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Structural estimation of price adjustment costs in the European car market☆

Carlos Noton

Center for Applied Economics, Department of Industrial Engineering, University of Chile, Beauchef 851, Santiago, Chile

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ABSTRACT

This paper characterizes the price adjustment costs that are consistent with observed price dynamics in the European car market. We estimate a dynamic model of international multiproduct firms that set prices in different currencies while facing price adjustment costs. We find that large price adjustment costs are not needed to rationalize the substantial degree of price inertia we observe in the data. Intuitively, since GDP, wages and exchange rates exhibit such a large degree of autocorrelation, small adjustment costs can explain very persistent prices. Also, accounting for country-specific price sensitivity, wages, GDP and exchange rates, the price adjustment costs should differ substantially across producers and markets to match the data.

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E-mail addresses: cnoton@dii.uchile.cl, cnoton@gmail.com

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1. Introduction

The source of the widely documented price rigidities observed in the data is a subject of ongoing debate in economics. The implications of rigid prices for resource allocation and the causes of business cycles depend critically on the mechanism generating sluggish price adjustment. There are two competing hypotheses on this issue. The first hypothesis is that price rigidity is caused by a costly adjustment. The second hypothesis is that the persistent economic environment is the cause of sticky prices despite a costless re-pricing. Disentangling these two hypotheses is problematic because it is difficult to jointly identify environmental dynamics and the cost structure of the firms.

In order to shed light on the relative weight of each source of price inertia, we suggest a new approach to characterize price adjustment costs while accounting for the persistent economic environment. In particular, we estimate a dynamic game of the European car manufacturers setting prices under price adjustment costs and persistent state variables such as the exchange rates, GDP and wages.

Although the European car markets impose many difficulties to our structural estimation of price adjustment costs – and certainly we will require simplifications – we think these markets fit nicely into this study for three reasons. First, there is a remarkable price autocorrelation as presented in Table 1. Second, key economic variables as wages, exchange rates and GDP are very persistent over time in each market. Third, several currencies had large and persistent changes in relative terms between 1970 and 1999, ensuring a proper exogenous variation to study pricing dynamics.

We identify price adjustment costs using the methodology developed by Bajari et al. (2007) (henceforth BBL). In our case, the BBL estimator follows the intuitive idea of finding the cost structure consistent with observed pricing behavior. Namely, we observe pricing behavior for each player in different markets while facing different paths of wages, GDP and exchange rates. We search over the structural cost parameters that support the

Table 1
Price autocorrelation in the European car market.

	Markets					
Producers	Belgium	France	Germany	Italy	UK	Average
American	979	1001	993	999	977	990
French	1004	1003	1008	1001	995	1002
German	986	984	993	988	477	885
Italian	986	989	989	994	1003	992
British	990	987	972	992	969	982
Japanese	992	949	968	1004	995	982
Average	989	985	987	996	903	972

Notes: The figures correspond to the OLS estimates of the lagged price coefficient, $\widehat{\alpha}$, in the linear regression $\ln(p_{it}) = \alpha \ln(p_{it-1}) + d_t + \epsilon_{it}$, where p_{it} is the nominal price of model i at year t in each market-manufacturer combination; d_t is a year fixed effect and ϵ_{it} is a mean zero and homoscedastic random shock. All estimates are significant at the 1% level.