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Asymmetry of price transmission within the French value chain of seafood products[1]

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ABSTRACT

A recent study in agricultural products has brought out evidence of asymmetrical transmission of price changes according to the sign (positive or negative) of past variation. Interestingly, asymmetry was more commonplace for products with a lower elasticity of supply due to the perishable nature of products. A similar study based on TAR and M-TAR cointegration models is carried out on the French markets for fish products. In particular, it investigates the relation between the characteristics of supply (farmed or wild-caught species) and the results regarding asymmetry of price transmission along the supply chain of fresh products. Like in previous studies, it is expected that farming, by increasing the security of supply, shows less asymmetry than wild caught products. Results bring no evidence of asymmetric price transmission in any value chain, whatever the origin of the supply, farmed or wild. It is nevertheless found differences in terms of speed of adjustment and size of margin that can be interpreted as a consequence of the uncertainty in the conditions of supply.

Keywords : asymmetric price transmission, cointegration, fish value chains, TAR and M-TAR models

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1. INTRODUCTION

The study of price transmission asymmetry has long been a standard issue in industrial and agricultural economics. It is based on the common feeling that market power is exerted by big retail stores not to fully transmit decreases of their supply price while they perfectly pass on the increases. It may be a source of distortion in the transmission of information down the marketing chain, in relation with the supply shocks. Considering a decrease in the input price associated with an increased primary production, if it is not transmitted to the retail level, then the retail price may not equalise the market clearing price and the production will be in excess.

Other explanations than market power exercise have been given to asymmetric vertical price transmission, such as inventory holding or the perishable nature of products. A recent study carried out in the French value chain for fresh vegetables (Hassan and Simioni, 2001) has investigated asymmetry in the farm retail price spread in two marketing channels, for tomato and chicory. It brought up evidence of asymmetric adjustments in some channels for tomato more than for chicory. The authors suggested that an explanation may lie in the greater perishable nature of chicory.

Looking at the market for fish, it is possible to make the analogy between the lower elasticity of supply encountered by perishable fresh vegetables and the lower elasticity of supply registered by wild caught species compared with farmed ones. Applying Hassan and Simioni's methodology, this paper explores the relation between the characteristics of supply (farmed or wild-caught species) and the results regarding asymmetry of price transmission along the supply chain of fresh products. It is expected that farming, by increasing the security of supply, shows less asymmetry than wild caught products.

The paper is organised as follows. Section 2 brings the background of the study. Section 3 introduces the sector and the data set. The methodology is developed in the following section preceding the empirical results which are discussed in the concluding sixth section.

2. BACKGROUND OF ASYMMETRIC PRICE TRANSMISSION ANALYSIS

The theoretical background of price transmission analysis is the Hicksian model (1957), further developed by Gardner (1975), Heien (1980) and Wohlgenant (1989), linking the elasticity of derived demand and direct elasticity:

$$E_a = \frac{\eta\sigma + e_b(S_a\eta - S_b\sigma)}{e_b + S_a\sigma - S_b\eta} \qquad (1)$$

where:

S_a is the share of the raw material a, $0 < S_a < 1$;
S_b is the share of the marketing input b, $0 < S_b < 1$;
E_a is the elasticity of derived demand for a;
η is the price elasticity of final demand;
σ is the elasticity of substitution between both inputs;
e_b is the elasticity of supply for input b.

It is common practice to assume fixed input proportions (Wohlgenant 2001), or even a single variable input for the model[2] (Asche *et al.*, 2002). If $S_b = 0$ (hence $S_a = 1$), no substitution is longer possible between both inputs ($\sigma = 0$). It comes:

$$E_a = \eta \qquad (2)$$

Both prices of raw material and final products can be used indifferently to estimate the price elasticity because the relative changes of the two prices should be identical. Therefore econometrics of time series can be very helpful to observe the long-run relation between prices P_1 and P_2 at different stages of the value chain, as described in the following model :

$$P_1 = \alpha P_2^{\beta} \qquad (3)$$

or in logarithms :

$$\ln P_1 = \ln\alpha + \beta \ln P_2 \qquad (4)$$

[2] This is quite a reasonable assumption in the case of fresh fish marketing chain since the cost of raw material represents often more than 80% of total cost (Asche *et al.*, 2002; Guillotreau *et al.*, 2000).

This framework allows for exploring many issues in the long run relationships between prices, particularly using cointegration tests which can be carried out because most of the series are non-stationary (Asche *et al.* 1998, 2002).
Various explanation of lead lag relations between different levels of the chain are given in the literature. Heien (1980) (and Worth 1999) writes that repricing may be costly due simply to the time requested to put on new labels but also to the loss of goodwill from consumers who desire stability in the prices. Heien also points out the importance of storage in price transmission and Wohlgenant (1985) has shown that inventory holding by retailers can explain for a large part the delay in the price pass-through between wholesale and retail. In addition, Kinnucan and Forker (1987) suggest two other reasons for lagged transmission which are market power and the way data are processed. Brorsen *et al.* (1985) have introduced risk in the analysis. Ward (1982) refers to the perishable nature of products which leads retailers to delay the transmission of upstream price raises in the fear that they will not be able to sell their whole stocks.
The causal direction is also a matter of interest for economists. Worth (1999) notes that all the studies addressing this issue in the fresh produce markets conclude that short run variation in the upstream price precede changes at the downstream level. Generally in the long run the causal relation is *a priori* considered to be upward[3], *i.e.* from the retailing sector to the shipping. This means that prices are driven by demand shifts more than by the variations in the level of production. Testing for causality, Heien (1980) confirms this hypothesis in 57% out of the cases (13 chains); only 9% (2 chains) are found to present an unidirectional causal relationship from the retailing sector to the upstream. Ward (1982) uses a distributed lagged price function similarly to Heien but does not consider any *a priori* direction of causality. He finds evidence of lagged adjustment of both retail and shipping prices to the wholesale one.
This is a common feeling that market power is used by stakeholders to fully pass onto their cost increases while they attempt not to fully transmit the decreases. This may lead to inefficiencies in the market, preventing from an optimal resource allocation. As a consequence, asymmetry in the vertical price transmission is generally considered as a sign of collusive behaviours (Carlton, 1989). This fear is reinforced in the food markets by the observation that the downstream sectors are more concentrated than the primary one. Nevertheless, a recent piece of works has shown that asymmetry also can be the consequence of a price war leading to phases of progressive decline in the price followed by a brutal increase when the price has reached such a low level that it is no more worthwhile for a firm to try and get a greater market share (Eckert, 2001). Azzam (1999) has also shown that a competitive retailing sector was not incompatible with asymmetry as far as spatially competitors face concave spatial demand functions. Bailey and Brorsen (1989), cited in von Cramon-Taubadel (1998) previously demonstrated that a kinked demand schedule could lead to asymmetric responses.

For Kinnucan and Forker (1987), public intervention on markets can be a source of asymmetry.

Von Cramon-Taubadel (1998) distinguishes between the short run elasticity which measures the speed of reaction of a price to a change in the "leading" price and the long run elasticity which describes the magnitude of this reaction. He lists four major explanations for asymmetry. In addition to the two reasons already reported above, an explanation lies in the adjustment costs which may be different, depending on the sign of the initial change. In this case, only the speed of transmission is expected to be asymmetric.

Many empirical studies have addressed the issue of price transmission in the agricultural markets. Among others, Ward (1982) studying a three-stage chain for fresh vegetables does not give a reason to explain asymmetry but note that the perishable nature of products may be a partial explanation as "rising prices could reduce retail sales and increase the incidence of spoilage" (p. 210). Griffith and Pigott (1993) studying the Australian three-stage chain for meat find as expected evidence of asymmetry in the beef and pork markets but not in the pork market characterised by a higher degree of concentration and in spite of high cross-price elasticities. Worth (2000) examining the markets for six fresh vegetables does not find any evidence of asymmetry in the transmission for four out of them (celery, lettuce, onions and potatoes). In the case of carrots and tomatoes, he finds evidence that retail prices show a greater response to shipping price increases. He does not want to conclude to market power since the increase in the marketing margin may reflect an increase in the retailers expenses (for instance, transportation and labour costs i.e. the marketing input "b" in equation 1) more than an increase in the retailers profit. More information is needed on retailers expenses to conclude.

[3] We refer to the terms "upstream, downstream, upward and downward" in a different manner than Heien, or others, do. According to the French IO tradition, the term upstream is used for the production sector while downstream is for the retailing sector, by analogy with a river flowing from its source (upstream) to the sea (downstream).

Almost all of the studies of asymmetry in price transmission use variants of an econometric technique introduced by Wolffram (1971), refined by Houck (1977) and generalised by Heien (1980) for estimating non reversible functions. Another characteristics shared by most of these works is the use of monthly average series (Hassan *et al.*, 2001). Abdulai (2002) examines short- and long-run farm-retail price spread, using treshold autoregressive (TAR) and momentum-autoregressive treshold (M-TAR) models. He finds evidence of asymmetric adjustments at the retail level where increases in supply prices are more rapidly passed onto than decreases. He leaves to future empirical work the task of explanation.
The same models have been used by a recent study carried out in the French value chain for fresh vegetables (Hassan and Simioni, 2001). It has investigated asymmetry in two marketing channels, for tomato and chicory and brought up evidence of asymmetric adjustments in the market for tomatoes but not for chicory. Moreover, in the tomato marketing chain, the speed of adjustment has been found greater in the case of a decrease of the upstream price than in the case of an increase in the price of the raw material. Interestingly, they suggest an interpretation in terms of the perishable nature of product, similarly to Ward (1982). Tomatoes are more perishable than chicory; when the price at the production level falls, the expectation of higher quantities to be marketed lead the retailers to quickly cut their price in the purpose of selling all the products they have stored.
An analogy exists between both markets for whole fresh fish and for whole fresh vegetables: they are devoted to the distribution of unprocessed primary products with different elasticities of supply. When the more or less perishable nature of products explains this gap in the elasticity in the vegetable case, the origin of the product, farmed or wild caught, comes as an explanation of the differentiated elasticity in the fish market. As a consequence, the paper investigates the relation between the characteristics of supply (farmed or wild-caught species) and the results regarding asymmetry of price transmission along the French supply chain of fresh fish. Like in Hassan and Simioni's study, it is expected that farming, by increasing the security of supply, shows less asymmetry than wild caught products.

3. THE VALUE CHAINS AND THE DATA SET

The paper explores a possible asymmetry in the value chains for fresh wild cod (*Gadus morhua*) and farmed salmon (*Salmo salar*) through supermarkets. These two species account for a 30% market share (all together- see table 2).The expected result is an asymmetry in the value chain for cod, not, or at least lower, for farmed salmon because of greater uncertainty in the supply of wild caught species.
Cod has been consumed in France for centuries, the country traditionally being an important producing country until recently. However, as stocks of gadiforms got depleted in the North Atlantic, the domestic catches have decreased in proportion to a low level. This fish is usually considered as the most representative and the most appreciated of the whitefish gadoid species with more than 100 000 tonnes consumed in 1998 whatever the products (frozen, fresh, breaded, fillets…).
Approximately half of the fresh cod consumed in France comes from the domestic landings, although the levels have sharply decreased since the early nineties: stable around 50,000 tonnes, they dropped down to some 17 500 tonnes in 1998 due to the reduction of the TAC and the national quota. The nature of the products (fresh, frozen, whole or fillets) determines the market channel and the type of outlets. When the fish is domestically landed as fresh whole fish, the primary processors are the first buyers though auction markets and may market the fish (whole or filleted) either directly to the supermarket chains, the other retailers (mainly the fishmongers) and the restaurants, or sell it to the wholesale markets located in the biggest French (Paris-Rungis, Bordeaux, Nantes, Marseille…).
The French market for cod has registered some structural evolutions over the twenty past years, such as the growing importance of supermarkets, the emerging consumption of processed food and the globalisation of the supplies but it has been relatively stable in comparison with the salmon consumption. This one has grown such in a spectacular manner that the market share of salmon (in value) sharply increased from less than 25 % in 1976 up to 40 % in 1998, despite a constant fall of salmon prices over the period and the increasing prices of whitefish species since 1995.
Atlantic salmon consumed in France is almost fully supplied by imports. In 1982, The market represented a quantity of about 23,000 t and a value close to 1 500 millions of francs 1998 (230 million Euros). The north-American producers of wild-caught pacific salmon (*Onchorynchus kisutch*) made the most of it with two-third of the supply (USA and Canada). Final consumption was dominated in quantity by processed products, mainly with smoked salmon (9 000 t) ; fresh fish only represented 3 000 t. A major part of smoked salmon came from the domestic smokehouses importing intermediate frozen fish (65 % of imports).
Sixteen years later, the arising breeding Atlantic salmon (*Salmo salar*) makes the bulk of the French market, in particular from Norway (57,400 t, including trade flows passing through Denmark) and Scotland (22,600 t). Since 1982, the market quantity has been five-fold this level (from 23,000 t up to 112,000 t) although the value has only been twofold in real terms (from 1,500 to 2,600 millions of francs 1998 ; i.e. 230 to 400 million Euros) due to the collapse of salmon prices over the period.

Final consumption of smoked salmon has kept on increasing to reach 40 000 t ; however, the processing industry now uses fresh fish instead of frozen fish. Consequently, fresh fish dominates the supply, as well as the French outlets with nearly half (50 000 t) of total demand in equivalent live weight. An outstanding 45 % of fresh salmon is consumed through different types of restaurants (collective, fast-food or commercial restaurants), this outlet being traditionally under-estimated in empirical studies dealing with the food industries. As far as the commercial outlets are concerned, fresh salmon suits perfectly to supermarkets. Available data show that more than 70 % of fresh salmon is marketed by hyper and supermarkets, far ahead from fishmongers, market stall and other retailers. As noticed by Worth, 1999, p. 27) "a more stable supply of fresh produce, likely due to improvements in agricultural techniques and increased imports, contributes to a reduction in the variance of grower prices. The increasing know-how of Norwegian producers and the development of the imports are two major features of the sector and they are likely to make farmed salmon a particularly suitable product for big retailing stores as they lead to a reduction in the uncertainty.

Tests have carried out on monthly price series for whole fresh from February 1988 to December 1999:

French landings of whole fresh cod	Source: Ofimer
Retail price of whole fresh cod in the French supermarkets	Source: Ofimer
Price of whole fresh salmon exported by Norway	Source: Norwegian Trade Statistics
Retail price of whole fresh salmon in the French supermarkets	Source: Ofimer

All series are in French francs *per* kg; Norwegian export prices were collected provided in Norwegian crowns and have been converted with Datastream exchange rate series.

These series have been chosen in the purpose of describing two short supply channels, without as far as possible trade intermediaries. This allows for interpreting Marketing margins mainly in terms of shippers ' or retailers' profit since there is no processing costs and that transportation and labour costs are relatively low compared with the price of raw material. This in turn leads to study a channel for cod which is less significant in terms of market share than the "steak and fillet" category (see table 2).

It is noticeable that fresh cod (whatever the product presentation) exhibits the same market share within supermarkets fresh fish sales (70,1% in 1998) than salmon. More than on the demand side, the main differences between both market chains are to be found in the supply organisations. Most of the fresh domestic cod is auctioned (16,000 out of 17,500 landed tonnes in 1998 while the remaining catches have been sold through contracts mainly to purchasing units of big retail chains); at the opposite, the supermarkets have implemented a contract-based supply strategy with Norwegian exporters of farmed salmon. This reduces the spot market share and in an aggregate price series leads to diminish the apparent variance.

4. THE METHODOLOGY

This part introduces two models for cointegration with asymmetric error correction initially developed by Enders and Granger (1998), the threshold autoregressive (TAR) and momentum-TAR (M-TAR) models. The great distinction between the TAR and M-TAR approach and the Engle-Granger (1987) and Johansen (1996) tests is that the latter implicitly assume a linear and symmetric adjustment mechanism. Indeed, it has been proved that tests for unit roots and cointegration all have low power in the presence of asymmetric adjustment. In particular, the Enders and Siklos M-TAR modification of the Engle-Granger (2001) testing strategy presented here has good power relative to the alternative assumption of symmetric adjustment. The Engle-Granger test appears to be a special case of this testing procedure.

Principles of the TAR and M-TAR approach in the case of two price series

Cointegration analysis (symmetric and asymmetric) is only applied to non-stationarity series. After estimating the long-run equilibrium relationship between two price series with Ordinary least Squares (OLS) in the form:

$$\ln P_t^R = \alpha + \beta \ln P_t^S + \mu_t \quad (1)$$

where:

$\ln P_t^S$ and $\ln P_t^R$ are the observed shipper and retail log-linearised price at time t, respectively;

β is a parameter to be estimated and μ_t a disturbance term which may be serially correlated,

The Engle-Granger methodology focuses on the OLS estimate of ρ in the following relationship:

$$\Delta\mu_t = \rho\mu_{t-1} + \varepsilon_t \quad (2)$$

where ε_t is a white noise disturbance and the residuals from (1) are used to estimate (2).
Rejecting the null hypothesis of no cointegration (i.e. accepting the alternative hypothesis $-2<\rho<0$) implies that the residuals in (1) are stationary with mean 0. The Granger representation theorem guarantees that, if $\rho \neq 0$, (1) and (2) jointly imply the existence of an error-correction representation of the variables in the form

$$\begin{cases} \Delta \ln P_t^R = \delta\mu_{t-1} + \sum_j \lambda_{1,j} \Delta \ln P_{t-j}^R + \sum_j \lambda_{2,j} \Delta \ln P_{t-j}^S + \nu_{1,t} \\ \Delta \ln P_t^S = \phi\mu_{t-1} + \sum_j \theta_{1,j} \Delta \ln P_{t-j}^R + \sum_j \theta_{2,j} \Delta \ln P_{t-j}^S + \nu_{2,t} \end{cases} \quad (3)$$

This system of equation can be estimated replacing the error-correction term μ_t by its estimated value and using OLS equation by equation. The equations are estimated using lag length that yield serially uncorrelated errors.
The speed of adjustment parameters δ and ϕ have important implications for the short-run dynamics of the system. Indeed, if the two price series are cointegrated, at least one of the speed of adjustment parameters should be significantly different from zero. Thus if for instance in the second equation, ϕ is not significantly different from zero whereas it is the case in the first equation, that means the shipper price is weakly exogenous.
The point is that these cointegration tests and their extensions are misspecified if adjustment is asymmetric.
Therefore, we consider the threshold autoregressive (TAR) model and the momentum-threshold autoregressive model (M-TAR), which represent alternative specifications of the error-correction model. Thus (2) can be written as

$$\Delta\mu_t = \rho_1 \mu_{t-1} 1(\mu_{t-1} \geq 0) + \rho_2 \mu_{t-1} 1(\mu_{t-1} < 0) + \varepsilon_t \quad (4)$$

or as

$$\Delta\mu_t = \rho_1 \mu_{t-1} 1(\Delta\mu_{t-1} \geq 0) + \rho_2 \mu_{t-1} 1(\Delta\mu_{t-1} < 0) + \varepsilon_t \quad (5)$$

where the Heaviside indicator $1(A) = \begin{cases} 1 \; if \;\; A \; is \, true \\ 0 \, if \;\; not \end{cases}$ and ε_t is a white noise.

$\mu_t = 0$ can be considered as the long-run equilibrium value of the sequence.
In the first model, the Heaviside indicator depends on the sign of the *level* of μ_{t-1} thus, if μ_{t-1} is above its long-run equilibrium value, the adjustment is $\rho_1\mu_{t-1}$, and if μ_{t-1} is below its long-run equilibrium value, the adjustment is $\rho_2\mu_{t-1}$. In the second model, the adjustment is now allowed to depend on the sign of the *change* of μ_{t-1} in the previous period.
The TAR model is designed to capture asymmetrically “deep” movements in the series of the deviations from the long-run equilibrium, while the M-TAR model is useful in capturing the possibility of asymmetrically “steep” movements in this series (Enders and Granger, 1998). You can notice that since adjustment is symmetric if $\rho_1 = \rho_2$, whatever the considered model, equation (2) is a special case of (4) or (5).

Asymmetry Tests with TAR and M-TAR models

We estimate a regression equation in the form of (4) or (5) where we use estimated residuals μ_t^{est} from equation (1), i.e. :

$$\Delta\mu_t^{est} = \rho_1 \mu_{t-1}^{est} 1(\mu_{t-1}^{est} \geq 0) + \rho_2 \mu_{t-1}^{est} 1(\mu_{t-1}^{est} < 0) + \sum_j \gamma_j \Delta\mu_{t-j}^{est} + \varepsilon_t \quad (6)$$

or

$$\Delta\mu_t^{est} = \rho_1 \mu_{t-1}^{est} 1(\Delta\mu_{t-1}^{est} \geq 0) + \rho_2 \mu_{t-1}^{est} 1(\Delta\mu_{t-1}^{est} < 0) + \sum_j \gamma_j \Delta\mu_{t-j}^{est} + \varepsilon_t \quad (7)$$

where lags are introduced such that the sequence of the ε_t appears to be white noise. We obtain the sample values of the t-statistics for the null hypothesis $\rho_1=0$ and $\rho_2=0$ and the *F*-statistic for the null hypothesis $\rho_1= \rho_2=0$. These values are compared with the appropriate critical values in Enders and Granger (1998) and Enders and Sicklos (2001) to determine whether the null hypothesis of a unit root can be rejected. If the alternative hypothesis is not rejected, it is possible to test for asymmetric adjustment since ρ_1 and ρ_2 converge to a multivariate normal distribution (Enders and Granger, 1998). The restriction that adjustment is symmetric, i.e., the null hypothesis $\rho_1 = \rho_2$ can be tested using the usual F-statistic.

Asymmetric Error Correction Model

Given that the price series are cointegrated, the short-run dynamics of the two price series can be represented using an error correction model of the form:

$$\Delta \ln P_t^R = \delta_1 \mu_{t-1}^+ + \delta_2 \mu_{t-1}^- + \sum_j \lambda_{1,j} \Delta \ln P_{t-j}^R + \sum_j \lambda_{2,j} \Delta \ln P_{t-j}^S + \nu_{1,t}$$
$$\Delta \ln P_t^S = \phi_1 \mu_{t-1}^+ + \phi_2 \mu_{t-1}^- + \sum_j \theta_{1,j} \Delta \ln P_{t-j}^R + \sum_j \theta_{2,j} \Delta \ln P_{t-j}^S + \nu_{2,t}$$

where $\mu_{t-1}^+ = \mu_{t-1} 1(\mu_{t-1} \geq 0)\ (= \mu_{t-1} 1(\Delta\mu_{t-1} \geq 0), resp)$

and $\mu_{t-1}^- = \mu_{t-1} 1(\mu_{t-1} < 0)\ (= \mu_{t-1} 1(\Delta\mu_{t-1} < 0), resp)$ if the deviations from the long-run relationship can be represented by a TAR model (M-TAR model, resp.).

We estimate the system equation (9) by replacing μ_{t-1} by its estimated value and using OLS equation by equation. The equations are estimated using lag lengths that yield serially uncorrelated errors. It is thus possible to calculate different speeds of short-run adjustment for each chosen (TAR or M-TAR) model. As above, joint significance tests on these parameters are performed in view to determine which stage is the channel leading price: shipping or retail.

5. EMPIRICAL RESULTS

In both cases, upstream prices and downstream prices were found to be cointegrated and the long-term relationship were the following :

Cod : $$\ln P_t^1 = 2{,}847 + 0{,}398 \ln P_t^2 + \mu_t^{est} \quad \text{(a)}$$

Salmon: $$\ln P_t^1 = 1{,}912 + 0{,}535 \ln P_t^2 + \mu_t^{est} \quad \text{(b)}$$

where $\ln P_t^1$ is the log-linearised price at the upstream level and $\ln P_t^2$ at the downstream level. The parameters of P^2 are the long run elasticities of P1 with respect to P2. They give in fact the magnitude of adjustment of the retail price to the variations of the shipping price. They indicate that shifts in the shipping price are not fully passed onto retail prices. Moreover, the magnitude is higher for salmon than for cod.

In both cases, asymmetry tests are performed with the above described treshold cointegration models. Results are displayed in table 3. They lead us to conclude that the price transmission is symmetric in the value chain (even if we noticed a quite important difference between ρ_1 and ρ_2 in the cod case not validated by the pvalue of the asymmetry test lower than in the salmon case but still superior to 10%). This unexpected result allows for estimating an error correction model which provide a measure of symmetric speeds of short-run adjustment. In both cases, the price at the upstream level were found to be weakly exogenous.

Results are listed in tables 3 and 4, along with long run adjustment values.

Figure 2 illustrates graphically the gap in the adjustment speed for both chains. At first glance, one can notice the similarity between the rise and the drop effects which is due to the symmetric property of the price transmission along these two value chains

Nevertheless, this graph clearly displays the differences between the two value chains concerning their reaction after a rise or a drop of 5% on the upstream price. The shipping-retail margin returns to the equilibrium path twice faster for salmon than for cod.

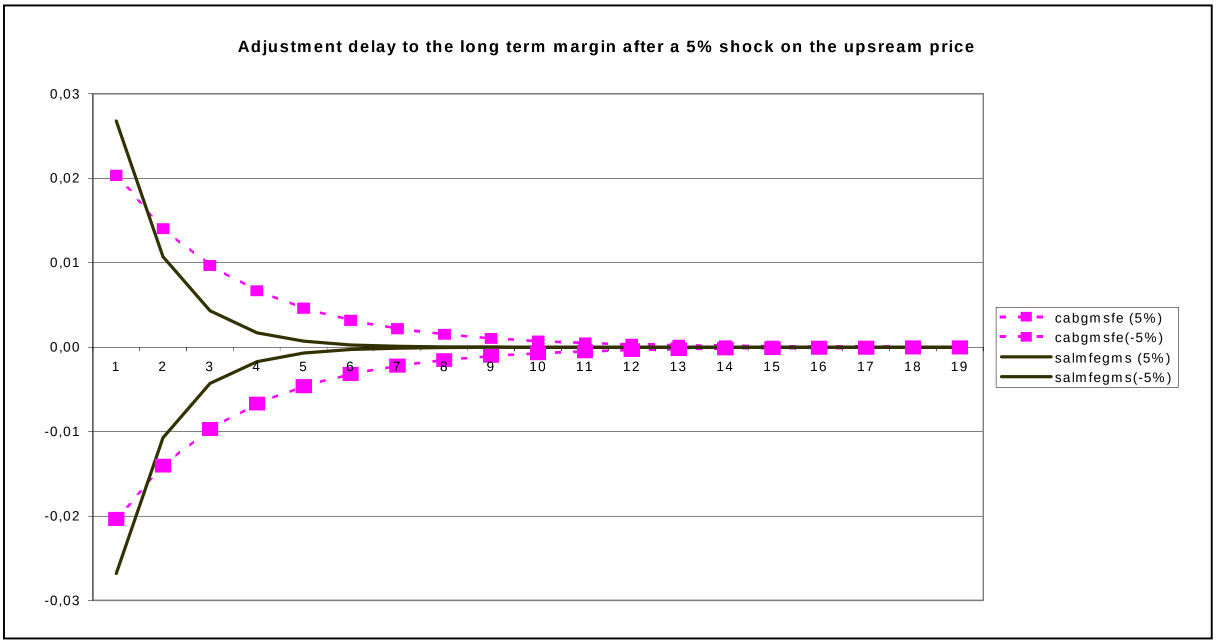

Figure 2. Speed of adjustment

6. CONCLUSION

The study of vertical price transmission has long been a standard issue in industrial economics. Nevertheless, we are aware of very few studies regarding the seafood sector (Hartmann *et al.*, 2000; Guillotreau *et al.* 2002; Asche *et al.* 2002a & b) and no paper has been found tackling with the asymmetry issue in the seafood market.

No asymmetry has been found in the market chains for whole fresh cod, even if the evidence of a symmetric adjustment was less strong in this case than for salmon. The analogy between the perishable nature of products which would explain the asymmetric farm retail spread and the uncertainty in the fishing sector does not appear to be relevant.

On an other hand, it has been shown in this paper that even though uncertainty in supply conditions has no impact on price transmission in terms of asymmetry, it is likely not to be neutral in terms of speed of adjustment and magnitude. This may be due to the following component of the menu costs: retailers may be reluctant to transmit price variations because they fear that the implied changes in relative prices will lead to substitution effects. Customers will rearrange their consumption preferences and retailers will have consequently to rearrange their stalls, storage facilities (even for fresh products, a minimum is requested) and supply organisation. Before doing such a costly operation, retailers need to know if the variations in the prices are durable enough so that the increase in the revenue will overcome the cost of repricing. It is not surprising to see that they need more time in the cod channel since uncertainty is a major feature of the fishery industry whose production is highly depending on natural conditions. Brorsen *et al.* (1985) have introduced uncertainty in analysis at the output price level. Further research will aim at introduce supply-side uncertainty in the analysis of price transmission.

References :

Abdulai, A. (2002). Using Treshold cointegration to estimate asymmetric price transmission in the Swiss pork market. *Applied Economics*, vol. 34, p. 679-687.

Asche, F., J. Hartmann, A. Fofana, S. Jaffry and R. Menezes (2002). Vertical Relationships in the Value Chain: an Analysis Based on Price Information for Cod and Salmon in Europe. EU-funded project Salmar, QLK5-CT1999-01346, *SNF Report n° 48/01*, 111 p.

Asche, F., R. Menezes and J. Ferreira Dias (2002). Transmission of price signals in cross boundary value chain. *Communication to the 12th EAFE Conference*, Faro Portugal, March 25-27, 17 p.

Azzam, A.M., (1999). Asymmetry and rigidity in farm-retail price transmission. *American Journal of Agricultural Economics*, vol. 59, p. 570-572.

Bailey and Brorsen (1989)

Ball, L., and N.G. Mankiw (1994). Asymmetric price adjustment and economic fluctuations. *The Economic Journal*, vol. 104, March, p. 247-261.

Blinder, A.S., (1991). Why are prices sticky? Preliminary evidence from a an interview survey. *American Economic Review*, vol.81, May, p. 89-96.

Bourbonnais, R., (2000). *Économétrie*. Dunod, Paris, 3rd ed., 314 p.

Brorsen, B.W, J.-P. Chavas, W.R. Grant and L.D. Schnake (1985) Marketing Margins and Price Uncertainty: the Case of the US Wheat Market, *American Journal of Agricultural Economics*, vol. 67, p. 521-528.

Boyd, M.S., and B.W. Brorsen (1988). Price asymmetry in the U.S. pork marketing channel. North Central Journal of Agricultural Economics, vol. 10, p. 103-110.

Carlton (1989).

Von Cramon-Taubadel, S., (1998). Estimating asymmetric price transmission with the error correction representation: An application to the German pork market. *European Review of Agricultural Economics*, vol. 25, p. 1-18.

Eckert, A., (2001). Retail price cycles and response asymmetry. *Canadian Journal of Economics*, Vol. 35, No.1, 52-77.

Gardner, B. (1975). The farm retail price spread in a competitive industry. *American Journal of Agricultural Economics*, vol. 57, p. 399-409

Gonzales, F., P. Guillotreau and L. Le Grel (2002). The Transmission of Price Variability along the French Cod Value Chain. *Communication to the 12th EAFE Conference*, Faro Portugal, March 25-27, 12 p.

Goodwin, B., and M. Holt (1999). Price transmission and asymmetry adjustment in the US beef sector. *American J. Agr. Econ*., vol. 81, p. 630-637.

Griffith, G.R., and N.E. Piggott (1994). Asymmetry in beef, lamb and pork retail price transmission in Australia. *Agricultural Economics*, vol. 10, p. 307-316.

Guillotreau, P. and Le Grel, L. (2000), Analysis of the European value chain for aquatic products ", SALMAR Report N°1, European Commission, DG 14, 245 p.

Guillotreau, P., L. Le Grel and M. Simioni (2002). Price-cost margins and structural change within the French salmon value chain. *Communication to the 12th EAFE Conference*, Faro Portugal, March 25-27, 17 p.

Hahn, W. F., (1990). Price transmission asymmetry in pork and beef markets. *The Journal of Agricultural Economic Research*, vol. 42, p. 21-30.

Hassan, D., and M. Simioni, 2001. Price Linkage and Transmission between Shippers and Retailers In the French Fresh Vegetable Channel, Working paper, *INRA-ESR*, *MAIA*, Toulouse, 26 p.

Heien, D.M., (1980). Markup pricing in a dynamic model of the food industry, American Journal of Agricultural Economics, vol. 62, p. 11-18.

Hicks, J.R. (1957). A revision of Demand Theory, Clarendon Press (1986, Oxford University Press).

Houck, J.P. (1977). An approach to specifying and estimating non reversible functions. *American Journal of Agricultural Economics*, vol. 59, p. 570-572.

Kinnucan, H.W., and O.D. Forker (1987). Asymmetry in farm retail price transmission for major dairy products, *American Journal of Agricultural Economics*, vol. 69, p. 285-292.

Kovenock, D., and K. Widdows (1998). Price leadership and asymmetric price rigidity. *European Journal of Political Economy*, vol.14, p. 167-87.

Kuiper, W.E., and M.T.G. Meulenberg (1999). Vertical Price leadership within a Channel : A Cointegration Study, *Communication to the European Association of Agricultural Economics (EAAE) IXth Congress*, Warsaw, Poland, 22 p.

Powers, N.J. (1995). Sticky Short-Run Prices and Vertical Pricing: Evidence from the Market of Iceberg Lettuce. *Agribusiness*, vol. 11, p. 57-75.

Schroeter, J. and Azzam A. (1991), Marketing margins, market power, and price uncertainty, *American Journal of Agricultural Economics* 73: 990-999

Ward, R.W. (1982). Asymmetry in Retail, Wholesale, and Shipping Price Point Pricing for Fresh Vegetables. American Journal of Agricultural Economics, 64, 205-212.

Wolffram, R. (1971). Positivistic measures of aggregate supply elasticities: some new approaches-some critical notes. *American Journal of Agricultural Economics*, vol. 53, p. 342-352.

Wohlgenant, M.K. (1985). voir VCT.

Wohlgenant, M.K. (1989). Demand for farm output in a complete system of demand functions. *American Journal of Agricultural Economics*, 71, p. 241-252.

Wohlgenant, M.K. (2001). Marketing Margins: Empirical Analysis, in Gardner B.L. and G.C. Rausser (Eds.) *Handbook of Agricultural Economics*, *Volume 1B*, North Holland, Amsterdam, Chapter 16, p. 933-970.

Worth, T. (2000). The F.O.B.-Retail Price Relationship for Selected Fresh Vegetables. Vegetables and Specialties, 279, November, p. 26-31.

Tables and figures

		whole fish	steaks and fillets	total
cod		1 269 t	8 448 t	9 717 t
		9 786 .10^3 euro	76 733 .10^3 euro	80 411 .10^3 euro
		7.71 euro/kg	9.08 euro/kg	8.28 euro/kg
salmon		6 752 t	11 486 t	18 238 t
		35 706.10^3 euro	115 880.10^3 euro	163 432.10^3 euro
		5.29 euro/kg	10.09 euro/kg	8.96 euro/kg

Table 1. Supermarket fresh sales in 1998
(source : from OFIMER)

		quantity	value
whole fresh fish	**cod**	2.6%	3.1%
	salmon	19.6%	16.0%
fresh steak & fillets	**cod**	15.0%	14.7%
	salmon	19.4%	21.0%
total fresh products	**cod**	10.4%	11.3%
	salmon	19.5%	19.6%

Table 2. Market shares in 1998
(source : from OFIMER)

Species	Model	Asymmetry:		Statistics		Symmetry
Codfish	TAR	ρ_1=-0,500	ρ_2=-0,727	$\phi_{\mu=34,63}$*	pvalue(ρ_1=ρ_2)=0,146	Yes
Codfish	M-TAR	ρ_1=-0,551	ρ_2=-0,729	$\phi_{\mu=35,37}$	pvalue(ρ_1=ρ_2)= 0,256	Yes
Salmon	TAR	ρ_1=-0,759	ρ_2=-0,719	$\phi_{\mu=30,71}$	pvalue(ρ_1=ρ_2)=0,798	Yes
Salmon	M-TAR	ρ_1=-0,718	ρ_2=-0,761	$\phi_{\mu=30,72}$	Pvalue(ρ_1=ρ_2)=0,783	Yes

Table 3. Threshold cointegration tests

Species	Magnitude of adjustment	Speed of adjustment
Cod	0.40	-0.315
Salmon	0.53	-0.602

Table 4. Magnitude and speed of adjustment

* ϕ_μ is the sample value of the statistic for the null hypothesis ρ_1=ρ_2=0. P-value(ρ_1=ρ_2) gives the empirical significance level for the null hypothesis ρ_1=ρ_2