



# When is a lower exchange rate pass-through associated with greater exchange rate exposure?

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## Abstract

We study the relationship between exchange rate pass-through (how exchange rates affect import prices) and exchange rate exposure (how exchange rates affect profits) under flexible prices. We note that the convexity of costs is an important determinant of both pass-through and exposure, and that an increase in the convexity of costs typically reduces both pass-through and exposure. Hence, the correlation between pass-through and exposure should be positive across industries if cost functions differ across industries. This effect can be mitigated by the negative correlation between pass-through and exposure induced by changes in the price elasticity of demand.

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## 1. Introduction

Microeconomic theory tells us that exchange rate fluctuations affect the pricing and output decisions of exporting firms, and hence also their profits. The pass-through of exchange rate changes into import prices, as well as the effect of exchange rate fluctuations on the value of the firm are two closely related topics, yet only one previous paper study their relationship

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in a theoretical model, namely Bodnar et al. (2002).<sup>1</sup> They set up a duopoly model with an exporting firm and an import competing foreign firm, and show that exchange rate pass-through and exposure should be negatively correlated across industries.<sup>2</sup> The intuition for their result is that when the substitutability between the domestically produced good and the imported good increases in an industry (which in effect increases the price elasticity of demand for the firms) both firms have greater incentives to stabilize prices, and hence exchange rate pass-through falls. Profits on the other hand become more sensitive to exchange rate changes, so exposure increases. If industries differ mainly in the substitutability between domestically produced and imported goods, one should therefore see a negative relationship between exchange rate pass-through and exposure across industries.

Bodnar et al. test their model on Japanese data and are capable of explaining some, but not all of the features of the data. In particular, the estimated pass-through and exposure coefficients do not vary as predictably across industries as their theoretical analysis suggests. This is not surprising and does not constitute a critique of the paper itself. First, since the authors only examine eight different industries, the scope for a cross-sectional empirical analysis is limited. Second, in the industrial organization literature, the problems in carrying out empirical inter-industry studies of relations among market structure and firm behavior and performance (commonly referred to as structure—conduct—performance analysis) are well known.<sup>3</sup> Individual industries differ to such a large extent that observable industry characteristics may not be sufficient to explain industry conduct and/or performance. In the case of exchange rate pass-through and exposure, there are many factors besides product substitutability that may vary substantially across industries, and also affect both exchange rate pass-through and exchange rate exposure.

In this paper we study how variation on the supply side across industries will affect the relationship between pass-through and exposure. Nonlinearities in costs act as an incentive for firms to stabilize demand, and hence prices. Since pricing affects profitability, we argue that it is important to allow for the possibility of nonlinearities in the cost function when studying the relationship between exchange rate pass-through and exposure across industries. This is especially so since the degree of scale economies, especially in the short-run, can differ across industries due to for example different labor intensities in production.

We introduce a convex cost function and study the effects of changing the convexity of costs. We do this both in a simple model of monopolistic competition as well as in the oligopoly models used by Bodnar et al. (2002). We find that increasing the convexity of costs reduces both exchange rate pass-through and exposure, both in the case of monopolistic competition as well as in the duopoly price and quantity models. The conclusion is thus that if industries differ mainly on the supply side, this implies a positive correlation between pass-through and exposure. We find that allowing for non-constant marginal costs, the model also fits the data better, both with respect to the estimated elasticities, and their correlation across industries.

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<sup>1</sup> For a nice survey of studies on exchange rate pass-through, see Pollard and Coughlin (2003). The literature on exchange rate exposure is vast. Previous theoretical papers include, to name a few, the seminal work by Adler and Dumas (1984), Levi (1994), and Marston (2001). Empirical papers include Jorion (1990), Ahimud (1994), Campa and Goldberg (1999), He and Ng (1998), Griffin and Stulz (2001), and lately Dominguez and Tesar (2006).

<sup>2</sup> Other theoretical models of exchange rate exposure in an oligopoly setting include Von Ungern-Sternberg and von Weizsacker (1990) and lately Friberg and Ganslandt (in press) who simulate exchange rate exposure for firms in the Swedish bottled water market.

<sup>3</sup> See for example Schmalensee (1989) for a discussion on this topic.

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