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# A macroeconomic model of international price discrimination

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## Abstract

This paper builds a baseline two-country model of real and monetary transmission in the presence of optimal international price discrimination by firms. Distributing traded goods to consumers requires nontradables, making the price elasticity of demand country-specific and a function of the exchange rate. Profit-maximizing monopolistic firms drive a wedge between prices across countries, optimally dampening the response of import and consumer prices to exchange-rate movements. We derive general equilibrium expressions for the pass-through into import and consumer prices, tracing the differential impact of real and monetary shocks on marginal cost and markup fluctuations through the exchange rate.

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## 1. Introduction

Cross-border price differentials are one of the most apparent manifestations that the world economy remains strikingly segmented along national boundaries. A large body of empirical work weighs in against the proposition that goods–market arbitrage is quick and effective in eliminating international price discrepancies for most types of tradable goods and services.<sup>1</sup> In particular, prices seem to respond only mildly, if at all, to changes in the nominal exchange rate. Exchange rate pass-through, quite low for consumer prices, is far from complete also for international prices, not only in the short run.<sup>2</sup> On the one hand, incomplete exchange rate pass-through is due to destination-specific markup adjustment by firms—which is possible because of market segmentation and may reflect ‘pricing-to-market’ (henceforth PTM) by firms.<sup>3</sup> With PTM, high exchange rate volatility implies that buyers across national markets face systematic differences in the prices of identical goods—when expressed in the same currency.<sup>4</sup> On the other hand, differences in consumer prices are also due to local currency price stability resulting from the presence of local components in marginal costs, particularly distribution services, which are known to be a significant portion of the retail price of tradables.

This paper introduces endogenous PTM and incomplete pass-through into a general equilibrium open-economy model. To facilitate comparison with the literature, we build on the analytical framework of Corsetti and Pesenti (2001a,b) and Obstfeld and Rogoff (1996, 2000). In our model, upstream firms with monopoly power sell tradables to competitive retailers situated in different locations. Because of local-input-intensive distribution services, the elasticity of demand differs across markets for the same good. This way of modelling vertical interaction among firms located in different markets yields several novel results, helping to qualitatively reconcile theoretical predictions with key stylized facts of the international economy.

First, deviations from the law of one price at both wholesale and retail level in our model derive *endogenously* from optimal pricing by monopolistic firms. We characterize optimal price discrimination under the constraint that prices should not provide opportunities for arbitrage across wholesalers and retailers in different market locations. Second, because of optimal cross-border price discrimination, exchange rate pass-through

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<sup>1</sup> See Rogoff (1996) for an excellent survey on the evidence of the failure of the law of one price. Although this law also fails to hold within national boundaries, the deviations are much more dramatic at the international level—which has led some researchers to posit a specific ‘border effect’ (i.e., the effect of switching currencies across jurisdictions) on the prices of tradables (see Engel and Rogers (1996)).

<sup>2</sup> According to the evidence surveyed by Goldberg and Knetter (1997), 1/2 is the median fraction by which exporters to the US offset a dollar appreciation by lowering their export prices after 1 year; for other industrialized countries this fraction appears to be somewhat higher, but lower than 1 (e.g., see Campa and Goldberg (2004)).

<sup>3</sup> Krugman (1987) labeled the phenomenon of exchange-rate-induced price discrimination ‘pricing-to-market.’ Overall, the average degree of pricing-to-market found by Marston’s (1990) classic study of Japanese industries is in the neighborhood of 50%. Similar findings are in Knetter (1989, 1993) and Gagnon and Knetter (1995), for Germany and the US.

<sup>4</sup> In his analysis of US exchange rate movements, using both consumer and producer price indexes, Engel (1999) finds that a great deal of the amount of deviations from purchasing power parity is due to a failure of the law of one price for internationally traded goods.

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