Imperfect competition in the fresh tomato industry

Vincent V. Requillart, Michel Simioni, Jose Luis Varela Irimia

Imperfect competition in the fresh tomato industry

Vincent Réquillart* Michel Simioni* Xosé-Luís Varela-Irimia†

September 3, 2008

Abstract

In this paper, we analyse the market power of the retail industry in the French tomato market. Following the methods developed in the New Empirical Industrial Organization, we develop a structural model of this industry.

The analysis is based on detailed data on final consumption and prices at both shipper and consumer levels for two types of tomatoes in France. The structural model is composed of a system of demand equations, supply equations and pricing equations which include terms which capture the oligopoly and oligopsony power of the retail sector. We show that i) elasticity of demand varies during the year ii) the retail sector exercise only a 'moderate' market power iii) the exercise of market power decreases over time iv) If markets were competitive, in the case of tomato 'ronde' retail price would decrease by about 1.2% to 4.5% depending on the year; v) In absence of market power, shipping price might be 6% to 24% higher than observed. We find higher distortions in the case of tomato 'grappe'. We also find that the distortions tend to decrease over time. We conclude to a moderate exercise of market power of the retail sector in the French tomato market.

JEL classification: L13, Q13, L66, L81

Keywords: Oligopoly, Oligopsony, Fresh products.

*Toulouse School of Economics (GREMAQ-INRA, IDEI)
†Toulouse School of Economics (GREMAQ-INRA)

1 Introduction

The questions of price formation and price transmission in food chains are important as a lot of analysis of the impact of agricultural policy changes generally assume that the prices changes are transmitted to the final consumers. It is therefore important to develop in depth analysis of how food chains are working and how changes in the supply of agricultural productions are transmitted to final consumers. The current debate about the impact on inflation of the significant increase in agricultural prices in 2007 is a good example.

Existing works about how prices are transmitted from producers to consumers in fresh fruit and vegetable sector in Europe do not provide strong support to the thesis of the exercise of a strong market power at the retail level. For example, statistical analysis of price transmission developed by Hassan and Simioni (2004) shows that, on the French tomato market, margins of the retail sector follow a constant pattern. They also showed that in half of the cases, price transmission is symmetric. Moreover, when it is asymmetric, they showed that positive changes in shipping prices are transmitted at a faster rate (to the consumers) than negative changes. To sum up, they did not find evidence of the exercise of 'strong' market power. Recent analysis of productivity gains in the French fruits and vegetables industry and how these gains are distributed along the chain (Butault (2006)) conclude that in the period 1990-2004, 80% of upstream productivity gains were kept by producers and only 20% were transmitted through price decrease. In a perfectly competitive industry, one anticipates that upstream productivity gains are fully transmitted to the consumers. The fact that upstream producers were able to keep a significant part of the productivity gains suggests that for any reasons, some market power was exercised at the upstream level.

The above results contradict the conventional wisdom that the retail sector, which is much more concentrated than the producer sector, exerts significant market power in the fruits and vegetables industry.

In this paper, we analyse the market power of the retail industry in the French tomato market. More precisely, following the methods developed in the New Empirical Industrial Organization (see Reiss and Wolak, (2007)), we develop a structural model of this industry. We follow the methodology developed by Shroeter and Azzam (1990). Other examples in this literature include Bettendorf and Verboven (2000) analysing price transmission in the European coffee market.

The analysis is based on detailed data on final consumption and prices at both shipper and consumer levels for two types of tomatoes in France. The structural model is composed of a system of demand equations, supply equations and pricing equations. Pricing equations include terms that represent the market power of the retail sector. We show that i) elasticity of demand varies during the year ii) the retail sector exercise only a 'moderate' market power iii) the exercise of market power decreases over time iv) If markets were competitive, retail price would decrease by about 1.2% to 4.5% depending on the year; v) In absence of market power, shipping price might be 6% to 24% higher than observed. We conclude to a moderate exercise of market power of the retail sector in this sector.

2 The French Tomato industry

Tomato is the main vegetable consumed in France. In 2004, households purchased 841000 t of fresh tomatoes for at home consumption (14 kg/per). In 2004, the French production of fresh tomatoes amounted to 624 000 t while imports were about 435 000 t (and exports amounted to 95 000t). From November to February, the supply mainly comes from imports while from March to October it mainly comes from the national production (Figure1).

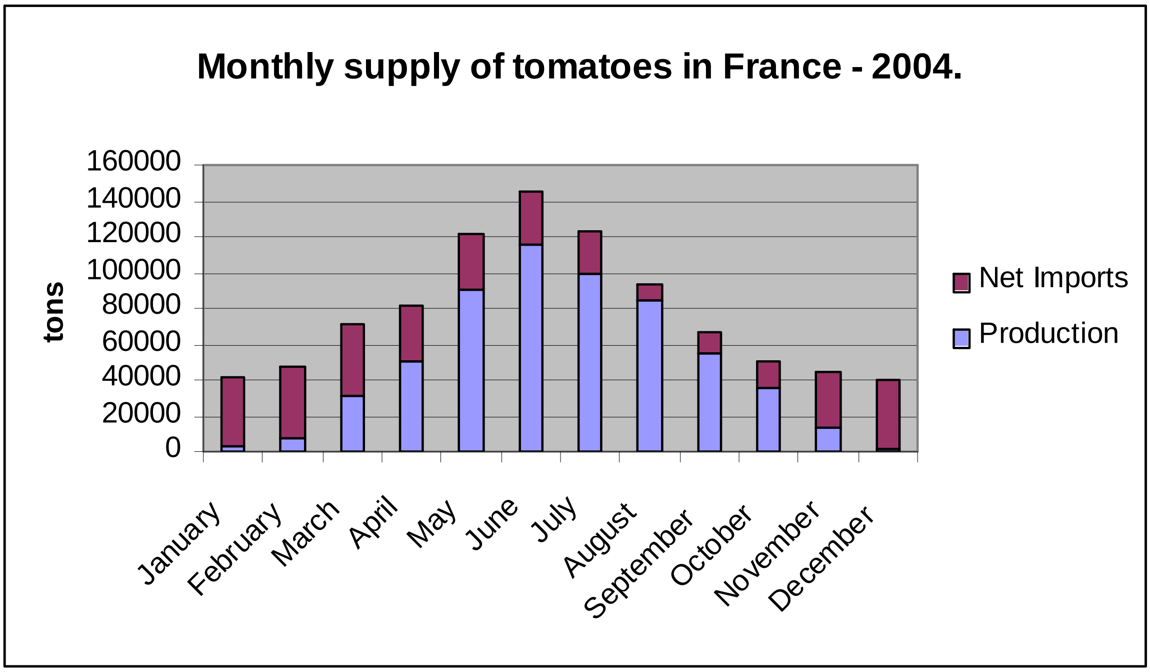

Figure 1: Monthly supply of tomatoes in France,2004.

Even if the tomato production is one of the most organized among the fruit and vegetable industry, the production is not concentrated as the 4 main organizations of producers sell 36% of the whole production (Giraud (2006)). The four main producers are Savéol, Prince de Bretagne, Rougeline and Océane which produced about 70, 70, 60 and 25 kt in 2005, respectively. The Hirschmann Herfindahl Index of concentration at the production level is about 400, which is typical of a non concentrated production.

On the contrary the retail sector is much more concentrated. In 2004, the market share of 'large' retailers was 79%, 14% for open markets, 5% for specialized shops and the remaining 2% corresponded to direct sales and others. As retail sector is highly concentrated in France, CR4 is around 65 to 70% while the HHI is certainly about 2000.

There are different varieties of tomatoes. The main varieties are tomato 'ronde' and tomato 'grappe' which represent more than 80% of the market in 2005 (Linéaires (2006)). The remaining are tomato 'allongée' (about 4% of the market), tomato 'cerise' (about 5% of the market) and other varieties (about 7% of the market).

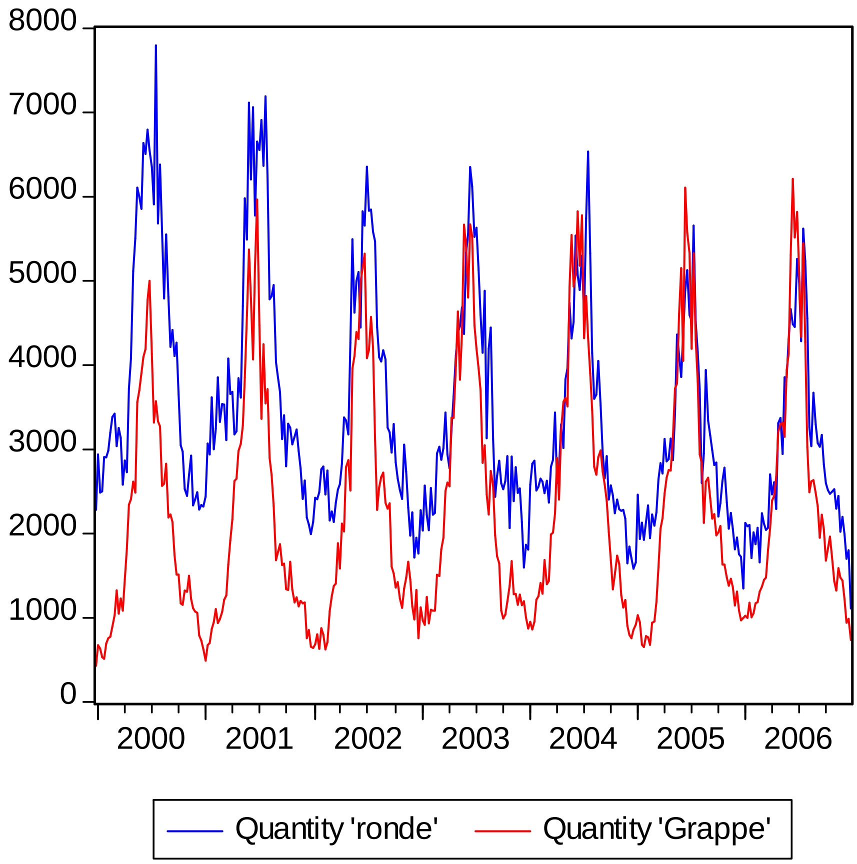

Figure 2: Consumption of tomato 'ronde' and tomato 'grappe' from 2000 to 2006 (t/week).

In this paper, we concentrate our analysis on the two main varieties that is tomato 'ronde' and tomato 'grappe'. As shown on Figure 2, the consumption of tomato strongly varies during the year with low consumption in winter and high consumption in summer. Over the period 2000-2006 the tomato 'grappe' has increased its market share, even if during winter (that is when imports are large) its market share is smaller (Figure3).

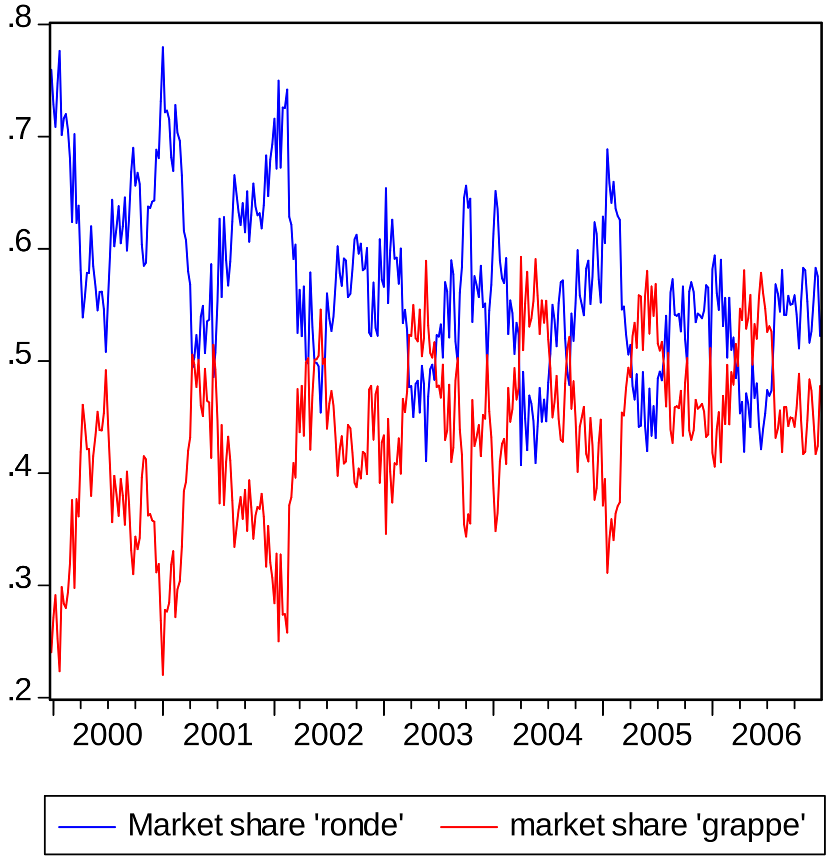

Figure 3: Relative share of tomato 'ronde' and tomato 'grappe' from 2000 to 2006

As illustrated by the example of tomato 'ronde' in Figure 4, there is a strong correlation between the consumer price and the shipper price. The 'margin' calculated as the difference between the two prices (Figure 5) does not exhibit a trend. These patterns hold also for the variety 'grappe'[1]. There are large and frequent variations around an average. While prices follow a general pattern along the year with lower prices in summer, margins do not exhibit such a trend. On the contrary, we find 'high' margins and 'low' margins during all the year. The time series of margins seem to be 'mean reverting'[2].

[1] The figures for 'grappe' were omitted due to space constraints but are available from the authors upon request

[2] We tested the stationarity of the margin series using the usual KPSS test.

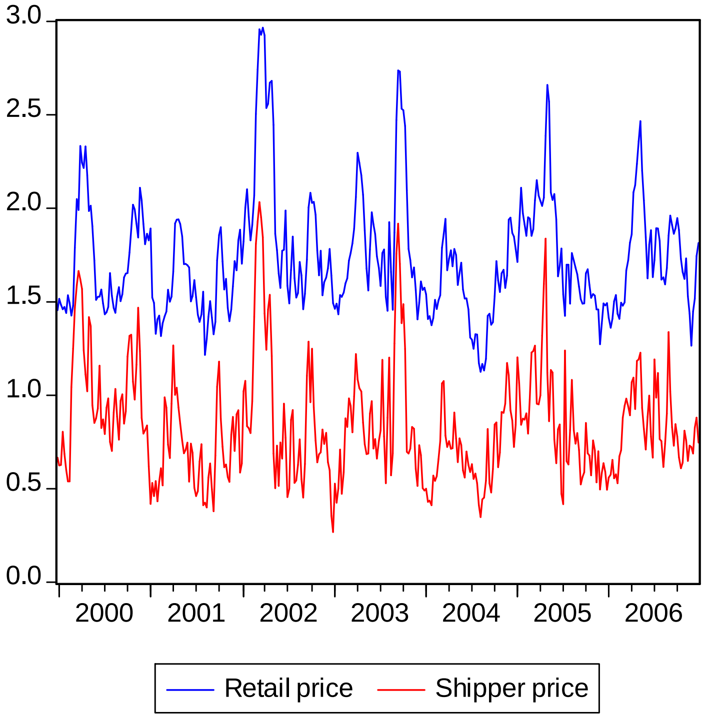

Figure 4: Tomato ‘ronde’: Retail price and shipper price from 2000 to 2006 (€/kg).

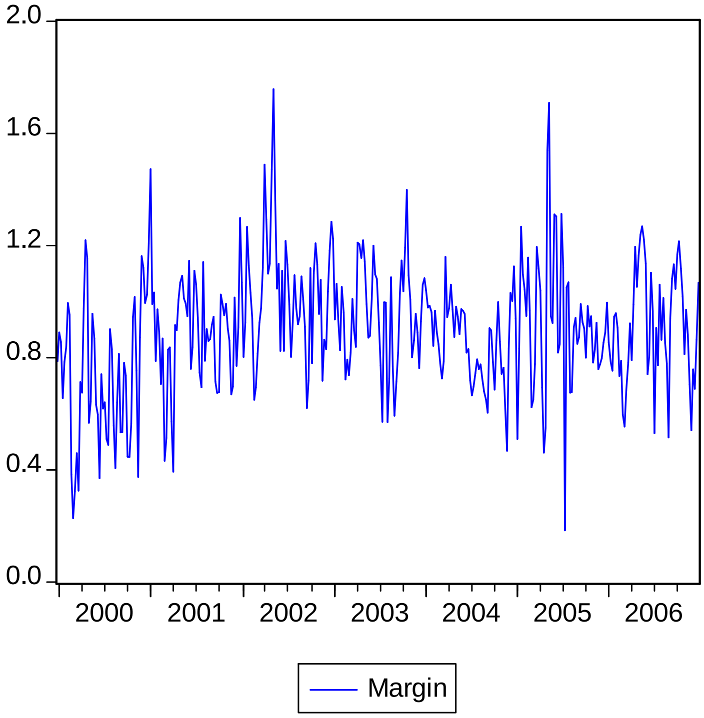

Figure 5: Tomato ‘ronde’: Retail Margin from 2000 to 2006 (€/kg).

3 Model

We develop a model for the French fresh tomato industry inspired by Appelbaum (1982) and Schroeter (1988). In particular, we consider a vertical chain with relatively small producers offering two varieties of tomato which are bought by retailers who then resell to final consumers. Therefore our setting is close to Schroeter and Azzam (1990) or Wann and Sexton (1992).

Consumer demand is written as follows:

$$Q^d_{jt} = D\left(p_{jt}, p_{kt}, y_t, Z_{1t}\right) \ \ , \ j, k = 1, 2$$

where j and k index product varieties ('ronde' and 'grappe'), such that the demand for j depends on its own price, the price of the other variety, income (y_t) and other shifters affecting demand (Z_{1t}). t is a time index.

Supply is given by:

$$Q^s_{jt} = S\left(r_{jt}, w_t, Z_{2t}\right) \ \ , \ j = 1, 2$$

where r_{jt} represents the price perceived by producers or shipping price, w_t represents the price of other inputs, and Z_{2t} other supply shifters. We assume that the price of the other variety in a given period t is not affecting the supply of j that period. This assumption is motivated by the fact that producers cannot switch to other variety in the immediate or short run. They must wait to the next season to do so.

The problem of the retailer i is to choose q^i_j and q^i_k to maximize:

$$\pi^i_t = P_1\left(Q_{1t}, Q_{2t}\right) q^i_{1t} - R_1\left(Q_{1t}\right) q^i_{1t} + P_2\left(Q_{1t}, Q_{2t}\right) q^i_{2t} - R_2\left(Q_{2t}\right) q^i_{2t} - C\left(q^i_{1t}, q^i_{2t}\right)$$

subject to the demand and supply equations above. $Q_{jt} = \sum_i q^i_{jt}$ is the total output of the industry, q^i_{jt} is the output of product j by firm i, $P(\cdot)$ is the inverse demand function of each product, $R(\cdot)$ is the inverse supply function, and $C(\cdot)$ is firm's i non-material input cost depending on quantity and other inputs' prices.

The first order conditions from this optimization problem are:

$$p_1 + \left[\frac{\theta_{11}^{id}}{\varepsilon_{11}} + \frac{\theta_{21}^{id}}{\varepsilon_{21}}\right] p_1 + \left[\frac{\theta_{11}^{id}}{\varepsilon_{12}} + \frac{\theta_{21}^{id}}{\varepsilon_{22}}\right] \frac{p_2 q_2^i}{q_1^i} = r_1 + C_{i1}^{'} + \left[\frac{\theta_{11}^{is}}{\eta_{11}}\right] r_1 + \left[\frac{\theta_{21}^{is}}{\eta_{22}}\right] \frac{r_2 q_2^i}{q_1^i}$$

$$p_2 + \left[\frac{\theta_{12}^{id}}{\varepsilon_{11}} + \frac{\theta_{22}^{id}}{\varepsilon_{21}}\right] \frac{p_1 q_1^i}{q_2^i} + \left[\frac{\theta_{12}^{id}}{\varepsilon_{12}} + \frac{\theta_{22}^{id}}{\varepsilon_{22}}\right] p_2 = r_2 + C_{i2}^{'} + \left[\frac{\theta_{12}^{is}}{\eta_{11}}\right] \frac{r_1 q_1^i}{q_2^i} + \left[\frac{\theta_{22}^{is}}{\eta_{22}}\right] r_2$$

where $C_{ij}^{'} = \frac{\partial C_i(\cdot)}{\partial q_j}$, is the non-material input marginal cost, $\varepsilon_{jk} = \frac{\partial Q_j}{\partial P_k}\frac{P_k}{Q_j}$ $(j, k = 1, 2)$ is the elasticity of demand, $\eta_{jk} = \frac{\partial Q_j}{\partial r_k}\frac{r_k}{Q_j}$ is the elasticity of material input supply and $\theta_{jk} = \frac{\partial Q_j}{\partial q_k^i}\frac{q_k^i}{Q_j}$ is the firm's conjectural variation elasticity. It represents the anticipation that firm i forms with respect to the reaction of other firms to a variation of its own level of production. We allow conjectures to be different upstream and dowstream. Following Schroeter and Azzam (1990), the $\theta's$ can give a measure of the non-competitive distortions in a market, although one should be careful in making inferences about the extent of market power, as pointed out by Corts (1999). As noted in Schroeter and Azzam (1990) θ_{11} and θ_{22} should be between 0 and 1, such that in a perfectly competitive market there is no distortion at all, because no firm expects to be able to affect total output when choosing its own quantity, while $\theta_{jj} = 1$ would correspond to the case of a monopoly. The values and signs of the cross conjectural parameters, θ_{12} and θ_{21} , are not restricted in general, for example they could be negative if products were substitutes. In summary, the first order conditions just tell us that for each product the marginal revenue is equal to the marginal cost of the material input plus the marginal cost of non-material inputs needed to provide the good. Under perfect competition the price would equal the price of the raw product plus the marginal non-material input cost.

This analysis has been developed at the firm level. However, using aggregate data requires some assumptions to guarantee that there is an industry counterpart to the first order equations given above. Basically, what is needed (see Schroeter and Azzam (1990)) is constant and equal marginal costs of production across firms plus non-jointness of production. This means that the production of variety 2 does not affect the marginal cost of producing variety 1, and viceversa. Fixed costs are allowed to vary across firms. More explicitely:

$$C\left(q_1^i, q_2^i\right) = C_1 q_1^i + C_2 q_2^i$$

Nevertheless, an aggregate counterpart for the first order conditions is not guaranteed to exist and so they must be written in terms of industry average values. The interpretation of the $\theta's$ is now that they are quantity weighted averages of the corresponding individual $\theta's$. Therefore, the industry averaged first order conditions can be written as:

$$p_1 + \left[\frac{\theta_{11}^d}{\varepsilon_{11}} + \frac{\theta_{21}^d}{\varepsilon_{21}}\right] p_1 + \left[\frac{\theta_{11}^d}{\varepsilon_{12}} + \frac{\theta_{21}^d}{\varepsilon_{22}}\right] \frac{p_2 q_2}{q_1} = r_1 + C_1 + \left[\frac{\theta_{11}^s}{\eta_{11}}\right] r_1 + \left[\frac{\theta_{21}^s}{\eta_{22}}\right] \frac{r_2 q_2}{q_1}$$

$$p_2 + \left[\frac{\theta_{12}^{id}}{\varepsilon_{11}} + \frac{\theta_{22}^{id}}{\varepsilon_{21}}\right] \frac{p_1 q_1^i}{q_2^i} + \left[\frac{\theta_{12}^{id}}{\varepsilon_{12}} + \frac{\theta_{22}^{id}}{\varepsilon_{22}}\right] p_2 = r_2 + C_2 + \left[\frac{\theta_{12}^s}{\eta_{11}}\right] \frac{r_1 q_1}{q_2} + \left[\frac{\theta_{22}^s}{\eta_{22}}\right] r_2$$

From these equations we define, as in Schroeter and Azzam (1990), the following measures of market power:

$$L_1 = -\frac{1}{p_1}\left\{\left[\frac{\theta_{11}^d}{\varepsilon_{11}} + \frac{\theta_{21}^d}{\varepsilon_{21}}\right] p_1 + \left[\frac{\theta_{11}^d}{\varepsilon_{12}} + \frac{\theta_{21}^d}{\varepsilon_{22}}\right] \frac{p_2 q_2}{q_1}\right\}$$

$$L_2 = -\frac{1}{p_2}\left\{\left[\frac{\theta_{12}^{id}}{\varepsilon_{11}} + \frac{\theta_{22}^{id}}{\varepsilon_{21}}\right] \frac{p_1 q_1^i}{q_2^i} + \left[\frac{\theta_{12}^{id}}{\varepsilon_{12}} + \frac{\theta_{22}^{id}}{\varepsilon_{22}}\right] p_2\right\}$$

$$M_1 = \frac{1}{r_1}\left\{\left[\frac{\theta_{11}^s}{\eta_{11}}\right] r_1 + \left[\frac{\theta_{21}^s}{\eta_{22}}\right] \frac{r_2 q_2}{q_1}\right\}$$

$$M_2 = \frac{1}{r_2}\left\{\left[\frac{\theta_{12}^s}{\eta_{11}}\right] \frac{r_1 q_1}{q_2} + \left[\frac{\theta_{22}^s}{\eta_{22}}\right] r_2\right\}$$

$$D_1 = \frac{p_1 L_1 + r_1 M_1}{p_1 - r_1} = \frac{p_1 - r_1 - C_1}{p_1 - r_1}$$

$$D_2 = \frac{p_2 L_2 + r_2 M_2}{p_2 - r_2} = \frac{p_2 - r_2 - C_2}{p_2 - r_2}$$

L measures the degree of distortion on the consumer side, M measures the distortion on the producers' side and D is an aggreage measure of market power. In general, we will have higher distortions the smaller the elasticities and /or the larger the $\theta's$.

Other comparisons of interest can be made with respect to the estimated competitive price. Perfect competition in retailing implies $p_j = r_j + C_j = p^*$. Provided we have estimates of supply and demand equations, one can impose competition and the solve for the market clearing price. This procedure provides a comparative static estimate of the competitive price, i.e. the price that clears the market if we do not allow for any distortion and we keep other things equal. With p^* we can also compute the competitive quantity and the distortions between actual and competitive prices and quantities.

4 Empirical Strategy

4.1 Demand specification

Following Bettendorf and Verboven (2000), we consider a linear demand function of the form:

$$Q_{jt} = \sum_{m=1}^{12} \alpha_{j1k} p_{jt} M_{tm} + \alpha_{j2} p_{kt} + \alpha_{j3} y_t + \alpha_{j4} Tm_t + \alpha_{j5} Q_{jt-1} + \alpha_{j6} Q_{kt-1}$$

p_{jt} represents the real price of variety j and p_{kt} the price of variety k. y_t is consumers' income in real terms. As it is unknown we take as proxy the total expenditure in fruits and vegetables. Tm is the average temperature and M_m a dummy for month m such that the own-price elasticity of demand is allowed to vary through the year. The consumption of tomato shows a positive correlation and therefore lagged quantities are introduced to control for the autocorrelation of the series. That is also the reason to not introduce a constant term. The cross-lagged quantity is introduced because it is reasonable to think that present consumption of tomato will be correlated with total past consumption, and not only with consumption of one variety. Therefore, covariates will explain the variation between previous and current consumption and hence elasticities should be understood as short run price elasticities.

4.2 Supply specification

The supply of tomato is modelled as a linear function:

$$Q_{jt} = \sum_{m=1}^{12} \beta_{j1k} r_{jt} M_{tm} + \beta_{j2} Sun\_NO_t + \beta_{j3} Q_{jt-52}$$

r_{jt} is the material input price j interacted with a monthly dummy. Sun_NO_t is a measure of the total solar radiation during week t in a representative producer area in the northwest of France. Sunlight is one of the most important determinants of tomato production. Q_{jt-52} is introduced as a proxy for productive capacity in week t because of this dependence of production on seasonal climatological conditions and also because the planted area does not vary much during the sample period. Therefore, this variable would be playing the role of a weekly constant term.

4.3 Pricing equation specification

We analyse the cost of the retail activity. The technology is rather simple as the product is not processed. It is essentially transported, displayed in the shop and sold. The elements of cost are thus mainly the wholesale price of the product, and other cost shifters that in this specification are summarized by the price index of transportation costs in real terms. It seems reasonable to assume that these inputs are used in fixed proportions. Therefore we can write the following empirical counterpart of the first order conditions, which are estimated in implict form:

$$p_1 = r_1 + \gamma_1 TrCost + \left[\frac{\theta_{11}^s}{\eta_{11}}\right] r_1 + \left[\frac{\theta_{21}^s}{\eta_{22}}\right] \frac{r_2 q_2}{q_1} - \left[\frac{\theta_{11}^d}{\varepsilon_{11}} + \frac{\theta_{21}^d}{\varepsilon_{21}}\right] p_1 - \left[\frac{\theta_{11}^d}{\varepsilon_{12}} + \frac{\theta_{21}^d}{\varepsilon_{22}}\right] \frac{p_2 q_2}{q_1}$$

$$p_2 = r_2 + \gamma_2 TrCost + \left[\frac{\theta_{12}^s}{\eta_{11}}\right] \frac{r_1 q_1}{q_2} + \left[\frac{\theta_{22}^s}{\eta_{22}}\right] r_2 - \left[\frac{\theta_{12}^d}{\varepsilon_{11}} + \frac{\theta_{22}^d}{\varepsilon_{21}}\right] \frac{p_1 q_1}{q_2} - \left[\frac{\theta_{11}^d}{\varepsilon_{12}} + \frac{\theta_{21}^d}{\varepsilon_{22}}\right] p_2$$

The variability in supply and demand elasticities allows the identification of all behavioral parameters.

4.4 Estimation

We add idiosyncratic error terms and estimate the system of six simultaneous equations using the Generalized Method of Moments (GMM) proposed in Hansen (1982)).

TM, $TrCost$, and Sun_NO are treated as exogenous variables and used as instruments for all equations in the system. Q_{jt-52} and Q_{kt-52} are considered to be predetermined and therefore added to the set of instruments as well. Considering that there is only evidence of an $AR(1)$ in quantities, Q_{t-52}, should not be correlated with the error term at time t. The set of instruments is completed with other meteorological variables: rainfall and temperature in the same representative area in the northwest of France, and solar radiation, rainfall and temperature in another representative producer area of southeast France.

These instruments are used to control for the endogeneity of consumer and material input prices, quantities, and income (recall that we use as proxy the total expenditure in fruits and vegetables).

5 Data

In this paper, we estimate the model on two varieties of tomato: tomato 'ronde' and tomate 'grappe'. We use different data sources. All data refers to the period 2000-2006. From the Service des Nouvelles des Marchés du Ministère de l'Agriculture et de la Pêche (SNM-MAP), we got weekly data on prices, both shipping and retail prices for the two varieties of tomatoes. From a consumer panel (TNS-SECODIP), we got weekly data on the quantities purchased by consumers (for each of these two varieties) as well as the weekly expenditures for fresh fruits and vegetables.

Meteorological data are from INRA and Météorologie Nationale and consist in daily information about the weather in Ile de France (for the demand side) and in North West and South East (for the supply side)[3]. It is easy to transform these daily data in weekly

[3]We use data from Ile de France as demand shifter because this region concentrates a significant part

data: the amount of rain during a week is obviously the sum of the daily amount of rain over the week while the temperature is the average. Finally, we got monthly data from the French Statistical Institute INSEE. This monthly data correspond to the fruit and vegetable price index (used as a deflator), and to the transport cost index. The labour cost index is quarterly. We transform these monthly (or quarterly) data into weekly data assuming linear change within the period. We finally have 365 observations ($7 * 52 + 1$).

We provide in Table 1 some descriptive statistics of the series. It should be noted that the shipping price is about 50 to 60% of the retail price. The retail 'margins' (calculated as the difference between the retail price and the shipping price) are quite similar for the two products and amount to 0.9 to 0.95€$/kg$ on average. In average the expenditures for tomatoes is about 8% of the total expenditures for fruits and vegetables.

Table 1 : Summary statistics.

	Average	Std. Dev.	Min.	Max.
Tomato 'Ronde'				
Shipping price	0.84	0.31	0.27	2.03
Retail price	1.74	0.32	1.13	2.96
Quantity	3 433	1 340	1 112	7 797
Tomato 'Grappe'				
Shipping price	1.26	0.43	0.42	2.61
Retail price	2.21	0.44	1.18	3.69
Quantity	2 316	1 424	431	6 212
F&V expenditures	134 512	15 277	107 656	167 726

(Weekly data. Prices expressed in €/kg, quantities in Tons, expenditures in k€)

of the French population. Regarding the supply side the main areas of production are North-West and South East.

6 Results

For both products, we find very significant coefficients with the expected signs (see Table A1 in the appendix which reports the value of the parameters as well as the $t-$statitictics). With respect to the demand side of the model, all estimated elasticities are of the right signs and are significantly different from 0. The own-price elasticity follows a U-shaped pattern through the year. In the short run, the demand is price inelastic. However, in winter the elasticity (absolute value) is about 0.7 while it reaches a minimum during summer (Figure 6)[4]. Because, the demand in t depends strongly on the demand in $t-1$, the long run elasticity is much higher. Cross-price elasticity is positive and significantly different from 0 indicating the substitutability between the two varieties of tomatoes. It follows a similar pattern. In average, the cross price elasticity for tomato 'ronde' is 0.5 and it is 0.4 for tomato 'grappe'. We find negative expenditure elasticities (not significant in the case of tomato 'grappe'). This might be due to substitutions among fruit and vegetables when expenditures increase, meaning that consumers diversify their purchases. Finally, temperature is a significant shifter of the demand.

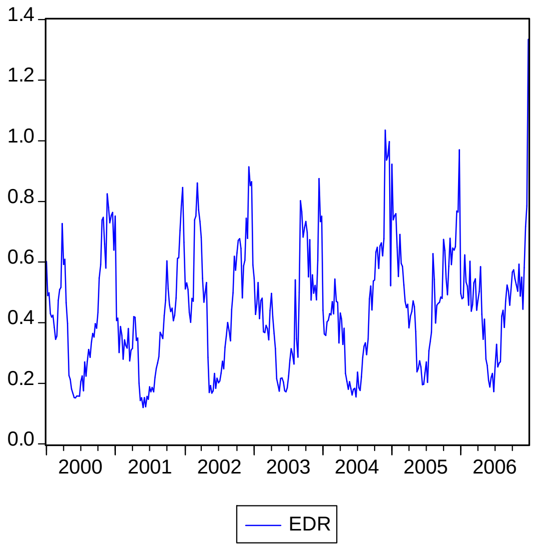

Figure 6: Elasticity of demand for tomato 'ronde' (absolute value).

[4]We only present Figures for tomato 'ronde' due to space constraints.

With respect to the supply side, all estimated elasticities have the right sign and are significantly different from 0 (one coefficient is negative and not significant). The short run own-price elasticity varies during the year with especially very low values in summer (Figure 7). The elasticity of supply is larger in winter when the supply is mainly from imports. The supply is dependent of solar irradiation.

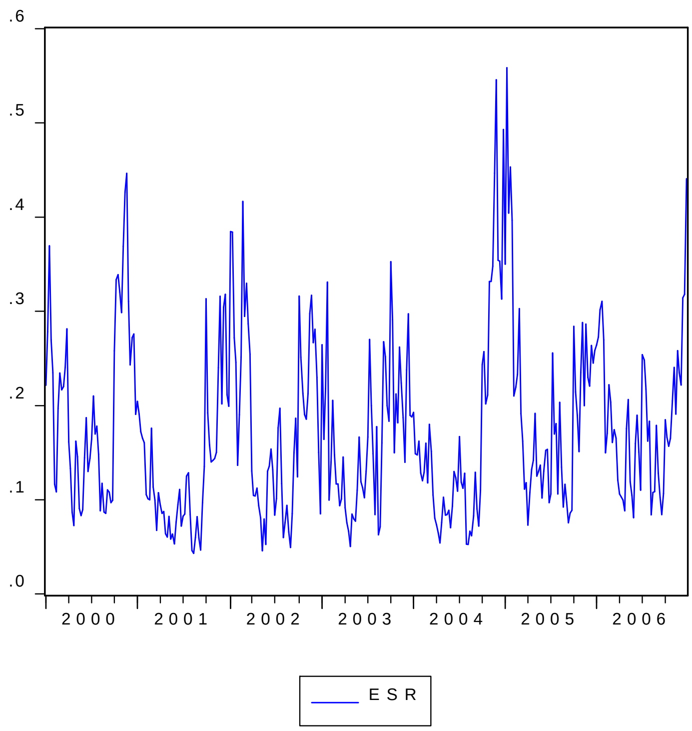

Figure 7: Elasticity of supply for tomato 'ronde'

For tomato 'ronde' own conjectural coefficients are positive and significantly different from 0. It is not the case for tomato 'grappe' as only cross conjectural coefficients are significantly different from 0 (cf. Table A1 in the appendix). To have an estimate of the distortion created by the exercise of market power, we computed the D, L and M indexes defined above (Table 2).

The exercise of market power is higher in the tomato 'grappe' case than in the tomato 'ronde' case. According to the results, the distortions created upstream and downstream are of same order of magnitude.

Table 2: Average Distortion due to the exercise of market power (%).

	Tomato 'Ronde'	Tomato 'Grappe'
Upstream	3.8	10.1
Downstream	3.8	10.2
Total	11.6	37.6

As elasticities vary within the year, the distortions also vary. We provide on the following figures the evolution of these indexes over the whole period. It seems that the distortions were higher at the beginning of the period than at the end of the period.

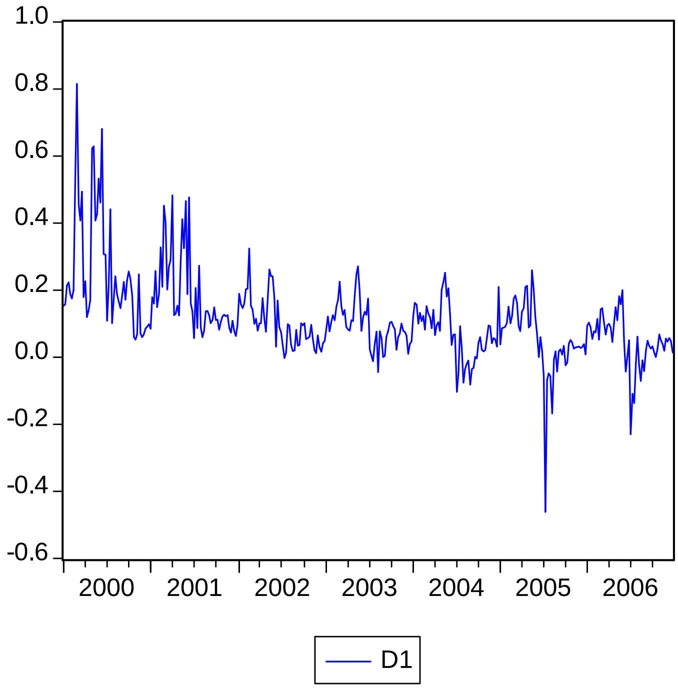

Figure 8: Total distortion due to market power, tomato 'ronde'

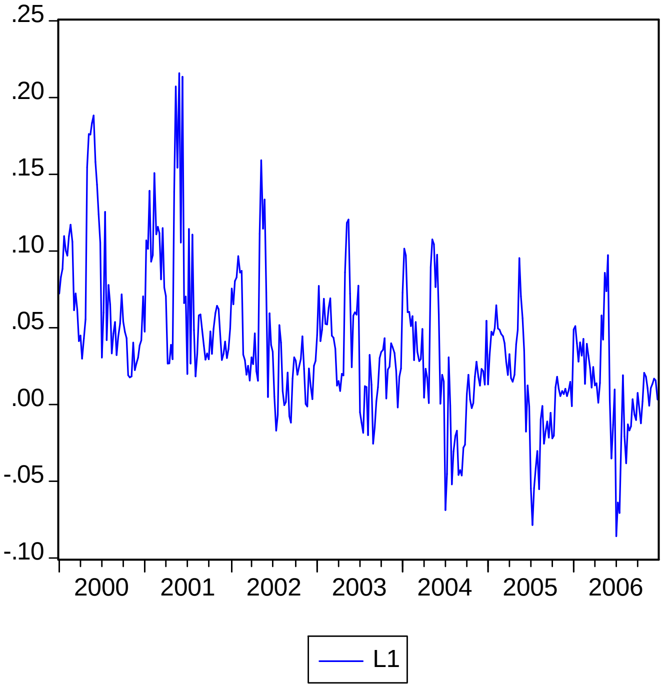

Figure 9: Downstream distortion due to market power, tomato 'ronde'

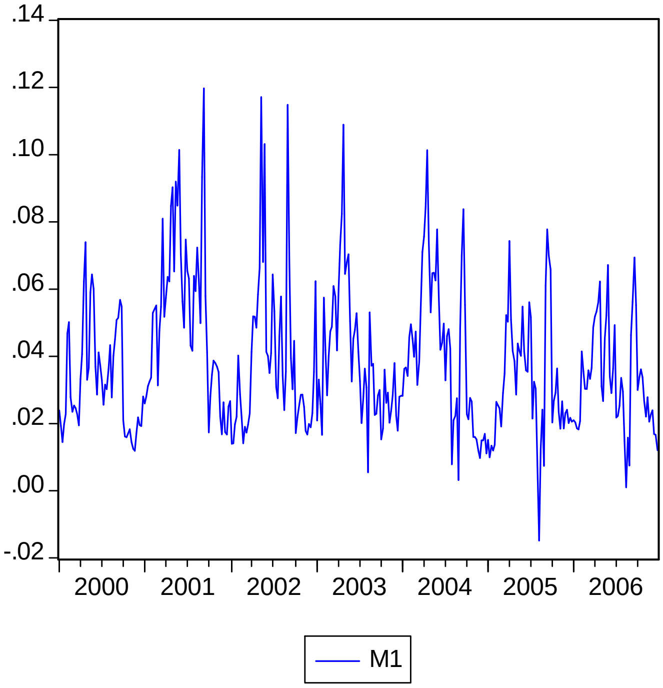

Figure 10: Upstream distortion due to market power,tomato 'ronde'

Using supply and demand functions, we then computed a counterfactual situation assuming perfect competition of the retail sector (both vis à vis the upstream sector and the downstream sector). In 2001, the competitive retail price would be 4.5% lower than the non competitive one for tomato 'ronde' (Table 3). The shipping price would be 23.3% higher than the non competitive. In 2006, the differences between competitive price and non competitive price are significantly lower.

Table 3: Average difference between observed price and competitive prices (in % of observed price).

	Tomato 'Ronde'		Tomato 'Grappe'	
	2001	2006	2001	2006
Retail price	4.5	1.2	9.3	2.2
Shipping price	−23.3	−5.9	−54.1	−13.2

We find higher distortions in the case of tomato 'grappe'. We also find that distortions were higher in 2001 than in 2006.

Restoring perfect competition on the market would not increase significantly the consumption of tomatoes and consumers' gains from competition, at least in 2006, are likely to be small. However, upstream producers have to gain from restoring competition as this would increase the shipping price by about 6% in 2006.

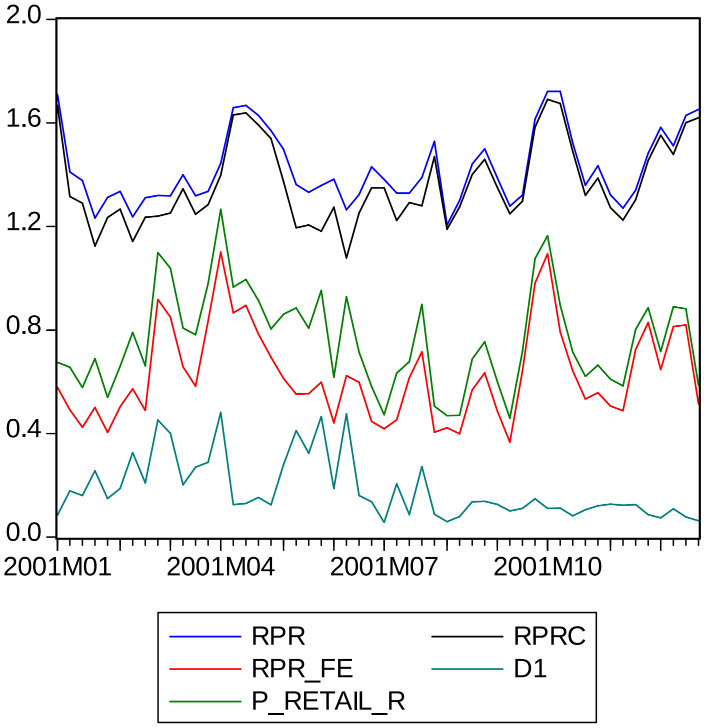

Figure 11: Evolution of observed and competitive price of tomato 'ronde' in 2001. (RPR stands for observed retail price, RPRC for competitive retail price (computed), RPR_FE for shipping price, P_Retail_R for computed competitive shipping price and D1 is the distortion index).

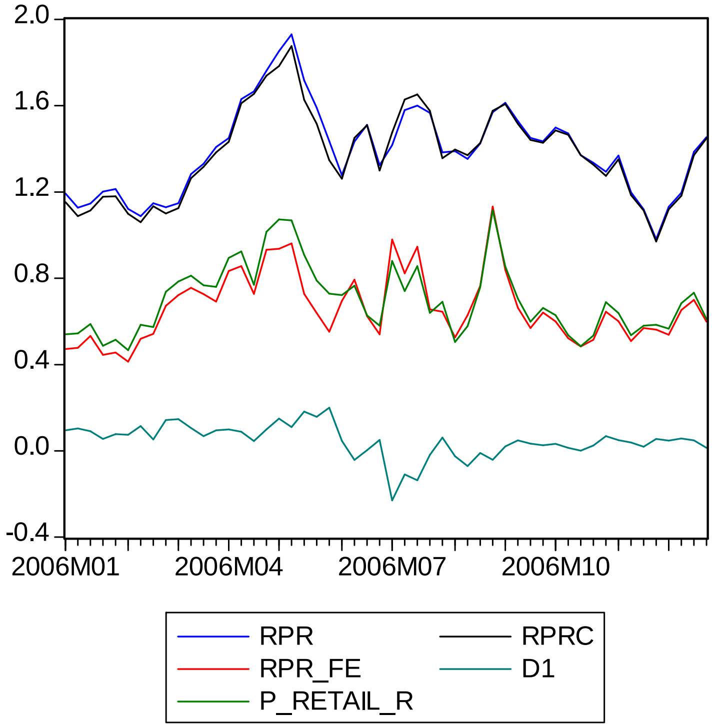

Figure 12: Evolution of observed and competitive price of tomato 'ronde' in 2006. (RPR stands for observed retail price, RPRC for competitive retail price (computed), RPR_FE for shipping price, P_Retail_R for computed competitive shipping price and D1 is the distortion index)

7 Conclusion

We propose a structural model of retailer behavior in the fresh tomato industry and we use it to estimate the average market power in the retailing activity. According to our results, the retail sector exert some market power vis à vis the consumers. However the exercise of this market power remains moderate. For example, in absence of market power, we estimate that this would induce a price decrease by about 1.2 to 4.5% depending on the year. This would lead to marginal increase in the consumption of tomatoes. While the retail sector is concentrated, these results suggest that, for this product, the competition among retailers is effective. A possible explanation may be that consumers select their retail shop according to the prices of a few number of products, among them the tomato.

Then price competition among retailers is rather ‘tough’ as low price for this product is a tool to attract consumers.

It is mainly producers of tomatoes who suffer from the market power of the retail industry. In absence of market power, shipping price might be 6 to 24% higher than observed for tomato ‘ronde’ and 13 to 54% for tomato ‘grappe’.

Finally, according to our results the exercise of market power was larger in 2001 than in 2006. Is the increase in producer’s concentration responsible for this change?

References

[1] Appelbaum, E. (1982) The Estimation of the Degree of Oligopoly Power. J of Econ, 19: 287-299.

[2] Bettendorf, L. and F. Verboven (2000) Incomplete transmission of Coffee Bean Prices: Evidence from the Netherlands. Eur. Rev. Ag. Econ. 27(1): 1-16.

[3] Butault, J.P. (2006) La formation des revenus agricoles dans les différentes orientations entre 1990 et 2004. Communication à la Commission des Comptes de l'Agriculture de la Nation, 26 Juin 2006.

[4] Corts K.S. (1999) Conduct parameters and the measurement of market power. J. of Econ 88(2): 227-50.

[5] Giraud, S. (2006) La Filière Tomate en France. Etude Descriptive. Rapport INRA-ESR Toulouse.

[6] Hansen, L.(1982). "Large Sample Properties of Generalized Method of Moments Estimators." Econometrica 50: 1029-1054

[7] Hassan, D. and M. Simioni (2004) Transmission des prix dans la filière des fruits et légumes: une application des tests de cointégration avec seuils. Economie Rurale 283-284: 27-46.

[8] Linéaires, 2006. Various issues, Paris.

[9] Reiss,P.C. and F.A. Wolak (2007) Structural Econometric Modeling: Rationales and Examples from Industrial Organization, in: Heckman, J.J., Leamer, E.E., Handbook of Econometrics, Vol. 6, Part 1, 4277-4415.

[10] Schroeter J.R. (1988) Estimating the Degree of Market power in the Beef Packing Industry. Rev Econ and Statis. 70: 158-62.

[11] Schroeter, J.R. and A. Azzam (1990) Measuring Market power in Multi-Product Oligopolies: The U.S. meat industry. Appl. Econ. 22: 1365-76.

[12] Wann J.T. and R. Sexton (1992) Imperfect Competition in Multiproduct Food Industries with Application to Pear processing. Am. J. Ag. Econ. 74(4): 980-90.

Appendix

Table A1: Results from the estimation of the full system.

	Tomato 'Ronde'		Tomato 'Grappe'	
Demand parameters	Value	t-statistic	Value	t-statistic
January	−886.330	−12.271	−343.059	−11.407
February	−870.645	−13.001	−331.853	−10.130
March	−846.888	−13.731	−333.205	−9.618
April	−805.104	−14.471	−322.951	−8.802
May	−628.680	−12.158	−296.250	−7.808
June	−686.289	−15.249	−482.868	−10.507
July	−892.716	−18.963	−878.609	−20.449
August	−991.281	−17.805	−777.584	−18.261
September	−1000.043	−17.463	−662.508	−16.496
October	−983.144	−16.218	−526.019	−14.706
November	−995.236	−15.331	−429.565	−12.934
December	−1020.977	−15.238	−383.393	−11.992
Cross-price effect	793.497	16.650	414.572	8.840
Income	−0.002	−2.906	−0.000	−0.734
Temperature	17.692	12.285	25.256	15.620
Q_{t-1} 'own'	0.922	72.545	0.899	74.557
Q_{t-1} 'cross'	0.041	2.629	0.079	7.671

	Tomato ‘Ronde’		Tomato ‘Grappe’	
Supply parameters	Value	t-statistic	Value	t-statistic
January	1191.907	22.557	162.092	18.154
February	679.158	19.124	39.794	3.650
March	472.013	12.425	65.384	6.102
April	314.174	9.329	203.395	8.728
May	632.171	10.854	564.844	17.310
June	1073.138	13.327	1380.432	29.753
July	1293.126	17.537	822.360	24.554
August	521.431	8.684	−10.015	−1.047
September	469.694	10.660	57.154	3.507
October	802.165	20.679	192.636	13.102
November	918.498	29.598	358.479	32.875
December	819.662	26.805	198.960	16.980
Q_{t-52}	0.616	91.415	0.515	52.827
Sun_NO	0.073	27.342	0.099	42.503

Conjectural elasticities	Tomato ‘Ronde’		Tomato ‘Grappe’	
Demand side	Value	t-statistic	Value	t-statistic
θ ‘own’	0.063	9.602	0.002	1.357
θ ‘cross’	0.011	5.945	0.084	9.089
Supply side				
θ ‘own’	0.005	4.974	0.000	1.178
θ ‘cross’	0.000	1.210	0.012	6.185