

**PRICING TO MARKET BEHAVIOR  
IN OLIGOPOLISTIC COMPETITION:  
A MICROECONOMETRIC APPROACH\***

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# **PRICING TO MARKET BEHAVIOR IN OLIGOPOLISTIC COMPETITION: A MICROECONOMETRIC APPROACH**

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## **ABSTRACT**

This paper takes into account the presence of oligopolistic rivalry between exporters to evaluate their pricing to market behavior. We specify the pricing policy as a simultaneous equation model, which captures the effects of possible interactions in multiple destination markets. The use of information related to multiple transactions helps to alleviate the cost measurement problem found in the typical analyses on prices and exchange rates. Furthermore, the exogenous variations of the exporters' exchange rate vis-à-vis the currency of each destination market will enable us to identify the reaction functions. The empirical approach is applied to the European ceramic tiles industry, where Italian and Spanish exporters compete. Prices are strategic complements and the markup adjustments, caused directly by exchange rate variations, are amplified by the feedback effects on rival's prices.

Keywords: Exchange rates; Reaction functions; Pricing to market

JEL classification: F12; F14; L13

## **RESUMEN**

En este trabajo consideramos la presencia de rivalidad oligopolística entre exportadores con objeto de evaluar la presencia de "pricing to market". Especificamos la política de precios mediante un modelo de ecuaciones simultáneas que recoge los efectos de las posibles interacciones existentes en múltiples mercados de destino de las exportaciones. El problema de estimación de costes, típico en el análisis de precios y tipos de cambio, se resuelve mediante el uso de información relativa a múltiples transacciones. Por otra parte, las variaciones exógenas del tipo de cambio de la moneda de los exportadores frente a la de cada mercado de destino permitirá identificar las funciones de reacción. La aproximación empírica obtenida se aplica a la industria europea de pavimentos y revestimientos cerámicos en la que los exportadores españoles y italianos compiten. Los resultados indican que los precios actúan como complementarios estratégicos y que los ajustes de márgenes de beneficio, causados directamente por las variaciones en los tipos de cambio, son amplificados por la retroalimentación existente sobre los precios de los rivales.

Palabras clave: tipos de cambio; funciones de reacción; "Pricing to market"

JEL clasificación: F12; F14; L13

## 1. Introduction

Since the second half of the 1980s, the studies that have arisen from the renewed interest in the relationship between exchange rate changes and traded goods price adjustments have been greatly enriched by the application of models of industrial organization. The paper by Dornbusch (1987) is a good example of this phenomenon. It shows that models that dispense with the traditional assumption of perfect competition are very useful to explain why exchange rate variations are seldom completely reflected in the importer's currency prices in a given market (i.e. incomplete exchange rate pass-through). From the analysis offered it is clearly inferred that, in the particular case of oligopolistic market structure, strategic interactions should be considered for the determination of price equilibriums following exchange rate movements. Although rivalry effects could be very relevant, this fact contrasts with the approach adopted in many empirical studies on this issue, where the competitors' prices are not taken into account. Furthermore, until recently, the few studies that have tried to take the competitors' prices into account have been limited to using aggregate price indices for substitute products as a control variable. This is where Gross and Schmitt's (2000) paper comes in as an original piece of research work. The authors take new developments in time series econometrics to analyze the degree of exchange rate pass-through for imported automobiles in Switzerland by considering the prices of each source country as an endogenous variable. In their paper, unit labor costs and the producer price index in manufacturing are used as proxy variables of the marginal cost. The fundamental reason for the use of cost indices is that economic marginal cost cannot be observed in a straightforward manner. Although the use of accounting data is quite typical in empirical research concerning the exchange rate pass-through, it is an important drawback according to the tradition of "new empirical industrial organization" studies (surveyed in Bresnahan, 1989). In general, even if observable indices could be a reasonable measure of the average cost, they are not an appropriate measure of the evolution of marginal costs. This empirical problem is emphasized by the latest generation of studies focused more sharply on the issue of pricing to market behavior (Krugman, 1987)<sup>1</sup>. Therefore, Golberg and Knetter (1997) deduce that cost indices may

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<sup>1</sup> The pricing to market behavior refers to specific markup adjustments in response to changes in exchange rate against the destination market. The policy acts as an active international price discrimination across different destination markets. The incomplete exchange rate pass-through is frequently associated with the presence of these markup adjustments.

introduce measurement errors that are correlated with exchange rates in a way that biases the estimated coefficients toward finding an excess of markup adjustments.

To solve this problem, Knetter (1989) proposed an original alternative in which no assumptions about functional form of the marginal cost have been made. The alternative is based on the idea that the idiosyncratic prices, fixed to several closely related markets, provide a way to disentangle cost variations from markup changes. More specifically, in order to capture marginal cost evolution Knetter assumes that, on the border of the exporter country, this variable is independent of the destination-market, in contrast with markup adjustments.

In the present paper, we highlight the interest in extending Knetter's multimarket model. The aim is to explore a useful method to study pricing to market behavior for exporters that compete under an oligopolistic market structure. The econometric model will allow prices fixed by each competitor to interact following an exchange rate shock, as in Gross and Schmitt's research<sup>2</sup>. Furthermore, as in Knetter's approach, we will be able to disentangle markup changes without resorting to proxy variables of marginal cost.

The proposed empirical model is used in order to provide evidence for the European ceramic tiles industry, where we deal with oligopolistic rivalry among producers at country level. We chose this particular industry for at least three reasons. First, the production of ceramic tiles is highly concentrated in Italy and Spain, and these countries supply the rest of the European markets<sup>3</sup>. Production of ceramic tiles in both source countries represents more than 80% of the total production in the European Union. In this context, since the domestic production in the rest of the European Union countries is relatively low and market share of Italian and Spanish firms on total imports is high for many of destination countries (see Table 1 and 2), we analyze the effect of price rivalry in a straightforward way by considering a duopoly competition model. Second, in the European markets Italian and Spanish exporters are not subject to tariffs or quantitative restrictions. Therefore, our analysis can be considered to be free of

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<sup>2</sup> This preceding work is also focused on the dynamic properties of the exchange rate pass-through.

<sup>3</sup> Therefore, both countries are the main exporters in the world. For a good description of the evolution of the ceramic tiles industry, see European Commission (1997).

distortions<sup>4</sup>. Third, Italy and Spain produce and export different brands of ceramic tiles<sup>5</sup>, and in a similar fashion the pricing behavior in each source country could be associated with the behavior of the exporters of the corresponding product brand.

**Table 1. Production of ceramic tiles (m<sup>2</sup> in millions and percentage on the European Union)**

<b>Area</b>	<b>1993</b>		<b>1996</b>	
Italy	453	50.00%	555	46.91%
Spain	281	31.20%	424	35.84%
European Union	906		1183	

Note: From Sezzi (1995) and Sezzi (1997). In 1993 the European Union excludes Austria, Sweden and Finland.

**Table 2. Imports of Italian and Spanish ceramic tiles by country (in percentage on total imports of ceramic tiles)**

<b>Country</b>	<b>Spain</b>	<b>Italy</b>	<b>Total</b>
France	11.20	61.92	73.12
United Kingdom	39.32	28.58	64.90
Belgium-Luxemburg	11.03	48.98	60.01
Ireland	35.68	28.09	63.77
Greece	27.98	61.87	89.95
Portugal	89.66	2.99	92.65
Germany	7.16	65.63	72.79
Netherlands	12.28	40.42	52.70
Denmark	4.67	48.90	53.57

Note: We refer to product 690890 (following Combined Nomenclature codes) on the period 1988-1997. Source COMEXT (Eurostat).

The rest of the paper is organized as follows. In section 2, we illustrate different market structures consistent with the economic framework used in this study. Section 3 provides the econometric model and the empirical results obtained for the European ceramic tiles industry. A final section contains the concluding remarks.

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<sup>4</sup> The international pricing behavior could be affected by the presence of trade restrictions. See, for example, Feenstra (1989) and Goldberg (1995). The first author shows the effect both exchange rates and tariffs on prices for several industries. The second author's interest lies in obtaining the effects of quotas on prices.

<sup>5</sup> The difference between brands of ceramic tiles lies essentially in the color and physical characteristics of the basic materials.

## 2. The economic framework

Let us suppose two firms that export different brands of the same goods. Each of these firms belong to different countries and compete in  $N$  separate international markets. The first-order conditions for profit maximization will imply that, on the border of each exporter country, firms equate the marginal revenue from sales in each destination market to common marginal cost. Thereby, the log of the optimal price for the exporter firms expressed in their own currency  $p_j$  ( $j=1,2$ ) can be written as:

$$p_{1_{it}} = mc_{1_t} + \mu_{1_{it}} \quad (1)$$

$$p_{2_{it}} = mc_{2_t} + \mu_{2_{it}} \quad (2)$$

$$i=1,\dots,N$$

$$t=1,\dots,T$$

where, in each equation,  $mc$  represents the log of common marginal cost and  $\mu$  the log of destination-specific markup.

Let us assume that markup depends on the firm's own export price and, furthermore, on the rival's price, both expressed in terms of the buyer's currency (henceforth, local-currency). Then, if we define  $e_{jit}$  as the log of the exchange rate between the currency of the seller  $j$  ( $j=1,2$ ) and the local-currency of the market  $i$  (expressed in units of the seller's currency per unit of the local-currency), an approximation to the destination-specific markup for the exporters can be written as follows<sup>6</sup>:

$$\mu_{1_{it}} = a_1(p_{1_{it}} - e_{1_{it}}) + b_2(p_{2_{it}} - e_{2_{it}}) + c_{1_i} \quad (3)$$

$$\mu_{2_{it}} = a_2(p_{2_{it}} - e_{2_{it}}) + b_1(p_{1_{it}} - e_{1_{it}}) + c_{2_i} \quad (4)$$

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<sup>6</sup> Little empirical work has been carried out that considers the rival's price as a further determinant of the variable markup. The studies of Hung et al. (1993) and Kongsted (1998) are some examples.

where coefficients  $a$  and  $b$  will be interpreted as the local-currency prices elasticities of markup. We expect that  $a \leq 0$  and  $b \geq 0$ . Lastly,  $c \geq 0$  represents an intercept which captures the constant specific markup for each destination market.

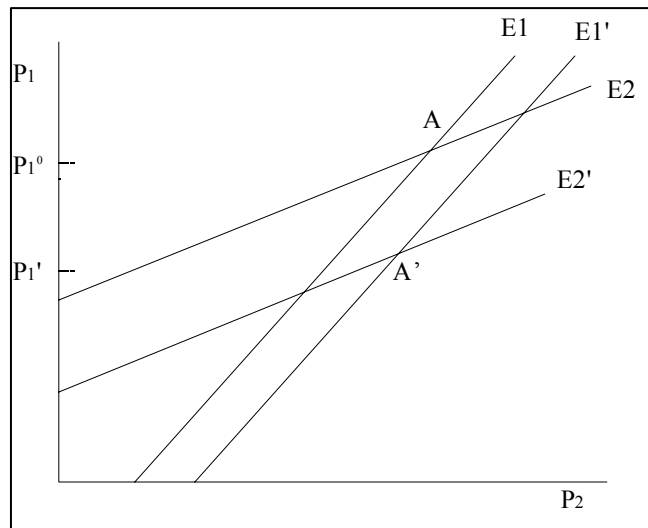
Substituting equations 3 and 4 into equations 1 and 2, respectively, and solving for each of the export prices, we obtain each firm's policy in terms of price reaction functions:

$$p_{1i} = \frac{1}{1-a_1}(c_{1i} + mc_{1i} - b_2 e_{2i} + b_2 p_{2i}) - \frac{a_1}{1-a_1} e_{1i} \quad (5)$$

$$p_{2i} = \frac{1}{1-a_2}(c_{2i} + mc_{2i} - b_1 e_{1i} + b_1 p_{1i}) - \frac{a_2}{1-a_2} e_{2i} \quad (6)$$

When coefficients  $b$  are non-zero, it is easy to infer that there is interdependence in the pricing policy of exporters. Therefore, an exchange rate variation affects the export price via the induced effect on the rival's price. To illustrate price interdependence, and its importance in the price determination following an exchange rate shock, Figure 1 plots the functions for a destination market  $i$ <sup>7</sup>. For the sake of simplicity we have

**Figure 1. Reaction functions and export prices equilibrium**



supposed that marginal cost is constant. Additionally, if we assume the conventional case in which coefficients  $a$  are negative and  $b$  are positive, both reaction functions are upward sloping in the export price space, thus showing that prices are strategic complements (Bulow *et al.*, 1985). The schedules E1 and E2 are the reaction functions and the initial equilibrium is represented at A.

<sup>7</sup> Reaction functions for an exporter and for domestic production can be seen in Dornbusch's (1987) "extended Dixit-Stiglitz model". It could be considered a particular case of our illustration, in which only the exchange rate between the currency of the exporter and the destination market  $i$  exists. In contrast with our analysis, both prices are expressed in domestic currency because Dornbusch focused on the determination of the import price.

An exogenous shock of the currency of the exporter 1's country, i.e. an appreciation ( $e_{1it}$  falls), *ceteris paribus*, will shift the reactions functions down and to the right. The new equilibrium after the exchange rate shock is therefore at A'. Since there is no variation in marginal cost, the new price of exporter 1,  $p_t'$ , is completely defined by the intensity of markup adjustments following this shock. In this case, both the slope and the magnitude of the shift in reaction functions imply a reduction in exporter 1 price (expressed in his own currency). From the equations 5 and 6 we can measure the degree of pricing variation of their own price in response to the exchange rate fluctuation against the market  $i$  (net of the possible effects on marginal cost), that is, the pricing to market for exporter 1 is as following:

$$\varphi_1 = \left( \frac{\partial p_{1it}}{\partial e_{1it}} \right)_{mc_{1t}} = \frac{-a_1(1-a_2) - b_1b_2}{(1-a_1)(1-a_2) - b_1b_2} \quad (7)$$

where all the elasticities related to the markups of both exporters are involved. Obviously, the pricing to market behavior for exporter 2 is symmetrical, and could be expressed as:

$$\varphi_2 = \left( \frac{\partial p_{2it}}{\partial e_{2it}} \right)_{mc_{2t}} = \frac{-a_2(1-a_1) - b_2b_1}{(1-a_2)(1-a_1) - b_2b_1} \quad (8)$$

The alternative hypothesis of no strategic interaction can also be inferred from the present analysis in a straightforward manner. The presence of zero coefficients in equations 5 and 6 is consistent with additional market structures and, furthermore, from equations 7 and 8 we can obtain the degree of pricing to market associated to each of them.

First, in the case that coefficients  $a$  are non-zero, but coefficients  $b$  are zero, each competitor firm will be ignored and we obtain a monopoly market structure where the specific fluctuations in exchange rates could affect markups via variations in each firm's own price (expressed in local-currency). As Knetter (1989, 1993) points out, the importance of pricing to market behavior will depend on the demand convexity as it is perceived by the exporter<sup>8</sup>. In the typical case of pricing to market, demand becomes

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<sup>8</sup> While in the simple monopoly case, the degree of pricing to market is linked with the market demand convexity, in a more general case of monopolistic competition market structure it will be linked with the "residual" demand convexity.



more elastic as local-currency prices rise. In this case, an increment in the local-currency price, caused by an exporter's currency appreciation ( $e_{ji}$  falls), would imply a decrease in the optimal markup and thus a certain degree of local-currency price stabilization. Since this behavior implies  $a_j < 0$  ( $j=1,2$ ), we obtain  $0 < \phi_j < 1$ . Second, when local-currency price elasticities of markup are zero but  $c_{ji} \neq 0$  for any destination market  $i$ , a fixed markup over marginal cost exists. In this case, the optimal markup will not change as exchange rate variations increase (or decrease) the price paid by the buyer. Since  $c_{ji}$  differs across destination markets, then the idiosyncratic markups indicate the presence of a policy of third-degree price discrimination. Third, when local-currency price elasticities of markup are constant  $a_j = 0$  and, additionally,  $c_{ji} = 0$  for overall  $i=1, \dots, N$ , the export prices are determined solely on the basis of the common marginal cost. This situation is compatible with the presence of a single competitive world market.

### 3. The econometric specification: a case study

In order to obtain a parsimonious specification we can express the exchange rates of equations 5 and 6 in terms of the domestic currency of the corresponding exporter. For this purpose, we decompose the bilateral exchange rate between the countries of the exporters 1 and 2 in the correspondent cross exchange rates against the currency of each destination market  $i$  (which will be guaranteed for the triangular arbitrage transaction in the spot foreign exchange markets). Hence,  $e_{12i} \equiv e_{1i} e_{2i}$  and  $e_{21i} \equiv e_{2i} e_{1i}$ , and equations 5 and 6 can be rewriting as follows:

$$p_{1i} = \frac{1}{1-a_1} c_{1i} + \frac{1}{1-a_1} [mc_{1i} - b_2 e_{12i}] - \frac{a_1 + b_2}{1-a_1} e_{1i} + \frac{b_2}{1-a_1} p_{2i} \quad (9)$$

$$p_{2i} = \frac{1}{1-a_2} c_{2i} + \frac{1}{1-a_2} [mc_{2i} - b_1 e_{21i}] - \frac{a_2 + b_1}{1-a_2} e_{2i} + \frac{b_1}{1-a_2} p_{1i} \quad (10)$$

If we define that  $\alpha_1 = (-a_1 - b_2)/(1-a_1)$ ,  $\beta_1 = b_2/(1-a_1)$ ,  $\alpha_2 = (-a_2 - b_1)/(1-a_2)$  and  $\beta_2 = b_1/(1-a_2)$ , a fixed effects model can be obtained directly from the equations represented in 9 and 10:

$$p_{1i} = \lambda_{1i} + \theta_{1i} + \alpha_1 e_{1i} + \beta_1 p_{2i} + u_{1i} \quad (11)$$

$$p_{2it} = \lambda_{2i} + \theta_{2t} + \alpha_2 e_{2it} + \beta_2 p_{1it} + u_{2it} \quad (12)$$

where  $\lambda_{1i}$  and  $\lambda_{2i}$  are the corresponding destination country effect, and  $\theta_{1t}$  and  $\theta_{2t}$  are time effects which capture the common variations in the corresponding export prices to the  $N$  destination markets. Lastly,  $u_{1it}$  and  $u_{2it}$  are the regression disturbance terms.

From the econometric model, we examine the predictions on pricing to market in a duopoly framework using a data set of nearly 2000 monthly observations of international prices corresponding to glazed ceramic flags and paving products shipped by Spain and Italy to 9 destination markets<sup>9</sup>. We include the main European destination countries in which both exporters compete: France, Germany, United Kingdom, Belgium-Luxemburg, Netherlands, Ireland, Denmark, Greece and Portugal. The period considered is from the birth of the Community Integrated Tariff (January 1988) until the moment in which the exchange rate fluctuations between both exporting countries and European importing countries stopped being notable (March 1997). Therefore, the exogenous variations in each exporter's exchange rate vis-à-vis the currency of each destination market  $i$  will enable us to identify the pricing equations.

The export price equations 11 and 12 have been estimated by the 3SLS procedure. Results are shown in Table 3.<sup>10</sup> A general outcome is that all the  $\alpha$  and  $\beta$  coefficients are statistically significant at a conventional level. This empirical finding indicates that the idiosyncratic effects on exporters' prices caused by the changes in conditions of each destination market are relevant.

The estimations can be interpreted in a more comprehensive form if we deduce the original local-currency price elasticities of markup. The coefficients  $a_j$  ( $j=Spain, Italy$ ) provide information about the effects on markup caused by a variation in the firm's own local-currency price apart from, obviously, a possible induced effect on the rival's price. The negative value of the corresponding estimation indicates that an

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<sup>9</sup> Data on shipments were obtained from the COMEXT database (EUROSTAT). In this database, harmonized data for the European exporter countries at industry level are available. The unit values are calculated in FOB terms. The product studied includes hearth or wall tiles and corresponds to classification code 690890. Ceramic goods made of siliceous fossil meals or similar siliceous, refractory ceramic goods, tiles made into stands, ornamental articles and tiles specifically manufactured for stoves are excluded. On the other hand, exchange rates used were those of the International Financial Statistics (published by the International Monetary Fund).

<sup>10</sup> No significant changes in estimates results occur when some destination countries, where market share of Spanish or Italian firms on total imports of product are smaller, are excluded.

increase (decrease) in the Spanish and Italian local-currency price would reduce (increase) their respective markups, as is expected. The magnitude of the estimated coefficients, which are -61.50 and -110.11 for Spain and Italy respectively, indicate that markups are very sensitive to the variations of the firm's own prices expressed in local-currency terms. Consequently, we find that the direct effects on export prices caused by exchange rate shocks are very important (0.99 for the Spanish exporters and 0.98 for the Italian exporters). This result implies that ceramic tile exporters tend towards greater markup adjustments with the aim of stabilizing their prices in terms of the local-currency. This phenomenon, frequently known as complete local-currency price stabilization, is not rejected by the Wald test at 5% significance level ( $\chi^2(2)=4.55$ ) for both exporting countries. However, pricing to market behavior might not be completely defined by the direct effect caused by exchange rate fluctuations. Since the estimate for coefficients  $b$  is non-zero, interaction in prices should be taken into consideration to obtain the total effects of exchange rate shocks on the export prices equilibrium. From the value of these estimated coefficients we find that an increase (decrease) in the rival's price in buyer's currency, considerably increases (reduces) the firm's own markup. This outcome implies that the slope of each reaction function is positive and prices are strategic complements, as we expected.

**Table 3. Pricing equations for the European ceramic tiles industry**

Estimated coefficients and pricing to market ( $\phi_j$ ) (j=Spain, Italy; k=Italy, Spain; k $\neq$ j)	Spanish export price	Italian export price
$\alpha$	0.169* (2.36)	-0.254* (-2.25)
$\beta$	0.815** (47.44)	1.245** (38.58)
$a_j$	-61.50	-110.11
$-a_j/(1-a_j)$	0.98	0.99
$b_k$	50.94	138.33
$b_k/(1-a_j)$	0.81	1.24
$\phi_j$	2.09	1.61
Wald test Ho; $\alpha_{\text{Spain}} + \beta_{\text{Spain}} = 1$ and $\alpha_{\text{Italy}} + \beta_{\text{Italy}} = 1$	$\chi^2(2)=4.55$ (0.10)	

Note: Estimation has been performed with LIMDEP 7.0 using six-monthly time effects. \*\* and \* indicate significance at the 1% and 5% levels, respectively. The figures in parentheses below the coefficients are t-statistics. The probability value is in parentheses for the chi-square distribution.

Lastly, we obtained an estimation for the pricing to market by taking into account the induced effects caused by price interactions. Results show that the magnitude of pricing to market estimation is 2.09 for the Spanish exporters and 1.61 for the Italian exporters, which indicates that price interdependence amplifies the direct effects on export prices to a substantial extent. Both Spanish and Italian exporters revise their markups taking into account the induced effects on the rival in response to exchange rate changes against the currencies of destination markets. Findings reveal that export price could vary to a greater degree than the exchange rate fluctuation due to rivalry effects.

#### **4. Conclusions**

In this paper we propose an empirical approach in the tradition of the "new empirical industrial organization" framework to study international pricing behavior in oligopolistic competition. The aim of the analysis is capture the possible effects of price rivalry between exporters on pricing to market behavior. To do so, we have made use of a simple model of duopoly which has been applied for the European ceramic tiles industry.

The papers of Knetter (1989) and Gross and Schmitt (2000) constitute the most direct empirical antecedents of the present research. We can also consider our analysis as an extension of Knetter's model insofar as it enables us to investigate the pricing policy in the presence of price interactions. Furthermore, this paper could represent a suitable alternative to Gross and Schmitt's approach to studying export price reactions following the exchange rate changes that come about when information related to transactions to multiple destination markets is available. In this case, it will be not necessary for a variable proxy to represent marginal cost, which could be an important advantage in the empirical analysis.

Evidence for the European ceramic tiles industry, where the Spanish and Italian exporters are basically the only competitors, has been put forward. The rejection of the perfectly competitive market structure and the segmentation of the European market is a direct result in the case of this industry. Estimations show that the direct response to exchange rate variations vis-à-vis the currency of each destination market is a strong destination-specific adjustment of markups for both exporter countries. Therefore, the markup adjustments, which are induced directly from the exchange rate fluctuations,

would allow price stabilization in local-currency terms. Nevertheless, we have obtained evidence that shows that the pricing interactions between the Spanish and Italian exporters do matter and, in turn, this fact affects the degree of pricing to market. More specifically, we found that the export prices in the ceramic tiles industry are strategic complements and, furthermore, the pricing interactions following an exchange rate shock amplify the initial markup adjustments caused directly by the exchange rate variation.

This study could contribute to a better understanding of the role of rivalry in the determination of the pricing to market behavior. One essential finding of our research is that, in an oligopolistic market structure, the exchange rate variations can have significant feedback effects on rivals' prices and, therefore, pricing interactions should be considered in the model specification. In this context, the use of prices for competitors with the aim of controlling for substitute products can be insufficient and the alternative proposed in this paper could be more satisfactory.

## References

- Bresnahan, T.F., 1989, Empirical Studies of Industries with Market Power, In: Schmalensee, R. and R. Willing, eds., *Handbook of Industrial Organization*, Vol. 2. (North-Holland, Amsterdam) 1012-1057.
- Bulow, J., J. Geanakoplos, P. Klemperer, 1985, Multimarket Oligopoly: Strategic Substitutes and Complements, *Journal of Political Economy* 93, 488-511.
- Dornbusch, R., 1987, Exchange Rates and Prices, *American Economic Review* 77, 93-106.
- European Commission, The, 1997, *Panorama of EU Industry*. Office for Official Publications of the European Communities, Luxembourg.
- Feenstra, R.C., 1989, Symmetric Pass-Through of Tariffs and Exchange Rate Under Imperfect Competition: An Empirical Test, *Journal of International Economics* 24, 25-45.
- Goldberg, P.K., 1995, Product Differentiation and Oligopoly in International Markets: The Case of US Automobile Industry, *Econometrica* 63, 891-952.
- Goldberg, P.K. and M.M. Knetter, 1997, Goods Prices and Exchange Rates: What Have We Learned? *Journal of Economic Literature* 35, 1243-1272.
- Gross, D.M. and N. Schmitt, 2000, Exchange Rate Pass-Through and Dynamic Oligopoly: An Empirical Investigation, *Journal of International Economics* 52, 89-112.
- Hung, W., Y. Kim, and K. Ohno, 1993, Pricing Exports: A Cross-Country Study, *Journal of International Money and Finance* 12, 3-28.
- Knetter, M.M., 1989, Price Discrimination by U.S. and German Exporters. *American Economic Review* 79, 198-210.
- Knetter, M.M., 1993, International Comparisons of Pricing-to-Market Behavior. *American Economic Review* 83, 473-486.
- Kongsted, H.C., 1998, Modeling Price and Quantity Relations for Danish Manufacturing Exports, *Journal of Business and Economic Statistics* 16, 81-91.
- Krugman, P.R., 1987, Pricing to Market When the Exchange Rate Changes. In: Arndt, S.W. and J.D. Richardson, eds., *Real Financial Linkages Among Open Economies* (MIT Press, Cambridge) .
- Sezzi, G., 1995, World Production and Consumption of Ceramic Tiles, *Ceramic World Review* 16, 36-39.
- Sezzi, G., 1997, World Production and Consumption of Ceramic Tiles, *Ceramic World Review* 24, 84-96.