Demand peaks and cost pass-through: a case of Irans's poultry market

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Abstract:

This article examines cost pass-through and pricing behavior for fresh poultry meat during periods of peak demand. The analysis is conducted on weekly poultry wholesale-retail price data collected in all provinces of Iran from 2010 to 2016. Two traditional festivals are identified as periods of peak demand. We use a panel co-integration framework to estimate pass-through elasticity and speed of adjustment during peak and off-peak periods. We find that wholesale and retail prices increase during these periods, while retail margins decline. We interpret these findings as increased retail competition during periods of peak demand. Moreover, our findings confirm a more sluggish price adjustment during these periods.

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JEL Codes: L11, L81

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Keywords: *Cost pass-through, Peak demand, Panel Error Correction Model, Poultry Market, Iran.*

JEL classification: *D12, L11, L81.*

1 Introduction

What happens if the demand for a retail good increases? Although the answer seems straightforward at a first glance, this simple question stirs controversy among economists. For example, Warner and Barsky (1995) observe falling retail prices during periods of peak demand (PoPD), i.e. during Christmas and weekends. The authors argue that in times of high demand, consumers are more price-sensitive which may create higher demand elasticities and lower

retail margins. MacDonald (2000) finds similar evidence for grocery prices and markups during PoPD in the US and argues that prices decline more strongly with higher market concentration.

Another explanation for falling prices during PoPD is embedded in loss-leader models (Lal and Matutes, 1994). Retailers may pursue a loss-leader pricing strategy, and advertise those products which consumers buy frequently to lure consumers into their stores. Therefore, the price of those products will decrease during PoPD. Chevalier et al. (2003) find results consistent with loss-leader retail pricing. They also document that average grocery prices and retail margins fall at their demand peaks. Countercyclical pricing behavior might also be driven by inter-brands substitution effect of items within a category. As Nevo and Hatzitaskos (2006) argue, consumers may purchase low-priced brands more often during high demand periods than expensive brands, which lowers the average price of products at the category level. Results in Empen and Hamilton (2013) do not indicate significant price reductions at the category level. Instead, German retailers increase promotional activity during PoPD in the beer category. In a similar study, Empen and Hamilton (2015) show that (regional) brand loyalty increases the retail price at the category-level.

In sum, there is no broad consensus about retail price dynamics during periods of peak demand. This analysis contributes to the literature on PoPD by focusing on four important aspects: retail prices, wholesale prices, retail margins and dynamic price adjustments. To carry out our analysis we chose the Iranian poultry meat industry for several reasons.

First, we are able to identify two periods of peak demand, Ramadan and Nowruz. In many Islamic countries, demand peaks coincide with Ramadan (Odabasi and Argan, 2009). Ramadan is the ninth month of the Islamic lunar calendar in which Muslims fast for 15-16 hours a day. While the majority of consumers may fast during this month, demand for certain food categories like chicken meat increases (Iran's Ministry of Agriculture, 2015). Nowruz is the traditional Iranian festival of spring which is considered as the first day of Iranian solar calendar. Nowruz festivals last for two weeks during March and April.

Second, the dynamics of cost pass-through have important welfare implications for consumers, retailers and farmers. The Iranian poultry industry is the largest in the Middle East, and it is ranked 7th throughout the world, producing nearly 2 million metric tons of chicken meat annually (FAO, 2015; Iran's Ministry of Agriculture, 2015). This industry has a prominent role in food security by supplying the primary source of animal protein (nearly 60 percent of per capita meat consumption) for the Iranian population (Central Bank of Iran, 2015; The Households Income and Expenditure Survey, 2015).

Third, positive demand shocks are one of the primary sources of market instability in Iranian poultry industry (Hosseini and Permeh, 2010; Gilanpour et al., 2012). Market interventions may come with significant negative externalities to the market agents (Hosseini et al., 2008; Gilanpour et al., 2012). A deeper understanding of price dynamics and underlying price adjustments can help officials to improve the efficiency of public interventions.

Fourth, price transmission along the Iranian poultry supply chain has gained much attention recently (Hosseini et al. 2008; Falsafian and Moghadasi, 2008; Amadeh, 2010; Hosseini et al., 2012; Shadmehri, 2014). However, none of these studies has attempted to analyze the potential impacts of PoPD on cost pass-through.

Further, we estimate cost pass-through at highly disaggregated level using weekly data wholesale-retail price data for all provinces of Iran from 2010 to 2016. To our knowledge, this is the first attempt in literature using such a dataset to estimate cost pass-through rates in the Iranian poultry meat market.

Our results show that retail and wholesale prices increase during demand peaks, which is in contrary to a number of studies (e.g. Warner and Barsky, 1995). Retailer market power in terms of relative margin declines, which is in line with findings in MacDonalds (2000) and Chevalier et al. (2003). Cost shocks are passed on to retail shelves more slowly during PoPD, which favors final consumers in the presence of increasing prices.

The paper is organized as follows: Section 2 describes the data set under study. In section 3, we present the empirical framework. Section 4 discusses the result. In the end, we summarize our findings and address future research options.

2 Data

For the present study, we use a unique panel data set on poultry meat price at retail and wholesale levels for all provinces of Iran. The prices are gathered from the spot markets of all provinces over the country by State Livestock Affairs Logistics (SLAL), affiliated with Iran's Ministry of Agriculture. Retail and wholesale prices are presented per kilogram of fresh poultry meat. The panel data set covers wholesale-retail level prices for 30 provinces[1] starting by the third week of April 2010 through the second week of June 2016, summing to 9720 observations (324 weeks for 30 provinces) for each variable. To identify peak demand periods, we investigated periodic data collected by Iran's Ministry of Agriculture showing that demand for the retail poultry meat during Ramadan and Nowruz is about 45 % higher than in other months[2].

[---Figure 1---]

There are a few reasons behind food and beverage demand spike specifically during Ramadan and Nowruz festivals such as changes in the consumption pattern, unplanned purchasing, psychological reasons or anticipated shortages (Odabasi and Argan, 2009). Table (1) presents the summary statistics of the price data. See also table-A1 in the appendix for province-specific summary statistics of wholesale-retail prices.

[---Table 1---]

[1] Note that the structure of provinces has changed a number of times during the last decades. In 2010, Karaj governorate was raised to provincial status, resulting in the creation of a new province known as Alborz. Therefore, Alborz is not included in our analysis, due to unavailability of data.

[2] We consider four weeks around Ramadan and Nowruz, as demand considerable increases already weeks before the events.

The statistics show that both retail and wholesale prices during periods of peak demand are relatively higher than the average price in the rest of the year for all provinces, which is in contrary to the results in Warner and Barsky, (1995), Chevalier et al. (2003), Nevo and Hatzitaskos, (2006) and Empen and Hamilton, (2013). However, relative margins are lower during PoPD, which is in line with findings in MacDonalds, (2000) and Chevalier et al. (2003). From a visual inspection of the averaged time series, we expect non-stationarity to be a concern for our analysis. To test for stationarity we use panel unit test root proposed by Hadri (2000) which rejects the null hypothesis of stationary retail and wholesale prices. Therefore, some panel members in both price series contain a unit root, which motivates the empirical model in the next section.

3 Empirical Model

We start with a standard reduced form cost pass-through model,

$$P_{it}^{r} = \alpha_{1i} + \alpha_{2i} P_{it}^{w} + \varepsilon_{it} \quad (1)$$

where P_{it}^{r} denotes the retail price of region i at time t and P_{it}^{w} denotes the corresponding wholesale price. The coefficient α_{2i} refers to the long-run price transmission elasticities from wholesale to retail, if we assume a co-integration relationship between the two sets of non-stationary time series. Under the null of an ideal competitive market, demand (and supply) shifter does not influence price transmission (Gardner, 1975; Lloyd et al., 2009; Kinnucan and Tadjion, 2014). Following this argument, we distinguish between two regimes to test the effects of demand peaks on cost pass-through,

$$P_{it}^{r} = \alpha_{1i} + \alpha_{2i} P_{it}^{w} + (\beta_{1i} + \beta_{2i} P_{it}^{w}) I_1 + \varepsilon_{it} \quad (2)$$

where β_{2i} refers to the price transmission elasticities from wholesale to retail during PoPD. I_1 is an indicator function corresponding to the peak demand periods (I_1=1 for peak demand and

zero otherwise). On the one hand, McCorriston et al. (1998) shows that market power and pass-through elasticity are negatively related. Thus, the existence of retailer market power translates into a lower price transmission elasticity. On the other hand McCorriston et al. (2001), Weldegebriel (2004) and Lloyd (2017) point out, that the impact of demand shifter on pass-through elasticity majorly depends on the functional forms of supply, demand and production functions[3]. Thus, the exact sign of β_{2i} is not identifiable a priori. Moreover, the coefficient β_{1i} measures the difference in retail margin during PoPD. As noted, a number of empirical studies predict that competition is higher during demand peaks (MacDonalds, 2000; Chevalier et al., 2003). Therefore, we expect a lower retail margin during PoPD ($\beta_{1i} < 0$).

Assuming that wholesale prices (P_{it}^{w}) cause retail prices (P_{it}^{r}) and all panel members follow the same error correction process with a common lag structure of order p and k, the ECM specification is given by

$$\Delta P_{it}^{r} = \rho_i + \gamma_{0i} ECT_{it-1} + I_1 \gamma_{1i} ECT_{it-1} + \sum_{j=1}^{p} \sigma_{ij}^{r} \Delta P_{it-j}^{r} + \sum_{j=0}^{q} \sigma_{ij}^{w} \Delta P_{it-j}^{w} + \nu_{it} \qquad (3)$$

where $ECT_{it-1}$is the error term of the first stage regression of equation 2. Higher adjustment coefficients ($\gamma_{1i} > 0$) imply that retail prices adjust more slowly during PoPD compared to the remaining weeks of the year. Thus, our model captures not only different cost pass-through elasticities in the long-run equilibrium (β_{2i}) but also different short-run adjustment rates for peak and off-peak demand periods (see e.g. Goetz et al., 2008; Blackburne and Frank, 2007).

We apply a Mean Group (MG) estimator. Generally, all MG type estimators follow the same procedure in two steps: first, estimating N group-specific ordinary least-squares (OLS) regression and then taking as average the estimated coefficients across groups (Pesaran and Smith, 1995; Pesaran, 2006; Blackburne and Frank, 2007; Frank, 2009; Eberhardt, 2011).

[3] For more detail please see: Weldegebriel (2004), table 1 (page112). The author argues that in the presence of different market structures and functional forms, the impacts of mark-up or mark-down may cancel each other in certain situation and therefore the final impact on price transmission elasticity is ambiguous. This argument has been examined by McCorriston et al. (2001) in the case of variable return to scale.

4 Results

We determine appropriate lag-length by averaged univariate Akaike Information Criteria (AIC) for all price series. According to the test results, we set the lag-length to p=q=3 for both, retail and wholesale price series. Further, we use panel-cointegration test by Westerlund (2007) to examine co-integration between price series. The four co-integration test statistics reject the null hypothesis of no panel-cointegration at 1% significance.

[---Table 2---]

Table 3 shows mean group estimates in three separate model specifications: 1- base model (off-peak), 2- panel model considering aggregated peak demand periods (peak), 3- panel model with two regimes, i.e. Ramadan and Nowruz periods individually.

[---Table 3---]

On the one hand, the constant dummies corresponding to periods of peak demand are significant and negative. This implies that the average margin during demand peaks is lower. In other words, market power decreases during high demand periods. We find this result is compatible with empirical studies like MacDonalds, (2000) and Chevalier et al. (2003), who argue that competition increases and mark-ups show countercyclical behavior during high aggregate demand. On the other hand, the dummy associated with pass-through elasticities during periods of peak demand is significantly positive meaning that the correlation between wholesale and retail prices increases. Our findings of a decrease of market power and an increase of pass-through elasticities are in line with McCorriston et al. (1998) and Weldegebriel (2004). However, the slight positive changes in the pass-through elasticity are small in economic terms and leveled out by the negative variation in the constant. Overall, our results are contrary to

previous studies expecting countercyclical pricing behavior (e.g. Warner and Barsky, 1995; Chevalier et al., 2003; Nevo and Hatzitaskos, 2006; Empen and Hamilton, 2013.) As discussed by Chevalier et al. (2003), the cyclical elasticity of demand is an alternative to explain the competition increase during periods of peak demand. It is argued that consumers are more price sensitive during periods of peak demand (Warner and Barsky, 1995). Consumer search cost (e.g. Varian, 1980) may also explain the observed pricing patterns. The price increases during Nowruz and Ramadan induces more consumers to search, and consequently, this leads to an increase in retailer competition.

Additionally, foreseeing demand peaks, the Iranian government intervenes in the market by supplying frozen chicken meat which is a close substitute to the fresh counterpart. Thus, this policy may lead to an increased market competition during demand peaks. However, the potential impacts of this policy need to be addressed in more detail in another analysis.

Note that retailer competition (retail margin) is higher (lower) during Nowruz compared to Ramadan. There is a factor that may explain the variation between pass-through elasticities during Ramadan and Nowruz which is related to the different cost of production and transportation. The supply during Nowruz is produced during the winter season (50-60 days before) which is more costly, due to extra cost regarding energy for heating and transportation. Therefore, the additional pressure from the wholesale side may squeeze the retail margin more during Nowruz compared to Ramadan[4].

In the next step, we proceed to estimate short-run equation to examine the price adjustment rate in periods of peak demand. Table (4) displays mean group estimates of the dynamic cost pass-through process error correction model.

[---Table 4---]

[4] Ramadan period is based on lunar calendar and it changes each year. But it has not been in winter season during the period under consideration.

According to base model A(I), retail prices adjust on average 28.6 percent towards their equilibrium value each week. Additionally, models A(II) and A(III) capture differences in pass-through rates of peak demand periods. The interaction terms are significantly positive ($\mathrm{ECT}_{\mathrm{it-1}}^{\mathrm{Nowr}} > 0$;$\mathrm{ECT}_{\mathrm{it-1}}^{Rmdn} > 0$), which indicates that cost changes are passed on to shelves more slowly in the short run. In the case of Ramadan, the speed of adjustment ($\mathrm{ECT}_{\mathrm{it-1}} + \mathrm{ECT}_{\mathrm{it-1}}^{\mathrm{Rmdn}}$) is equal to 13% which is lower than it is in Nowruz (16%). In the presence of increasing prices, a more sluggish price adjustment favors final consumers as more fiercely competing retailers delay pass-through of increasing wholesale prices.

6 Summaries and Conclusion

We employed a unique data set on the wholesale-retail price of all provinces throughout the country that includes 9720 observation for each price series. The empirical model was estimated by a panel error correction model using a mean group estimator. Our findings reveal that competition tends to be higher during demand peaks in the Iranian chicken meat market. The governmental intervention in the market like supplying frozen poultry meat, as a close substitute, may enhance competition during high demand periods. Moreover, our results show that price is not declining during demand peaks, which is contrary to the results found in Warner and Barsky (1995), Chevalier et al. (2003), Nevo and Hatzitaskos (2006), and Empen and Hamilton (2013). There are two main reasons that may explain our observation of increasing prices. First, like other developing countries, the variety of food product brand in the chicken meat market is not as diverse as in western countries. Also, the low level of chicken meat price compared to other substitutes like fish and beef might exacerbate demand pressure on chicken meat during demand peaks.

Our results also can be generalized to other developing countries with a relatively similar situation in terms of the market structure and food brand variations. The present study has several constraints which should be addressed in the future studies. First, the variation between pass-through rates at province level needs to be investigated more closely. Second, the relationship between fresh and frozen poultry meat could provide more information about the efficiency of public interventions, which aim to prevent anticipated market shortages and price spikes. The poultry industry has a prominent role in providing the primary source of protein for the Iranian population of 80 million. Therefore, any changes in this market can profoundly affect food security and welfare of the whole country. Analyzing price dynamic during demand peaks can help Iranian policy makers to implement better policies to mitigate instability in these periods. Future work should conduct more detailed analyses of differences in time-variant pass-through mechanisms and their respective determinants.

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References

Amadeh, H. (2010):. A Survey on the Price Changes of Chicken Meat in Tehran,. Economic Research, 10(2):, 295-325 [in Persian].

Blackburne, E.F. and Frank, M.W. (2007):. Estimation of Nonstationary Heterogeneous Panels,. The Stata Journal, 7:, 197–208.

Central Bank of Iran, quarterly data report, (2015): Online available at: http://cbi.ir/default_en.aspx

Chevalier, J., Kashyap, A. and Rossi, P. (2003):. Why don't prices rise during peak demand periods? Evidence from scanner data. American Economic Review, 93, 15–37.

Eberhardt, M. (2011):. XTMG: Stata module to estimate panel time series models with heterogeneous slopes, Statistical Software Components, Boston College Department of Economics. Online available at: http://ideas.repec.org/c/boc/bocode/s457238.html.

Empen J., and Hamilton, S.F. (2013):. How Do Supermarkets Respond to Brand-Level Demand Shocks? Evidence from the German Beer Market,. American Journal of Agricultural Economics, 95(5):, 1223-1229.

Empen J., and Hamilton, S.F. (2015):. How do retailers price beer during periods of peak demand? Evidence from game weeks of the German Bundesliga. Southern Economic Journal, 81(3):, 679–696.

Falsafian, A. and , Moghaddasi, R.(2008):. Spatial integration and asymmetric price transmission in selected Iranian chicken markets. Paper Prepared for Presentation at the 12th European Agricultural Economics Congress, Gent, Belgium.

FAO (2015). Annual statistics, Rome, FAO. Online available at: http://faostat.fao.org/

Frank, M. (2009):. Inequality and growth in the United States: evidence from a new state-level panel of income inequality measures. Econ.omic Inq.uiry, 47(1):, 55–68.

Gardner, B.L. (1975):. The Farm-Retail Price Spread in a Competitive Food Industry,. American Journal of Agricultural Economics, 57(3), 399-409.

Gilanpour, O., Kohansal, M.R., Permeh, Z. and Z. Esmailipur, E. (2012):. Investigation of government intervention in the chicken meat market,. Iranian Journal of Trade Studies, 63(15):, 137-168.

Goetz, L. Von Cramon-Taubadel, S., Stephan, E. (2008): Threshold Adjustment and/ or Threshold Cointegration? An Application to the German Apple Market. In: Götz, L., Determinants of Pricing in the EU Fresh Fruit and Vegetable Markets: The EU Entry Price System and Spatial and Vertical Price Transmission. Ph.D. Dissertaton, University of Göttingen.

Hadri, K. (2000):. Testing for stationarity in heterogeneous panels. The Econometrics Journal 3, 148-161.

Hosseini, M. and Permeh, Z. (2010):. Evaluation of Monopoly, Competition and Market Concentration in Chicken And Egg Market of Iran. Journal of Agricultural Economics and Development, Science and Development Journal (in Persian). . 30:, 188-214. [in Persian].

Hosseini, S.S., Salami, H.A. and Nikoukar, A. (2008):. Price transmission model for Iranian chicken industry,. Iranian Journal of Agricultural Economics (in Persian), , 2(1):, 1-21 [in Persian]..

Hosseini, S.S., Nikoukar, A. and Dourandish, A. (2012):. Price Transmission Analysis in Iran Chicken Market,. International Journal of Agricultural Management and Development (IJAMAD), 2(4):, 243-253.

Households Income and Expenditure Survey, Statistical Center of Iran, (2015). Online available at: https://www.amar.org.ir/english

Iran's Ministry of Agriculture, (2015): Annual data set. Online available at: https://www.amar.org.ir/english

Kinnucan, H.W. and Tadjion, O. (2014):. Theoretical restrictions on farm-retail price transmission elasticities: A note. Agribusiness, 30, 278–289.

Lal, R. and Mattutes, C. (1994):. Retail pricing and advertising strategies. In: Journal of Business, 67(3), P. 345-370.

Lloyd, T.A. (2017):. Forty Years of Price Transmission Research in the Food Industry: Insights, Challenges and Prospects,. Journal of Agricultural Economics, 68(1):, 3–21.

Lloyd, T.A., McCorriston, S., Morgan, C.W., Rayaner, A.J. AND and Weldegebriel, H. (2009):. Buyer power in U.K. food retailing: A 'first-pass' test', . Journal of Agricultural & Food Industrial Organization:, 7(5),: pp. 1–38.

MacDonald, J.M., (2000)., Demand, Information, and Competition: Why Do Food Prices Fall at Seasonal Demand Peaks? Journal of Industrial Economics, 48(1):, 27-45.

McCorriston, S. Morgan, C. W. and Rayner, A. J. (2001). Price transmission: the interaction between market power and returns to scale, European Review of Agricultural Economics, 28, 143–159.

McCorriston, S., Morgan, C.W. and Rayaner, A.J. (1998):. Processing Technology, Market Power and Price Transmission,. Journal of Agricultural Economics, 49(2):, 185-201.

Nevo, A. and Hatzitaskoz, K. (2006):, Why does the average price fall during high demand periods? In: Working Paper, Department of Economics, Northwestern University.

Odabasi, Y. and Argan, M. (2009):, Aspects of Underlying Ramadan Consumption Patterns in Turkey. Journal of International Consumer Marketing, 21, 203-218.

Pesaran, M.H. and Smith, R.P. (1995):. Estimating long-run relationships from dynamic heterogeneous panels. Journal of Econometrics, 68:, 79–113.

Pesaran, M.H.(2006):. Estimation and Inference in Large Heterogeneous Panels with a Multifactor Error Structure,. Econometrica, 74(2):, 967-1012.

Shadmehri, M.T.A. (2014):. Price Transmission Mechanism in the Iran Chicken Market Using the TECM, ECM-EG and GETS Models,. Asian Journal of Research in Business Economics and Management, 4(4):, 213-225.

Varian, H. R. (1980,). A model of sales. American Economic Review, 70 (4), 651–659.

Warner, E.J. and Barsky, B.R. (1995):. The Timing and Magnitude of Retail Store Markdowns: Evidence from Weekends and Holidays. In: The Quarterly Journal of Economics, 110(2), P. 321-352.

Weldegebriel, H.T. (2004):, Imperfect price transmission: Is market power really to blame?', Journal of Agricultural Economics, 55:, 101–114.

Westerlund, J, (2007),. Testing for error correction in panel data. Oxford Bulletin of Economics and Statistics, 69:, 709–748

Appendix A(I)

Descriptive statistics on the provincial level of chicken meat prices over the period of 2010 to 2016.

Province	N	Retail price			Wholesale price		
		Overall	Ramadan	Nowruz	Overall	Ramadan	Nowruz
Azarbaijan-e-Sharghi	324	10.816	10.860	10.881	10.784	10.886	10.909
Azarbaijan-e-Gharbi	324	10.757	10.809	10.830	10.739	10.829	10.851
Ardebil	324	10.826	10.859	10.881	10.780	10.905	10.925
Esfahan	324	10.854	10.887	10.900	10.816	10.925	10.933
Ilam	324	10.805	10.805	10.840	10.753	10.855	10.888
Bushehr	324	10.874	10.857	10.861	10.807	10.935	10.919
Tehran	324	10.834	10.846	10.829	10.752	10.924	10.915
Chaharmahal-o-Bakhtiari	324	10.825	10.798	10.861	10.784	10.840	10.902
Khorasan-e-Razavi	324	10.798	10.800	10.818	10.741	10.852	10.872
Khorasan-e-Jonoubi	324	10.860	10.858	10.880	10.794	10.921	10.944
Khorasan-e-Shomali	324	10.818	10.821	10.847	10.765	10.871	10.901
Khozestan	324	10.849	10.816	10.867	10.790	10.872	10.920
Zanjan	324	10.813	10.786	10.837	10.758	10.837	10.889
Semnan	324	10.811	10.790	10.843	10.758	10.844	10.890
Sistan-o-Baluchesta	324	10.859	10.882	10.902	10.820	10.920	10.935
Fars	324	10.846	10.824	10.883	10.794	10.876	10.934
Ghazvin	324	10.822	10.812	10.837	10.762	10.873	10.894
Ghom	324	10.807	10.832	10.868	10.784	10.854	10.892
Kurdistan	324	10.827	10.885	10.857	10.795	10.918	10.890
Kerman	324	10.829	10.809	10.890	10.781	10.851	10.933
Kermanshah	324	10.805	10.819	10.832	10.759	10.868	10.872
Kohgiluyeh-o-Boyer-Ahmad	324	10.873	10.876	10.903	10.811	10.937	10.962
Golestan	324	10.826	10.815	10.823	10.744	10.889	10.903
Gilan	324	10.810	10.831	10.849	10.755	10.883	10.911
Lorestan	324	10.816	10.830	10.851	10.787	10.855	10.875
Mazandaran	324	10.833	10.824	10.850	10.780	10.879	10.904
Markazi	324	10.776	10.750	10.791	10.711	10.811	10.850
Hormozgan	324	10.895	10.875	10.909	10.829	10.938	10.971
Hamedan	324	10.796	10.844	10.819	10.746	10.888	10.869
Yazd	324	10.832	10.851	10.879	10.789	10.890	10.915

Notes: This table reports the average of wholesaler and retailer prices for individual provinces. The prices are in logarithm form. The first column (Overall) shows average prices for the entire period. Whereas, columns entitled Ramadan and Nowruz present the average prices during Ramadan and Nowruz respectively. All retail and wholesale prices are logs of IRR per Kg poultry meat. [IRR: 0.00002 USD].

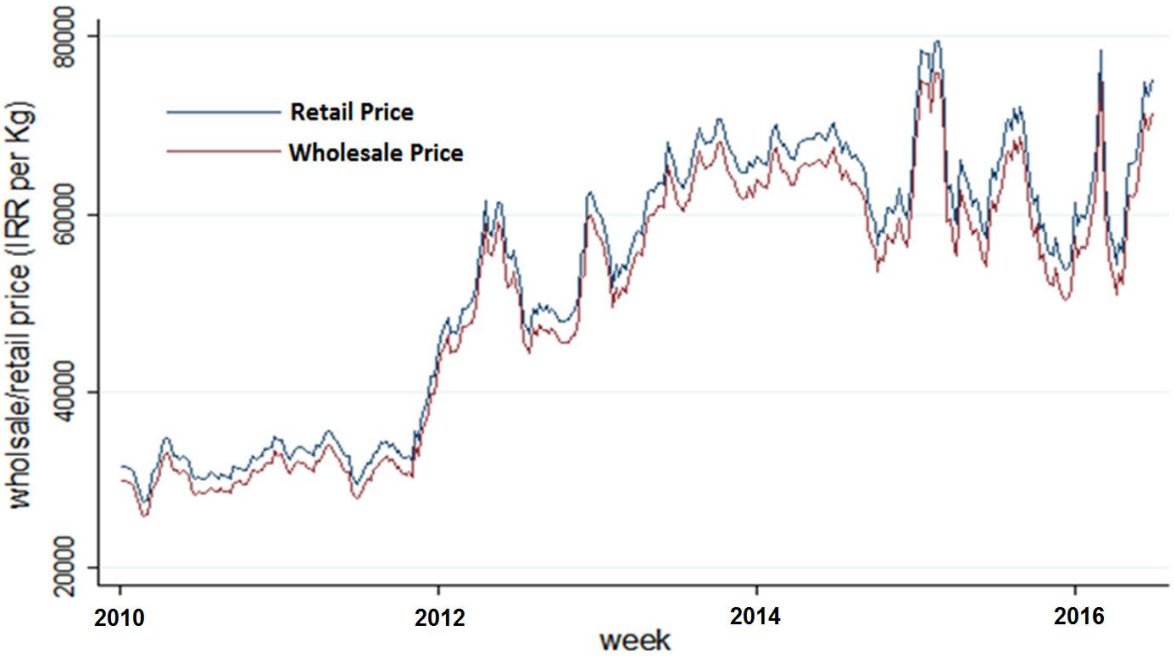

Figure 1: Evolution of poultry meat retail and wholesale prices over the country during 2010-2016

Notes: The figure shows the weekly evolution of wholesale and retail prices between 2010 and 2016. Data are from State Livestock Affairs Logistics (SLAL) and expressed in logarithm form. The vertical axis presents the average wholesale and retail prices (IRR per Kg) of the provinces throughout the country and horizontal axis presents the weeks. [IRR: 0.00002 USD]

Table 1: Descriptive statistics of poultry meat prices over the period of 2010 to 2016.

Measure	Definition	mean	Min.	Max.	N
$\ln P_{it}^{r}$	Logarithm of retail price	10.82	10.04	11.36	9720
$\ln P_{it}^{w}$	Logarithm of wholesale price	10.77	9.97	11.32	9720
$\ln P_{it}^{w,Rmdn}$	Logarithm of retail price in Ramadan*	10.88	10.23	11.21	840
$\ln P_{it}^{r,Rmdn}$	Logarithm of wholesale price in Ramadan	10.83	10.29	11.28	840
$\ln P_{it}^{w,Nowr}$	Logarithm of retail price in Nowruz	10.90	10.27	11.28	720
$\ln P_{it}^{r,Nowr}$	Logarithm of wholesale price in Nowruz	10.85	10.29	11.35	720
$\ln RM_{it}$	Logarithm of retail margin	0.050	0.000	0832	9720
$\ln RM_{it}^{Rmdn}$	Logarithm of retail margin in Ramadan	0.049	0.005	0.336	840
$\ln RM_{it}^{Nowr}$	Logarithm of retail margin in Nowruz	0.048	0.007	0.179	720

Notes: The Table reports wholesale price, retail price and retail margin. Data is available for 2010 and 2016. Four weeks including two weeks before and two weeks after first of Ramadan and Nowruz are considered as the PoPD. The logarithm of retail margin ($\ln RM_{it}$) is referred as relative retail margin. All retail and wholesale prices are logs of IRR per Kg poultry meat. [IRR: 0.00002 USD]

Table 2: Co-integration tests of wholesale and retail price series based on Westerlund (2007)

statistic	value	Z-value	P-value
Group mean tests			
G_t	-4.49	-18.52	0.00
G_a	-59.77	-67.41	0.00
Panel tests			
P_t	-32.93	-25.81	0.00
P_a	-76.65	-143.06	0.00

Note: The table reports Westerlund Co-integration tests of wholesale and retail price series with the null hypothesis of no co-integration.

Table 3: Long-run Equilibrium of Retail Wholesale prices Relationship

Dependent variables	A(I) off-peak	A(II) Peak	A(III) Nowruz/Ramadan
Const.	0.177***	0.187***	0.187***
	(0.032)	(0.033)	(0.033)
Dum_t^{peak}	--	-0.075***	--
		(0.016)	
Dum_t^{Rmdn}	--	--	-0.060***
			(0.028)
Dum_t^{Nowr}	--	--	-0.111***
			(0.019)
lnP_{it}^{w}	0.987***	0.987***	0.987***
	(0.003)	(0.003)	(0.003)
$Dum_t^{peak}.lnP_t^w$	--	0.006***	--
		(0.001)	
$Dum_t^{Rmdn}.lnP_t^w$	--	--	0.005**
			(0.002)
$Dum_t^{Nowr}.lnP_t^w$	--	--	0.010***
			(0.001)

Note: The table reports the mean group estimated coefficients of the long-run equilibrium. The independent variable is the logarithm of the retail price. The first column shows the estimation results for the basic model without considering PoPD. The second column shows the results for model A(2) which includes both peak demand periods together. The last column also reports the estimates of coefficients for peak periods individually. Dum_t^{peak} denotes a dummy variable for peak periods including both Ramadan and Nowruz. Dum_t^{Rmdn} denotes dummies for only Ramadan period and Dum_t^{Nowr} is dummies for Nowruz period. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Short-run Error Correction Estimates

Dependent variable	A(I) off-peak	A(II) Peak	A(III) Nowruz/Ramadan
ECT_{it-1}	-0.276***	-0.280***	-0.284***
	(0.039)	(0.042)	(0.042)
ECT_{it-1}^{peak}	--	0.137***	--
		(0.048)	
ECT_{it-1}^{Rmdn}	--	--	0.157***
			(0.058)
ECT_{it-1}^{Nowr}	--	--	0.105*
			(0.057)
$\Delta \ln P_{it}^{w}$	0.924***	0.925***	0.925***
	(0.009)	(0.009)	(0.008)
$\Delta \ln P_{it}^{w}(-1)$	0.288***	0.262***	0.264***
	(0.031)	(0.032)	(0.034)
$\Delta \ln P_{it}^{w}(-2)$	0.170***	0.158***	0.159***
	(0.021)	(0.023)	(0.023)
$\Delta \ln P_{it}^{w}(-3)$	0.074***	0.073***	0.074***
	(0.012)	(0.012)	(0.012)
$\Delta \ln P_{it}^{r}(-1)$	-0.302***	-0.277***	-0.281***
	(0.033)	(0.035)	(0.036)
$\Delta \ln P_{it}^{r}(-2)$	-0.179***	-0.164***	-0.164***
	(0.023)	(0.026)	(0.026)
$\Delta \ln P_{it}^{r}(-3)$	-0.088***	-0.085***	-0.087***
	(0.013)	(0.013)	(0.013)
Constant	0.0003***	0.0003***	0.0003***
	(0.000)	(0.000)	(0.0000)
Observations	9,600	9,600	9,600
Wald chi^2	10597.6	10716.4	10940.2
Number of id	30	30	30

Note: The table reports the results of panel error correction estimates based. ECTs are extracted from the corresponding long-run equations in Table (3). For instance, ECTs for the first model is based on the equation A(I) in Table (3) and so on. ECT_{it-1}^{peak} denotes the interaction between the ECTs and the indicator of PoPD (including both Ramadan and Nowruz). ECT_{it-1}^{Rmdn} denotes the interaction of Ramadan demand peaks and ECTs, and ECT_{it-1}^{Nowr} denotes the interaction of Nowruz demand peaks and ECTs. Robust standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1