of Economic Activities in the European Community, Revision 2) activities are B-Mining and quarrying, C-Manufacturing, and D-Electricity, gas, steam and air conditioning supply. The monthly indices and increase rates for 34 Hijri years (1407–1440) are transformed from the 2015 = 100 base year IPI of the period from August 1986 to August 2019.

2.1 Transformation of the data into the Hijri calendar

Although many works on the Ramadan effect were carried out using the original domain of the data, i.e., the Gregorian calendar, some analyses were made by transforming data into the Hijri calendar in the literature. Yucel (2005) reconstructed the Hijri data (monthly increase rates of food price index) by summing up the weighted increase rates of corresponding original monthly food price data of Turkey. Riazuddin (2012) proposed a method for calendar transformation and produced the Hijri CPI of Pakistan.

The method used in this work for the transformation of indicators, namely the reconstruction of the Hijri series, assumes that the price level is stable within each Gregorian month, and the production made in each day of a month are equal. The Hijri indicator is defined for price data as:

$$HX_{im} = \frac{1}{h_{im}} \sum_n \sum_j GX_{jn} n_{im,jn} \tag{1}$$

It is defined for production data as:

$$HX_{im} = \sum_n \sum_j GX_{jn} n_{im,jn} \frac{1}{g_{jn}} \tag{2}$$

where:

- HX_{im} : indicator for Hijri month i of year m ;
- GX_{jn} : indicator for Gregorian month j of year n ;
- h_{im} : number of days of i^{th} Hijri month of year m ;
- g_{jn} : number of days of j^{th} Gregorian month of year n ;
- $n_{im,jn}$: number of days in i^{th} Hijri month of year m corresponding to j^{th} Gregorian month of year n .

The transformation of the CPI that is produced following the Gregorian calendar to seven months of the Hijri calendar is exemplified in Table 2.

The Hijri calendar used in Muslim societies is not unique due to the disputes at the beginning of months. Since the data used in this work is of Turkey, the lunar period of Ramadan that the work based is defined following the calendar declared by the Presidency of Religious Affairs of Turkey (DİB, 2020). The first day of each Hijri year and its corresponding Gregorian date are listed in Table A2 in the Annex.

The graphs of the original and transformed series of two indicators, CPI and the Manufacturing Production Index, are in Figures A1–A4 in the Annex.

Table 2 Example of Calendar Transformation of CPI to Seven Hijri Months

Hijri months			Corresponding Gregorian months				CPI-Original Gregorian)	Partial Effect	CPI-New (Hijri)
Year	Month	Number of days of month	Year	Month	Corresponding dates	Number of corresponding days			
(<i>m</i>)	(<i>i</i>)	(<i>h_{im}</i>)	(<i>n</i>)	(<i>j</i>)		(<i>n_{im,jn}</i>)	(<i>GX_{jn}</i>)	(<i>GX_{jn}</i> / <i>h_{im}²n_{im,jn}</i>)	Sum of partials
1414	12	30	1994	5	12–31.05.1994	20	1.144	0.763	1.152
			1994	6	01–10.06.1994	10	1.167	0.389	
1415	1	29	1994	6	11–30.06.1994	20	1.167	0.805	1.178
			1994	7	01–09.07.1994	9	1.203	0.373	
1415	2	29	1994	7	10–31.07.1994	22	1.203	0.913	1.211
			1994	8	01–07.08.1994	7	1.237	0.299	
1415	3	30	1994	8	08–31.08.1994	24	1.237	0.990	1.253
			1994	9	01–06.09.1994	6	1.314	0.263	
1415	4	29	1994	9	07–30.09.1994	24	1.314	1.087	1.330
			1994	10	01–05.10.1994	5	1.409	0.243	
1415	5	30	1994	10	06–31.10.1994	26	1.409	1.221	1.421
			1994	11	01–04.11.1994	4	1.499	0.200	
1415	6	29	1994	11	05–30.11.1994	26	1.499	1.344	1.510
			1994	12	01–03.12.1994	3	1.604	0.166	

Source: Authors' calculation

3 ANALYSIS AND DISCUSSION

3.1 Consumer price in Ramadan

The means of monthly increase rates of prices in 26 Hijri years (1415–1440) are listed and ranked (see Table A3 in the Annex). The indices and prices with the first and second, highest and lowest means of increase rates (ranks of 12, 11, 1, and 2 respectively) in 9th month Ramadan, the previous month Shaban, and the next month Shawwal (Table 3) are distinctly tested for having means of monthly increase rates higher or lower than the means of the remaining months. The term "Corresponding" should be deleted and the following should be a new paragraph.

CPI and prices of four items increased most on average in Ramadan (Table 3). The means of the increase rates of prices of three items (*Milk*, *Mutton*, *Veal*) are significantly higher than the means of other months (see Table A4 in the Annex). However, the difference in the increase rates of *CPI* and price of *butter* in Ramadan and in other months are not significant. On the other hand, although the means of the increase rates of the prices of *chickpea* and *Women's Sport Shoes* decreased most on average in Ramadan, they are not significantly lower than in other months. The monthly means of increase rates of selected nine prices are graphed in Figure 1, and the monthly distributions of increase rates of selected three prices are graphed in Figure 2.

Table 3 The price indicators with highest and lowest increase rates in Shaban, Ramadan, and Shawwal

8 – Shaban		9 – Ramadan		10 – Shawwal	
Indicator	Rank*	Indicator	Rank'	Indicator	Rank*
Bread	12	Ind_CPI	12	Ind_Food	12
Corn Oil	12	Butter	12	Kasar Cheese	12
Dessert	12	Milk	12	Olive	12
Egg	12	Mutton	12	Onion	12
Lentils	12	Veal	12	Tomato	12
Olive Oil	12	Ind_Food	11	Butter	11
Sun-Flower Oil	12	Airplane Fare	11	Garlic-Flavored Sausage	11
Wheat Flour	12	Carbonated Fruity Beverages	11	Milk	11
Bus Fare (Intra-Urban)	11	Dessert	11	Mutton	11
Dry Bean	11	Olive Oil	11	Tea	11
Olive	11	Raki	11	Dry Bean	2
Veal	11	Tomato	11	Egg	2
Airplane Fare	2	Wine	11	Lentils	2
Potato	1	Ind_Clothing-Footwear	2	Sun-Flower Oil	2
		Men's Footwear	2	Women's Sport Shoes	2
		Men's Sport Shoes	2	Ind_Clothing-Footwear	1
		Chickpea	1	Bread	1
		Women's Sport Shoes	1	Fruit Juice	1
				Men's Footwear	1
				Men's Sport Shoes	1
				Women's Footwear	1

Note: * 1: lowest increase rate, 12: highest increase rate.

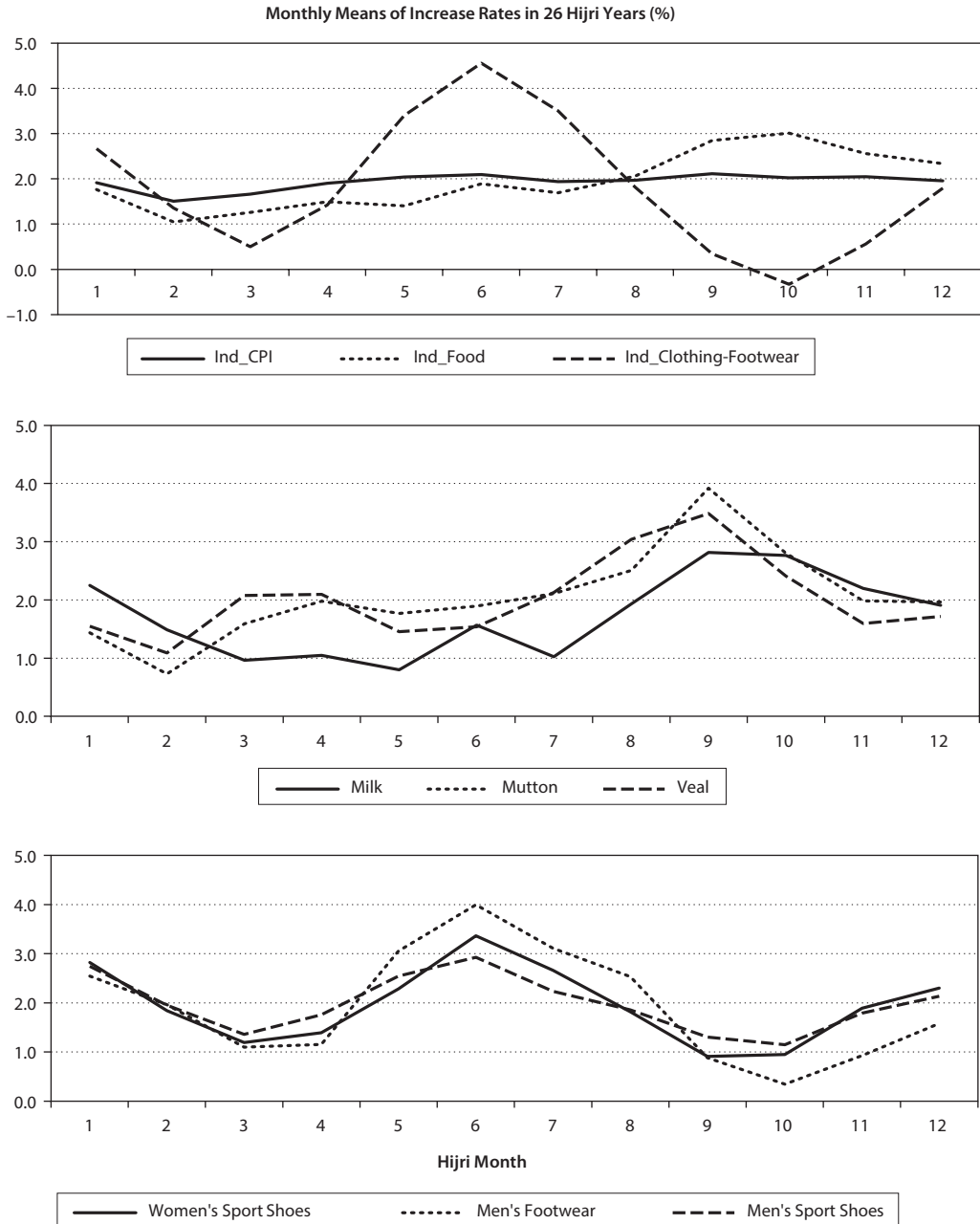
Source: Authors' calculation

The price movements related to Ramadan may affect the previous and next months. The demand for some items may increase in the previous month due to preparation for Ramadan. On the other hand, the price of some items, stocked for Ramadan and Eid al-Fitr (the religious holiday just after the month Ramadan) but could not be sold, may decrease in the next month, and the increased price at the end of Ramadan may be misreported and shifted to the next month. Besides, the calendar transformation mechanism, namely the assumption of the stability of prices during each Gregorian month, may carry some of the price movement to and from the previous and next month of Ramadan. Therefore, the price movements in the previous and next months of Ramadan may provide additional information about the *Ramadan effect*.

In the 8th month Shaban, the increase rates of eight items' prices are the highest, and four items' rates are the second-highest (Table 3). However, only one item's with the highest (*Egg*), and one item's with the second-highest (*Veal*) increase rates have significantly different means (see Table A5 in the Annex). The difference of the means of seven items with highest (*Bread*, *Corn Oil*, *Dessert*, *Lentils*, *Olive Oil*,

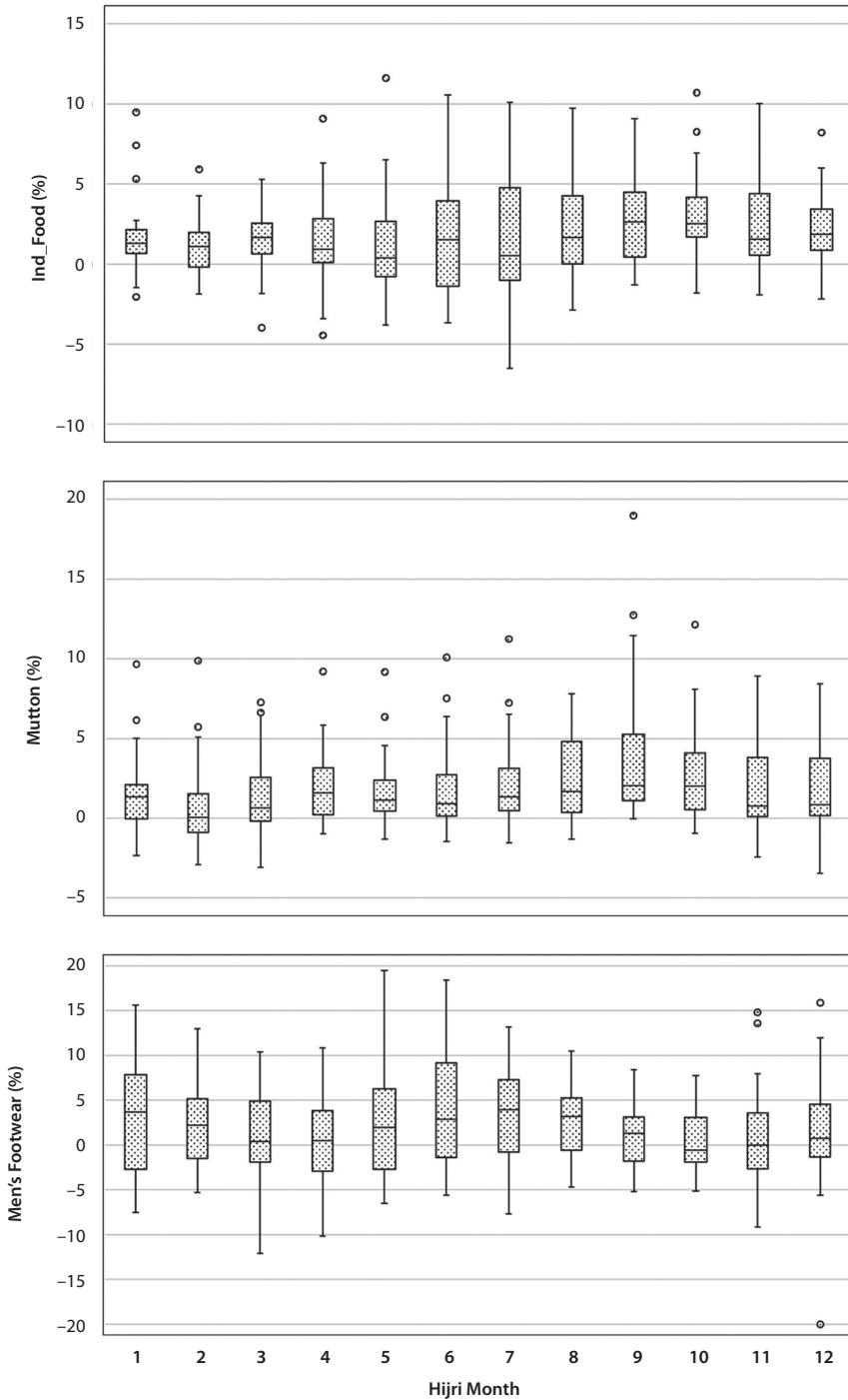
Sun-Flower Oil, Wheat Flour) and three items with the second-highest (*Bus Fare (Intra-Urban), Dry Bean, Olive*) increase rate in Shaban are not significant. There is not any item with the average increase rate in the 8th month that is significantly lower than in other months.

Figure 1 Monthly means of increase rates of selected prices in 26 Hijri years



Source: Authors' construction

Figure 2 Monthly distributions of increase rates of selected prices in 26 Hijri years



Source: Authors' construction

In Shawwal, the 10th month, the *Food Price Index*, and prices of four items increased most, and the increase rates of prices of the other five items are the second-highest (Table 3). The *Food Price Index* and the price of *Tomato* increased significantly more (see Table A6 in the Annex). Other items with the highest increase rates in Shawwal (*Kasar Cheese, Olive, Onion*) did not increase significantly higher than in other months. Although it has the second-highest increase rate in Shawwal, the rate of *Milk* is significantly higher than in other months. The differences in the increase rates of four items (*Butter, Garlic-Flavored Sausage, Mutton, Tea*) in this month from other months are not significant. *The Clothing and Footwear Price Index* and the prices of two of five items with lowest (*Men's Footwear, Men's Sport Shoes*) and one of the five items with second lowest (*Women's Sport Shoes*) increase rate in Shawwal increased significantly lower than in other months.

Finally, the combined price movements in the 8th, 9th, and 10th Hijri months (Shaban, Ramadan, Shawwal) are evaluated by testing the significance of the differences between the means of monthly increase rates of three months and the means of the rates of other nine months for all indices and items. The items with significantly different means of the increase rates and the test parameters are listed in Table A7 in the Annex.

Although the increase rate of *CPI* is the highest on average in Ramadan, the mean of the increase rates of *CPI* in Ramadan is not significantly higher than the mean of other months. However, the mean of the increase rates of *Food Price Index*, a sub-index of *CPI* is highest in Shawwal and second highest in Ramadan. The difference of the mean of the rates in Shawwal from other months is significant (*sig.: 0.029*), but it is not in Ramadan. On the other hand, the increase rate of another sub-index, *Clothing and Footwear Price Index*, is significantly lower than other months both in Shawwal (*sig: 0.002*) and Ramadan (*sig.: 0.018*). However, the comparison of the mean of increase rates of combined three months with the mean of the remaining nine months presents more significant differences (Table 4). The monthly increase rates of the *Food Price Index* and prices of *Bus Fare, Milk, Mutton, and Veal* are significantly (at %1 sig. level) higher in the three months than their increase rates in other months.

Table 4 The index and items with monthly increase rates significantly higher and lower than other months and the significance levels

Indicator	Sig. (1-tailed)			
	Ramadan	Shaban	Shawwal	3 Months
<i>Higher than Other Months</i>				
Ind_Food			0.029**	0.009***
Bus Fare (Intra-Urban)				0.006***
Egg		0.018**		
Milk	0.030**		0.037**	0.005***
Mutton	0.017**			0.001***
Tomato			0.046**	0.019**
Veal	0.004***	0.033**		0.000***
<i>Lower than Other Months</i>				
Ind_Clothing-Footwear	0.018**		0.002***	0.004***
Men's Footwear			0.012**	
Men's Sport Shoes			0.036**	0.043**
Men's Trousers				0.040**
Skirt				0.029**
Women's Sport Shoes			0.024**	0.012**

Note: *** and ** implies that the difference is significant at 1% and 5% level, respectively.

Source: Authors' calculation

3.2 Production in Ramadan

Similar methodology used in testing the prices is applied to one digit sub-indices of the IPI. The means of monthly increase rates in 34 Hijri years (1407–1440) are listed and ranked (see Table A8 in the Annex). The production indices of two-digit or more specific activities comprised within IPI are worth to test. However, for the production indices of sub-activities, the calendar adjusted Industrial Production Index is available since 2005, and it corresponds to 15 Hijri years. Since the data is considered not enough for such an analysis, the sub-sectors are excluded.

As it is presented in Table A8 in the Annex, the production indices of *B-Mining and quarrying* and *C- Manufacturing* increased least in Ramadan, actually decreased on average. The increase rates of two indices in Ramadan (Mth_9 in Table 5) are tested against the null hypotheses that the level of difference, more specifically the decreased rate in Ramadan compared to other months, is not significant (Table 5).

Table 5 T-test results of increase rates of production indices (Ramadan-others)

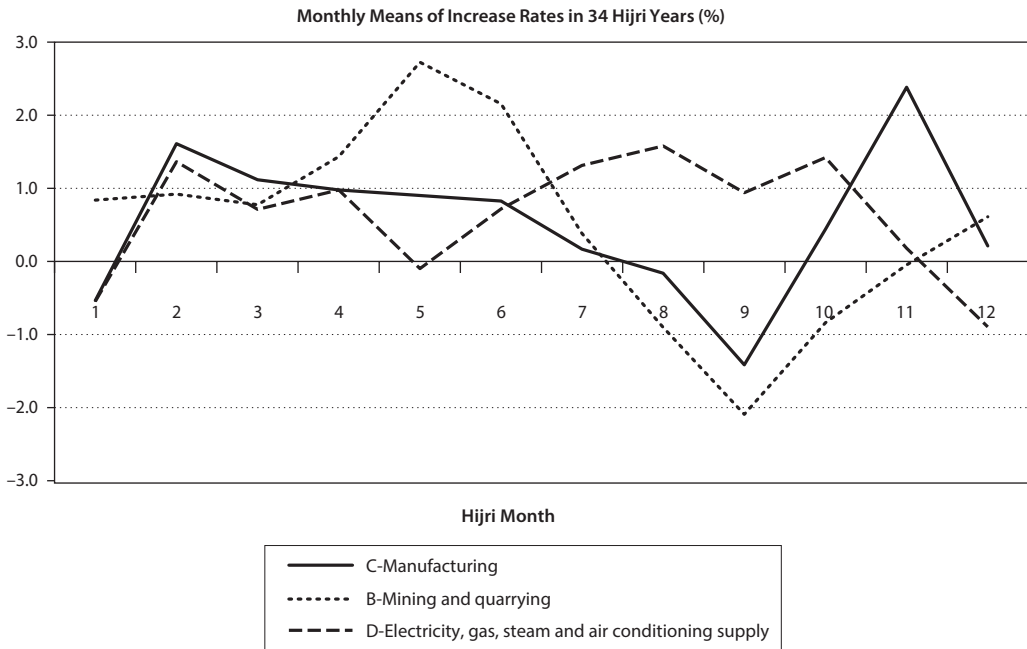
Ramadan and others		N	Mean	Std. Error Mean
B-Mining and quarrying	Mth_9	34	-2.091	0.984
	Others	374	0.732	0.404
C-Manufacturing	Mth_9	34	-1.417	0.902
	Others	374	0.720	0.330
D-Electricity, gas, steam and air conditioning supply	Mth_9	34	0.941	1.041
	Others	374	0.611	0.253

Indicator	Equal Variances Assumed?	Levene's Test for Equality of Variances		t-test for Equality of Means Ramadan and others						
		F	Sig.	t	df	Sig. (1-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
B-Mining and quarrying	Yes	2.716	0.1001	-2.056	406	0.020**	-2.823	1.373	-5.523	-0.123
	No			-2.653	44.943	0.005	-2.823	1.064	-4.966	-0.680
C-Manufacturing	Yes	1.763	0.185	-1.894	406	0.029**	-2.138	1.129	-4.357	0.081
	No			-2.225	42.363	0.016	-2.138	0.961	-4.076	-0.199
D-Electricity, gas, steam and air conditioning supply	Yes	2.869	0.091	0.369	406	0.356	0.330	0.895	-1.430	2.090
	No			0.308	37.001	0.380	0.330	1.071	-1.841	2.501

Note: *** and ** implies that the difference is significant at 1% and 5% level, respectively.

Source: Authors' calculation

The increase rates of both tested indicators are significantly less than the rates of other months on average (*sig.*: 0.020 for *B-Mining and quarrying* and *sig.*: 0.029 for *C-Manufacturing*). On the other hand, the mean of the increase rates of the *D-Electricity, gas, steam and air conditioning supply index* in Ramadan is over the average of other months. Still, it is neither the highest increase rate among the months nor not significantly higher than the means in other months (Figure 3). The analysis indicates that manufacturing production and mining activities decrease significantly in Ramadan.

Figure 3 Monthly means of increase rates of production in 34 Hijri years

Source: Authors' construction

CONCLUSION

CPI of Turkey is found to have the highest increase rate, on average, in Ramadan, among the Hijri months, but the difference between the means of its increase rates in Ramadan and other months is not significant. However, the means of the increase rates of the prices of three food items (*Milk, Mutton, and Veal*) in Ramadan are significantly higher than the means of other months. On the other hand, the increase rate of *Clothing and Footwear Price Index* in Ramadan is significantly lower than in other months.

In Shaban and Shawwal, the previous and next months of Ramadan, respectively, the means of the increase rates of the prices of several items are significantly high, which may be related to the Ramadan effect. More importantly, the mean of the monthly increase rates in the combined three months (Shaban, Ramadan, and Shawwal) is significantly higher than in the remaining nine months for more items than it is in individual months. Besides, the significance levels are mostly better, implying that the Ramadan effect is expanded to three months. However, it must be noted that the expansion may be partly false for two reasons. At first, the price movements of some items that emerge at the end of the months may be misreported and technically shifted to next month due to the methodology used. Secondly, the assumption of the stability of prices during each Gregorian month, which is essential for calendar transformation of the indicators, may carry some part of the price movement to and from the previous and next month of Ramadan.

The existence of the Ramadan effect on industrial production in Turkey is also observed. Two of the three sub-indices of Industrial Production Index (*B-Mining and quarrying* and *C-Manufacturing*) are decreased in Ramadan significantly more than in other months.

Utilizing the findings may improve the quality of economic forecasts, such as the accuracy of inflation forecasting models. Besides, the impact on production should be considered in the calculation of adjusted indices with other seasonal effects.

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ANNEX: Supplementary tables and figures

Table A1 The sub-items of 1994 = 100 CPI that used in linking the prices

Item – 2003 = 100 CPI	Item – 1994 = 100 CPI
Rice	Rice (Baldo)
Bread	White bread
Dessert	Desserts (Baklava)
Veal	Veal (incised meat)
Mutton	Mutton (Meat cut in large pieces)
Poultry	Poultry (Whole)
White Cheese	White cheese (Semi-skimmed)
Kasar Cheese	Kosher cheese (Fresh)
Lentils	Lentils (Red)
Olive	Olive (Black)
Granulated Sugar	Powdered sugar
Cube Sugar	Lump sugar
Tea	Tea (Produced by Private Sector)
Carbonated Fruity Beverages	Carbonated fruity beverages (Plastic bottle)
Coke	Coke (Plastic bottle)
Fruit Juice	Fruit Juices (Carton box 1lt.)
Raki	Raki (average of 35 cl and 70 cl)
Wine	Wine (Produced by Private Sector)
Beer	Beer (Produced by Private Sector)
Men's Trousers	Trousers (Terrycloth Men)
Skirt	Skirts (Linen Women)
Women's Trousers	Trousers (Gabardin Women)
Men's Footwear	Men's footwear (Without lace)
Men's Sport Shoes	Sport shoes (Leather Men)
Women's Footwear	Women's footwear (Without lace)
Women's Sport Shoes	Sport shoes (Leather Women)
Bus Fare (Intra-Urban)	Bus fare (Adana)
Airplane Fare	Airplane fare (İzmir)

Source: TURKSTAT

Table A2 The Hijri New Year and the corresponding Gregorian date

Hijri New Year	Corresponding Gregorian Date
1.1.1407	5.9.1986
1.1.1408	26.8.1987
1.1.1409	14.8.1988
1.1.1410	3.8.1989
1.1.1411	23.7.1990
1.1.1412	13.7.1991
1.1.1413	2.7.1992
1.1.1414	21.6.1993
1.1.1415	11.06.1994
1.1.1416	31.05.1995
1.1.1417	19.05.1996
1.1.1418	8.5.1997
1.1.1419	27.4.1998
1.1.1420	17.4.1999
1.1.1421	6.4.2000
1.1.1422	26.3.2001
1.1.1423	15.3.2002
1.1.1424	4.3.2003
1.1.1425	21.2.2004
1.1.1426	10.2.2005
1.1.1427	31.1.2006
1.1.1428	20.1.2007
1.1.1429	10.1.2008
1.1.1430	29.12.2008
1.1.1431	17.12.2009
1.1.1432	7.12.2010
1.1.1433	26.11.2011
1.1.1434	15.11.2012
1.1.1435	4.11.2013
1.1.1436	25.10.2014
1.1.1437	14.10.2015
1.1.1438	2.10.2016
1.1.1439	21.9.2017
1.1.1440	11.9.2018

Source: Presidency of Religious Affairs of Turkey

Table A3 Monthly means of increase rates of prices in 26 Hijri years and their ranks among months

Indicator	Monthly Means of Increase Rates in 26 Hijri Years (%)												Rank of the Month (1:lowest, 12:highest)											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1 Ind_CPI	1.91	1.50	1.66	1.90	2.04	2.10	1.94	1.97	2.11	2.02	2.05	1.96	4	1	2	3	9	11	5	7	12	8	10	6
2 Ind_Food	1.76	1.05	1.26	1.49	1.40	1.89	1.69	2.06	2.85	3.01	2.56	2.33	6	1	2	4	3	7	5	8	11	12	10	9
3 Ind_Clothing-Footwear	2.67	1.35	0.50	1.42	3.40	4.56	3.50	1.82	0.34	-0.33	0.56	1.79	9	5	3	6	10	12	11	8	2	1	4	7
4 Airplane Fare	0.30	2.61	3.13	3.78	3.21	1.29	2.30	1.23	3.60	2.94	1.75	2.37	1	7	9	12	10	3	5	2	11	8	4	6
5 Beer	2.42	2.39	3.01	2.64	1.85	1.39	0.96	1.50	2.30	2.42	3.21	2.68	8	6	11	9	4	2	1	3	5	7	12	10
6 Bread	2.01	2.43	1.82	2.32	1.48	1.75	2.73	2.77	2.04	1.11	1.53	1.33	7	10	6	9	3	5	11	12	8	1	4	2
7 Bus Fare (Intra-Urban)	0.71	0.46	1.22	1.76	2.11	2.13	2.19	2.94	2.94	2.72	1.47	3.46	2	1	3	5	6	7	8	11	10	9	4	12
8 Butter	2.11	1.81	1.40	1.51	1.62	2.54	1.68	1.66	2.73	2.59	2.19	1.80	8	7	1	2	3	10	5	4	12	11	9	6
9 Carbonated Fruity Beverages	1.85	1.41	1.43	1.08	1.10	1.85	1.63	1.79	2.04	1.58	1.81	2.47	9	3	4	1	2	10	6	7	11	5	8	12
10 Chickpea	1.79	2.52	2.45	1.71	1.57	2.21	2.39	2.34	1.24	1.77	1.96	1.78	6	12	11	3	2	8	10	9	1	4	7	5
11 Coke	1.91	1.34	1.29	0.76	1.09	1.98	1.92	1.77	2.00	1.54	2.06	2.60	7	4	3	1	2	9	8	6	10	5	11	12
12 Corn Oil	1.72	2.19	1.69	1.76	1.89	1.97	2.14	2.54	1.45	1.24	0.74	1.09	6	11	5	7	8	9	10	12	4	3	1	2
13 Cube Sugar	1.48	1.85	1.65	2.04	2.30	1.99	2.03	1.79	1.86	1.74	1.82	1.42	2	7	3	11	12	9	10	5	8	4	6	1
14 Dessert	2.19	1.72	1.80	2.10	2.23	1.93	2.22	2.71	2.26	1.86	1.69	1.45	8	3	4	7	10	6	9	12	11	5	2	1
15 Dry Bean	1.99	2.88	2.16	1.84	1.28	1.94	2.74	2.84	1.55	1.24	1.44	1.20	8	12	9	6	3	7	10	11	5	2	4	1
16 Egg	-3.47	1.61	4.93	1.79	1.06	3.28	1.85	5.69	1.78	0.29	5.34	2.39	1	4	10	6	3	9	7	12	5	2	11	8
17 Fruit Juice	2.00	2.32	1.70	1.60	1.39	1.82	1.58	1.67	1.45	1.36	1.72	2.21	10	12	7	5	2	9	4	6	3	1	8	11
18 Garlic-Flavored Sausage	1.83	1.68	1.97	2.71	1.75	1.76	1.71	1.90	1.78	2.17	1.68	1.61	8	2	10	12	5	6	4	9	7	11	3	1

Table A3

continuation

Indicator	Monthly Means of Increase Rates in 26 Hjiiri Years (%)												Rank of the Month (1:lowest, 12:highest)											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
19 Granulated Sugar	1.45	2.24	1.54	2.19	2.58	1.90	1.91	1.81	2.14	1.68	1.66	1.42	2	11	3	10	12	7	8	6	9	5	4	1
20 Kasar Cheese	2.27	1.66	1.35	1.51	1.89	2.24	1.86	1.71	1.69	2.38	2.15	2.19	11	3	1	2	7	10	6	5	4	12	8	9
21 Lentils	1.69	1.46	2.17	2.09	2.03	1.92	2.96	2.96	1.95	1.46	1.58	1.31	5	3	10	9	8	6	11	12	7	2	4	1
22 Men's Footwear	2.54	1.97	1.10	1.16	3.05	4.00	3.11	2.53	0.88	0.35	0.92	1.58	9	7	4	5	10	12	11	8	2	1	3	6
23 Men's Sport Shoes	2.74	1.95	1.36	1.76	2.54	2.93	2.24	1.86	1.30	1.15	1.79	2.13	11	7	3	4	10	12	9	6	2	1	5	8
24 Men's Trousers	5.26	3.00	0.05	-0.52	0.33	1.68	1.06	1.18	0.75	0.78	2.92	4.85	12	10	2	1	3	8	6	7	4	5	9	11
25 Milk	2.25	1.49	0.96	1.05	0.80	1.56	1.02	1.93	2.82	2.76	2.20	1.91	10	5	2	4	1	6	3	8	12	11	9	7
26 Mutton	1.43	0.73	1.59	1.98	1.77	1.90	2.11	2.51	3.92	2.80	1.98	1.97	2	1	3	7	4	5	9	10	12	11	8	6
27 Olive	1.88	1.76	1.79	1.77	1.76	1.96	1.75	2.02	1.96	2.11	1.68	1.66	8	5	7	6	4	9	3	11	10	12	2	1
28 Olive Oil	1.53	1.75	2.39	2.41	1.49	1.96	1.99	2.65	2.48	2.04	1.55	1.28	3	5	9	10	2	6	7	12	11	8	4	1
29 Onion	5.32	5.62	4.37	3.00	-0.58	-2.84	-1.83	1.05	4.70	6.15	1.63	2.49	10	11	8	7	3	1	2	4	9	12	5	6
30 Potato	6.53	5.12	4.24	5.55	2.13	0.00	1.35	-0.07	1.99	1.45	0.13	2.91	12	10	9	11	7	2	4	1	6	5	3	8
31 Poultry	1.11	5.84	7.23	4.63	1.49	0.53	0.82	1.55	4.16	0.66	-2.57	-1.73	6	11	12	10	7	3	5	8	9	4	1	2
32 Raki	2.81	1.65	3.63	2.82	2.73	1.62	1.38	2.91	3.19	2.00	2.56	2.07	8	3	12	9	7	2	1	10	11	4	6	5
33 Rice	2.06	2.71	2.79	2.74	1.59	2.14	1.73	1.73	1.39	1.04	1.04	0.99	8	10	12	11	5	9	7	6	4	3	2	1
34 Skirt	5.05	2.29	0.01	-0.54	0.42	2.26	1.80	0.45	0.11	1.10	4.27	5.11	11	9	2	1	4	8	7	5	3	6	10	12
35 Sun-Flower Oil	2.01	2.25	1.88	1.97	1.76	1.61	2.02	2.39	1.88	1.19	0.85	1.33	9	11	7	8	5	4	10	12	6	2	1	3
36 Tea	2.33	2.22	2.90	1.70	1.29	1.36	1.96	1.50	1.63	2.77	1.65	1.66	10	9	12	7	1	2	8	3	4	11	5	6
37 Tomato	4.96	-3.65	-4.86	-2.66	-1.66	4.64	8.80	2.74	10.95	13.53	8.88	10.22	7	2	1	3	4	6	8	5	11	12	9	10
38 Veal	1.55	1.09	2.07	2.09	1.45	1.54	2.13	3.04	3.49	2.41	1.59	1.72	4	1	7	8	2	3	9	11	12	10	5	6
39 Wheat Flour	1.70	2.10	2.04	1.41	0.91	1.64	2.54	2.61	1.80	1.66	1.65	1.49	7	10	9	2	1	4	11	12	8	6	5	3
40 Whisky	2.67	1.47	3.36	2.41	2.74	1.55	1.52	2.06	2.69	2.53	2.60	2.76	8	1	12	5	10	3	2	4	9	6	7	11
41 White Cheese	2.51	1.55	1.33	1.31	1.84	2.52	2.17	2.01	1.77	1.96	1.83	3.67	10	3	2	1	6	11	9	8	4	7	5	12
42 Wine	1.90	1.92	2.90	2.19	1.74	2.07	1.86	2.29	2.33	2.27	2.17	1.66	4	5	12	8	2	6	3	10	11	9	7	1
43 Women's Footwear	2.37	0.95	0.65	0.86	3.31	4.59	3.17	2.04	1.10	0.50	1.36	1.88	9	4	2	3	11	12	10	8	5	1	6	7
44 Women's Sport Shoes	2.82	1.84	1.19	1.39	2.29	3.36	2.66	1.82	0.91	0.95	1.89	2.30	11	6	3	4	8	12	10	5	1	2	7	9
45 Women's Trousers	2.67	1.32	-0.12	0.23	2.85	5.74	4.38	2.92	0.55	-0.54	0.72	1.79	8	6	2	3	9	12	11	10	4	1	5	7
46 Yoghurt	2.43	1.73	1.20	1.59	1.80	2.25	1.39	1.43	2.13	2.00	1.87	2.02	12	5	1	4	6	11	2	3	10	8	7	9

Source: Authors' calculation

Table A4 T-test results of means of increase rates of prices, Ramadan-others
A. Group statistics

Ramadan and others		N	Mean	Std. Deviation	Std Error Mean.
Ind_CPI	Mth_9	26	2.113	2.106	0.413
	Others	286	1.914	2.007	0.119
Ind_Food	Mth_9	26	2.847	2.984	0.585
	Others	286	1.865	2.987	0.177
Ind_Clothing-Footwear	Mth_9	26	0.344	3.327	0.652
	Others	286	1.931	5.679	0.336
Dessert	Mth_9	26	2.260	1.978	0.388
	Others	286	1.991	2.000	0.118
Veal	Mth_9	26	3.487	3.222	0.632
	Others	286	1.880	2.924	0.173
Mutton	Mth_9	26	3.918	4.553	0.893
	Others	286	1.887	2.811	0.166
Milk	Mth_9	26	2.818	2.880	0.565
	Others	286	1.631	3.081	0.182
Butter	Mth_9	26	2.731	2.918	0.572
	Others	286	1.900	2.784	0.165
Olive Oil	Mth_9	26	2.481	4.412	0.865
	Others	286	1.914	3.728	0.220
Tomato	Mth_9	26	10.946	23.978	4.703
	Others	286	3.721	23.262	1.376
Chickpea	Mth_9	26	1.237	3.483	0.683
	Others	286	2.045	3.584	0.212
Carbonated Fruity Beverages	Mth_9	26	2.044	2.456	0.482
	Others	286	1.635	3.050	0.180
Raki	Mth_9	26	3.195	6.658	1.306
	Others	286	2.380	4.560	0.270
Wine	Mth_9	26	2.326	3.202	0.628
	Others	286	2.088	3.135	0.185
Men's Footwear	Mth_9	26	0.881	3.607	0.707
	Others	286	2.028	5.686	0.336
Men's Sport Shoes	Mth_9	26	1.301	2.993	0.587
	Others	286	2.041	3.995	0.236
Women's Sport Shoes	Mth_9	26	0.907	2.900	0.569
	Others	286	2.047	4.126	0.244
Airplane Fare	Mth_9	26	3.597	9.029	1.771
	Others	286	2.265	6.655	0.394

Source: Authors' calculation

Table A4 T-test results of means of increase rates of prices, Ramadan-others (cont'd)
B. T-test parameters

Indicator	Equal Variances Assumed?	Levene's Test for Equal. of Varian.		t-test for Equality of Means Ramadan and others						
		F	Sig.	t	df	Sig. (1-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Ind_CPI	Yes	0.220	0.639	0.483	310	0.315	0.199	0.413	-0.613	1.012
	No			0.464	29.281	0.323	0.199	0.430	-0.679	1.078
Ind_Food	Yes	0.070	0.791	1.605	310	0.055	0.982	0.612	-0.222	2.186
	No			1.606	29.740	0.059	0.982	0.611	-0.267	2.231
Ind_Clothing-Footwear	Yes	12.751	0.000***	-1.403	310	0.081	-1.588	1.132	-3.815	0.640
	No			-2.164	39.751	0.018**	-1.588	0.734	-3.071	-0.104
Dessert	Yes	0.177	0.674	0.656	310	0.256	0.268	0.409	-0.537	1.074
	No			0.662	29.841	0.257	0.268	0.406	-0.560	1.097
Veal	Yes	0.215	0.643	2.659	310	0.004***	1.606	0.604	0.418	2.795
	No			2.452	28.869	0.010	1.606	0.655	0.266	2.947
Mutton	Yes	8.189	0.005***	3.316	310	0.001	2.030	0.612	0.826	3.235
	No			2.236	26.760	0.017**	2.030	0.908	0.166	3.895
Milk	Yes	0.158	0.692	1.891	310	0.030**	1.187	0.628	-0.048	2.422
	No			2.000	30.442	0.027	1.187	0.594	-0.024	2.398
Butter	Yes	1.072	0.301	1.451	310	0.074	0.831	0.573	-0.296	1.957
	No			1.395	29.290	0.087	0.831	0.596	-0.387	2.048
Olive Oil	Yes	1.859	0.174	0.731	310	0.233	0.567	0.776	-0.960	2.094
	No			0.635	28.342	0.265	0.567	0.893	-1.261	2.395
Tomato	Yes	0.002	0.969	1.512	310	0.066	7.224	4.777	-2.175	16.624
	No			1.474	29.442	0.075	7.224	4.900	-2.790	17.238
Chickpea	Yes	0.692	0.406	-1.102	310	0.136	-0.808	0.733	-2.249	0.634
	No			-1.129	30.020	0.134	-0.808	0.715	-2.268	0.653
Carbonated Fruity Beverages	Yes	0.014	0.906	0.664	310	0.254	0.409	0.616	-0.803	1.621
	No			0.795	32.447	0.216	0.409	0.514	-0.638	1.456
Raki	Yes	2.868	0.091	0.834	310	0.202	0.814	0.976	-1.106	2.734
	No			0.611	27.173	0.273	0.814	1.333	-1.921	3.549
Wine	Yes	0.765	0.383	0.370	310	0.356	0.238	0.643	-1.028	1.503
	No			0.363	29.526	0.360	0.238	0.655	-1.100	1.576
Men's Footwear	Yes	6.235	0.013**	-1.009	310	0.157	-1.147	1.136	-3.383	1.089
	No			-1.464	37.407	0.076	-1.147	0.783	-2.733	0.439
Men's Sport Shoes	Yes	1.658	0.199	-0.921	310	0.179	-0.740	0.804	-2.322	0.841
	No			-1.170	33.673	0.125	-0.740	0.633	-2.027	0.546
Women's Sport Shoes	Yes	1.776	0.184	-1.377	310	0.085	-1.140	0.828	-2.769	0.489
	No			-1.842	34.942	0.037	-1.140	0.619	-2.396	0.117
Airplane Fare	Yes	3.076	0.080	0.946	310	0.173	1.332	1.409	-1.440	4.104
	No			0.734	27.525	0.234	1.332	1.814	-2.386	5.050

Note: *** and ** implies that the difference is significant at 1% and 5% level, respectively.
Source: Authors' calculation

Table A5 T-test results of means of increase rates of prices, Shaban-others
A. Group statistics

Shaban and others		N	Mean	Std. Deviation	Std Error Mean.
Wheat Flour	Mth_8	26	2.614	4.147	0.813
	Others	286	1.722	2.585	0.153
Bread	Mth_8	26	2.770	4.085	0.801
	Others	286	1.869	2.676	0.158
Dessert	Mth_8	26	2.713	2.439	0.478
	Others	286	1.950	1.944	0.115
Veal	Mth_8	26	3.041	2.226	0.437
	Others	286	1.921	3.023	0.179
Egg	Mth_8	26	5.686	9.774	1.917
	Others	286	1.896	8.730	0.516
Olive Oil	Mth_8	26	2.652	5.063	0.993
	Others	286	1.898	3.652	0.216
Sun-Flower Oil	Mth_8	26	2.392	6.563	1.287
	Others	286	1.705	3.394	0.201
Corn Oil	Mth_8	26	2.540	6.617	1.298
	Others	286	1.625	3.358	0.199
Potato	Mth_8	26	-0.066	9.770	1.916
	Others	286	2.855	13.255	0.784
Dry Bean	Mth_8	26	2.845	5.679	1.114
	Others	286	1.843	3.570	0.211
Lentils	Mth_8	26	2.965	4.582	0.899
	Others	286	1.875	4.409	0.261
Olive	Mth_8	26	2.024	2.450	0.480
	Others	286	1.826	1.786	0.106
Bus Fare (Intra-Urban)	Mth_8	26	2.942	4.914	0.964
	Others	286	1.925	3.292	0.195
Airplane Fare	Mth_8	26	1.229	3.039	0.596
	Others	286	2.480	7.117	0.421

Source: Authors' calculation

Table A5 T-test results of means of increase rates of prices, Shaban-others (cont'd)
B. T-test parameters

Indicator	Equal Variances Assumed?	Levene's Test for Equal. of Varian.		t-test for Equality of Means Shaban and others						
		F	Sig.	t	df	Sig. (1-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Wheat Flour	Yes	6.861	0.009***	1.586	310	0.057	0.892	0.562	-0.214	1.998
	No			1.077	26.794	0.145	0.892	0.828	-0.807	2.590
Bread	Yes	5.901	0.016**	1.562	310	0.060	0.901	0.577	-0.234	2.036
	No			1.103	26.985	0.140	0.901	0.817	-0.775	2.576
Dessert	Yes	5.398	0.021**	1.874	310	0.031	0.763	0.407	-0.038	1.565
	No			1.552	27.963	0.066	0.763	0.492	-0.244	1.771
Veal	Yes	1.469	0.226	1.843	310	0.033**	1.120	0.608	-0.076	2.316
	No			2.374	34.001	0.012	1.120	0.472	0.161	2.079
Egg	Yes	0.562	0.454	2.098	310	0.018**	3.790	1.806	0.236	7.344
	No			1.909	28.745	0.033	3.790	1.985	-0.271	7.852
Olive Oil	Yes	1.934	0.165	0.972	310	0.166	0.754	0.775	-0.772	2.279
	No			0.742	27.416	0.232	0.754	1.016	-1.330	2.837
Sun-Flower Oil	Yes	4.050	0.045**	0.895	310	0.186	0.688	0.768	-0.824	2.199
	No			0.528	26.229	0.301	0.688	1.303	-1.989	3.364
Corn Oil	Yes	3.162	0.076	1.198	310	0.116	0.915	0.764	-0.588	2.417
	No			0.697	26.183	0.246	0.915	1.313	-1.783	3.612
Potato	Yes	0.456	0.500	-1.096	310	0.137	-2.921	2.665	-8.164	2.322
	No			-1.411	33.984	0.084	-2.921	2.070	-7.128	1.287
Dry Bean	Yes	9.599	0.002***	1.293	310	0.098	1.002	0.775	-0.523	2.527
	No			0.884	26.826	0.192	1.002	1.134	-1.324	3.329
Lentils	Yes	1.678	0.196	1.203	310	0.115	1.090	0.906	-0.693	2.873
	No			1.165	29.368	0.127	1.090	0.936	-0.823	3.003
Olive	Yes	6.058	0.014**	0.523	310	0.301	0.198	0.379	-0.547	0.943
	No			0.403	27.469	0.345	0.198	0.492	-0.810	1.207
Bus Fare (Intra-Urban)	Yes	2.061	0.152	1.439	310	0.076	1.017	0.707	-0.373	2.408
	No			1.035	27.077	0.155	1.017	0.983	-1.000	3.034
Airplane Fare	Yes	2.081	0.150	-0.888	310	0.188	-1.251	1.409	-4.024	1.521
	No			-1.715	54.939	0.046	-1.251	0.730	-2.714	0.211

Note: *** and ** implies that the difference is significant at 1% and 5% level, respectively.
Source: Authors' calculation

Table A6 T-test results of means of increase rates of prices, Shawwal-others
A. Group statistics

Shawwal and others		N	Mean	Std. Deviation	Std Error Mean.
Ind_Food	Mth_10	26	3.013	2.794	0.548
	Others	286	1.850	2.997	0.177
Ind_Clothing-Footwear	Mth_10	26	-0.329	3.501	0.687
	Others	286	1.993	5.648	0.334
Bread	Mth_10	26	1.114	1.483	0.291
	Others	286	2.020	2.904	0.172
Mutton	Mth_10	26	2.800	3.117	0.611
	Others	286	1.989	3.026	0.179
Garlic-Flavored Sausage	Mth_10	26	2.170	1.487	0.292
	Others	286	1.853	2.671	0.158
Milk	Mth_10	26	2.763	2.180	0.427
	Others	286	1.636	3.133	0.185
Kasar Cheese	Mth_10	26	2.382	1.475	0.289
	Others	286	1.864	3.204	0.189
Egg	Mth_10	26	0.287	9.011	1.767
	Others	286	2.387	8.849	0.523
Butter	Mth_10	26	2.586	2.240	0.439
	Others	286	1.913	2.842	0.168
Sun-Flower Oil	Mth_10	26	1.190	2.687	0.527
	Others	286	1.814	3.830	0.226
Tomato	Mth_10	26	13.532	28.599	5.609
	Others	286	3.486	22.710	1.343
Onion	Mth_10	26	6.153	10.139	1.988
	Others	286	2.085	13.586	0.803
Dry Bean	Mth_10	26	1.236	3.285	0.644
	Others	286	1.989	3.830	0.226
Lentils	Mth_10	26	1.460	3.027	0.594
	Others	286	2.012	4.534	0.268
Olive	Mth_10	26	2.112	1.723	0.338
	Others	286	1.818	1.858	0.110
Tea	Mth_10	26	2.769	4.666	0.915
	Others	286	1.837	3.659	0.216
Fruit Juice	Mth_10	26	1.355	1.439	0.282
	Others	286	1.771	2.484	0.147
Men's Footwear	Mth_10	26	0.345	3.332	0.653
	Others	286	2.076	5.689	0.336
Men's Sport Shoes	Mth_10	26	1.149	2.179	0.427
	Others	286	2.055	4.038	0.239
Women's Footwear	Mth_10	26	0.499	5.355	1.050
	Others	286	2.025	6.559	0.388
Women's Sport Shoes	Mth_10	26	0.949	2.440	0.478
	Others	286	2.043	4.153	0.246

Source: Authors' calculation

Table A6 T-test results of means of increase rates of prices, Shawwal-others (cont'd)
B. T-test parameters

Indicator	Equal Variances Assumed?	Levene's Test for Equal. of Varian.		t-test for Equality of Means Shawwal and others						
		F	Sig.	t	df	Sig. (1-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Ind_Food	Yes	0.293	0.588	1.904	310	0.029**	1.163	0.611	-0.039	2.365
	No			2.019	30.474	0.026	1.163	0.576	-0.012	2.339
Ind_Clothing-Footwear	Yes	11.267	0.001***	-2.058	310	0.020	-2.321	1.128	-4.540	-0.102
	No			-3.040	38.042	0.002***	-2.321	0.764	-3.867	-0.775
Bread	Yes	3.862	0.0503	-1.571	310	0.059	-0.906	0.577	-2.041	0.229
	No			-2.682	44.989	0.005	-0.906	0.338	-1.586	-0.226
Mutton	Yes	0.053	0.818	1.305	310	0.096	0.811	0.621	-0.411	2.034
	No			1.274	29.449	0.106	0.811	0.637	-0.491	2.113
Garlic-Flavored Sausage	Yes	4.123	0.043**	0.597	310	0.276	0.317	0.532	-0.729	1.364
	No			0.957	41.521	0.172	0.317	0.332	-0.352	0.987
Milk	Yes	1.581	0.210	1.794	310	0.037**	1.127	0.628	-0.109	2.363
	No			2.420	35.162	0.010	1.127	0.466	0.182	2.073
Kasar Cheese	Yes	3.737	0.054	0.815	310	0.208	0.517	0.635	-0.732	1.767
	No			1.497	50.245	0.070	0.517	0.346	-0.177	1.212
Egg	Yes	0.003	0.954	-1.157	310	0.124	-2.100	1.815	-5.671	1.472
	No			-1.139	29.555	0.132	-2.100	1.843	-5.866	1.667
Butter	Yes	0.403	0.526	1.175	310	0.120	0.673	0.573	-0.454	1.801
	No			1.431	32.787	0.081	0.673	0.470	-0.284	1.631
Sun-Flower Oil	Yes	0.416	0.519	-0.813	310	0.209	-0.624	0.768	-2.136	0.887
	No			-1.089	34.983	0.142	-0.624	0.574	-1.789	0.540
Tomato	Yes	2.285	0.132	2.110	310	0.018**	10.046	4.760	0.679	19.413
	No			1.742	27.940	0.046	10.046	5.767	-1.769	21.861
Onion	Yes	0.401	0.527	1.489	310	0.069	4.068	2.733	-1.309	9.445
	No			1.897	33.749	0.033	4.068	2.145	-0.291	8.428
Dry Bean	Yes	0.829	0.363	-0.971	310	0.166	-0.753	0.776	-2.280	0.774
	No			-1.103	31.517	0.139	-0.753	0.683	-2.145	0.638
Lentils	Yes	2.770	0.097	-0.608	310	0.272	-0.552	0.908	-2.338	1.234
	No			-0.847	36.101	0.201	-0.552	0.651	-1.873	0.769
Olive	Yes	0.352	0.553	0.777	310	0.219	0.294	0.378	-0.451	1.038
	No			0.827	30.531	0.207	0.294	0.355	-0.431	1.019
Tea	Yes	2.580	0.109	1.213	310	0.113	0.932	0.768	-0.580	2.443
	No			0.991	27.865	0.165	0.932	0.940	-0.995	2.858
Fruit Juice	Yes	4.572	0.033**	-0.839	310	0.201	-0.415	0.495	-1.389	0.558
	No			-1.306	40.115	0.100	-0.415	0.318	-1.058	0.228
Men's Footwear	Yes	7.933	0.005***	-1.527	310	0.064	-1.731	1.134	-3.962	0.500
	No			-2.355	39.759	0.012**	-1.731	0.735	-3.217	-0.245
Men's Sport Shoes	Yes	5.752	0.017**	-1.127	310	0.130	-0.905	0.803	-2.486	0.675
	No			-1.850	42.684	0.036**	-0.905	0.489	-1.893	0.082
Women's Footwear	Yes	2.501	0.115	-1.151	310	0.125	-1.526	1.325	-4.134	1.082
	No			-1.363	32.232	0.091	-1.526	1.120	-3.806	0.754
Women's Sport Shoes	Yes	5.669	0.018**	-1.322	310	0.094	-1.094	0.828	-2.723	0.535
	No			-2.035	39.668	0.024**	-1.094	0.538	-2.181	-0.007

Note: *** and ** implies that the difference is significant at 1% and 5% level, respectively.

Source: Authors' calculation

Table A7 T-test results of means of increase rates of prices, 3 months: Shaban, Ramadan, Shawwal – others
A. Group statistics

3 Months (Shaban, Ramadan, Shawwal) – others		N	Mean	Std. Deviation	Std Error Mean.
Ind_Food	Mth_8-10	78	2.639	2.915	0.330
	Others	234	1.716	2.990	0.195
Ind_Clothing-Footwear	Mth_8-10	78	0.612	3.842	0.435
	Others	234	2.195	5.948	0.389
Rice	Mth_8-10	78	1.386	2.778	0.315
	Others	234	1.977	3.273	0.214
Dessert	Mth_8-10	78	2.278	2.021	0.229
	Others	234	1.925	1.985	0.130
Veal	Mth_8-10	78	2.979	2.574	0.291
	Others	234	1.693	3.038	0.199
Mutton	Mth_8-10	78	3.075	3.546	0.401
	Others	234	1.717	2.774	0.181
Milk	Mth_8-10	78	2.504	2.780	0.315
	Others	234	1.471	3.134	0.205
Butter	Mth_8-10	78	2.326	2.480	0.281
	Others	234	1.850	2.894	0.189
Tomato	Mth_8-10	78	9.071	23.687	2.682
	Others	234	2.741	23.097	1.510
Men's Trousers	Mth_8-10	78	0.903	3.962	0.449
	Others	234	2.070	7.503	0.490
Skirt	Mth_8-10	78	0.555	6.098	0.690
	Others	234	2.296	9.225	0.603
Women's Trousers	Mth_8-10	78	0.973	6.137	0.695
	Others	234	2.174	7.983	0.522
Men's Footwear	Mth_8-10	78	1.253	3.865	0.438
	Others	234	2.159	5.995	0.392
Men's Sport Shoes	Mth_8-10	78	1.436	2.794	0.316
	Others	234	2.161	4.222	0.276
Women's Sport Shoes	Mth_8-10	78	1.225	2.817	0.319
	Others	234	2.195	4.359	0.285
Bus Fare (Intra-Urban)	Mth_8-10	78	2.867	3.976	0.450
	Others	234	1.723	3.224	0.211

Source: Authors' calculation

Table A7 T-test results of means of increase rates of prices, 3 months: Shaban, Ramadan, Shawwal – others (cont'd)
B. T-test parameters

Indicator	Equal Variances Assumed?	Levene's Test for Equal. of Varian.		t-test for Equality of Means 3 Months (Shaban, Ramadan, Shawwal) – others						
		F	Sig.	t	df	Sig. (1-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Ind_Food	Yes	0.039	0.843	2.377	310	0.009***	0.923	0.389	0.159	1.688
	No			2.407	135.003	0.009	0.923	0.384	0.165	1.682
Ind_Clothing-Footwear	Yes	25.586	0.000***	-2.202	310	0.014	-1.583	0.719	-2.999	-0.168
	No			-2.714	205.807	0.004***	-1.583	0.583	-2.734	-0.433
Rice	Yes	1.050	0.306	-1.431	310	0.077	-0.591	0.413	-1.403	0.221
	No			-1.553	153.859	0.061	-0.591	0.380	-1.342	0.161
Dessert	Yes	0.724	0.395	1.353	310	0.088	0.353	0.261	-0.160	0.866
	No			1.341	130.066	0.091	0.353	0.263	-0.168	0.873
Veal	Yes	2.517	0.114	3.359	310	0.000***	1.287	0.383	0.533	2.040
	No			3.649	154.173	0.000	1.287	0.353	0.590	1.983
Mutton	Yes	4.141	0.043**	3.481	310	0.000	1.358	0.390	0.590	2.126
	No			3.083	110.105	0.001***	1.358	0.441	0.485	2.231
Milk	Yes	0.194	0.660	2.590	310	0.005***	1.033	0.399	0.248	1.817
	No			2.750	147.339	0.003	1.033	0.376	0.290	1.775
Butter	Yes	0.041	0.839	1.302	310	0.097	0.476	0.366	-0.243	1.196
	No			1.407	152.393	0.081	0.476	0.339	-0.193	1.145
Tomato	Yes	0.060	0.807	2.083	310	0.019**	6.331	3.039	0.351	12.311
	No			2.057	129.248	0.021	6.331	3.078	0.241	12.420
Men's Trousers	Yes	21.282	0.000***	-1.314	310	0.095	-1.167	0.889	-2.916	0.581
	No			-1.756	252.051	0.040**	-1.167	0.665	-2.477	0.142
Skirt	Yes	17.861	0.000***	-1.557	310	0.060	-1.742	1.119	-3.943	0.460
	No			-1.900	200.705	0.029**	-1.742	0.917	-3.549	0.066
Women's Trousers	Yes	4.157	0.042**	-1.214	310	0.113	-1.201	0.989	-3.147	0.746
	No			-1.382	170.436	0.084	-1.201	0.869	-2.916	0.515
Men's Footwear	Yes	15.197	0.000***	-1.249	310	0.106	-0.905	0.725	-2.331	0.521
	No			-1.541	206.204	0.062	-0.905	0.587	-2.063	0.253
Men's Sport Shoes	Yes	8.525	0.004***	-1.415	310	0.079	-0.725	0.512	-1.732	0.283
	No			-1.726	200.479	0.043**	-0.725	0.420	-1.552	0.103
Women's Sport Shoes	Yes	9.394	0.002***	-1.840	310	0.033	-0.970	0.527	-2.007	0.067
	No			-2.267	205.699	0.012**	-0.970	0.428	-1.813	-0.127
Bus Fare (Intra-Urban)	Yes	1.153	0.284	2.553	310	0.006***	1.144	0.448	0.262	2.025
	No			2.301	112.670	0.012	1.144	0.497	0.159	2.129

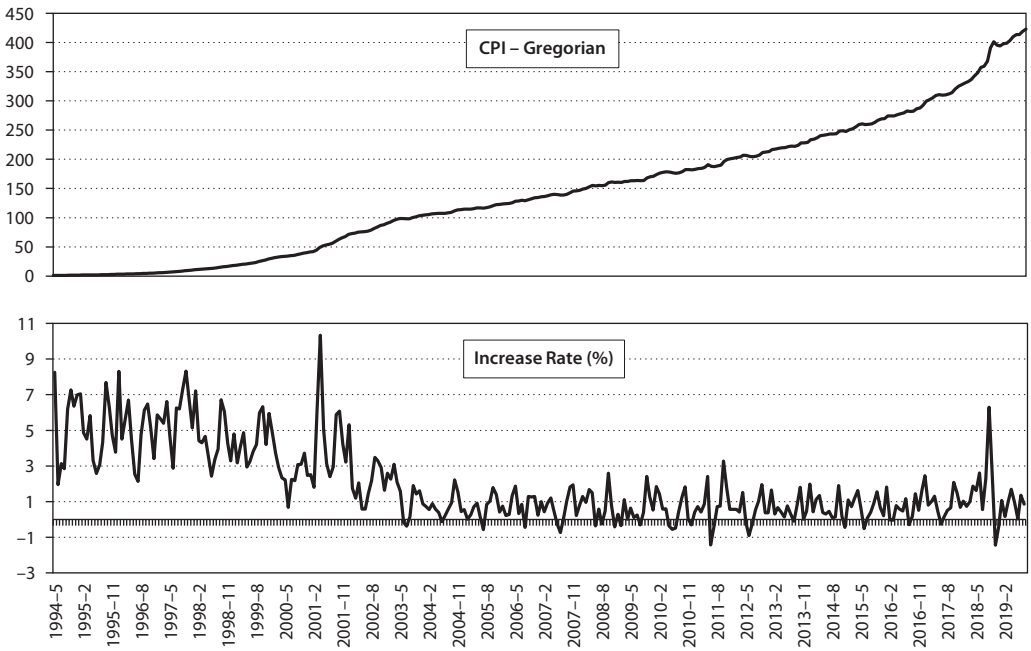
Note: *** and ** implies that the difference is significant at 1% and 5% level, respectively.
 Source: Authors' calculation

Table A8 Monthly means of increase rates of production in 34 Hijri years and their ranks among months

Indicator		Monthly Means of Increase Rates in 34 Hijri Years (%)											
		1	2	3	4	5	6	7	8	9	10	11	12
1	C-Manufacturing	-0.54	1.61	1.11	0.97	0.90	0.83	0.17	-0.16	-1.42	0.44	2.38	0.21
2	B-Mining and quarrying	0.84	0.92	0.78	1.43	2.73	2.16	0.38	-0.90	-2.09	-0.84	-0.05	0.61
3	D-Electricity, gas, steam and air conditioning supply	-0.55	1.36	0.71	0.98	-0.10	0.72	1.31	1.58	0.94	1.42	0.18	-0.90
Indicator		Rank of the Month (1:lowest, 12:highest)											
		1	2	3	4	5	6	7	8	9	10	11	12
1	C-Manufacturing	2	11	10	9	8	7	4	3	1	6	12	5
2	B-Mining and quarrying	8	9	7	10	12	11	5	2	1	3	4	6
3	D-Electricity, gas, steam and air conditioning supply	2	10	5	8	3	6	9	12	7	11	4	1

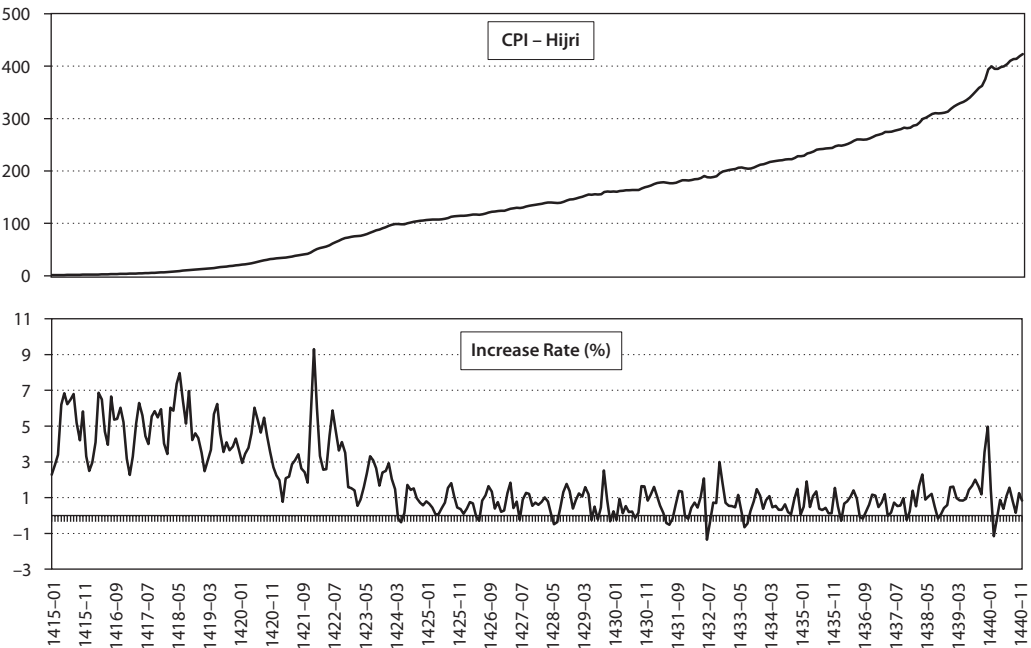
Source: Authors' calculation

Figure A1 CPI – Gregorian



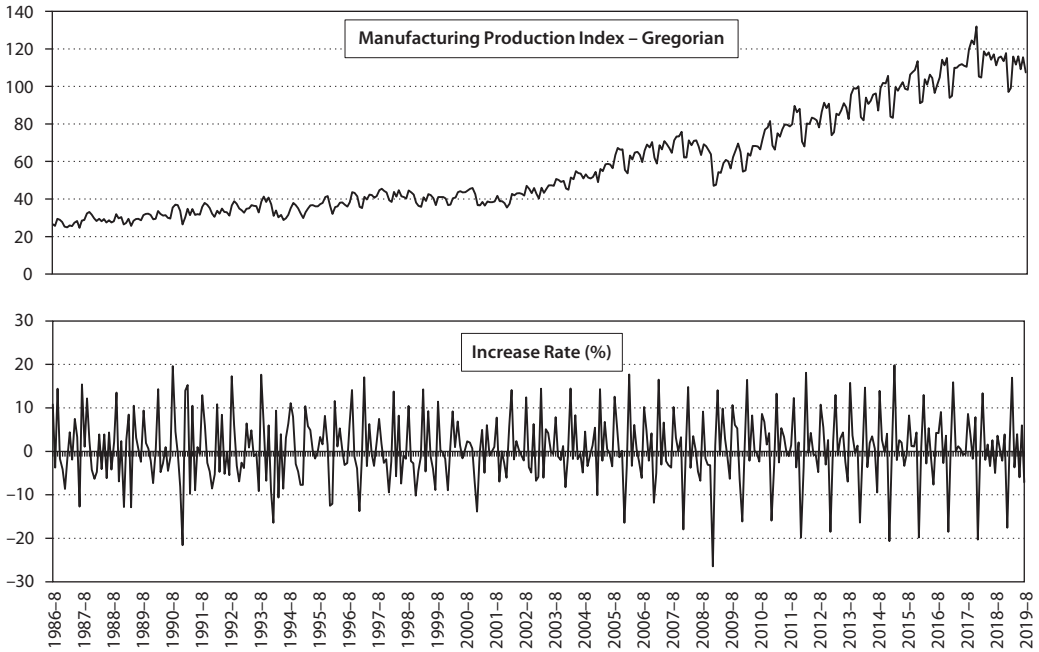
Source: Authors' construction based on TURKSTAT data

Figure A2 CPI – Hijri



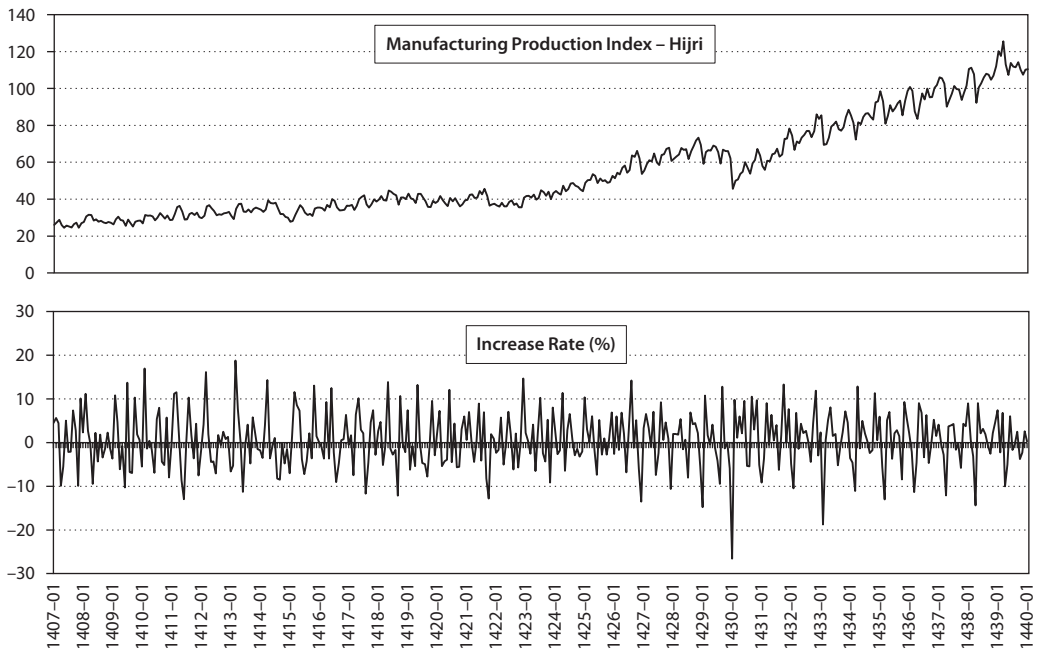
Source: Authors' construction

Figure A3 Manufacturing production index – Gregorian



Source: Authors' construction based on TURKSTAT data

Figure A4 Manufacturing production index – Hijri



Source: Authors' construction