Supply Chain Management, Agricultural Policies and Anti-Trust: The Case of Parmigiano Reggiano and Grana Padano

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1. Introduction

During the 1990s the Anti Trust Authorities of the Member States of the European Union have ruled on five agribusiness cases.[1]   This paper focusses on the 1996 ruling regarding the two largest dairy producer organizations, the Consorzio del Parmigiano Reggiano (CPR) and the Consorzio del Grana Padano (CGP); both were found guilty of uncompetitive behaviour by the Italian Antitrust Authority (IAA). The case has been quite controversial, wih suggestions that the anti trust legislation, developed to address the needs of advanced industrial and service sectors, may be poorly suited to interface with traditional and established practices of the agricultural sector.
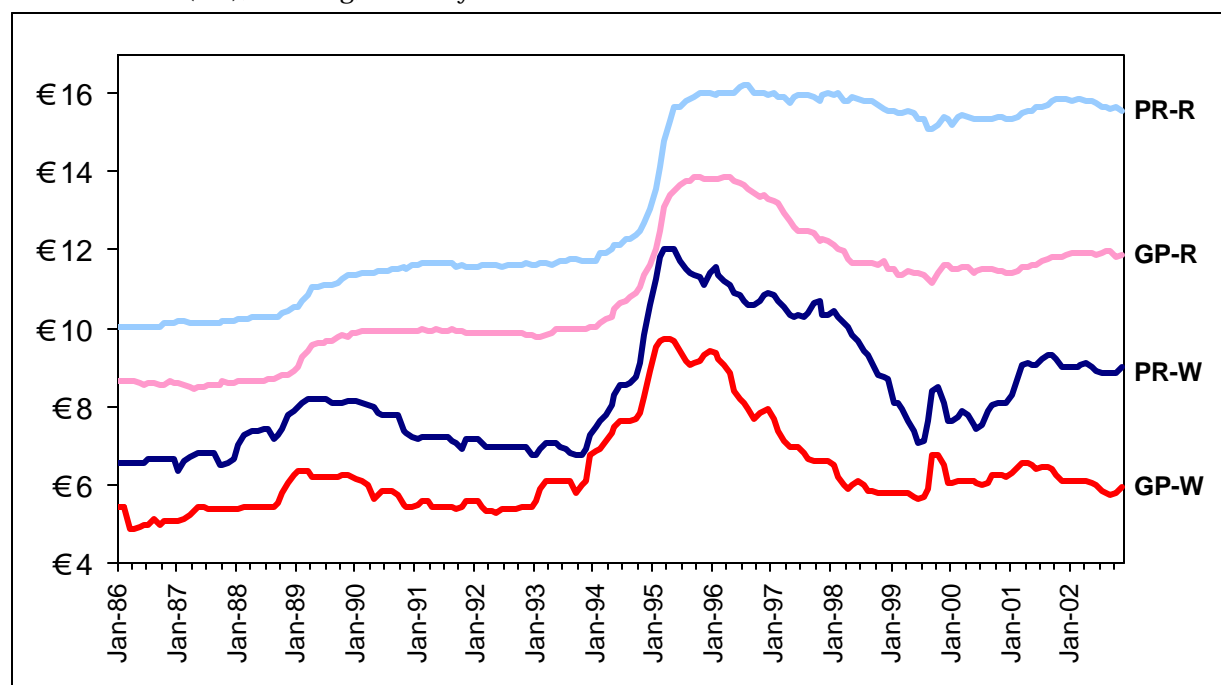
Parmigiano Reggiano and Grana Padano are the two most important cheeses in Italy by value of production and are considered true icons of Italy's emphasis on typical products of highest quality.

The IAA started the case following the significant increase of the retail price of the two cheeses during 1994-95, which is illustrated in Figure 1. The main concern of the IAA was with the market coordination mechanism used by CPR and CGP to co-manage each other's market share, through strict production quotas placed on each dairy.

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[1] In France, there have been two cases concerning cheese and chicken - Conseil de la Concurrence (Paris), decisions 92-D-30 (April 1992) and 94-D-41 (July 1994). In Italy, there have been three cases, two of them concerning cheese

Figure 1: Average monthly retail (R) and wholesale (W) prices of Parmigiano Reggiano (PR) and Grana Padano (GP), Euro/kg, January 1986 to November 2002.

Source: Osservatorio Latte, Università Cattolica, Cremona (Italy).

The IAA argued that the investigation was warranted because of the potential impact of this price increase on Italian households, 75% of whom consume one of the two cheeses at least once a week. The investigation started in November 1995 (decision 3396) and ended in October 1996 (decision 4352)[2]. During the hearings, both CPR and CGP argued that -as a matter of fact- they were mandated by the existing Italian ag. policy legislation to coordinate their production in order to reduce the cyclical nature of the market. The price increase, they argued, could be explained by the cyclical nature of the supply of their cheeses, rather than by the compounded effect of production quotas and market share agreement, as maintained by the IAA. Accordingly, the price increase during 1995 was the result of the contraction in production following the price drop in 1991-1992. In addition, they argued that the control of production of each single dairy trough a quota system was necessary to comply with the legislated requirement to monitor product quality[3]. In October, 1996, the CPR and CGP were find guilty of uncompetitive behavior and given three months to table appropriate changes to their behaviour, de facto terminating their market coordination practice[4].

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[2] The full text of the decisions is available at the web-site of the IAA (Autorità Garante per la Concorrenza e Mercati) www.agcm.it.

[3] For the CTs, it is easier, less expensive and more effective to monitor the quality of 'grana-type' cheeses through a preventive control (i.e. setting a quota equal to the productive capacity of each single dairy), rather than trough chemical and microbiological controls on the milk to be transformed.

[4] In essence, the decision 4352 (1996) declares uncompetitive both the production quotas as mean to monitor the quality and the market share agreement between the GP and PR CTs that intended stabilize the market from cyclical supply.

Despite the relevance of this decision, no empirical investigation has yet been conducted on its supply chain impact, on the ensuing economic benefits and on the localization of such benefits.

The purpose of this paper is to explore and document the changes in price transmission within the supply chain, documenting how the possible conflict between antitrust legislation and existing agricultural policies may result in perverse consequences that are neither needed nor desirable. This will be done by: a) Documenting the "conflicts" between antitrust provisions and agricultural policies; b) Illustrating the key aspects of the production of the two cheeses, Parmigiano Reggiano and Grana Padano; c) Evaluating the impact of the decision on the degree of price coordination between the two supply chains at the wholesale and retail level, and between wholesale and retail levels within each of the two chains.

The starting point is the observation that an effective ruling by the IAA should change the price relation between the two cheeses at both the retail and the wholesale level, reducing the high level of coordination supposedly existing before the ruling.

This is confirmed by the empirical results, as the antitrust rulings has indeed broken the price co-movement of Parmigiano Reggiano and Grana Padano, and has also resulted in significantly lower wholesale prices. At the same time, however, the retail consumer –supposedly the key concern of the IAA- did not benefit at all. Margins for both cheese have widened significantly and retail prices have increased their inertia to any change in wholesale prices. Hardly what the IAA was would have advocated.

The paper is organized in five sections. First, it describes the antitrust policies in place in EU and the exemptions granted to the agricultural sector. Then, it outlines the salient features of the GP and PR industry. The third section will briefly illustrate the empirical methodology (presented more formally in Appendix I). The fourth section presents the empirical results and a discussion of the implications. The general conclusions complete the paper.

2. Competition Policy.

The aim of this section is to document some controversial points in this antitrust case.

2.1 Antitrust, merger and acquisition policies in EU.

The Treaty of Rome introduces the first antitrust policy in Europe[5].   Essentially, the EU relies on two sets of measures: one dealing with antitrust and the other with merger and acquisition issues. The two differ in two aspects: the object of investigation and the time of intervention. The EU legislation was received by Italy in 1990 with law No. 287/90.

The antitrust policy, arts. 81 and 82 of treaty of Rome, deals with a firm's behavior in the markets. In particular art. 81 is concerned with uncompetitive agreements such as price-fixing, market sharing and collusive agreements. Art. 82 deals with the abuses exerted by the dominant firm or group of firms (i.e. predatory pricing). The European Commission enforces these articles after a violation has ocurred (ex-post intervention). On the contrary, the mergers and acquisition policy, based mainly on the Regulation 4064/89, calls for an ex ante evaluation of the expected impact of a merger or an acquisition, either allowing or denying it.

2.2 Agriculture and Antitrust policy.

Agricultural policies of developed countries often use price and income support measures to reduce price and income instability. Often mechanisms are designed to enhance the bargaining power of farmers, and may provide exemption from antitrust policy. The Capper-Volstead Act (1922) is the first example of an exemption to competition policy: not only the Act defined the legal criteria to constitute farm cooperatives in US, but also granted them exemption from the Sherman Antitrust Act [Tweeteen]. Similar examples are found in a number of OECD countries. For example, in Sweden competition law is not applied to farm cooperatives unless they exert a dominant position or price collude; in Germany exemptions to competition law are granted for coordination of production and sale of agricultural product; in the UK several marketing agreements are allowed despite their violation of competition policy [Canali and Boccaletti]. In France, a national market organization is allowed for potatoes [Buccirossi et al.].

More generally, art. 42 of the Treaty of Rome reserves a "special attention" to the agro-food sector on anti-trust and merger & acquisition issues: an 'uncompetitive behaviour' within the agro-food sector cannot be challenged if deemed necessary to implement some of the objectives of the common agricultural policy (CAP). Moreover, the R.CEE n.26/62 introduced two specific exemptions. First, 'collusive' practices undertaken in order to reach the objectives of CAP, cannot be challenged under the antitrust policy. Second, the European Commission, under the supervision of European Court of Justice, is the only organism empowered to rule on whether agricultural 'collusive' practices can be challenged [Cobbo and Cazzola; Canali and Boccaletti].

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[5] Almost 70 years after the Sherman Antitrust Act (1890).

3. The Parmigiano Reggiano and Grana Padano.

The purpose of this section is to provide a general understanding of the economic and legislative issues surrounding the production of these Protected Designation of Origin (PDO) cheeses.

3.1 Legislative framework.

A key rationale for PDO labelling is the desire to support the otherwise weak bargaining power of farmers through improved transmission of quality signals. This principle has been affirmed several times: for exmple in Law 125/1954, D.P.R. n.1269/1955 and D.M. 1981. The first act enabled the CPR and CGP with the mandate to monitor the production of grana-type cheeses, traditionally the core of Italian cheesemaking. Later, D.P.R. 1269/1955, conferred them the PDO designation and approved a strict production protocol, in essence laying the foundations of the enhanced differentiation of the two cheeses. Finally, the D.M. 1981 strengthened the monitoring role of CPR and CGP, conferring them the power to cap total annual production and to implement this cap by means of capacity-based production quotas at the plant level. Following the introduction of EU quota system, these quotas were later changed to refelct total production by conferring farmers (Reg. (CE) n.856/84).

3.2 Production of Parmigiano Reggiano and Grana Padano.

Both Parmigiano Reggiano and Grana Padano use only milk produced in a limited geographic area, follow precise traditional production protocols, and are aged up to 24 months. The two cheeses differ for the area of origin and for milk production, milk processing and cheese maturation protocols[6]. Generally speaking, rules are more restrictive for Parmigiano Reggiano. For example, silage and compounded feeds are allowed in the case of Grana Padano, but only forages are permitted for Parmigiano Reggiano. The ageing process is longer for Parmigiano Reggiano than for Grana Padano: 12 to 24 months vs 9 to 18 months. As a result, producers of Parmigiano Reggiano face a more expensive milk, tend to remain small and to produce exclusively premium-priced Parmigiano Reggiano. On the contrary, Grana Padano dairies may produce other cheeses such as the PDO Provolone or other branded "commodity" cheeses. Grana Padano dairies enjoy a more diversified -less risky- portfolio of products, and can benefit from economies of size. In addition, Grana Padano dairies, thanks to somewhat 'deeper pockets' and a shorter aging process tend to maintain ownership of the maturing cheese, whereas Parmigiano Reggiano dairies tend to (rather, may have to) sell the cheese before the maturation

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[6] The CPR is an association of dairies located in the Italian provinces of Reggio Emilia, Parma, Modena and in part of the provinces of Bologna and Mantova. Diaries belonging to the CGP are located in a wider area, including the provinces of Alessandria, Asti, Cuneo Novara, Torino Vercelli, Bergamo, Brescia, Como, Lodi, Cremona, Milano, Pavia, Sondrio, Varese, Trento, Padova, Rovigo, Treviso, Venezia, Verona, Vicenza, Forli, Piacenza, Ravenna and partly the province of Bologna and Mantova.

process is complete. In a sense, producers of Grana Padano enjoy more flexibility than producers of Parmigiano Reggiano.

4. Quantitative Methods.

The quantitative objective of this paper is to verify whether -and if so how- the IAA ruling has changed the co-movement of the GP and PR prices. To better model the impact of the ruling, the quantitative tests will be completed within each chain between wholesale and retail prices, and between chains at both the wholesale and retail level.

Long term change in price relations was investigated by testing for changes in the co-integration relationship between the prices before and after the antitrust decision. Short-run dynamics between prices are investigated with the estimation of an Error Correction Model (ECM). The econometric approach is described in detail in Appendix I.

The dataset is constituted by 203 monthly observations of wholesale and retail prices of Parmigiano Reggiano and Grana Padano, from January 1986 to November 2002. The retail prices are the average monthly retail price reported by the statistical office of the City of Milan, a representative market for the two cheeses; the wholesale prices are the average wholesale price in Reggio Emilia, the most important wholesale market for the two cheeses. Two sub-samples are considered. The first -before the antitrust ruling- runs from 1987:02 to 1996:12, matching the tabling of the mandated changes. The second begins in 1998:01 and ends in 2002:11. The first 12 observations following the IAA ruling -corresponding to 1997- were discarded to account for the minimum lag between the changed market condition and the marketing of the aged cheese[7].   Logs of prices are used in the analysis.

5. Empirical results.

The next two sub-sections present and discuss the short-run price transmission elasticity at the retail and wholesale level both between the chains and within each chain. The results are illustrated in Figures 2 and 3 in the case of the between chains results, and 4 and 5 for the within chain ones. In the figures, PR and GP indicate the price of the Parmigiano Reggiano and Grana Padano; R and W refer to retail or wholesale prices; 1 and 2 indicates the pre or post IAA ruling subsample. The lag is the measurement is indicated by Mi, with i= 0 to 6, with M0 for the same-month transmission and M1 to M6 for the cumulative transmission over the indicated number of months. A dashed line connects observations that are not statistically different from their long-term equilibrium[8].

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[7] The estimation was completed also using the full sub sample: the results are largely consistent with the one presented here.
[8] Detailed tables are presented in Appendix II.

Overall, prices are not stationary and are co-integrated between chains and within the chain, and significant changes are observed in the co-integration relationship after the antitrust rulings[9].

5.1. Horizontal price coordination.

Figures 2 and 3 illustrate the elasticity of price transmission between chains at the retail and wholesale levels, respectively.

At the retail level, the price of Grana Padano reacts quickly and completely to a change in the price of Parmigiano Reggiano, reaching its long term equilibrium within one month, with no statistically significant differences before and after the IAA ruling. On the other hand, the price of Parmigiano Reggiano is slower to react to a change in the price of Grana Padano, requiring two months to reach its long term equilibrium before the IAA ruling and 5 months after the ruling. The adjustment post 1997 is also much smaller than in the previous period: 60% versus 100%, and the differences are statistically significant starting with observation M2 onward.

Overall, this scenario points to a diminished and slower reaction in the price of Parmigiano Reggiano after the IAA ruling, whereas no major differences are noted in the case of Grana Padano.

At the wholesale level the scenario is reversed. The price of Parmigiano Reggiano reacts promptly and completely to a change in the price of Grana Padano, with no statistical difference before and after the ruling, whereas the price of Grana Padano -which reacts in a "well behaved" manner before the ruling- appears to react quite differently after the ruling, showing a reaction only in the very short term, up to two months, a reacton which appears to wilt away over a longer period of time.

Figure 2. Price transmission elasticity between chains at retail level. [10]

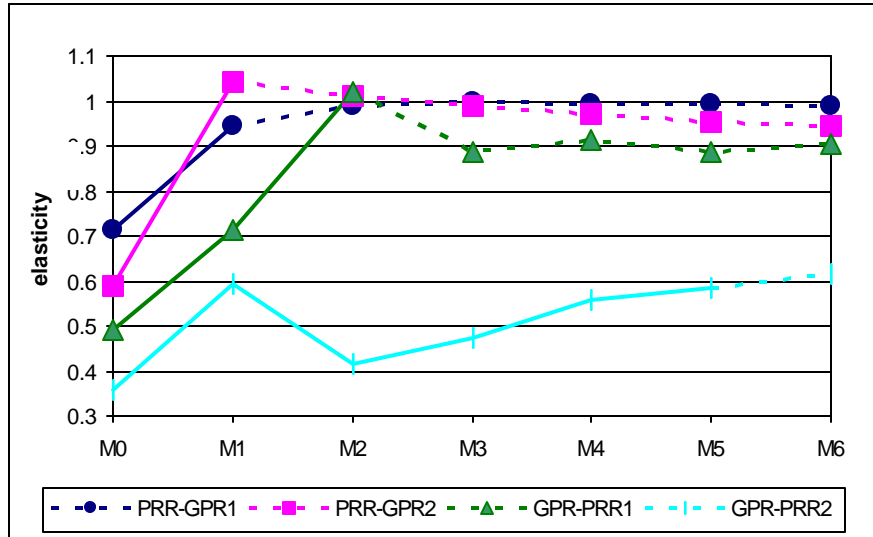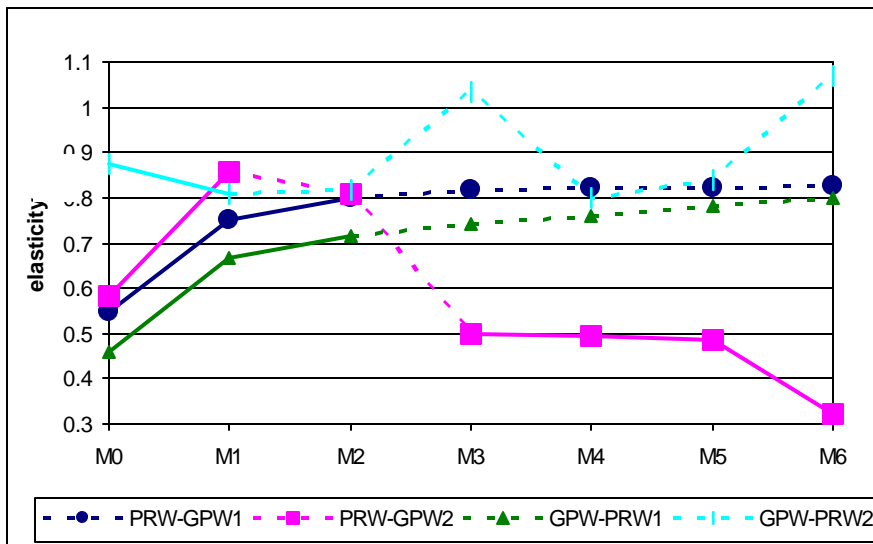[9] These results are not reported in the appendix; however, they are available upon request .

Figure 3. Price transmission elasticity between chains at wholesale level.[9]

Overall, prices of PR and GP tracked each other well before the IAA ruling, both at the retail and at the wholesale level, confirming the effectiveness of the marketing agreement between the two Consorzi, and hence providing support for the decision by the IAA to investigate the matter. After the ruling, however, the picture is quite different. This may indeed indicate that the IAA intervention did bear fruits. The problem is that these fruits are not exactly consistent with the expectations. Indeed, after the ruling the retail price of the better quality, more expensive Parmigiano Reggiano does not seem to react much to a shock in the price of the
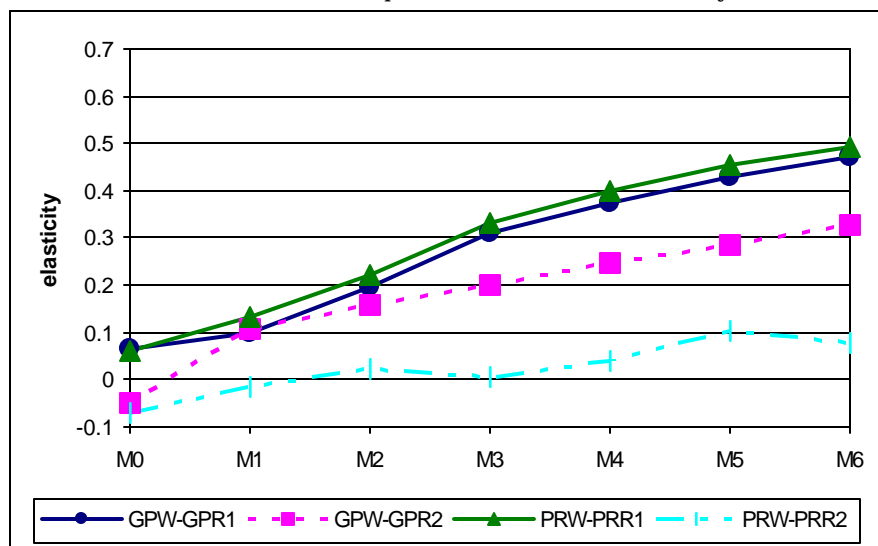
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10 In the figures, PR and GP indicate the price of Parmigiano Reggiano and Grana Padano; retail and wholesale prices are indicated by a R or W, and the period before the IAA ruling is identified by a 1, whereas 2 indicates the period subsequent to the ruling; the label used for the observations, Mi, i= 0 to 6, refer to a same-month transmission (M0) or to a cumulative transmission over a longer period, up to six months (M6). A dashed line connects observations that are not statistically different from their long term equilibrium value estimated by the co-integration relationship, whereas a solid line is used to indicate that at least one observation is statistically different from this value.

Grana Padano, as the price of Parmigiano Reggiano remains at very high level by historical standards. At the wholesale level, the price of the more "industrialized" Grana Padano does not react much to a change in the price of Parmigiano Reggiano. As was seen in Figure 1, retail prices remain high, whereas wholesale prices drop significantly; the Grana Padano market seems to be more "independent" from the Parmigiano Reggiano one rather than the other way around. This is consistent with the different "industrial organization" scenario for the two chains discussed previously. At the retail level the premium-priced Parmigiano remains the reference price, at very high levels (apparently consumers are less price sensitive than feared by the IAA). Whereas at the wholesale the market maker is the GP and the price of PR adjusts to it (producers of PR have less bargaining power than producers of GP).   It is not surprising that a wider margin results.

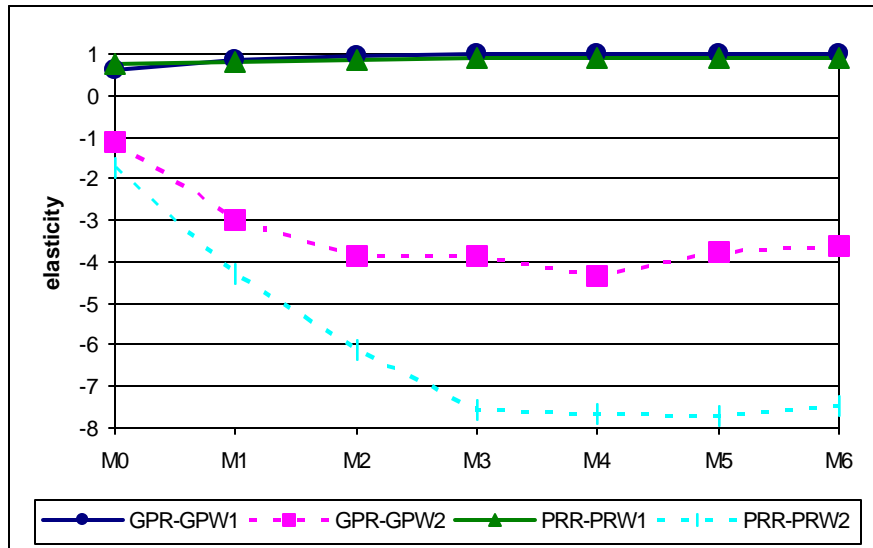## 5.2. Vertical price transmission within the chain.

The results presented in the previous section indicate that the ruling resulted in the reduction in price transmission between the two chains. The question now becomes what happens within each chain, given a wholesale or retail price shock. The empirical answers are are presented in Figures 4 (wholesale shock) and 5 (retail shock).

Figure 4. Wholesale shock and within chain price transmission elasticity.

Before the ruling, only ½ of a wholesale shock is transmitted to retail prices. No statistically significant difference is noted in the Grana Padano retail price response before and after the ruling. This result does not hold for the Parmigiano Reggiano, as the elasticity of transmission decreases significantly after the ruling. In essence, after the ruling, the Parmigiano Reggiano wholesale price changes are not transmitted to the retail level.

Figure 5. Retail shock, within chain price transmission elasticity.

Before the ruling the reaction to a retail shock is "well behaved" for both GP and PR: the wholesale prices follow retail shocks quite well, in line with their long term equilibrium values tending to 1. Following the ruling, the wholesale prices appear to "disengage" and to follow an independent price pattern with negative elasticities values that are multiples of retail price changes. This is a rather atypical pattern. Whereas, in the long-run, wholesale and retail prices of both cheeses are co-integrated, the estimates of short-run price elasticity multipliers are negative and do not converge to their long term value. This scenario is consistent with a situation with retailers enjoy an increasing markup and pricing power, which translates to wider margins and increasing inertia of retail prices. It is worth noting that before the antitrust ruling the ratio of wholesale to retail volatility is approximately equal to 1.6 for both chains, whereas after the ruling this ratio jumps to over 6 for the Grana Padano and to 44 for the Parmigiano Reggiano.

6. Conclusions

Overall, the findings suggest some concerns regarding the efficacy of the IAA action. True, the between chain price transmission is reduced somewhat, as perhaps desired and desirable, but a reduced within-chain price transmission is associated with a perverse effect: the drop in wholesale prices observed after the ruling does not reach the final consumer and it is instead captured by wholesalers and retailers that are successful in imposing wider margins. In essence, the empirical findings suggest that the weakened bargaining power of farmers did not result in any real benefit for the retail consumer.

The controversial aspect in this antitrust case is represented by the conflicting objectives of the European and Italian policies. On one side there is the competition policy with the aim to promote competition and to increase the welfare of the society as whole. On the other the agricultural policy, with the aim to protect the quality of

typical products and allowing a 'production self-regulation' designed to secure their quality. Implicitly, the latter provided the producers with leverage when confronting the market power of wholesalers and retailers. The IAA ruling obviously has changed this equilibrium. Who has benefited? Not farmers, and more so in the case of the Parmigiano Reggiano producers. The consumers did not gain. The wholesalers / retailers clearly benefited from a much wider margin, but it is not possible to conclude who benefited the most.

Without unduly criticizing the IAA, it is possible to conclude that a "routine" application of antitrust provisions, without a full understanding and complete assessment of their likely impacts on the entire supply chain, may indeed lead to undesirable results, and would be poorly suited to interface effectively with traditional and established practices in the agricultural sector. It appears that most affected are the producers of Parmigiano Reggiano, the better of the two cheeses, who face the most restrictive production protocol, the most expensive milk and have no alternate uses for their milk. This is perhaps a perverse result - but it is not surprising given the differences in the two chains. Never mind this perverse result; what is also disturbing is that these results also damage the government-promoted "quality first" strategic choice for Italian agribusiness. Overall a highly undesirable situation.

APPENDIX I:

Econometric model

The Error Correction Model represents a class of econometric models in which the error term constrained the long-run component of the variables Y_t and X_t to an equilibrium relationship (i.e. co-integration) and at the same time allows a flexible specifications to the short-run deviations.

This appendix is divided in three sections. The first illustrates how to perform a test of structural changes on the co-integration relationship. The second section describes the derivation of the ECM from an Augmented Distributed Lags (ADL) model. The third derives cumulative elasticities.

A. Structural changes in the co-integration relationship.

The presence of a co-integration relationship between two or more variables indicates that between them there is a stable relationship in the long-run such that they do not wander too far apart. More specifically, the deviations of each variable with respect to their long-run common trend are characterized by an invariant mean and variance[11]. The Engle Granger test is used to test a co-integration relationship and to estimate it. Two are the steps of this test. In first step, through a simple linear regression the coefficients of a linear combination (i.e. co-integration relationship) are estimated (eq. 1).

$$Y_t = c + bX_t + \varepsilon_t \qquad [1]$$

The second step is to test the stationarity of residuals (i.e $\varepsilon_t \sim I(0)$). Of course, the co-integration test is performed only if the two variables are not stationary.

To test the presence a structural change in the co-integration relationship, we can perform the Engle Granger test in presence of binary variables D_t. This variable is constructed such that if the structural change occurs at time τ, then $D_t = 0$ for $t<\tau$ and $D_t = X_t$ for $t \geq \tau$. Then, if the estimate coefficient of the dummy variable is significative, it will indicate the presence of a structural change at time τ.

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11 If the variance and the mean of a variable change over time, the variable is defined not stationary. The Dickey and Fuller test, illustrated in the appendix, is used to detect the non-stationarity of a variable. According the Engle and Granger a co-integration relationship may exists among non-stationary variables characterized by the same order of integration, which indicate the number of first differences required to make stationary a non-stationary variable. The Engle and Granger and Johansen tests, illustrated in appendix, are two tests used to detect a co-integration relationship.

B. Derivation of an ECM from and ADL model.

An ADL model is used to define the process of price adjustment in the short run between two prices series. The model is presented in equation 2.

$$Y_t = c + a_1Y_{t-1} + a_2Y_{t-2} + a_3Y_{t-3} + b_0X_t + b_1X_{t-1} + b_2X_{t-2} + b_3X_{t-3} \quad [2]$$

In this instance logs of data are used, so b_0 will the instantaneous price elasticity, whereas $\Sigma b/(1-\Sigma a)$ will the long-run price elasticity[12]. In eq.2, *n* represents the number of lags that is determined minimizing the AIC [Harvey, pp.177-8]. In literature, Ravaillon used a model, based on eq.2, to assess the market integration among spatially separated markets.

If prices are not stationary and co-integrated the coefficients estimated through model 2 are biased. To address the issues of non-stationarity and co-integration, we can specify an ECM (eq. 3), where the relationship between the parameters estimated through the model 3 and the original ADL model (eq. 2) is illustrated by the following equations:

$$\Delta Y_t = c + \sum_{j=1}^{2} a_j \Delta Y_{t-j} + \sum_{j=0}^{2} b_j \Delta X_{t-j} + \delta\,(Y_{t-3} - \beta X_{t-3}) + \varepsilon_t \quad [3]$$

$$\alpha_1 = a_1 - 1 \qquad\qquad\qquad\qquad [3a]$$
$$\alpha_2 = a_1 + a_2 - 1 \qquad\qquad\qquad [3b]$$
$$\beta_0 = b_0 \qquad\qquad\qquad\qquad\qquad\qquad [3c]$$
$$\beta_1 = b_0 + b_1 \qquad\qquad\qquad\qquad [3d]$$
$$\beta_2 = b_0 + b_1 + b_2 \qquad\qquad\qquad\qquad\quad [3e]$$
$$\delta = a_1 + a_2 + a_3 - 1 \qquad\qquad\qquad\quad [3f]$$
$$\beta\delta = -(b_0 + b_1 + b_2 + b_3) \qquad\qquad\quad [3g]$$

In this case, the estimation will be consistent, addressing the issues of stationarity and co-integration of time-series. The parameter b_3 will be derived from identity 3g. In the equation 3g, β represents the stable long-run relationship estimated through the Engle and Granger approach.

C. Multipliers.

The speed of price adjustment is given by the cumulative value of the partial derivatives $\partial Y_t/\partial X_t$, $\partial Y_t/\partial X_{t+1}$, $\partial Y_t/\partial X_{t+2}$, $\partial Y_t/\partial X_{t+3}$ … $\partial Y_t/\partial X_{t+n}$ calculated for the model 2. For example, the "instantaneous" adjustment is given by $\partial Y_t/\partial X_t$, or b_0, the adjustment over two observations is given by $(\partial Y_t/\partial X_t + \partial Y_t/\partial X_{t+1})$, and so on. The "long – run" equilibrium is reached when the multiplier is statistically not

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12 At the steady state (i.e. long-run) $Y^*=Y_t = Y_{t-1}=\ldots= Y_{t-3}$ and $X^*=X_t = X_{t-1}=\ldots= X_{t-3}$, thus eq.2 becomes $(1-a_1-a_2-a_3)Y^* = c + (b_0+b_1+b_2+b_3)X^*$.

different from the steady state assessed by the co-integration analysis -b- estimated in equation 1.

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