

## The impacts of Atlantic bonito rush and the avian influenza on meat products in Turkey

Sayed H. Saghaian  
*University of Kentucky*

Gökhan Özertan  
*Bogazici University*

Aslihan D. Spaulding  
*Illinois State University, Normal*

### *Abstract*

The Atlantic bonito rush experienced in Turkey in the Fall of 2005 coincided with the avian influenza food scare that happened exactly at the same time-period in the country. This study examines the reactions of Turkish retail prices to those events. In this research, using time-series techniques, we investigate how the food scare and the excess fish caught jointly influence the retail prices for beef, chicken, and fish products in Turkey. Historical decomposition of beef, chicken, and fish price series explains the behavior of prices in a neighborhood of the two events. The results showed that both fish and chicken prices fell initially due to those conflicting events, but beef and fish prices increased as more of these products were substituted for chicken.

---

This article is Journal Paper Number 08-04-016 of the Kentucky Agricultural Experiment Station.

**Citation:** Saghaian, Sayed H., Gökhan Özertan, and Aslihan D. Spaulding, (2008) "The impacts of Atlantic bonito rush and the avian influenza on meat products in Turkey." *Economics Bulletin*, Vol. 17, No. 16 pp. 1-10

**Submitted:** August 30, 2008. **Accepted:** September 15, 2008.

**URL:** <http://economicsbulletin.vanderbilt.edu/2008/volume17/EB-08Q00015A.pdf>

## **1. Introduction**

The Atlantic bonito rush experienced in Turkey in Fall 2005 coincides with the H5N1 avian influenza food scare that happened exactly at the same time-period in the country. Hence, an interesting question that arises is how the avian flu food safety scare and the excess fish caught might jointly influence the demand for meat products in Turkey. Using time-series techniques we derive the impacts of these two events on the retail-level beef, chicken, and fish prices for the mentioned period. Historical data on these three price series for the time period between January 2003 and March 2007 are used in this analysis. The data used on real prices are presented in Figure 1 (prices are measured in Yeni Türk Lirası, YTL (new Turkish currency), per kg). Historical data on meat production in Turkey are presented in Table 1.

## **2. Poultry Sector in Turkey**

Size of the poultry market in Turkey is estimated to be around three billion dollars, annually. Consumption of poultry meat in 2005 was almost one million tons, where the production in 2006 was also close to that amount. Comparing the per capita poultry consumption of around 14 kg in 2006, in 2005, per capita consumption of red meat (bovine, sheep, and goat) was around nine kilograms and per capita fish consumption was around seven kilograms (Besd-Bir, 2007). Turkey's State Planning Organization projections show that in year 2010 demand for poultry meat in Turkey is expected to reach 1.2 million tons with a per person consumption of 16 kg/year. Respective estimations are 1.5 million tons and 19 kg/year per person for the year 2015 (Besd-Bir, 2006).

### **2.1. Avian Influenza in 2005**

Turkey was hit twice with avian influenza outbreaks, first in October 2005 and then in January 2006. As of mid-March 2006, the presence of the H5N1 virus was confirmed in 58 of Turkey's 81 provinces. World Health Organization (WHO) reported 21 human cases of avian influenza resulting with four deaths (WHO, 2006). Although on August 2006 Turkey was cleared from the highly pathogenic avian influenza based on the OIE Animal Terrestrial Code classifications, cases of avian influenza were again detected in 2007. Since Turkey is on the migratory route of wild birds, such cases are expected to occur also in the future.

Poultry consumption fell by 50 percent and retail poultry prices fell by 20 percent in two weeks following the outbreak (EU, 2006; Sarnıç, 2006). Real retail and wholesale poultry prices were at their minimum in November 2005 since the year 2003. Recovery of the sector with regard to sales only occurred in March 2006.

### **3. Fishery Sector in Turkey**

Turkey has a long coastline of the size of 8,300 km. However, the annual production and consumption of fish are not in parallel with this size and they are remarkably small compared with the world averages. Considering the per capita fish consumption, world average is around 15 kg, with levels of 25 kg in Italy, 31 kg in France, 44 kg in Spain, 70 kg in Japan; this value was only 10 kg in 1995 in Turkey, and this level even dropped to 7.5 kg in recent years (Saygı et al., 2006). Annual production in 2004 was 456,752 tons (Turkstat). Historically, around 76 percent of fish caught comes from Black Sea, 11 percent from Marmara, nine percent from Aegean, and five percent from Mediterranean seas (Timur and Doğan, 1999). Annual aquaculture production was 79,943 tons in 2003 but cultured fish production has been steadily increasing in recent years. Contribution of fisheries to the GDP is only at 0.3 percent and to Turkey's total agricultural production only at 2.7 percent (FAO, 2006).

The major fish species caught commercially in Turkey, counting for 90 percent of total marine catches, are anchovy, grey mullet, hake, whiting, pilchard, horse mackerel, Atlantic bonito, chub mackerel, sprat, and blue fish (ABGS, 2006). Data on quantity on sea fish caught is presented in Table 2. Among the fish caught 25 percent is used to produce flour or oil and the remaining 75 percent are consumed as fresh or processed meat (Şanslı and Saygı, 2001). The legal commercial fishing season in Turkey is between September and April.

#### **3.1. Atlantic Bonito “rush” of Fall 2005**

Atlantic bonito is one of the highly traded fish species in Turkey. Whereas historic data shows that until 2001 annual Atlantic bonito caught was above 12,000 tons, this number suddenly decreased to the levels of 6,000 tons in 2002 and stayed around that until 2005. Not only for Atlantic bonito but for fish caught in Turkey in general, the highly cited reasons for this decrease are excess fishing and sea and ecological pollution. However, the picture changed in September 2005 with the Atlantic bonito “rush.” Whereas in the previous five years at most 13,460 tons were caught in a single year, in 2005, the amount rose to 70,797 tons. This is directly reflected in prices; whereas the (CPI adjusted) price of Atlantic bonito at the Istanbul Sea Products Marketplace was 3.30 YTL/kg in September 2005, it decreased to 2.27 YTL/kg in October, and further to 1.44 YTL/kg in November. Historical Atlantic quantity caught and Atlantic bonito prices at Istanbul Sea Products Marketplace are presented in Figure 2. Istanbul is the largest city in Turkey and a major portion of fish caught in Turkey is traded at the Istanbul Sea Products Marketplace (Tekinay et al., 2003).

#### 4. Empirical Model and Results

Historical decomposition graphs are used to measure the impact of the food safety scare and the Atlantic bonito shock on prices (Chopra and Bessler, 2005). Historical decompositions decompose the series to determine the impact of the two events on retail-level price responses in the neighborhood of the events (RATS, 2004). Historical decomposition graphs are based upon partitioning of the moving average series into two parts:

$$P_{t+j} = \sum_{s=0}^{j-1} \psi_s U_{t+j-s} + \left[ X_{t+j} \beta + \sum_{s=j}^{\infty} \psi_s U_{t+j-s} \right],$$

where  $P_{t+j}$  is the multivariate stochastic process,  $U$  is its multivariate noise process, and  $X$  is the deterministic part of  $P_{t+j}$ . The first sum represents that part of  $P_{t+j}$  due to innovations (shocks) that drive the joint behavior of the series for period  $t+1$  to  $t+j$ , the horizon of interest, and the second is the forecast of the series based on information available at time  $t$ , the date of an event—that is, how series would have evolved if there had been no shocks (RATS, 2004).

Figure 3 shows the historical decomposition graphs of the three price series for a six month horizon from RATS software. The solid line is the actual average prices for beef, chicken, and fish in Turkey which include the impact of the events, and the dashed line is the forecast of that variable excluding the effect of any shock. The dynamic impacts of the shocks can spread over many time periods or dissipate quickly. It is also likely that other effects would normally occur after a few weeks or months might cloud their impacts. For this study we have used a six month time-period for forecasting and testing the impact of the fish surge and the H5N1 virus shock.

The Atlantic bonito rush occurred in the Fall of 2005, and the H5N1 virus was discovered in October 2005. In September 2005, the actual beef, chicken, and fish price series (solid lines) and their forecasted estimates (dashed lines) followed each other closely with minor differences that are commonly expected between any actual series and their forecasts. However, these series began to depart in October 2005. Historical decomposition of the real retail-level prices, which includes the impact of the shock, showed that the wide departure of actual chicken and fish prices began in October and reached their maximum by November 2005. It is estimated that the chicken prices dropped by 28 percent in October 2005 in contrast to its forecasted prices.

In November 2005, the estimated magnitude of the actual beef prices was exactly the same as its forecasted amounts. Beef prices increased in December with a one month lag

when compared to the increase in fish prices, and quickly surpassed its own forecasted amounts. Between October and November of 2005, beef prices were increasing as expected and indicated by the forecasted series.

We know that there was a huge increase in the quantity of fish caught during the same period, leading to a decrease in the fish prices; but consumers apparently considered fish as a substitute for poultry and, as a result, the amount of fish consumed increased. However, as the consumption of fish began to increase by the beginning of November 2005, at that time its price was still significantly less than its forecasted levels. Fish prices did not surpass its forecasted levels until January.

It is important to note that the data represent equilibrium prices, and price movements might be attributable to either demand or supply shifts. Regarding the Atlantic bonito rush, one expects supply to shift outward, but Turkish consumers consume so little fish that one would expect any supply impact not to be overwhelmed by potential demand impacts. No supply shifts are anticipated in connection with the beef products in Turkey, and we are not aware of any substantial concurrent supply shifts caused by other factors. Thus, while recognizing the possibility of confounding supply-side influences, we interpret the results under the expectation that price variation during the events' windows is primarily driven by shifting consumer confidence in meat quality and meat safety.

The difference between the actual (solid line) and the forecasted chicken prices (dashed line) indicates that chicken prices did not reach its forecasted estimates for the whole duration of the time period under investigation, suggesting the lingering consumers' concerns for food safety. There was a suppressed demand for poultry during the crisis with demand for poultry meat decreasing, while companies allegedly destroyed chicks they owned and cancelled the contracts they had signed with growers, suppressing their supply as well. Also, during the crisis, several small sized producers went bankrupt and exited the market due to excess financial pressures (Yalçın, 2006).

Overall, the historical decomposition results showed, as expected, that the H5N1 virus discovery impacted chicken consumption negatively, decreasing retail prices. The H5N1 virus discovery was covered by the media and electronic news outlets rather quickly, indicating that there was no problem with the flow of information through the supply chain. Therefore, the estimated one month lag of the increase in fish consumption might most likely reflect the increase in more than normal levels of fish caught and consequent lower prices.

## 5. Conclusions

In 2005, the avian influenza outbreak in Turkey occurred in the middle of the fishing season, where more than normal levels of fish were caught. Despite the increase in supply, fish was the cheapest source of protein since bonitos and similar fish are usually relatively inexpensive compared to red meat during the winter months in Turkey (Sarigedik, 2006). Red meat prices varied a lot during the crisis where the bovine meat prices went up as high as 9.60 YTL/kg of carcass weight during earlier stages of the crisis, and dropped to 7.80 - 8.20 YTL/kg of carcass weight, which is about the same price prior to the outbreak. Red meat prices were stable between April and June of 2006.

The results of this study indicated that price responses in the neighborhood of avian influenza and Atlantic bonito rush events were expectedly dissimilar, but they were consistent with relatively well-informed, rational consumers. The prices of poultry dropped as expected due to the H5N1 avian influenza scare and consumers substituted beef and fish for chicken. With the increase in fish supply, fish prices initially decreased. However, increase in consumption of fish as a source of protein substituting for chicken, eventually increased fish prices. Fish consumption increased, and as a result, fish prices actually doubled.

According to Taha (2007), countries affected by avian influenza outbreak had a similar experience; “initial declines in poultry consumption as consumers fear contagion, followed by recovering consumption after a few months as consumers gain confidence.” (p.24) Poultry prices dropped, consumers shifted their consumption away from chicken towards beef, fish, and other substitutes (Obayelu, 2007). However, with media coverage and consumer education during and after the crisis, consumers’ food safety concerns diminished and poultry consumption increased.

## References

- ABGS (Republic of Turkey Prime Ministry Secretariat General for EU Affairs) (2006) “Turkey-Screening Fisheries Acquis: Answers to Non-exhaustive List of Issues and Questions to Facilitate Preparation for Bilateral Meetings.” Retrieved August 15, 2008 from Turkish Ministry of Agriculture website at [http://www.tarim.gov.tr/AB\\_Tarim/balickilik/sualname\\_cvp\\_eng.doc](http://www.tarim.gov.tr/AB_Tarim/balickilik/sualname_cvp_eng.doc).
- Besd-Bir (2006) Poultry Meat Producers and Breeders Association website; <http://www.besd-bir.org>.
- Besd-Bir (2007) “Kanatlı Bilgileri Yıllığı-2006” (Annual Report on Poultry-2006), Ankara, Turkey.

- Chopra, A. and D.A. Bessler (2005) "Impact of BSE and FMD on beef industry in U.K." Paper presented at the NCR-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management, St. Louis, Missouri, April 18-19.
- European Union (EU). 2006. "Avian Influenza Preparedness and Response Project" Retrieved April, 30, 2007 from European Commission website at [http://ec.europa.eu/enlargement/fiche\\_projet/document/Turkey%202006\\_17966%20Avian%20influenza%20project%20fiche.pdf](http://ec.europa.eu/enlargement/fiche_projet/document/Turkey%202006_17966%20Avian%20influenza%20project%20fiche.pdf).
- FAO (2006) "National Aquaculture Sector Overview – Turkey" Retrieved August 15, 2008 from Food and Agriculture Organization of the United Nations website at: [http://www.fao.org/fi/website/FIRetrieveAction.do?dom=countrysector&xml=naso\\_turkey.xml](http://www.fao.org/fi/website/FIRetrieveAction.do?dom=countrysector&xml=naso_turkey.xml).
- Obayelu A. E. (2007) "Socio-economic analysis of the impacts of avian influenza epidemic on households poultry consumption and poultry industry in Nigeria: empirical investigation of Kwara State." *Livestock Research for Rural Development*. Volume 19, Article #4. Retrieved August 14, 2008 from CIPAV website at <http://www.cipav.org.co/lrrd/lrrd19/1/obay19004.htm>.
- RATS *User's Guide*, Version 6, Estima, 2004.
- Sarigedik, Unal (2006) "Turkey Poultry and Products An Update on AI in Turkey-Correction 2006" USDA Foreign Agricultural Service, GAIN Report, GAIN Report Number: TU6027, 6/2/2006, Retrieved August 14, 2008 from FAS website at [www.fas.usda.gov/gainfiles/200606/146197968.doc](http://www.fas.usda.gov/gainfiles/200606/146197968.doc).
- Sarıncı, M. (2006) "Kuş Gribi Hastalığının Türkiye Ekonomisi Üzerindeki Etkileri (The effects of Avian Influenza on the Turkish Economy)" Retrieved April, 2007 from the website at: [http://www.ekodialog.com/Makaleler/kusgribi\\_ekonomiye\\_etkisi.html](http://www.ekodialog.com/Makaleler/kusgribi_ekonomiye_etkisi.html).
- Saygı, Hülya, Şahin Saka, Kürşat Fırat, and Tuncer Katağan (2006) "İzmir Merkez İlçelerinde Kamuoyunun Balık Tüketimi ve Balık Yetiştiriciliğine Yaklaşımı (The consumption of fish and approach to fish culture of public opinion in Izmir Central Districts)" *E.U. Journal of Fisheries & Aquatic Sciences*, Vol.23, No:1-2, pp.133-138.
- Şanslı, Şenol, and Hülya Saygı (2001) "Su Ürünleri Tüketimi İçin Bir Ekonometrik Model (Econometric model for seafood consumption)" *E.U. Journal of Fisheries & Aquatic Sciences*, Vol.18, No:3-4, pp.383-390.
- Taha, Fawzi A. (2007) "How Highly Pathogenic Avian Influenza Has Affected World

Poultry-Meat Trade”A Report from the Economic Research Service, LDP-M-159-02, Economic Research Service/USDA, October 2007, Retrieved August 14, 2008 from ERS website at

<http://www.ers.usda.gov/Publications/LDP/2007/10Oct/LDPM15902/LDPM15902.pdf>.

Tekinay, Adem A., Mustafa Alpaslan, Özcan Özen, Pınar E. Akyüz, Gülçin Kahyaoğlu, and Derya Güroy (2003) “A Comparative Analysis of Istanbul Fish Market Records Between 1998 and 2001” *E.U. Journal of Fisheries & Aquatic Sciences*, Vol.20, No:3-4, pp.413-418.

Timur, Metin, and Kadir Doğan, (1999) “İstanbul Balık Hali (Türkiye) ve Halde Pazarlanan Su Ürünleri (İstanbul (Turkey) fish auction hall and marketing)” *E.U. Journal of Fisheries & Aquatic Sciences*, Vol.16, No:1-2, pp.1-17.

Turkstat (Turkish Statistical Institute), <http://www.turkstat.gov.tr>.

World Health Organization (WHO), “Avian Influenza fact sheet,” Retrieved April, 2007 from WHO website at [http://www.who.int/mediacentre/factsheets/avian\\_influenza/en](http://www.who.int/mediacentre/factsheets/avian_influenza/en) 2006.

Yalçın, C. Professor at the Department of Animal Health Economics and Management, Ankara University, Turkey, Personal communication on October 4, 2006.



**Table 1**  
**Meat production in Turkey (tons)**

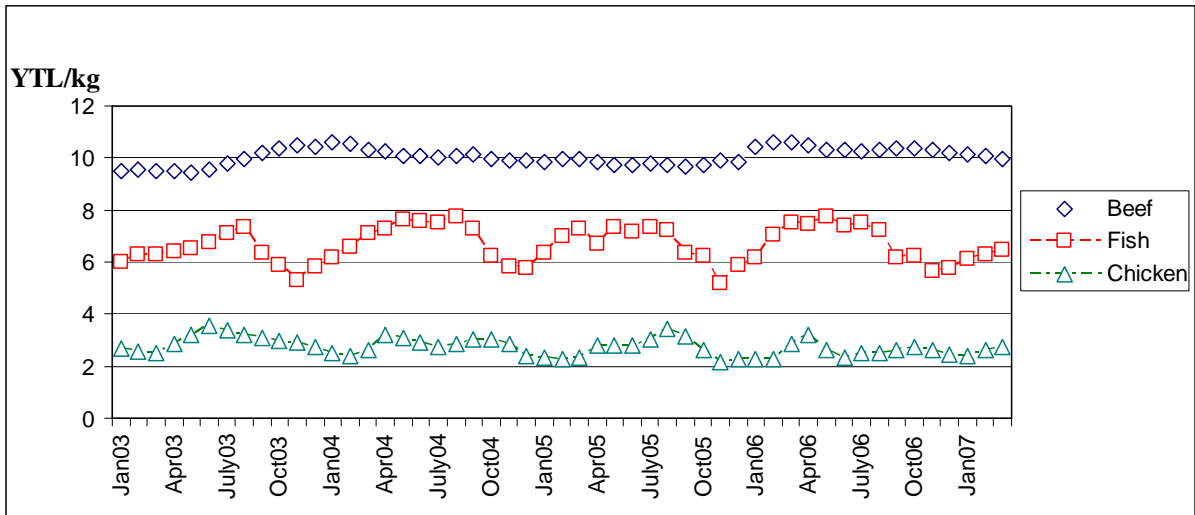
	<b>Sheep and goat</b>	<b>Cattle</b>	<b>Poultry</b>	<b>Fish</b>
2000	132,534	354,636	662,748	441,690
2001	101,799	331,589	629,888	465,180
2002	91,282	327,629	726,607	493,446
2003	74,493	290,455	905,252	416,126
2004	80,015	364,999	914,458	456,752
2005	86,133	321,681	979,412	334,248
2006	96,032	340,705	934,732	409,945

**Sources: Turkstat and Besd-Bir (2007)**

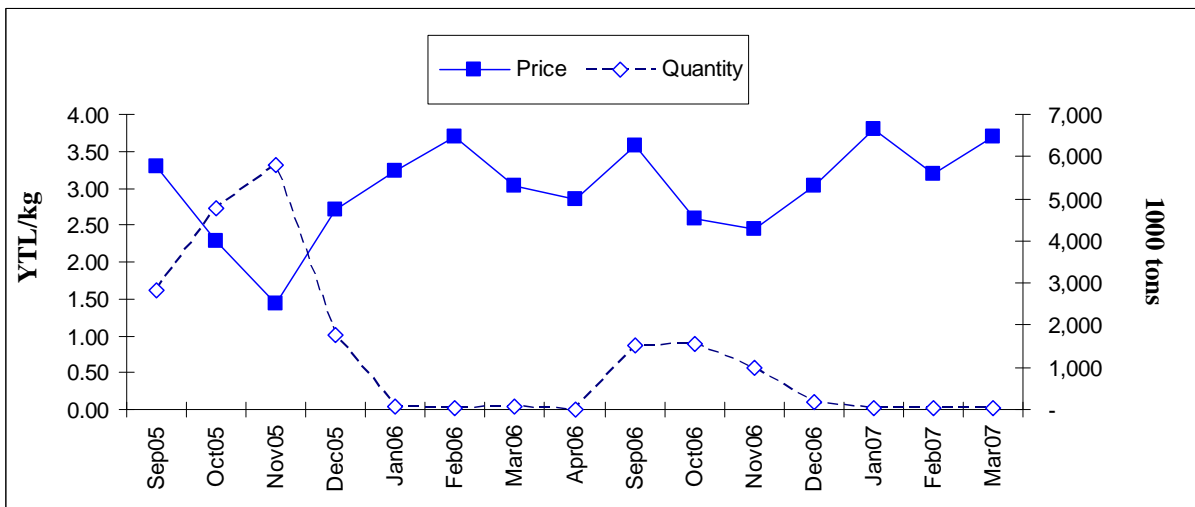
**Table 2**  
**Quantity of sea fish caught in Turkey (tons)**

<b>Type of fish</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>
Anchovy	280,000	320,000	373,000	295,000	340,000	138,569	270,000
Blue fish	4,250	13,060	25,000	22,000	19,901	18,357	8,399
Horse mackerel	15,000	15,545	19,500	16,400	18,068	13,540	14,127
Pilchard	16,500	10,000	8,684	12,000	12,883	20,656	15,586
Grey mullet	27,000	22,000	12,000	11,000	12,424	10,560	8,915
Whiting	18,000	10,000	8,808	8,000	8,205	8,309	9,112
Atlantic bonito	12,000	13,460	6,286	6,000	5,701	70,797	29,690
Sprat	7,000	1,000	2,050	6,025	5,411	5,500	7,311
Hake-European hake	18,190	20,810	10,500	7,500	4,380	4,100	3,460
Chup mackerel	9,000	4,500	1,500	1,480	1,402	2,001	2,760
Other	34,750	34,805	26,118	30,721	28,377	41,859	40,585
<b>Total</b>	<b>441,690</b>	<b>465,180</b>	<b>493,446</b>	<b>416,126</b>	<b>456,752</b>	<b>334,248</b>	<b>409,945</b>

**Source: Turkstat**

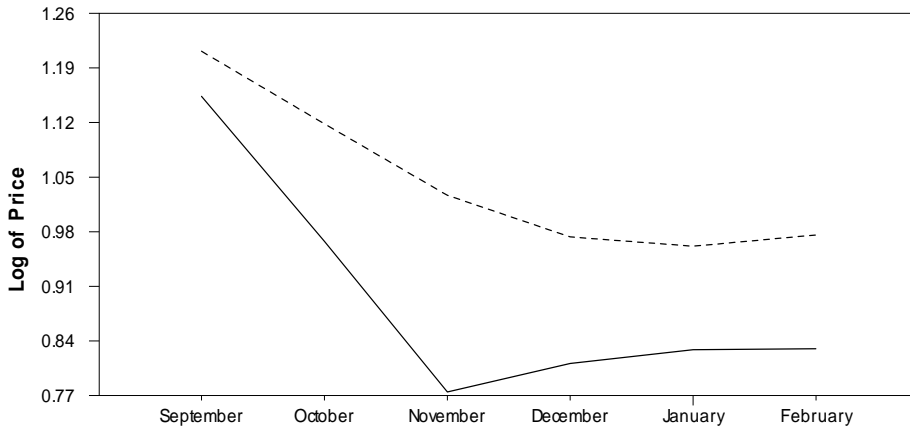


**Figure 1: Real beef, fish, and chicken prices in Turkey**

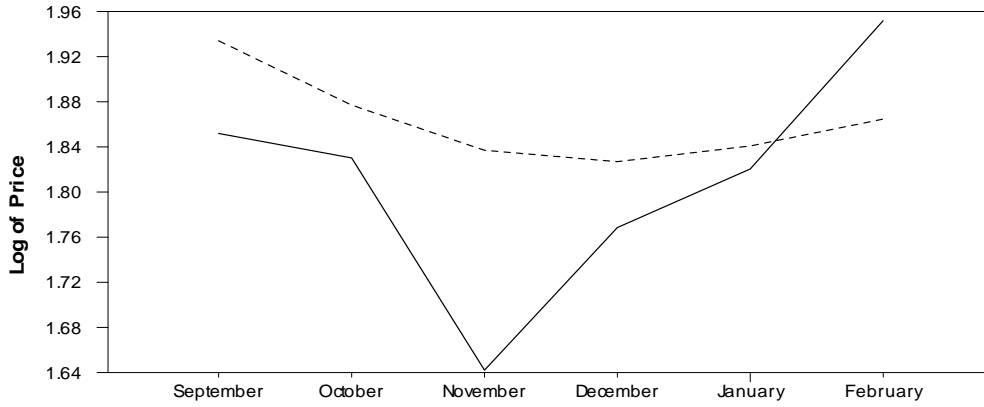


**Figure 2: Atlantic Bonito—Quantity caught and real prices at Istanbul Sea Products Marketplace**

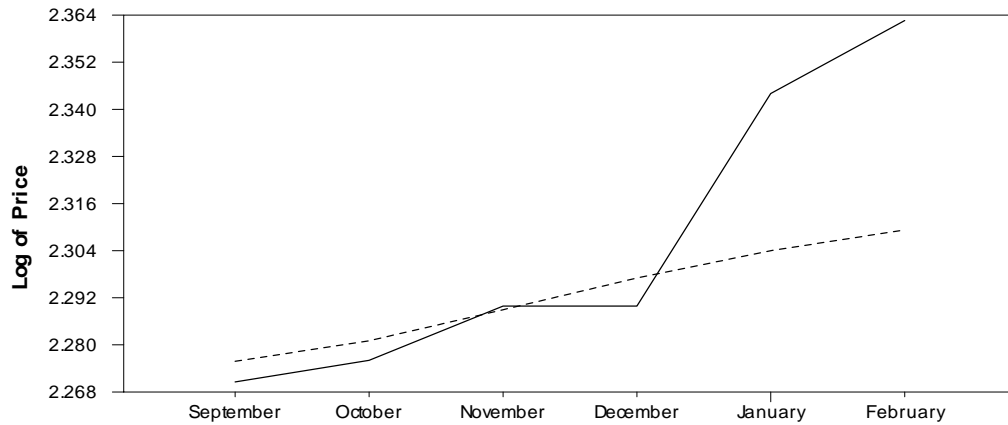
### Historical Decomposition of CHICKEN



### Historical Decomposition of FISH



### Historical Decomposition of BEEF



**Figure 3: The H5N1 avian influenza and Atlantic bonito impacts on Turkish beef, chicken, and fish prices for the period September 2005-February 2006**