MODELLING PRICE BEHAVIOUR IN THE EUROPEAN CAR MARKET: 1970 – 1985

by

Yves Mertens
London School of Economics and Political Science

Discussion Paper
No. EI/1
May 1990

The Toyota Centre
Suntory and Toyota International Centres for Economics and Related Disciplines
London School of Economics and Political Science
Houghton Street
London WC2A 2AE
Tel.: (020) 7955 6674

I wish to thank Stephen Davies, john Sutton and Hugh Wills for valuable comments and suggestions. Financial support from the Collège Interuniversitaire d'Etudes Directorales dans les Sciences du Management, Brussels is gratefully acknowledged. Any errors are, of course, mine.

Abstract

This paper is concerned with the determinants of car prices in four European countries: Belgium, France, Germany and the United Kingdom, over the period 1970 – 1985. The main focus of the study lies in explaining the levels of, and changes in, the large price differentials observed across the several countries, and in exploring the impact of the trade restrictions imposed on Japanese car exports to Europe over the period in question. The main finding is that these two sources of price differentials play a substantive role in explaining observed differentials. The second major theme relates to the effects of the increase of Japanese import penetration and the resulting trade restrictions.

Keywords: European car market; car prices; price differentials; trade restrictions.

I. INTRODUCTION

The paper is concerned with the determinants of car prices in four European countries , Belgium, France, Germany and the United Kingdom over the period 1970-1985. The main focus of the study lies in explaining the levels of, and the changes in, the large price differentials observed across the several countries, and in exploring the impact of the trade restrictions imposed on Japanese car exports to Europe over the period in question.

A simple oligopoly model is developed, and estimated, in order to unravel the several factors which can lead to the appearance of price differentials across countries. Two polar cases are distinguished. Firstly, even if we assume that purchasing power parity (PPP) holds exactly at all times, price differentials will appear, which reflect differences in price-cost elasticities, in the timing and magnitude of Japanese import penetration and in associated trade restrictions, and in the related speeds of adjustment. On the other hand, if PPP does not hold (precisely), a further contribution to the appearance of price differentials arises as prices adjust only partially and/or slowly to the cost changes arising from real exchange rate fluctuations.

The main finding of the present paper is that these two sources of price differentials play a substantive role in explaining observed differentials. During the seventies, the real exchange rate effect tended to make cars progressively more expensive in Belgium than France, Germany or the United Kingdom, but a reversal of this trend occurred at the end of the seventies. The remaining factors tended to work in the opposite direction, however, from the beginning of the seventies onwards. Over the first period, the two sources of differentials identified above work broadly in opposite directions, and the overall effect is one of relatively narrow differentials. Over the second period, they work broadly in the same direction, leading to a widening of price differentials. The second major theme of the study relates to the effects of the increase of Japanese import penetration and the resulting trade restrictions. The impact of

trade restrictions is found to be two fold[1]. Firstly, they led to a rise in Japanese car prices across European markets. Secondly, they led to a shift in market share in favour of German producers in Belgium, France and the United Kingdom.

The paper is organised as follows. Section II introduces the simple microeconomic framework leading to an econometric model which can be estimated. The impact of Japanese import penetration and trade restrictions is discussed in section III. The basic model is estimated in section IV, while section V presents a decomposition of the contributory factors underlying price differentials. Section VI describes the pattern of market shares in the European car market over the period 1970-1985, while in section VII we summarize our results and draw our conclusions.

II. THE BASIC MODEL

Consider a set of N firms selling differentiated products in M different markets corresponding, say, to different countries. Suppose now that firm i, i=1,...N is located in country i and assume M > N. In particular we imagine that the first N markets/countries have exactly one domestic manufacturer while the remaining M-N countries have no domestic producers, and imports all their consumption of the products in question from the N firms. we presuppose therefore a distinction between those countries with a significant domestic motor industry (e.g. France, Germany, Italy, Japan or the United Kingdom) and those

---

1 A third effect, quality upgrading by Japanese producers, is investigated in my Ph.D. dissertation (Mertens [1988]).

countries which do not have a domestic producer. The latter are in practice usually more open to foreign competition (e.g. Belgium, Denmark, the Netherlands)[2].

Let now $P_i^j(t)$ denote the nominal price[3] charged by firm i, i=1,...,N in country j, j=1,...,M at time t. Let $I^j(t)$ denote the nominal price of a Hicksian composite commodity representing 'all other goods' sold in country j at time t. Both are assumed to be expressed in local currency.

Suppose that the demand function for the product sold by firm i in country j has the following form:

$$(2.1) \qquad q_i^j(t) = f_i^j(p_1^j(t),\ldots,p_N^j(t))$$

where

$$p_i^j(t) \equiv \frac{P_i^j(t)}{I^j(t)}, i = 1,\ldots,N, j = 1,\ldots,M$$

The demand function (2.1) is taken to differ across countries for any given manufacturer.

The quantity sold at time t is taken to depend only on current prices; income effects are ignored. We assume that arbitrage is impossible: consumers in country j are unable to purchase the good in country j'. The motivation for this assumption, in the context of the European car market, is provided in appendix 1.

---

2 We ignore here, for the sake of simplicity, the fact that some manufacturers assemble cars in different countries. Belgium is a particularly good example of such a situation. There is no Belgian car maker (apart from some marginal and highly specialised firms) but some large car manufacturers such as Ford, GM, Renault, VW, Volvo and until recently, Austin-Rover, assemble cars in Belgium, mainly for export rather than local consumption.

3 We adopt the following conventions. A superscript denotes a market/country and a subscript a specific firm. Moreover, capital letters correspond to nominal variables, lower cases to real variables and Greek letters to parameters.

Each firm is assumed to have a constant marginal cost $c_i^i(t)$

$$(2.2) \qquad c_i^i(t) = \frac{C_i^i(t)}{I^i(t)} \equiv MC_i^i(t), i = 1, \ldots, N$$

where $C_i^i(t)$ is the nominal unit production cost of firm i, expressed in the currency of its home country.

Let now $E^{ij}(t)$ denote the exchange rate between the currencies of country j and i, expressed as the number of units of currency j per unit of currency i.

Total profits of firm i across the M markets are then given by

$$(2.3) \qquad \Pi_i(t) = \sum_{j=1}^{M} [E^{ij}(t).P_i^j(t) - C_i^i(t)].q_i^j(t)$$

where $E^{ii}(t)$ is equal to 1 by definition.

If we rearrange equation (2.3) we get:

$$(2.4a) \qquad \pi_i(t) = \frac{\Pi_i(t)}{I^i(t)} = \sum_{j=1}^{M} e^{ij}(t).[p_i^j(t) - c_i^j(t)].q_i^j(t)$$

where

$$(2.4b) \qquad e^{ij}(t) = E^{ij}(t).\frac{I^j(t)}{I^i(t)}$$

and

$$(2.4c) \qquad c_i^j(t) \equiv e^{ji}(t).c_i^i(t)$$

Consider now the case of a Nash equilibrium in prices i.e. suppose each firm i, i=1,...,N, selects at time t a price vector $(p_i^1(t), \ldots, p_i^M(t))$ which maximises the profit function (2.4a) given the prices selected by its competitors. The assumption of independence of demand functions across countries and of constant marginal cost imply that this is equivalent to saying that firm i maximises profits in each market j, j=1,...,M given $p_k^i(t)$, $k \neq i$ This allows us to investigate equilibrium prices in each market separately.

If purchasing power parity between currency i and currency j is imposed, $e^{ij}(t)$ is constant over time. If, on the other hand, exchange rates do not adjust perfectly to differences in inflation rates across countries then $e^{ij}(t)$ will fluctuate over time.

Consider first a market/country j which has no domestic manufacturer and suppose the demand function of firm i is given by

$$(2.5a) \qquad q_i^j(t) = \alpha_i^j - \beta^j.\left\{p_i^j(t) - \bar{p}^j(t)\right\} - \gamma^j \bar{p}^j(t)$$

where

$$(2.5b) \qquad \bar{p}^j(t) = \frac{1}{N}\sum_{k=1}^{N} p_k^j(t) \qquad , \quad \alpha_i^j > 0 \quad ; \quad 0 < \gamma^j \leq \beta^j \quad , \quad i = 1, \ldots N.$$

Equation (2.5a) is a special case of (2.1) and is used to derive the econometric specification estimated in section III.

The first order conditions for profit maximization take the form:

$$(2.6) \qquad A^j.p_i^j(t) = \alpha_i^j + (\beta^j - \gamma^j).\bar{p}^j(t) + B^j.c_i^j(t) \qquad i = 1, \ldots, N$$

where

$$A^j \equiv 2.\beta^j - \frac{1}{N}.(\beta^j - \gamma^j) > 0 \qquad , \qquad B^j \equiv \beta^j - \frac{1}{N}.(\beta^j - \gamma^j) > 0$$

Solving for the vector of equilibrium prices $(p_1^{*j}(t), \ldots, p_N^{*j}(t))$ we obtain :

$$(2.7) \qquad p_i^{*j}(t) = \frac{\alpha_i^j}{A^j} + \frac{\beta^j - \gamma^j}{A^j \Gamma^j}\bar{\alpha}^j + (\beta^j - \gamma^j)\frac{B^j}{A^j \Gamma^j}\bar{c}^j(t) + \frac{B^j}{A^j}c_i^j(t) \quad , \quad i = 1, \ldots, N$$

where

$$\bar{\alpha}^j = \frac{1}{N}\sum_{k=1}^{N} \alpha_k^j \qquad , \qquad \bar{c}^j(t) = \frac{1}{N}\sum_{k=1}^{N} c_i^j(t) \qquad , \qquad \Gamma^j = \beta^j + \gamma^j - \frac{1}{N}(\beta^j - \gamma^j)$$

It can be seen from (2.7) that the price charged in country j by firm i is a linear function of its own unit production cost as well as of the average unit production cost of all its competitors. Moreover, it is easy to show that

$$(2.8) \qquad 0 < \frac{\partial p_i^{*j}(t)}{\partial c_i^j(t)} = (\beta^j + \gamma^j)\frac{B^j}{A^j \Gamma^j} < 1 \qquad \text{and} \qquad 0 < \eta_i^j = \frac{\partial p_i^{*j}(t)}{\partial c_i^j(t)}.\frac{c_i^j(t)}{p_i^{*j}}(t) < 1$$

i.e. in equilibrium, cost changes are not in general passed through fully into price changes[4].

Consider now the case of a country j which has one domestic producer and suppose that the demand faced by the domestic firm is given by

$$(2.9) \qquad q_d^j(t) = \alpha_d^j - \beta_d^j p_d^j(t) + \gamma_d^j p_I^j(t) \quad , \quad 0 \le \gamma_d^j < \beta_d^j$$

where $p_d^j(t)$ is the price charged by the domestic firm and

$$p_I^j(t) = \frac{1}{N-1} \sum_{i \in I} p_i^j(t) \quad , \quad I = \{1, \ldots, N\} \setminus \{d\}$$

Thus, we assume that demand for the domestic product depends on domestic price and the average price of imported substitute products (I denotes the set of importers).

Similarly, demand for the (imported) product i is (by extending (2.5a) to allow for a difference between the impact of price changes by the domestic rival, and by foreign rivals):

$$(2.10) \qquad q_i^j(t) = \alpha_i^j - \beta_i^j \{p_i^j(t) - \bar{p}^j(t)\} - \gamma_I^j \bar{p}^j(t) \quad , \quad 0 < \gamma_I^j \le \beta_I^j \quad , \quad i \in I$$

where

$$\bar{p}^j(t) = \omega^j p_d^j(t) + (1 - \omega^j) p_I^j(t) \quad , \quad 0 \le \omega^j \le 1$$

The (Nash) equilibrium price charged by the domestic firm is a linear function of the unit domestic production cost and of the average unit production cost of imported substitutes. The equilibrium price charged by any importer is a linear function of its own unit production cost, of the unit production cost of the domestic firm and of the average unit production cost of imported substitutes.

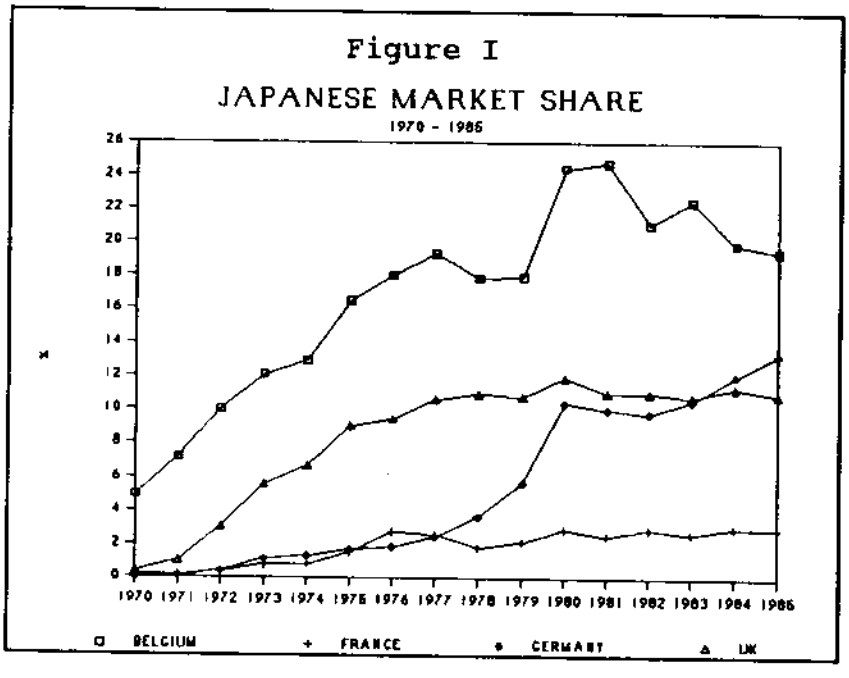
---

4 A number of alternative oligopoly models have been explored in the literature (notably the kinked-demand-curve solution). In particular, Cowling and Sugden [1984] claim that in an oligopolistic market, cost changes will not automatically be translated into proportionate changes in price levels. They argue that an oligopolist's decision to cut price (or not), for instance, will be influenced by (i) its temporary increase in profits before the period when rivals respond and (ii) its conjectures about rivals' perception and response to the price change.

III. Japanese import penetration, trade restrictions, and price differentials

One of the most important changes which occurred in the European motor industry during the seventies was a rapid growth in the level of Japanese imports (figure I). The scale and timing of this change varied widely across different countries. In particular, Japanese producers share grew more rapidly in those markets, such as the Belgian market, which did not have a dominant domestic manufacturer. The Belgian market was also unusual in that Belgium was singled out in the early seventies by Japanese manufacturers, and especially by Toyota, as a 'test market', in building up a European presence. It is therefore plausible that the objective of Japanese manufacturers in Belgium in the early seventies was not just to maximise short term profits but also to build up market share per se[5].

Figure I



5 If Japanese manufacturers deviate from short run profit maximisation in an attempt to build up market share , the result would be a fall in all prices, with Japanese prices falling more than European car prices. Moreover, the elasticity of Japanese car prices to their own unit production cost would be smaller than in the case of standard profit maximisation. This question can be discussed formally in a simple way by assuming, for instance, that the pay-off function of Japanese firms is a weighted sum of profits, as defined previously, and a quadratic cost associated with deviation from a sales target.

Most European countries responded over the past decade to the rapid increase of Japanese imports by introducing various unofficial import restrictions, and by negociating voluntary export restraints.

The British and Japanese motor manufacturers were the first to conclude an agreement in 1975. It stipulated that "both sides should exchange views on a regular basis concerning the revitalisation of the British automobile industry" (OECD [1987] p.43). In 1977, however, an agreement froze the Japanese market share in Britain at 11 % (The Future of the Automobile [1984] p.44).

France was the second country to negociate restrictions with the Japanese car makers. Japanese automobile imports are limited to 3 % of the French market since 1977. They are monitored on a monthly basis since 1981.

The Japanese agreed to reduce their imports by 7 % in Belgium between 1980 and 1981. Germany was promised that Japanese manufacturers would limit the rate of growth of their market share (The Future of the Automobile [1984] p.44).

The effect of such restrictions within the present model may be developped as follows. To fix ideas, consider a country j without domestic manufacturer where a single Japanese firm denoted J competes with N-1 European firms. The Japanese producer is allowed to sell a quantity $\hat{q}_j^J(t)$ and adjusts its price to stay on its demand curve given the prices charged by its European rivals[6].

It can then be shown that

$$(2.11\alpha) \qquad \overline{p}^{\prime J}_E(t) - \overline{p}^{*J}_E(t) = \frac{1}{\Delta' N}(\beta' - \gamma')(q^{*J}_j(t) - \hat{q}^J_j(t))$$

---

6 The impact of trade restrictions on Japanese imports has been subject to many theoretical and empirical studies, especially in the context of the U.S. market (see for example Lambson and Richardson [1987] for a recent Theoretic analysis, Feenstra [1984],[1985] for an empirical analysis of the U.S market and the references cited in these papers). In this paper, we restrict our attention to the impact of these restrictions on car prices.

$$(2.11b) \qquad p'^{J}_{J}(t) - p^{*J}_{J}(t) = \frac{1}{\Delta^{J}}(\beta' + \gamma')(q^{*J}_{J}(t) - \hat{q}^{J}_{J}(t))$$

where $\bar{p}'^{J}_{E}(t)$ is the average equilibrium price charged by European firms and $p'^{J}_{J}(t)$ the price charged by the Japanese producer when subject to trade restrictions, $\bar{p}^{*J}_{E}(t)$ $p^{*J}_{J}(t)$ and $q^{*J}_{J}(t)$ are the corresponding equilibrium prices and quantities under free trade and Δ^{J} is a positive constant.

The impact on Japanese car prices will depend on the magnitude of the quota and the degree of substitutability between Japanese and European cars. Prices of European cars will also increase as a result of trade restrictions, but by less than those of Japanese producers so that a change in relative prices should be observed. Also note that if many firms are competing in the European market, the impact on European car prices will be correspondingly small.

We now turn to the question of how price differentials emerge, and how they vary over time[7].

The price differential for the product sold by firm i in two countries a and b is given by :

---

7 In reviewing the determinants of differentials here, we ignore a number of effects which have been discussed in the literature.

The successive mergers of Citroën, Peugeot (1974) and Talbot (1978) influenced European car markets in a very different way, leading, inter alia, to a change in market share leadership in the French market. In other countries, where French manufacturers have a relatively small market share, the impact of these mergers on market structure was insignificant.

The impact of tax differentials across EEC countries on variations in net-of-tax car prices was investigated by Murfin [1985] and Gual [1988]. Murfin concludes that , at least in the case of the four countries studied in this paper, they explain only a small proportion of the differences in price levels across countries while Gual reports some impact on price differentials. In both cases, the effect seems to be small once Denmark, a country with very high tax rates, is excluded from the analysis.

Finally, matters are further complicated by the existence of price controls in Belgium and France.

$$(2.12) \qquad D_i^{b|a}(t) \equiv \frac{P_i^b(t)}{P_i^a(t)} E^{ab}(t) = \frac{p_i^b(t)}{p_i^a(t)} e^{ab}(t) \quad , \qquad a,b \in \{1,\ldots M\}$$

(country a is used as the reference in constructing this index).

In order to illustrate in a simple way the mechanisms at work, two polar cases can be distinguished.

Suppose first that purchasing power parity (PPP) holds at each point in time (i.e. $e^{ab}(t)$is constant for all t).

The discussion of the previous paragraphs leads to to the conclusion that the price charged by manufacturer i in country j is a function of the production costs of all firms competing in that market and of the timing and magnitude of the trade restrictions imposed on Japanese imports. Moreover the parameters of the equilibrium price equations depend on the parameters of the underlying demand functions and on the objective function of the various firms.

It now follows immediately that a price differential will appear at time t if the demand functions facing the firms and/or the objective functions vary between country a and b or if there are differences in the timing and/or the magnitude of the the trade restrictions across the two countries.

Notice, in particular, that the fact that firms adjust only partially, or even not at all, to changes in their own unit production cost does not in itself lead to the emergence of price differentials. What matters, is whether the elasticity of price to own cost is different across countries.

Consider now the second polar case. Assume that exchange rates depart from PPP but that the price equation of firm i is identical in both countries. Suppose further that there are no trade restrictions in the two countries. A price differential will now emerge as soon as firm i does not fully adjust price to changes in its own unit cost i.e. as soon as the price elasticity to unit production cost is less than unity a property of the model introduced in this section as well as of the alternative models discussed above.

The econometric model estimated in the next section is used to unravel the respective impact on the observed price differentials of real exchange rate fluctuations, trade restrictions, and of all other factors respectively.

IV. Estimation of the basic model

The empirical analysis is based on a large data set covering sixteen years (1970-1985) and four European markets, Belgium, France, Germany and the United Kingdom. The details of the data set are given in appendix 2. For each year, data on registrations by model, price and characteristics of cars sold in each of these markets have been collected. A total of 6,967 observations is available, which corresponds, on average, to slightly more than one hundred observations for each market and each year.

In each market, we consider six groups of manufacturers identified by the following countries of origin : France, Germany, Italy, Japan, the United Kingdom, and a residual group including those manufacturers who lie outside our present scope.

Two points should be stressed :

1. Most car manufacturers produce components and/or assemble vehicles in several countries. Hence, no perfect association between a manufacturer and a country is possible. It is however rather natural to classify Fiat as an Italian company and VW-Audi as a German producer.

2. The case of Ford and GM (Opel-Vauxhall) is even more complex. In the present paper, Ford and GM (Opel) are classified as German in Belgium, France and Germany, although both have assembly plants in Belgium (in Genk and Antwerpen respectively). In the United Kingdom, Ford and GM (Vauxhall) are included in the group of British manufacturers.

As the quality of the cars produced by these manufacturers has changed over time and varies across markets and manufacturers, hedonic regressions (Griliches [1971]) are used to construct

price series adjusted for changes in quality. The word quality will, in the present context, refer to the vector of technical characteristics associated with each vehicle ; engine capacity, power, body style, and so on.

We compute first the price differentials existing across the four countries over the period 1970-1985 using the Belgian market as a reference. The following model (cf. Mertens and Ginsburgh [1985]) is estimated for each year between 1970 and 1985 by pooling all observations on car prices across the four markets :

$$(3.1) \qquad \ln p_i^j(t) = \sum_{k=1}^{K} \theta_{kt} x_{ki}^j(t) + \sum_{m=1}^{M} \phi_t^m d_i^{jm}(t) + \epsilon_i^j(t)$$

where $p_i^j(t)$ is the (list) price of car i at time t, t=1,...T, in market j, j=1,...M (expressed in a common currency), $d_i^{jm}(t)$ is equal to one if j=m and zero otherwise, and $(x_{1i}^j(t),\ldots,x_{Ki}^j(t))$ is a vector of technical characteristics associated with car i, and $\epsilon_i^j(t)$ is an error term.

The following variables are used in this paper : engine capacity (in cc), power/weight (in Kw DIN/Kg), total length (in cm), DISC, a dummy variable equal to one if the car has both front and rear disc brakes and zero otherwise, DIESEL, a dummy variable equal to one if the vehicle has a diesel engine and zero otherwise, and BODY, a dummy variable equal to one if the car is neither a saloon nor an hatchback.

The price differential at time t between country m and Belgium (BE) is then given by :

$$(3.2) \qquad D^{m|BE}(t) = \exp\{\phi_t^m - \phi_t^{BE}\} \qquad .$$

Table I presents the estimated price differentials using net-of-tax prices based on equation (3.1).

It can be seen that price differentials seem to be the rule, rather than the exception, in this industry since, for each year, at least one country displays a significant price differential with respect to Belgium. Moreover, cars become

Table I : Price differentials across the four markets: 1970-1985

All cars together, prices excluding taxes
reference : Belgium

N.B.: * significant at a 5% level
** significant at a 1% level

Year	Price differential between Belgium and ...		
	France	Germany	United Kingdom
1970	91**	100	97
1971	98	112**	106**
1972	100	109**	107**
1973	99	119**	94**
1974	93**	116**	100
1975	109**	114**	103
1976	102	112**	98
1977	98	112**	105*
1978	102	111**	107**
1979	105*	112**	123**
1980	112**	112**	135**
1981	113**	111**	140**
1982	110**	120**	148**
1983	113**	120**	142**
1984	111**	116**	134**
1985	114**	114**	137**

progressively cheaper in Belgium than in the three other countries at the end of the seventies. A peak is reached in 1982-1983 and a decline observed in 1984 and 1985.

We now turn our attention to the construction of disaggregate hedonic price series for the various groups of producers introduced at the beginning of this section[8].

The disaggregate price series are based on the following specification :

$$(3.3) \qquad \ln p_i^j(t) = \sum_{k=1}^{K} \theta_{kt}^j x_{ki}^j(t) + \sum_{g=1}^{G} \lambda_{gt}^j d_{gi}^j(t) + \xi_i^j(t) \qquad , \quad j = 1, \ldots, M$$

8 An analysis of covariance reveals that the price levels, holding the characteristics of the cars constant, vary significantly across these groups in each market. Moreover, relative prices change significantly over time except in Germany (see my Ph. D. dissertation for further details). These results imply, in turn, that the construction of disaggregate series makes sense.

where $d^j_{gi}(t)$, g=1,...,G is a dummy variable equal to one if car i is manufactured by a firm included in group g and zero otherwise, $\xi^j_i(t)$ is an error term, and all other variables have the same meaning as in equation (3.1).

Since an analysis of covariance shows that hedonic coefficients (i.e. the coefficients associated with the various technical characteristics) are usually not stable over time, they are allowed to vary both over time and across markets. They are assumed however to be the same across the various groups of producers at time t in market j. Price series can then be constructed for a vehicle with a given vector of characteristics by estimating the price of that vehicle for each year and each group of producers in each market. These price series have been constructed using list prices excluding taxes and expressed in each market in the local currency at 1970 price level.

Labour cost, which accounts for about 35% of the total cost of a vehicle, is used as a proxy for marginal cost. Series of unit labour cost have been constructed as follows :

$$(3.4) \qquad ulc^j_i(t) = \frac{e^{ji}(t).w_i(t)}{I_{ai}(t)}$$

where

$ulc^j_i(t)$ is the unit hourly labour cost, adjusted for changes in productivity, in market j for the i^{th} group of car makers (expressed at 1970 price level and in the currency of market j);

$e^{ji}(t)$ is the real exchange rate between the two currencies, $w_i(t)$ represents average hourly earnings for production workers in the motor industry of country i (at 1970 price level and in the currency of market i) and $I_{ai}(t)$ is an index of labour productivity in the automobile industry[9].

---

9 The definition of the motor industry includes both car makers and equipment manufacturers (NACE 35 or SIC 371). Production figures include both passengers and commercial vehicles. A 'normal' level of labour productivity based on the estimated trend over time was constructed to take into account short term variations over the business cycle. Finally, the Japanese industry in 1970 was chosen as the base of the labour productivity index.

The impact of trade restrictions on Japanese and non-Japanese car prices is captured by a dummy variable equal to one when Japanese car makers are subject to trade restrictions and zero otherwise. We distinguish on the one hand the year when trade restrictions are introduced, officially or not, and, on the other hand, the year when the constraint becomes actually binding.

We also constructed several proxies to capture the impact of Japanese penetration in Belgium. Traditional concentration indexes do not capture this phenomenon however since they tend to reflect both the impact of Japanese penetration and the successive mergers of Citroën, Peugeot and Talbot. The Japanese market share itself could be used, of course, but leads to an obvious problem of simultaneity. Several other variables have therefore been constructed, such as the share of the first four leading brands or the variance of market share by brand. All these variables are highly correlated and capture the substantial change in the Belgian market that took place during the first half of the seventies.

Consider now a market j, $j \in \{1,\ldots,M\}$ with a domestic automobile industry. The basic econometric specification is the following:

<u>domestic firm d :</u>

$$(3.5a) \qquad p_d^j(t) = \mu_{0d}^j + \mu_1^j ulc_d^j(t) + \mu_2^j(t) ulc_i^j(t) + \mu_3^j ver^j(t) + \epsilon_d^j(t)$$

<u>importers ($i \in I$)</u>

$$(3.5b) \qquad p_i^j(t) = \mu_{0i}^j + \mu_4^j ulc_d^j(t) + \mu_5^j ulc_{-i}^j(t) + \mu_6^j ulc_i^j(t)$$
$$+ \mu_3^j ver^j(t)\{1 - d_i^j(t)\} + \mu_7^j ver^j(t) d_i^j(t) + \epsilon_i^j(t)$$

where $p_i^j(t)$ is the (hedonic) price charged by firm i in market j at time t (prices are in local currency at 1970 price level), $ulc_i^j(t)$, $ulc_d^j(t)$, $ulc_{-i}^j(t)$, are, respectively, the unit labour cost of firm i, the average unit labour cost of all importers and the average unit labour cost of all firms but i, $ver^j(t)$ is a dummy variable equal to one if Japanese car manufacturers are subject

to trade restrictions in market j at time t and zero otherwise, and $d_i^j(t)$ is a dummy variable equal to one for Japanese manufacturers and zero otherwise.

Ashworth et Al. [1982] suggest that car makers may adjust prices only slowly to exogenous shocks. They argue that producers may impute substantial costs to short run fluctuations in market share because, for example, selling cars implies heavy fixed costs in terms of providing a distribution and spares network, etc.

This idea is incorporated by introducing the following simple dynamic adjustment model :

$$(3.6) \qquad p_i^j(t) - p_i^j(t-1) = \omega_i^j \{ p_i^{*j}(t) - p_i^j(t-1) \}, \qquad 0 < \omega_i^j \leq 1 \quad , \qquad i = 1, \ldots, N$$

where $p_i^j(t)$ is the observed price level and $p_i^{*j}(t)$ the desired price level at time t, which is assumed to have the same functional form as the static model given in equations (3.5a) and (3.5b).

The basic model is sligthly different in the case of Belgium, a market without domestic manufacturers. The static econometric model is given by :

$$(3.7) \qquad p_i^j(t) = \nu_{0i}^j + \nu_1^j ulc_i^j(t) + \nu_2^j ulc_{-i}^j(t) + \nu_3^j(t) ver^j(t) \{ 1 - d_i^j(t) \}$$

$$+ \nu_4^j ver^j(t) d_i^j(t) + \nu_5^j \mathrm{comp}^j(t) + \epsilon_i^j(t)$$

where $\mathrm{comp}^j(t)$ is a measure of Japanese competition in market j at time t and all other variables have the same meaning as above.

Equations (3.5a) and (3.5b) (or (3.7)) have been estimated as a set of multivariate regressions with a correction for first order autocorrelation. The dynamic version, on the other hand, was estimated as a set of non-linear multivariate regressions. These static and dynamic models were used as a starting point but several variants were also estimated. Insignificant coefficients are omitted from the 'preferred' specifications which are reported in table II.

We now turn our attention to a discussion of the specification search and to an analysis of the conclusions suggested by the final specification presented below.

Table II : Dynamic model : Final specification

Market	Belgium	France	Germany		United Kingdom
			1	2	
speed of adjustment					
France	0.409	0.836	0.292	0.237	0.590
	(0.159)	(0.176)	(0.144)	(0.205)	(0.116)
Germany	0.930	0.491	0.791	0.689	0.575
	(0.147)	(0.117)	(0.153)	(0.197)	(0.120)
Italy	0.464	0.582	0.296	0.766	0.573
	(0.185)	(0.184)	(0.165)	(0.291)	(0.139)
Japan	0.551	1.040	0.757	-	0.748
	(0.119)	(0.203)	(0.093)		(0.116)
U.K.	0.464	0.531	0.780	-	0.208
	(0.106)	(0.160)	(0.284)		(0.083)
domestic manu-facturers					
domestic cost (long term)	-	318.43	375.19	363.44	164.86
		(123.19)	(43.84)	(51.17)	(36.68)
	-	e=0.404[a]	e=0.721	e=0.698	e=0.470
average cost of importers (long term)	-	..	..	..	213.28
					(50.02)
					e=0.608
importers					
own cost (long term)	153.70	101.92	16.32	-0.38.40	164.86
	(31.76)	(39.88)	(17.36)	(67.44)	(36.68)
	e_m0.197[b]	e_m=0.114	e_m=0.016	e_m=-0.049	e_m=0.156
	e_M=0.507	e_M=0.335	e_M=0.048	e_M=-0.045	e_M=0.278
average cost of other importers (long term)	..	..	..	..	213.28[c]
					(50.02)
					e_m=0.202
					e_M=0.360
domestic cost (long term)	-	321.41	16.28	255.08	..
		(133.59)	(36.04)	(83.26)	
		e_m=0.360	e_m=0.016	e_m=0.242	
		e_M=1.055	e_M=0.048	e_M=0.294	
Japanese pen-etration					
CR4 (brand) (long term)	521.07	..	..	..	..
	(206.79)				

Table II : Dynamic model ; Final specification (continued)

Market	Belgium	France	Germany		United Kingdom
			1	2	
Impact of trade restrictions	e_m=0.240 e_M=0.275				
Japanese car prices (long term)	6476.0[d] (2258.4) +8.8%	718.73[d] (211.13) +8.3%	..	..	92.97[d] (11.96) +11.7%
non-Japanese car prices	..	..	..	..	..
r2 [e]					
France	0.20	0.54	0.67	0.67	0.82
Germany	0.60	0.83	0.88	0.88	0.66
Italy	0.23	0.65	0.58	0.58	0.69
Japan	0.73	0.68	0.08	-	0.73
U.K.	0.73	0.68	0.16	-	0.81
Rho [f]					
France	0.06 (0.31)	0.01 (0.27)	0.38 (0.26)	0.38 (0.26)	-0.03 (0.28)
Germany	-0.00 (0.30)	0.14 (0.26)	-0.08 (0.30)	-0.08 (0.30)	0.35 (0.24)
Italy	-0.18 (0.30)	0.13 (0.29)	-0.27 (0.27)	-0.27 (0.27)	0.01 (0.28)
Japan	-0.31 (0.27)	-0.25 (0.25)	0.23 (0.27)	-	0.23 (0.26)
U.K.	-0.51 (0.25)	-0.09 (0.28)	0.20 (0.25)	-	0.18 (0.28)

a elasticity

b e_m, e_M are respectively the minimum and maximum values of the elasticity

c all other firms including British manufacturers in this case

d change taking place in 1977 in France and the United Kingdom, and 1981 in Belgium

e square of the correlation coefficient between observed and predicted prices

f estimated first-order serial correlation coefficient

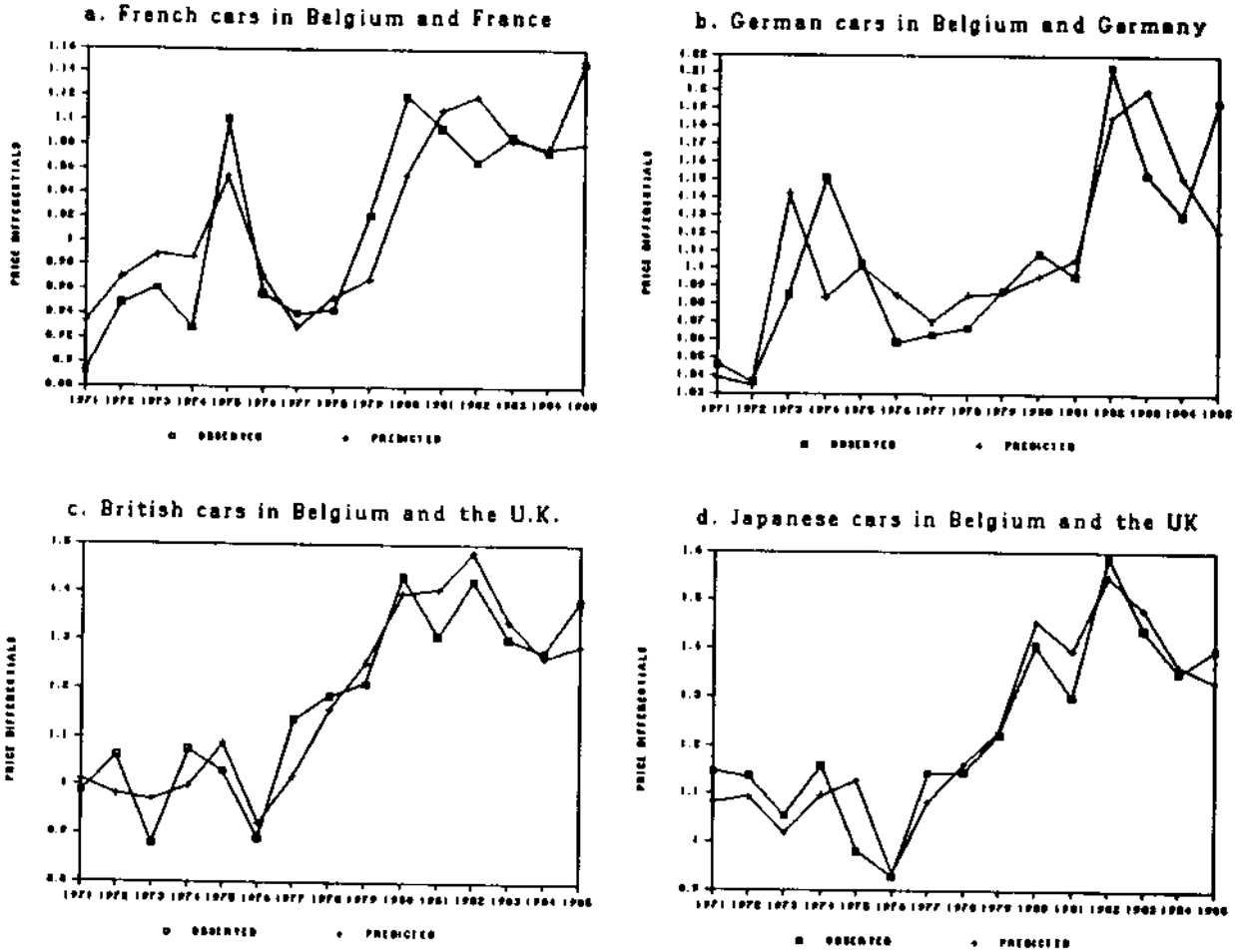
\- not included or meaningless

.. was found to be statistically insignificant and is dropped from final specification

Figure II reports some examples of the overall fit of the model. A detailed discussion is presented at the end of this section, where we draw attention to a number of respects in which the fit is less good.

Figure II : Observed and predicted differentials

reference market : Belgium



Speed of adjustment

Empirical findings show that car prices adjust only gradually to exogenous changes and a dynamic version of the model was therefore selected as 'preferred' specification. Speeds of adjustment vary considerably from one group of manufacturers to another. For example, in Belgium, German car prices adjust almost instantaneously, while the estimated mean lag for French car prices is close to 18 months. It can also be seen that substantial differences are observed across the four markets for

a given group of producers. This is an important point to notice since such differences across markets have a direct impact on price differentials.

French and German car prices tend to adjust more quickly in their home market than in their export markets[10]. The opposite conclusion holds however for British producers.

Price behaviour of domestic manufacturers

Domestic production costs, have a significant impact on domestic prices in France and Germany with an estimated elasticity less than unity. The average cost of imported cars was found to be small and statistically insignificant in both markets and is therefore not included in the final specification.

The British market contrasts sharply with the French and German ones. The impact of British production costs on British car prices is, in general, not significantly different from zero, while the average cost of imported cars has a significantly positive impact on British prices. At the same time, British costs do not influence imported car prices. This suggests that domestic car makers do not appear to have a dominant role in the United Kingdom, contrary to French and German producers in their respective home country.

We therefore decided to estimate a sligthly different model in the case of the British market; the price charged by each group of manufacturers was assumed to depend only on its own cost and on the average cost of all other producers (moreover the same values were imposed on both British and foreign manufacturers). Table II reports the estimation of this model which was chosen as preferred specification.

Price behaviour of importers

In three markets, Belgium, France and the United Kingdom, importers are found to adjust prices in response to changes in

---

10 Similarly, German producers tend to adjust rapidly in the Belgian market where they have, in fact, a dominant position.

their own costs. However, no significant effect shows up in Germany and in the three other cases, the elasticity is well below unity.

In Belgium, importers seem to respond to changes in their own production costs only. Indeed, the coefficient corresponding to the average cost of other importers is small, negative, and statistically insignificant. This variable is therefore not included in the final specification reported in table II.

French production costs have a large and positive impact on imported car prices in France. The average cost of other importers turns out to be positive but insignificant and is not included in the final specification.

The first specification for Germany includes the five usual groups of producers and leads to the conclusion that neither German nor own production costs seem to influence the pricing strategies of importers in Germany. The same conclusion holds for the average cost of other importers. The second specification, which excludes British and Japanese cars, shows however that French and Italian car makers tend to follow German production costs but to completely absorb fluctuations of their own production costs. In fact, British and Japanese car prices are roughly constant in real terms over the whole period. British producers have a very small market share in Germany, where they sell, on average, less than 10,000 cars a year. It is therefore plausible that their main objective is to remain present in the market and to avoid any further decrease of their market share. This could explain, for example, why British car prices did not increase in relative terms after 1977-1978, when Sterling began its revaluation vis-à-vis the DM. A plausible explanation of the Japanese price strategy might be their willingness to steadily increase their market share (cfr. figure I).

The case of the British market was in fact already discussed above. Importers were found to respond changes of their own costs and of the average cost of their competitors.

Impact of Japanese penetration in Belgium

Table II confirms that, ceteris paribus, Japanese penetration in Belgium pushed car prices down in real terms (the estimated impact over the period 1970-1985 is a decrease of 6 or 7%). No such effect is found in the three other markets, but this is unsurprising given that the impact of Japanese entry is much greater in Belgium than in the three other countries.

Impact of trade restrictions on Japanese and non-Japanese car prices

Trade restrictions have a substantial impact on Japanese car prices in Belgium, France, and the United Kingdom but no impact in Germany where the existence of voluntary export restraints is dubious anyway.

In all markets, a small positive impact on European car prices (between one third and one half of the impact estimated for Japanese cars) is found. This coefficient is significantly positive only in the case of the static model estimated for the United Kingdom. Once dynamic price adjustments are introduced, no such effect shows up.

Hence, it seems reasonable to conclude that competition among European producers has prevented any substantial increase of European car prices after the introduction of trade restrictions.

Goodness of fit of the model

Table II reports the goodness of fit of the final specification and it clear that it fits the data rather well in general except in four cases to which we now turn.

In Belgium, the model explains only 20 % of the variations of French and Italian car prices. In Germany, the model breaks down in the case of British and Japanese car prices. In all these cases, car prices are observed to remain more or less constant in real terms. In other words, it seems that these importers simply adjust prices to changes in the local general price level.

V. Decomposing the contributory factors underlying price differentials

The econometric model can now be used to identify the role played by real exchange rates, trade restrictions and other factors on the emergence of price differentials in the European car market. Two specific cases will be used to illustrate the mechanisms at work.

The factors explaining the price differentials observed for French cars between Belgium and France are examined first.

Figure III presents a decomposition of the differentials into a real exchange rate effect on the one hand, and residual effect including all other factors on the other hand.

The impact of exchange rates is identified as follows. All exogenous variables are maintained at their 1970 level, except real exchange rates, which are for each year, at their current level. The estimated price equations are then used to predict the differentials that would have been observed under such a set of assumptions. Figure III.a shows that the differential remains more or less constant until 1975-1976, when cars suddenly become cheaper in France than in Belgium because of a substantial devaluation of the French Franc vis-à-vis the Belgian Franc. The small price-cost elasticities and speed of adjustment estimated for French manufacturers in Belgium imply indeed that they do not fully adjust their Belgian prices to this exogenous shock. After 1977, the Belgian Franc depreciates progressively and leads in 1985 to a situation close to that observed in 1970. Under this set of assumptions, French cars would have been 13 % cheaper in France than in Belgium in 1977.

We now look at the impact of other exogenous factors, holding real exchange rates constant (figure III.b). Between 1970 and 1975, French cars become progressively more expensive in France than in Belgium. A jump of about 7 % then occurs between 1975 and 1976 and prices remain about 9 % higher in France than in Belgium. After 1981, a negative trend appears so that, by the end of 1985, prices are only 5 % higher in France.

The following mechanisms are driving these results[11] :

i) The intensification of competition in the Belgian market leads to a progressive decrease (in real terms) of Belgian car prices between 1970 and 1975 (the estimated impact on French car prices, ceteris paribus, is -6.0 %).

ii) This effect has to be combined with the pattern of French production costs and their differential impact on French and Belgian prices. As discussed in the previous section, in the absence of a real exchange rate effect, price differentials depend on differences in the price-cost elasticities and/or the speed of adjustment across markets. This can be seen from table II which shows that the long term price-cost elasticity is 0.40 in France but only 0.20 in Belgium, and that French car prices adjust moreover more rapidly in France than in Belgium.

If the two components are combined, an interesting observation emerges. At certain periods, real exchange rate fluctuations tend more or less to offset the impact of the other factors involved; at other periods, the two groups of factors operate in the same direction. This is why, for example, no significant differential is observed in 1976. Real exchange rates push the differential for French cars downwards, but, at the same time, French production costs and Japanese competition in Belgium push the differential in the opposite direction, as explained above. On the other hand, the reversal in the trend of real exchange rate leads to a substantial differential after 1980, when both groups of factors operate in the same direction.

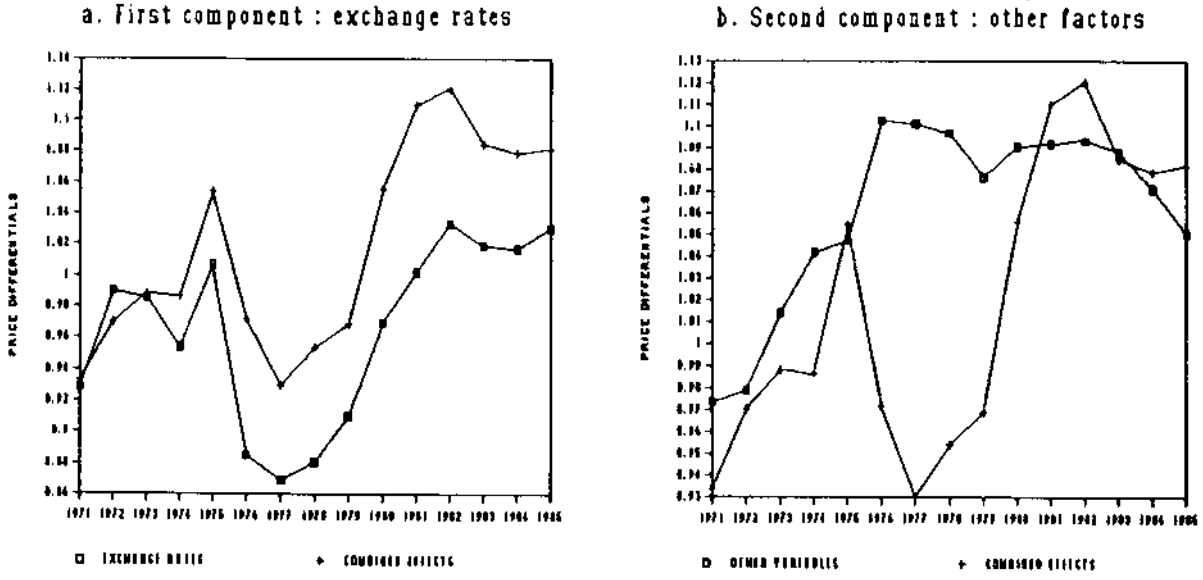
We now turn our attention to the factors explaining the price differentials observed for Japanese cars between Belgium and the United Kingdom. Figure IV presents a decomposition of the price differentials into a real exchange rate effect, a trade restrictions effect, and a residual effect.

---

11 Differences in tax rates between the two countries cannot account for the observed fluctuations of the differentials since they remain unchanged in both countries over the period 1971-1985 (apart from the introduction of a special tax levied on large cars in Belgium in 1981).

Figure III : Decomposition of the price differentials between Belgium and France: French cars

reference market : Belgium



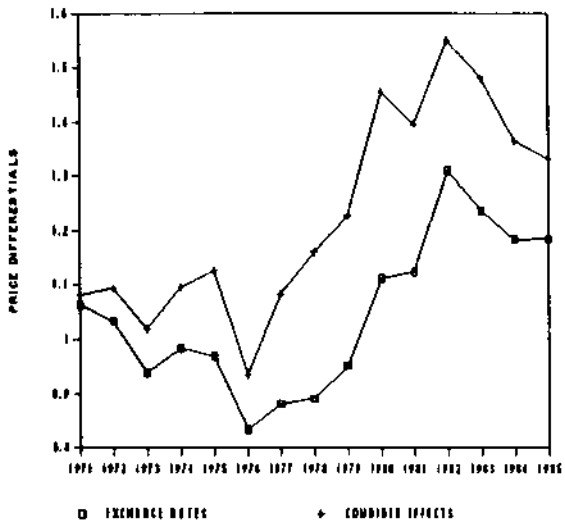
It is clear from figure IV.a that exchange rate fluctuations play a major, but partial, role in explaining the observed differentials for Japanese cars between Belgium and the United Kingdom[12]. Notice in particular the very large impact of real exchange rates, ceteris paribus, on price differentials between September 1978 and September 1982. The general price level increased by 63 % in the United Kingdom and by 32 % in Belgium over this period of 4 years. However, Sterling did not depreciate vis-à-vis the Belgian Franc, but rather appreciated by about 38 %. Moreover, Japanese producers adjusted prices only slowly and progressively to these exchange rates fluctuations therefore leading to the emergence of a differential between the two countries for identical cars.

12 The simulation is based on the assumption that all exogenous variables are at their 1970 level except real exchange rates which are for each year at their current level.

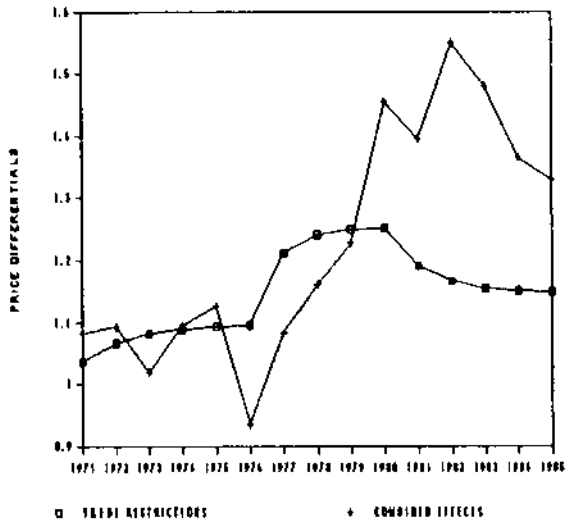
Figure IV : Decomposition of the price differential between Belgium and the United Kingdom: Japanese cars

reference market : Belgium

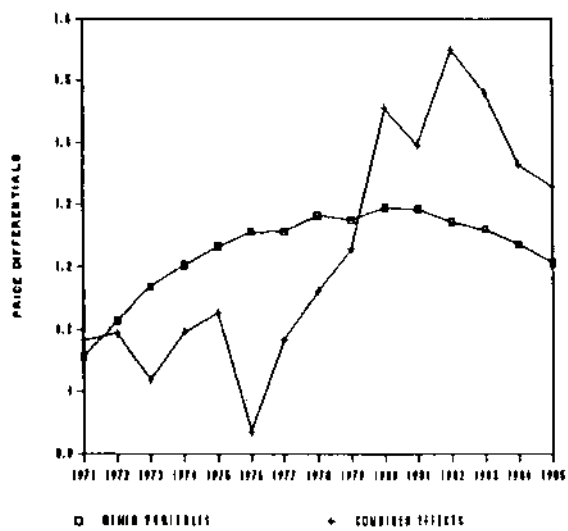
a. First component : exchange rates



b. Second component: trade restrictions



c. Third component : other factors



The existence of trade restrictions on Japanese imports is a second factor explaining the emergence of price differentials for Japanese cars as shown by the simulation reported in figure IV. b[13]. Japanese car prices become progressively more expensive in Britain than in Belgium after 1977 as Japanese producers adjust prices to the restraint they face in Britain. A movement in the opposite direction takes place after 1981 when Japanese car prices increase rapidly in Belgium.

Finally, the third component corresponds to the impact of the remaining exogenous variables[14]. This simulation captures the impact of the Japanese penetration strategy in the Belgian market in the early seventies as well as the effect of changes in unit (labour) production costs once the influence of real exchange rates is removed. As discussed in the previous section, such cost changes lead to price differentials because of differences in price-cost elasticities and speed of adjustment.

Figure IV illustrates clearly that the three components all play some role in explaining the observed price differentials. They push the differential upward over the period 1976-1982 and in the opposite direction thereafter.

VI. The pattern of market shares in the European car market

We now look at how the rise in Japanese imports and the introduction of trade restrictions impinged on the shares of non-Japanese producers, market by market.

Table III gives the distribution of new car registrations by country of origin for four selected years.

The rapid increase in Japanese market share in Belgium corresponds to a decrease of French, Italian and British imports. By

---

13 The simulation is based on the assumption that all variables are maintained at their 1970 level except the variables corresponding to trade restrictions in both countries which are for each year at their actual level.

14 In this simulation real exchange rates are maintained at their 1970 level and it is assumed that no trade restrictions exist on Japanese cars.

contrast, German manufacturers maintain their market share over the period 1970-1985. They increase it substantially after 1980 when the Japanese market share starts to fall.

The limitation of Japanese imports in France does not prevent a very significant reduction in the share of domestically produced cars. Again, German manufacturers increase their market share after 1980 when trade restrictions on Japanese imports become binding.

German manufacturers maintain their dominant position in their home country but Japanese cars progressively replace imports from other European countries.

Table III : Market shares by origin (selected years)

market	origin *	market share (%)			
		1970	1975	1980	1985
Belgium	Germany	36.6	30.6	34.2	41.8
	Japan	4.9	16.5	24.5	19.5
	other	58.5	52.9	41.3	38.7
France	France	80.2	79.7	76.9	63.4
	Germany	10.9	10.4	12.1	21.7
	Japan	0.2	1.6	2.9	3.0
	other	8.7	8.3	8.1	11.9
Germany	Germany	77.5	75.2	73.9	69.4
	Japan	0.1	1.7	10.4	13.3
	other	22.4	23.1	15.7	17.3
U.K.	U.K.	85.7	66.8	45.4	41.9
	Germany	5.1	6.0	18.1	23.6
	Japan	0.4	9.0	11.9	10.9
	other	8.8	18.2	24.6	23.6

* Cars are classified according to the country where they are actually manufactured and not according to the nationality of the manufacturer.

Table III shows clearly the well known decline of the British motor industry and the increasing share of cars imported from Germany.

A rather clear and consistent picture emerges from this discussion. German manufacturers gain market share in their export markets, especially when trade restrictions are imposed on Japanese cars. On the other hand, the tight restrictions imposed in France and the U.K. did not prevent the decline of their respective domestic industry.

VII. Summary and conclusions

We have estimated a simple oligopoly model, whose overall fit appears to be rather good; and we have noted a number of specific points in respect of which the fit is relatively poor. Our main focus of interest has been in using the model to present a decomposition of the factors determining price differentials into those associated with exchange rates fluctuations, those reflecting the impact of trade restrictions and those corresponding to other 'real' factors.

We have found a number of substantial differences in pricing behaviour across the four countries studied here.

In the case of the French and German markets, the prices of both domestically produced and imported cars depend crucially on local production cost in both markets. The Belgian market offers a completely different picture; car manufacturers seem to adjust only partially to changes in their own production costs but do not respond to changes in their rivals' production costs. The British market seems to lie between these two polar cases : firms respond to changes in their own unit production costs and to variations in their rivals' costs but the cost of British manufacturers does not seem to be the main determinant of all car prices as in France or in Germany.

In looking at the evolution of price differentials over time, we have found that the period under study divides naturally into two subperiods (before and after 1979-80). Over the first period, the two sources of differentials identified above work broadly in opposite directions, and the overall effect is one of

relatively narrow differentials. Over the second period, they work broadly in the same direction, leading to a widening of price differentials.

Finally, we have noted the impact of trade restrictions on the changing pattern of market shares in the European motor industry.

REFERENCES

Ashworth, M., J. Kay, and T. Sharpe, [1982], 'Differentials Between Car Prices in the UK and Belgium', London : The Institute for Fiscal Studies, Report series N°2.

BEUC, [1981], [1982], 'Rapport sur les Prix des Voitures et sur l'Importation Privée de Voitures dans les Pays de la CEE', Brussels : Bureau Européen des Unions de Consommateurs.

Cowling, K. and R. Sugden, [1984], 'Exchange Rate Adjustment and Oligopoly Pricing Behaviour', paper presented to the European Association for Research in Industrial Economics Conference, Fontainebleau.

Davidson, R., M. Dewatripont, V. Ginsburgh and M. Labbé, [1987], 'On the Welfare Effects of Anti-Discrimination Regulations in the EC Car Market', Centre d'Economie Mathématique et d'Econométrie, Université Libre de Bruxelles, mimeo.

Feenstra, R., [1984],'Voluntary Export Restraint in U.S. Autos, 1980-81 : Quality, Employment and Welfare Effects', in Robert E. Baldwin and Anne O. Krueger, eds., The Structure and Evolution of Recent U.S. Trade Policy, NBER, Chicago : University of Chicago Press.

Feenstra, R., [1985], 'Automobile Prices and Protection : The U.S.-Japan Trade Restraint', Journal of Policy Modelling, Spring 7(1), pp. 49-68.

Ginsburgh, V., B. MacLeod and S. Weber, [1987], 'Price Discrimination and Product Line Rivalry', Centre d'Economie Mathématique et d'Econométrie, Université Libre de Bruxelles, working paper 8717.

Ginsburgh, V. and G. Vanhamme, [1988], 'Price Discrimination in the EC Car Market : Some Further Results', Centre d'Economie Mathématique et d'Econométrie, Université Libre de Bruxelles, mimeo.

Griliches, Z. editor, [1971], Price Indexes and Quality Change, Cambridge : Harvard University Press.

Gual, J., [1988], 'An Econometric Analysis of Price Differentials in the EEC Automobile Market', Instituto de Estudios Superiores de la Empresa (IESE), Universidad de Navarra, mimeo

Kravis, I., Z. Kennessey, A. Heston and R. Summers, [1975], A System of International Comparisons of Gross Product and Purchasing Power, The John Hopkins University Press.

Lambson, V.E. and J.D. Richardson, [1987], 'Tacit Collusion and Voluntary Restraint Arrangements in the U.S. Auto Market', Department of Economics, University of Wisconsin.

Mertens, Y. and V. Ginsburgh, [1985], 'Product Differentiation and Price Discrimination in the European Community : The Case of Automobiles', Journal of Industrial Economics, 34, p.151-166.

Mertens, Y. [1988], Price Discrimination and the Effects of Trade Restrictions in the European Car Market, 1970-1985, Unpublished Ph.D. dissertation, The London School of Economics and Political Science.

Murfin, A., [1985], 'Price Discrimination and Tax Differences in the European Motor Industry', Center of Labour Economics, London School of Economics, working paper n°724.

Neven, D. and L. Phlips, [1985], 'Discriminating Oligopolists and Common Markets', Journal of Industrial Economics, 34, p. 133-150.

OECD, [1987], Structural Adjustment in Industry : Study of the Automobile Industry, Paris : OECD.

Roos, D., and A. Altshuler eds., [1984], The Future of the Automobile Program, George Allen and Unwin and MIT Press.

Appendix 1 : The 'No-Arbitrage' Assumption

The European car market is characterised by a high degree of geographical segmentation.The car makers use a number of strategies which have the effect of making arbitrage difficult or costly. The first step is to select exclusive and selective distribution contracts and the second step to prevent parallel imports i.e. imports from lower-price to higher-price markets outside the established distribution channels.

Article 85(1) of the Treaty of Rome prohibits restrictive agreements and concerted practices that are incompatible with the concept of a Common Market. Exemption is however possible in some cases under Article 85(3). Exclusive and selective distribution agreements in particular may benefit from such an exemption and are covered by Regulation 83/83 and 84/83.

The European motor industry benefits from such an exemption but territorial protection is not absolute however as confirmed by the BMW case in 1975[15]. The case made clear that the exemption did not authorise a manufacturer to prevent one of his dealers from selling to a foreign customer or to an agent acting on his behalf. Independent wholesalers do not belong to this category and were therefore not allowed to start buying in bulk in one country and resell in another, hence reducing considerably the scope for arbitrage across countries.

In december 1984, the Commission published a Regulation[16] (effective in July 1985) for block exemption[17] of selective distribution contract in the motor vehicle industry. Article 10 says that " The Commission may withdraw the benefit of this Regulation" (i.e. the exemption) in several instances, in particular "where, over a considerable period, prices or conditions

---

15 78/155 EEC: Commission Decision of 23 December 1977 Relating to a proceeding under Article 85 of the EEC Treaty (IV/29.146-BMW Belgium NV and BMW dealers) OJ L 046 17.02.78 p.33.

16 Commission Regulation (EEC) N° 123/85 of December 1984 on the Application of Article 85(3) of the treaty to certain categories of Motor Vehicle Agreements, OJ L 015 18.01.85 p.16.

17 i.e. an automatic exemption of all firms fulfilling the conditions imposed by the Commission.

of supply for contract goods or for corresponding goods are applied wich differ substantially as between Member States and such differences are chiefly due to obligations exempted by this Regulation". In such circumstances, independent wholesalers would, for the first time, be allowed to establish and purchase cars in bulk in one country to resell in another.

The first draft of this Regulation[18] published in 1983, in a context of large price differentials, stipulated that the exemption would be withdrawn if the recommended prices (list prices) of comparable cars diverged by more than 12 % for a period of more than six month or if delivery periods for comparable cars differed too much across Member States. However, countries with high tax rates (Denmark for instance) or those where price controls exist would not have been included in the comparison of prices. This so-called 12 per cent rule was eventually dropped from the final version under pressure from the motor industry and only appears, in a weaker form, in a notice describing the guidelines the Commission intend to adopt.

Overall, then, it seems that car makers were able to effectively segment the various national markets over the period 1970-1985.

---

18 Draft Commission Regulation on the Application of Article 85(3) of the Treaty to Certain Categories of Motor Vehicle Distribution and Servicing Agreements, OJ C 162 24.6.83 p.2.

Appendix 2 : Description of the data set

Data on prices, technical characteristics and number of new car registrations have been collected for all major models sold in Belgium, France, Germany and the United Kingdom over the period 1970-1985. For each model included in the data set, we attempted to select the most typical version for which price and technical characteristics were collected.

The following items are available for each car included in the data set, (i) list price (in local currency), (ii) engine capacity (cc), (iii) power (kw DIN), (iv) 5 speed/automatic (dummy), (v) brake system (drum/drum, drum/disc, disc/disc), (vi) weight (kg), (vii) length (cm), (viii) width (cm), (ix) maximum speed (km/h), (x) diesel/petrol (dummy), (xi) body style (saloon, coupe,...).

Data on prices and characteristics were collected from various magazines : Belgique Automobile and Le Moniteur de l'Automobile (Belgium), L'Auto Journal and Science et Vie, spécial salon (France), Auto Moto und Sport and Auto Zeitung (Germany), What Car ?, Motor and Autocar (U.K.).

Labour cost data are based on series of average hourly earnings published by Eurostat for France, Italy, Germany and the U.K. and from the Ministry of Labour (Monthly Labour Statistics Investigation reports) for Japan. It would have been more accurate to use of hourly compensation of production workers in the motor industry. Such series are estimated by the U.S. Department of Labour, Bureau of Labour Statistics (Office of Productivity and Technology) but begin in 1975 only and therefore do not cover the whole period 1970-1985.

Employment data in the automobile industry have been supplied by the national trade associations for European manufacturers and come from the Labour Statistics Investigation Reports mentioned above in the case of Japan.

Annual production data of passenger cars and commercial vehicles come from various issues of L'Automobile dans le Monde published by the trade association Fabrimetal, Brussels.