



# Regime-dependent exchange-rate pass-through to import prices



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## ABSTRACT

This paper investigates departures from linearity in the exchange rate pass-through (ERPT) to import prices of six major economies by using a logistic smooth transition pass-through (LSTP) regression. The analysis of LSTP regressions provides the following new insights into the dynamic features of ERPT: (i) There is strong evidence for the presence of smooth transition type threshold effects in the ERPT. The identified threshold dynamics reveals the existence of two extreme regimes, one with “low” and another with “high” pass-through. (ii) Both the short-run and the long-run pass-through estimates exhibit variation across these extreme regimes and in the long-run, pass-through tends to be complete in the “high” pass-through regime and low, but, incomplete in the “low” pass-through regime. (iii) Import price elasticities are asymmetric, as such, the same 1% depreciation of the currency is not associated with the same degree of ERPT across regimes. (iv) Temporal behavior of ERPT for a given country is generally similar across local currency appreciation and inflation rate-driven episodes. On the other hand, there is considerable variation across countries in the speed of the transitions and the estimated thresholds under each transition variable. These findings may explain why the linear ERPT literature might have obtained mixed results on the degree of ERPT across countries and sample periods used.

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## 1. Introduction

One of the central questions in international finance is the degree of exchange rate changes that are passed-through to import and consumer prices. This question has generated a large body of research. Findings of the extant literature suggest limited sensitivity of prices to exchange rate movements and considerable variation in the estimated elasticities over various sampling periods and countries (see, Bailliu & Bouakez, 2004; Bailliu & Fujii, 2004; Busière, Chiaie, & Peltonen, *in press*; Campa & Goldberg, 2005; Gagnon & Ihrig, 2001; Goldberg & Knetter, 1997). Recent studies also provide evidence that suggests a decline in exchange rate pass-through (ERPT) to import prices during 1990s and early 2000s in some industrialized countries (Bouakez & Rebei, 2008; Campa & Goldberg, 2005; Goldberg & Campa, 2010; Gust, Leduc, & Vigfusson, 2006).

With the exception of a few recent papers, the extant empirical literature on ERPT relied heavily on linearity of the relationship between import prices and exchange rates and therefore, used linear regressions to test the presence of pass-through to import prices. Obviously, linearity in ERPT implies that import prices react the same way to “small” and “big” changes in the exchange rate and the response as well as its degree do not depend on economically relevant episodes or regimes. Despite their simplicity, linear regressions are limited in providing important insights into our understanding of the ERPT when the relationship between prices and exchange rates involves relatively complex dynamic features. Therefore, this paper aims to evaluate departures from linearity in ERPT to import prices. To this end, the paper uses a nonlinear ERPT regression called Logistic Smooth Transition Pass-through (LSTP) regression. This

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new model allows us to investigate rigorously whether import price elasticities show variation across regimes which are driven by the sign and size of the deviation of observable economic variables from statistically identifiable threshold levels. By utilizing the LSTP framework, this paper contributes to the empirical ERPT literature by providing the following four core insights into the nonlinear dynamics of ERPT to import prices in six major economies, including Australia, Canada, Germany, Japan, the UK and the USA.

First, the analysis in the paper establishes strong statistical evidence for the presence of smooth transition type threshold effects in the ERPT to import prices over the floating period. By using the past (average) exchange rate appreciation and the inflation rates of the importing country as transition variables in the LSTP regressions, we identify the presence of two extreme regimes; one with “incomplete” (or “weak”) and another with “complete” pass-through, depending on the direction and the size of the deviation of each transition variable from the estimated respective threshold levels. These nonlinear dynamic results are especially pronounced for the US, Japan, Germany, Canada, and the UK.

Second, both the short-run and the long-run pass-through estimates exhibit variation over episodes of appreciation/depreciation and over inflation/disinflation. For majority of the countries, pass-throughs are not statistically different from one in the “high pass-through” regime. In contrast, in the “low pass-through” regime, measures are considerably low and far from being complete and most often are found to be statistically insignificant. We report strong statistical evidence that show stark differences in ERPT estimates across these extreme regimes.

Third, import price elasticities show asymmetric dynamics, as such, a 1% depreciation of the importing country's currency is associated with different degrees of ERPT depending on the direction and size of the deviations of transition variables used in the paper from the estimated threshold levels. This implies that not all 1% depreciations are the same in terms of pass-through dynamics. While a 1% depreciation of the currency may fully passed into import prices during the “high” pass-through episodes, the same 1% depreciation may not induce large enough response or any economically meaningful response in import prices during “low” pass-through periods.

Fourth, despite some differences in the frequency and timing of switches between the extreme pass-through regimes, import price elasticities generally have similar temporal dynamics for a given country over exchange rate- and inflation rate-driven transition episodes. Countries in our sample, however, differ in terms of both estimated threshold levels and the speed of transitions between “low” and “high” pass-through regimes. Estimated threshold levels range between 1.993% (for Australia) and 6.317% (for Japan) with slope of the transition functions between 2.723 (for the USA) and 8.380 (for Australia) with the past exchange rate changes as the transition variable. Similarly, estimated threshold levels fall between 0.363% (for Canada) and 4.413% (for the USA) with the speed of adjustment parameter ranging between 3.079 (for Japan) and 7.860 (for Australia) under the inflation rate as the transition variable.

A natural question is, why do ERPT to import prices displays the smooth transition type threshold dynamics as found in this paper? Is there a theoretical framework supporting this type of nonlinear and asymmetric dynamics? A review of the theoretical literature shows that the presence of menu cost price adjustment, differences in market structure and demand curves, presence of hysteresis in trade, productivity differences among importing/exporting firms, strategic interactions, and the stance of monetary policy environment can lead to nonlinear and asymmetric responses in price to exchange rate changes.<sup>1</sup> A partial list of studies that point nonlinear dynamics in ERPT includes Dornbusch (1987), Krugman (1987), Baldwin (1988), Knetter (1989), Froot and Klemperer (1989), Dixit (1989), Kasa (1992), Knetter (1991, 1993), Kogut and Kulatilaka (1994), Bergin and Feenstra (2001), Atkeson and Burstein (2008), Berman, Martin, and Mayer (2012), Sanyal and Jones (1982), Taylor (2000), Corsetti and Dedola (2008), Devereux and Yetman (2010), and Shintani, Terada-Hagiwara, and Yabu (2013).<sup>2</sup> Although these studies do not directly imply the very specific nonlinear and asymmetric dynamics reported in this paper, they provide insights into why threshold effects and asymmetric responses are relevant and important for ERPT. Therefore, results from our empirical nonlinear model, at a general level, are consistent with the implications of the theoretical studies.

We should note also that our findings reveal the rather complex features of the link between import prices and exchange rates while providing useful insights into the ERPT dynamics. For example, the finding that the degree of ERPT depends on the past deviations of exchange rate changes and inflation rate from threshold levels is generally consistent with pricing to market and menu cost of price adjustment. The result implies that, on average, exporters and importers care about their market share as they tend to offset a fraction of changes in exchange rates and the degree of aggregate response of import prices varies with the magnitude of past appreciation and inflation rate in a nonlinear fashion. Moreover, the variation in the degree of ERPT over inflationary and disinflationary episodes may suggest that as local costs (as measured by the importing country's inflation) increase, importing firms gain some competitive advantage. This in turn may make these firms to worry relatively less about their market share, and the price adjustment costs. Therefore, their preponderance to pass exchange rate shocks to prices tend to increase. Overall, estimation and test results reported in the paper may also reconcile the mixed empirical evidence on the low or lack of ERPT and variability in the degree of pass-through over countries and sampling periods used in the previous studies. For example, the decline in the pass-through during the late 1980s and most of the 1990s to import prices might be

<sup>1</sup> For example, in the presence of menu costs of price adjustment, exchange rate shocks that do not exceed a certain threshold level may be only partially passed or not passed at all. See, Section 2 and references therein and Busière (2012) who provides an excellent review of the literature on nonlinearity and convexities in ERPT.

<sup>2</sup> Shintani et al. (2013) is the only study that implies smooth transition type nonlinear dynamics in ERPT which, strictly speaking, is different from the nonlinear dynamics modeled under LSTP regressions in this paper. See, Shintani et al. (2013) for details and the estimated exponential smooth transition autoregressive (STAR) models to evaluate the implications of their theoretical model.

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