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Comparative Analysis of Exchange Rate Pass Through in Large vs. Small Open Economies

By

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Abstract

Exchange Rate Pass Through (ERPT) is the percentage change in a destination country’s import price given a percentage change in the exchange rate. A complete ERPT occurs when import price decreases by the same percentage as the depreciation of the exporting country’s currency and vice versa. In this paper I analyze ERPT in large and small open economies, and hypothesize that as destination economy size gets larger, ERPT will decrease. Reasons I provide to support this hypothesis are: the import share of exporters in destination economies, the demand elasticity that foreign exporters face, and the proportion of consumer demand to world demand that the foreign exporter faces. I find, with statistical significance, that ERPT decreases as the destination economy size increases. The main reason attributed to this inverse relationship is the import share of foreign exporters in destination economies. As import share of the foreign exporter increases, ERPT increases within those destination economies. Since foreign exporters have a higher chance of establishing a large import share in small economies than in large economies, they have a better chance of passing through exchange rate changes into destination country prices.
I. Introduction

A common concern about large fluctuations in exchange rates is its adverse implications for export dependent economies and import dependent economies. There have been many large fluctuations in the exchange rates post-Bretton Woods and a question of interest is: what is the behavior of an exporting firm when the exchange rate fluctuates in its favor and vice versa? If an exporting country’s exchange rate appreciates, how much of the exchange rate increase would the exporting firm allow to flow into prices? A recent article in the Wall Street Journal depicts this statement very clearly. India’s Rupee has appreciated 4.6% against the US Dollar since August 1st, 2010, and this has influenced Indian basmati rice exporters to think about whether they should reduce quantity, increase prices, both, or just drop out of the market. India is the world’s largest basmati grower and exporter, and the basmati exporters have decided to reduce exports in the US to between 5% and 7% for the 2011 fiscal year. Currently, basmati exports have been sold for $900, and it has been reported that new contracts have been signed for $1,050-$1,100.

Exchange Rate Pass Through (ERPT) is the percentage change in the destination country’s import price given a percentage change in the exchange rate. A complete ERPT occurs when import prices change by the same percentage as the exchange rate, or the exchange rate change completely passes into the import price. An incomplete or partial ERPT is when import prices don’t change or change by less than the percentage change in exchange rate.

ERPT is very interesting in reference to a firm’s action when the exchange rate changes. In a perfect world, Law of One Price (LOP) should hold. LOP states that a good in one country (say the US) should have the same price as a good in another country (say the EU) after the price is adjusted for the exchange rate.
So for example, say a piece of candy in the EU costs €1, then that same piece of candy should cost $1.50 in the US, if the exchange rate is 1.50$/€. If the Euro appreciates to 1.60$/€, then the price of that piece of candy should also increase to $1.60, this would be a complete ERPT and LOP holds. However, if the price of the candy does not change or increases to $1.53 instead of $1.60, LOP fails, and this would be an incomplete or partial ERPT.

Thus if LOP were to hold and the exchange rate fluctuates, prices should also fluctuate by the same amount. This, however, is sometimes not the case. Since the 1980’s many empirical studies (Campa et al. 2004, Ihrig et al. 2006, Xu et al. 1999) show that LOP does not hold, especially in the short to medium term. Economists have studied why LOP doesn’t hold, and it essentially boils down to industrial organization and price discrimination in segmented markets. One large determinant of ERPT is the destination country’s market structure. Dornbusch (1987) concluded that incomplete pass through arises when firms trade into imperfectly competitive markets, and adjust their mark-ups to changes in exchange rates. This conclusion is highly regarded in other literature and many economists seem to think that the market structure is the reason for incomplete pass through. Trading into perfectly competitive markets where foreign firms are price takers, foreign firms will keep prices fixed despite changes in the exchange rates, and trading into imperfectly competitive markets where firms can establish market power, foreign firms will change mark-up and prices to buffer the loss it might encounter when the exchange rate does not change in its favor. Thus because large open markets tend to be competitive, and small open markets tend to be imperfectly competitive, large countries will have a complete ERPT, while small countries will have an incomplete ERPT.

Although Dornbusch’s intuition is sound, there is one more thing to consider: the variation in import share for exporters. Moving from small to large import share would make the
opposite of Dornbusch’s argument true – in perfectly competitive markets, ERPT will be weaker than the pass through in imperfectly competitive markets; so large countries (like the US) will have a weaker ERPT than smaller countries (like Singapore). I believe this is the case because firms practice a strategy called Pricing-to-Market (PTM). PTM states that exporting firms change mark-ups in destination countries in response to changes in the exchange rate. However, PTM is not the same across every industry; it depends on the demand that the foreign firms face. According to Knetter (1992), sellers reduce mark-up to buyers whose currency has depreciated against the seller. So if a foreign firm is trading into a large, competitive economy, this firm will be competing against other foreign firms as well as domestic (local) firms. This foreign firm will have a small market share to begin with and possibly face an elastic demand curve. If this firm’s exchange rate appreciates the price of its good in this large, competitive market will increase. As the price rises the firm will lose market share for its good (since demand is very elastic). Thus the firm will reduce prices to keep market share up or Price-to-Market. This essentially is incomplete or partial ERPT. Now if a foreign firm is trading into an imperfectly competitive market and the firm’s exchange rate appreciates, it will allow its price to rise and keep it there; because I assume that this firm will have market power and a large market share. Thus this would lead to a complete ERPT.

This paper’s main argument or main hypothesis, Hypothesis #1, is that as destination economy size gets smaller, ERPT will increase. The corollary is that as destination economy size gets larger, ERPT will decrease. There are three main arguments or hypotheses that support my overall hypothesis. They are as follows:

Hypothesis #2: Given two economies, one is a large open economy and one is a small open economy. In both economies the foreign exporter faces the same demand curve, however
the foreign firm exporting into the large economy has a small market share and the foreign firm exporting into the small economy has a large market share. Given these assumptions, the large open economy will have a weaker ERPT. The corollary to this is that the small open economy will have a stronger ERPT. I believe this is true because firms with a small market share (typically ones trading into large economies) will have to maintain market share in the destination economy and thus practice pricing-to-market.

**Hypothesis #3:** In a large open economy, where there are many substitutes, the foreign exporter faces a relatively elastic demand curve and in a small open economy, where there is no competition, the foreign exporter faces a relatively inelastic demand curve. Given these assumptions, there will be a weaker ERPT in the large open economy. The corollary to this is that there will be a stronger ERPT in the small open economy. Again, pricing-to-market will be practiced in the large destination economy to counter-act the affect an appreciation would have on prices.

**Hypothesis #4:** There will be a weaker ERPT in a large open economy where consumer demand is a large share of world demand. If a depreciation causes the exporters price to fall, demand for that good will increase, therefore increasing world demand. The increase in world demand will increase the price in the destination economy, off-setting the exchange rate change.

This paper is divided into six other sections. Section two is the Literature Review, which will discuss other research done within this study’s topic. Section three will provide a breakdown of each hypothesis. Some theoretical equations will be explained in section four. Section five will provide a brief description of the data and empirical models being used. Section six will summarize the estimation results, and finally section seven will conclude.
II. Literature Review

Pricing to Market

Krugman (1986) was the first to analyze this strategy called Pricing-to-Market. He said that a foreign firm could either fully pass through the change in the exchange rate or the firm can absorb the change using mark-ups and changing the profit margin. Krugman stated that a main goal of a foreign exporting firm is to maintain prices in the destination markets. Thus if the foreign firm’s currency appreciates this firm’s price in the destination market would increase. That firm will then reduce mark-ups in order to keep prices down and maintain price stability.

Gagnon and Knetter (1992) did an empirical analysis on pricing-to-market using the automobile market. The study analyzed three countries: US, Germany, and Japan. They concluded that Japan’s automobile exports had a high degree of mark-up adjustment to maintain price stability, while there was weak evidence supporting mark-up adjustment in Germany and US. Gagnon and Knetter hypothesized many reasons for this result, but the one that stuck out was that at that time, Japanese exporters provided many low cost vehicles to their destination markets. Within those destination markets these Japanese exporters faced many competitors providing low cost automobiles. So when the Yen appreciated, Japanese automobile exporting firms reduced mark-up to keep prices stable.

Another study by Knetter (1992) stated that more competition (meaning smaller market share) leads to more price discipline, so adding competitors will increase PTM observations. Knetter did not find any evidence of PTM behavior by the United States which is a large open economy.
These studies conclude that increased competition leads to more price stability and pricing-to-market. Large economies, like that of the US, tend to have more competition between firms than small economies. Thus one would observe more pricing-to-market by exporters into large economies like the US.

*Market Share*

Froot and Klemperer (1989) created a model to test whether market share is a consideration of firms when the exchange rate fluctuates. They found that foreign firms price more aggressively in their exporting market, in an attempt to gain market share, when it is expected that the domestic currency will appreciate.

Feenstra, Gagnon, and Knetter (1996) empirically analyzed market share and exchange rate pass through using the world automobile market. They tried to show that ERPT should be high for exporters in a country with a very large share of total destination market sales. They concluded that the relationship between pass-through and market share is non-linear. Specifically they found that pass-through is lowest when market share is around 45% and it is highest when the country’s market share reaches 100%.

Another measure of market share is market power. Xu and Bernhofen (1999) analyzed exchange rates and market power using the petrochemical industry. They looked at the behavior of firms exporting their petrochemicals into the US. They concluded that German and Japanese petrochemical firms exercised statistically significant market power during the time period analyzed, and it led to an incomplete pass-through.

Thus with increased competition, market share of importers would fall. Small market share increases the likelihood of pricing-to-market, and pricing-to-market reduces ERPT.
Market Competition and Product Substitutability

Dornbusch (1987) used a series of industrial organization models, specifically the Cournot Competition model, and concluded that ERPT becomes smaller as number of substitutes drop and the industry becomes less competitive.

Contrary to Dornbusch’s paper, Kim et al. (2003) looked at market competitiveness and ERPT. They looked at three different wheat exporting countries: US, Canada, and Australia, and two importing countries: Japan and Korea. Both Japan and Korea are extremely dependent on wheat imports, however Japan produces 10% of wheat domestically and regulates the industry, while Korea has no domestic production and no regulation. Kim concluded that in Japan, which is very competitive, there was close to zero degree of ERPT, but in Korea, which has a less competitive market, had a higher degree of ERPT.

Large Economy Analysis

Campa and Goldberg (2005) use cross-country and time series data on ERPT into import prices of twenty-three OECD countries. Their study found partial pass-through in the short-run and higher pass-through in the long run. They attributed this difference to producer currency pricing\(^1\) in the long run. In addition, the variation seen across the different OCED countries can be explained by the volatility in monetary aggregates and exchange rates.

Another study by Ihrig, Marazzi, and Rothenberg (2006) examined the decline of the ERPT into import prices and consumer prices using the G7 countries. The study found that a 10 percent depreciation of local currency would have increased import prices by nearly 7 percent on

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\(^1\) Producer Currency Pricing (PCP) is when a producer selling in a foreign market has the price of the good rigid in his/her home currency. In theory this should make ERPT into import prices complete.
average across these countries in the late 1970s and 1980s, however in the last 15 years a 10 percent depreciation would have increased import prices by 4 percent. Respectively, a 10 percent depreciation in local currency would have increased consumer prices by 2 percent on average in the late 1970s and 1980s, yet same amount of depreciation in the last 15 years would have had a neutral effect on consumer prices. Essentially ERPT has become weaker over the years.

Small Economy Analysis

A paper by Zorzi, Hahn, and Sanchez (2007) empirically studied the ERPT in emerging economies, and found that pass through into import and consumer prices are low, which is very similar to findings in developed economies. This goes against conventional thinking that ERPT is stronger in emerging economies, than in developed economies.

Parsley (2001) did an empirical analysis on ERPT in a small open economy. The country in question was Hong Kong. Parsley found that Hong Kong had a relatively faster import price adjustment than larger, less open economies.

Many small open countries tend to have small bargaining power when it comes to trade, and this may reflect an incomplete ERPT for these economies. A study done by Dholakia and Saradhi (2000) revealed that import prices in India are relatively complete. One reason for this result could be that fact that India is a price taker. When exchange rate changes, exporters could only change their profit margins rather than changing prices, this will cause the import prices in the rupee to change by less than the change in the exchange rate.

These studies on large and small economies, in a nutshell, show how large economies have a weaker pass through than smaller economies. It also portrays the gradual decline in pass through over last couple decades, especially in a large economy like the US.
III. Hypothesis Breakdown

Hypothesis #2: Given two economies, one is a large open economy and one is a small open economy. In both economies the foreign exporter faces the same demand curve, however the foreign firm exporting to the large economy has a small market share and the foreign firm exporting into the small economy has a large market share. Given these assumptions, the large open economy will have a weak ERPT. The corollary to this is that the small open economy will have a stronger ERPT.

Figure 1 in Appendix A, is a graph portraying a foreign firm exporting into a large open economy. The first assumption I make is that there are two firms producing the same good. The domestic firm is producing 99,000 units, while the foreign firm is producing 1000 units. The foreign firm imports 1000 units regardless of what the firm’s demand at home is. The total supply of this good in this large country is 100,000 units, and since both firms have the same cost structure and the marginal cost is constant, the supply curve is the horizontal line at $50. Since the foreign firm is only providing 1000 units, it has a small market share within this industry, and thus has little influence on prices. Now the foreign country’s currency appreciates, which causes the foreign firm’s costs to rise. As costs rise, the price in the domestic market rises to $100. This causes the foreign firm’s supply curve to rise to $100. Since the foreign firm is only providing 1000 units, a small part of the supply curve moves up. Demand of this firm’s product will fall because cheaper domestic substitutes may be available and thus this foreign firm will be priced out of the market. In this scenario, I assume that this firm will practice pricing-to-market and will
drop mark-up/prices to keep the price stable at $50, thus there will be an incomplete pass through.

Figure 2 in Appendix A portrays a graph of foreign firm exporting to a small open economy. In this scenario the foreign firm provides 99,000 units, while the domestic firm provides 1000 units. Thus, the foreign firm has the larger market share. Again both firms have the same cost structure, constant marginal costs, and the total supply curve is horizontal at $50. The foreign firm’s currency appreciates, which causes costs to go up. The price follows, and rises in domestic market. In contrast to the Figure 1, a larger part of the supply curve moves up because of the price increase, and this larger part intersects with the demand curve. So even though the price of the foreign firm’s imported good increases, it still meets demand, and thus this firm will not drop out of the market. The domestic firm now will have a larger demand, however its capacity is 1000 units. Thus as demand increases the price of the domestic product will also increase.

**Hypothesis #3:** Given two economies, one is a large open economy and one is a small open economy. In the large open economy the foreign exporter faces a relatively elastic demand curve and in the small open economy the foreign exporter faces a relatively inelastic demand curve. Given these assumptions, there will be a weak ERPT in the large open economy. The corollary to this is that there will be a strong ERPT in the small open economy.

Figure 3 in Appendix A shows the case of the large open economy. In this scenario I make the assumption that consumers have many available substitutes, thus a foreign firm exporting to this type of economy faces a relatively elastic curve. The marginal cost of this foreign firm is a function of the exchange rate, so as the foreign firm’s currency appreciates the
marginal cost curve shifts up. The price increase is small in this case because the demand curve is elastic, leading to a lower degree of ERPT.

In contrast, Figure 4 in Appendix A, shows the case where a foreign firm is trading into a small country. The assumption I make here is that consumers in small economies have a small amount of substitutes and in many cases, no substitutes at all. Thus a foreign firm exporting to this economy faces a relatively inelastic demand curve. Again the foreign firm has a marginal cost as a function of exchange rate. The exchange rate appreciates, which causes the marginal cost curve to shift up. The price change here is larger than in the elastic demand case, leading to an increase in ERPT.

**Hypothesis #4**: In a large open economy where consumer demand is a large share of world demand, there will be a weak ERPT. Reason being is that if the large country’s currency appreciates the price of foreign imports in that country falls. Because the price falls, the large country’s consumer demand rises. Since the country’s demand is a large share of world demand, the higher demand caused by the price fall will shift the demand curve up causing price to rise. As the price of the good rises, the exchange rate change will be offset.

**IV. Theoretical Framework**

A firm’s profit maximizing equation is given by the following equation:\(^2\) :

\[
\text{Max}_p = [pD(p) - (1/e)C(D(p))]
\]

Where \(D(p) = q\), \(e\) denotes the exchange rate, \(^3\) \(p\) is the price, and \(C(q) = c•q\).

When differentiating with respect to \(p\) the following first order equation is:

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\(^2\) Tirole (1988) p. 66
\(^3\) Exchange rate is defined as (exporting country’s currency)/(destination country’s currency)
\[ P = \frac{1}{e}MC(\varepsilon/\varepsilon - 1) \]

Where \( \varepsilon \) is demand elasticity at a specific \( p \), and \( MC \) is marginal cost, which is constant marginal cost in this instance.

**Hypothesis 2:** Given the above equation and assuming there is constant elasticity I can apply it to Case 1: A foreign firm with a small market share trading into a large economy and Case 2: A foreign firm with a large market share trading into a small economy.

For Case 1, the foreign firm faces many competitors, which are price takers so price is fixed. Thus the firm will get priced out of the market when an appreciation in the exchange rate causes cost to rise higher than the price, so there will be a partial to incomplete pass through:

\[ P_{\text{fixed}} < \frac{1}{e}MC(\varepsilon/\varepsilon - 1) \]

For Case 2, the foreign firm faces a small amount of competition or no competition at all, so it can set price to whatever it wants to, and thus will allow the exchange rate to fully pass through:

\[ P = \frac{1}{e}MC(\varepsilon/\varepsilon - 1) \]

One can think of Case 2 as a monopoly situation.

**Hypothesis 3:** Using the same first-order equation derived earlier, Feenstra (1996) derives a relationship with pass through elasticity and demand elasticity:\(^4\):

\[ \frac{\partial \ln p_i}{\partial \ln e_i} = \left[ 1 + \frac{1}{\eta_i - 1} \frac{\partial \ln \eta_i}{\partial \ln p_i} \right]^{-1} \]

Here \( \eta \) is elasticity of demand.

Given the above equation one can see that pass through varies with elasticity of demand. So if the exchange rate appreciates, the price will increase but pass through will vary based on

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\(^4\) Equation derived in Feenstra et al. (1996), p.193
elasticity: as price increases and elasticity increases, then pass through will be low. However, if price increases and elasticity falls, then pass through will increase.

V. Methodology

**Hypothesis 1:** I start with testing my overall hypothesis on ERPT in large vs. small economies. This test involves two parts. The first regression I use is as follows:

\[ \ln(P_{it}^D) = \alpha_i + \beta_{1i} \ln(e_{ij}) + \beta_{2i} \ln(c_{E}^j) + \varepsilon_t \]  \hspace{1cm} (1)

Where \( P_{it}^D \) denotes the import price in destination market and I use the logged import price index. The data is from the International Finance Statistics (IFS) database from 1960:Q1 to 2010:Q3. Here \( i \) is indexing each separate destination country, \( j \) is indexing each separate exporting country, and \( D \) denotes that the data is from the destination country. \( e_{ij} \) is the exchange rate and is defined as exporting country’s currency/destination country’s currency. For example if India is trading into the United States the exchange rate will be Rupee/USD. An increase means an appreciation in destination currency, and should then have a downward effect on import prices. Data is provided by the IFS from 1960:Q1 to 2010:Q3. \( c_{E}^j \) is the cost within the exporting nations. Data on costs are hard to find, so a proxy that the literature uses is the Producer Price Index within these countries. PPI data can be found in the IFS dataset.

\[ H_0: \text{Corr}(\beta_{1i}, \text{GDP}_i) > 0 \]

As destination country size gets larger, ERPT should decrease, or \( \beta_{1i} \) should get less negative/more positive. The goal of this regression is essentially to find the correlation between ERPT (\( \beta_{1i} \)) and Real GDP.
To calculate the correlation, nine destination countries were analyzed. These countries were ranked based on its average real GDP from 1960 to 2010. The countries used were the United States, Japan, United Kingdom, South Africa, Argentina, Singapore, Guatemala, Iceland, and Malta; US having the largest average real GDP and Malta having the smallest. Each destination country was analyzed using three exporting countries chosen at random. I created a panel data set for each destination country, and estimated one $\beta_{1i}$ for each destination country. To calculate the correlation between $\beta_{1i}$ and average real GDP, another regression was run with $\beta_{1i}$ as the dependent variable, and average real GDP as the explanatory variable.

The second part of regression 1 involves finding how ERPT differs as real GDP varies. A new interaction term is included in estimation equation (2): interacting the exchange rate with the real GDP. $\beta_3$ here will capture how ERPT changes as real GDP changes. The same countries and country pairs were used from part 1 of estimation equation (1). The data is quarterly from 1960:Q1 to 2010:Q4. I created a large panel data set with each destination country and its three exporting countries. A regression was run taking into consideration country and time fixed effects.

$$\ln(P_{ti}^D) = \alpha_i + \alpha_t + \beta_1 \ln(e_{ij}) + \beta_2 \ln(e_{ij}^E) + \beta_3 \ln(Y_{ti}^D) \cdot \ln(e_{ij}) + \beta_4 \ln(Y_{ti}^D) + \varepsilon_t$$ (2)

Where $Y_{ti}^D$ denotes real GDP for the destination country. This data is yearly, and available in the IFS from 1960 to 2009.

$H_0: \beta_3 > 0$

The null hypothesis states that as the country size gets larger, $\beta_3$ (ERPT) should decrease, or get more positive.

**Hypothesis #2:** The market share difference is my second hypothesis. I tested the following equation in regard to import share, $S_i$: 


\[
\ln(P_{it}^D) = \alpha_i + \beta_{1i} \ln(e_{ij}) + \beta_{2i} \ln(c_{it}^E) + \varepsilon_t \quad (3)
\]

\[H_0: \text{Corr}(\beta_{1i}, S_i) < 0\]

As market share gets larger, ERPT should increase, or get more negative, because of less PTM, thus \(\beta_{1i}\) should get smaller, and the correlation will be negative.

The International Trade Centre provides the import shares within destination countries. This study used two destination countries, US and Japan. Based on the import shares within US, I chose three exporting countries with large import shares, three countries with a medium import shares, and finally three exporting countries with low import shares. The same was done for Japan. I used quarterly data from 1960:Q1 to 2010:Q4. The \(\beta_{1i}\) determined from each country pair regression was then regressed with average import share of each exporting country to figure out the correlation.

Just like the regression tests from hypothesis one, this regression has two parts. The second part tries to analyze how ERPT changes as import share varies. The estimation equation is below, and a new interaction term is added, the interaction between exchange rate and import share. \(\beta_3\) shows how ERPT changes as import share changes. The data was from 2001 to 2010, and the data was yearly. As this study expects, as import share gets larger, ERPT increases, or gets more negative. Hence \(\beta_3\) should be less than zero.

\[
\ln(P_{it}^D) = \alpha_i + \alpha_t + \beta_1 \ln(e_{ij}) + \beta_2 \ln(c_{it}^E) + \beta_3 \ln(e_{ij}) \cdot \ln(s_{ij}) + \beta_4 \ln(s_{ij}) + \varepsilon_t \quad (4)
\]

Where \(s_{ij}\) denotes the import share is of exporting countries in destination countries. Data for import shares are provided by the International Trade Statistics.

\[H_0: \beta_3 < 0\]

**Hypothesis #3:** My third hypothesis is the elasticity of demand hypothesis. As demand gets more elastic ERPT will decrease. To test this I will use the following regression equation:
\[ \ln(P_{it}^D) = \alpha_i + \alpha_t + \beta_1 \ln(e_{ij}) + \beta_2 \ln(e_{ij}^E) + \beta_3 \ln(CPI_{it}^D) + \beta_4 \ln(CPI_{it}^D) + \varepsilon_t \quad (5) \]

Where \( CPI_{it}^D \) is the proxy for demand elasticity in destination country. This data can be found in the IFS, and can be found for most countries in quarterly format from 1960:Q1 to 2010:Q3.

\[ H_0: \beta_3 < 0 \]

To calculate \( \beta_3 \) the same destination countries and its exporting pairs from estimation equation (1) were used. In this regression, the exchange rate was interacted with CPI, and thus \( \beta_3 \) would reflect how ERPT changes as CPI varies, or as competition varies. A reason for a CPI increase could be due to a reduction in competition because I assume that an increase in CPI is due to a decrease in substitutes. As CPI increases, ERPT will increase, or get more negative in this case.

**Hypothesis #4:** My final hypothesis is when a country’s demand for a good makes up a large share for the world demand for that same good, then a weaker ERPT will exist. This makes the assumption that exporters will fully pass through the exchange rate change, going against my previous three hypotheses. The equation I use to test this is:

\[ \ln(CPI_{ij}^E) = \alpha_i + \alpha_t + \beta_1 \ln(e_{ij}) \cdot \ln(Y_{it}^D) + \beta_2 \ln(e_{ij}) + \beta_3 \ln(Oil_{ij}) + \beta_4 \ln(Y_{it}^D) + \varepsilon_t \quad (6) \]

Where Oil\(_{ij}\) denotes the Oil prices in the exporting country for each year.

\[ H_0: \beta_1 > 0 \]

As the destination country size gets larger, here used as a proxy for demand and measured by GDP, prices in the exporting country should rise if depreciation in the exporting country’s currency occurs. However, ERPT should increase, thus \( \beta_1 \) should be positive. I use CPI in the exporting country because I assume an exchange rate will not impact exporting countries
prices, however an increase or decrease in world demand will influence the exporting country’s CPI.

VI. Estimation Results

Regression 1 tests how ERPT changes with the size of the destination economy. The hypothesis is that as the size of the destination economy gets larger, based on real GDP, ERPT would decrease. The definition of the exchange rate used in this analysis is exporting country currency/destination country currency. So an increase in exchange rate would mean a depreciation in the exporting country’s currency, thus leading to a fall in prices. Therefore, the hypothesis would be that as the destination country size gets larger, ERPT decreases, or gets more positive. Regression 1 has two parts: one is trying to find the correlation between ERPT and real GDP and refers to equation (1). The second part tries to find how ERPT varies as real GDP changes, and estimation equation (2) was tested.

For the first part (Table 1, in Appendix B) the correlation was determined to be -.01, and was statistically insignificant. This correlation shows that as the destination country gets larger based on real GDP, ERPT increases, or they are negatively correlated. So this result goes against the null hypothesis, which states that as destination country gets larger ERPT would get smaller, or positively correlated. However, the result is insignificant.

When looking closely at each specific destination country in Table 1 in Appendix B, one can see the larger countries have large pass through coefficients, while smaller countries have small pass through coefficients. In some cases the coefficients came out positive, which is
counter-intuitive. One reason why the result is insignificant could be due to the nature of the data. The data is in time-series format, so the data can be extremely correlated year over year, and is non-stationary. The regression took into consideration fixed effects, but running it first-differences might change the results.

In the second part of the regression 1 (Table 2, in Appendix B) the $\beta_3$ is .24***, and was significant. Thus the result rejects the null hypothesis referred to equation (2). This coefficient can be interpreted as follows: when real GDP gets larger by 1%, ERPT decreases by .24%. Thus when a country trades into two different countries, one country having the larger economy the other having the smaller economy, the ERPT in the smaller economy is stronger than in the larger economy.

Regression 2 again, like regression 1, has two parts. The first part tests the correlation between ERPT and import share, (estimation equation (3)). The second part tests how ERPT changes as import share varies (estimation equation (4)). For the first part (Table 3, in Appendix B), the correlation came out to be -.02***, and was significant. This confirms the null hypothesis (estimation equation (3)); as import share gets larger, pass through should get larger, or more negative, thus the two are negatively correlated.

In the second part of regression 2 (Table 4, in Appendix B) which includes the interaction, the coefficient was determined to be -.13***, and was significant. Thus as import share gets larger by 1%, ERPT increases by .13%.

The next regression (estimation equation (5), Table 5 in Appendix B) tests the demand hypothesis, which states that as demand gets more elastic, ERPT will fall. $\beta_3$, the coefficient on the interaction term had a result of .19***, and was significant. So as CPI gets larger by 1%, or demand gets more inelastic, ERPT decreases by .19%. The null hypothesis referred to in
equation (5) does not hold with this result. One reason why the coefficient on the interaction term is positive, could be because CPI might not be a good measure of demand elasticity, since many things go into calculating the final CPI value.

Table 6 shows the results for the last regression (estimation equation (6)). This equation is testing the hypothesis of consumer demand in the destination country being a large proportion of world demand. The main explanatory variable, $\beta_1$, had a coefficient of .22***, and was significant. This result confirmed the null hypothesis that as demand in the destination country increases, measured in this case by GDP, ERPT will fall in the destination country; and ERPT does fall, by .22%.

Appendix C shows the results for the same panel regressions; however the regressions were run using first differences. I ran these regressions using first differences because the data I had was non-stationary. Essentially the mean, variance, and standard deviations of the data are different in different time periods. To make the data stationary, first-differences was used. Not much changed for the results to Hypothesis #1. The first part of hypothesis #1 still remained insignificant, while the second part remained significant. The $\beta_3$, however became larger. So a one percentage increase in real GDP would cause ERPT to decrease more than in the simple panel regression case. The most significant impact of running the first difference tests was on the market share hypothesis, Hypothesis #2. The results for both parts of hypothesis #2 turned out to be insignificant, in addition the $\beta_3$ for part two was positive, which is counter-intuitive. Hypothesis #3 and #4 both stayed statistically significant, however just like the panel results, the results to null hypothesis #3 was rejected. The first-difference test was essentially used for a robustness check and to reduce the spuriousness/positive biasness of my regressions, it however
proved to break some of the null hypotheses proposed earlier, in addition to providing more insignificant results.

In terms of further research, I think gathering more data for equation (4) would be beneficial. The only destination countries analyzed were the US and Japan, adding more data might make a difference, especially in the first difference results. In addition, for equation (5), finding a better proxy for demand elasticity might change the results to favor my null hypothesis. Another idea would possibly do an industry analysis and using those results to make a prediction on the macro/country-wide results.

VII. Conclusion

This study empirically and theoretically analyses ERPT in large and small open economies. The main hypothesis is that there will be a stronger ERPT when exporting into a large destination economy, than exporting into small destination economy. There are three hypotheses that have a main purpose of supporting my main hypothesis. The first relates to the import share within destination countries. The second refers to the demand elasticity an exporter faces. Finally, the last relates to the proportion of consumer demand to world demand in the destination economy.

This analysis can conclude, with statistical significance, that ERPT decreases as the destination country size, based on real GDP, increases. As real GDP of destination countries increases by 1%, the ERPT within those countries decreases by .24%. Out of the three supporting hypotheses tested it seems that the most likely reason for the last finding is the import share hypothesis. The correlation between ERPT and import share is positive and statistically
significant, which means that as import share gets larger, ERPT increases. In addition, as import shares within destination countries increases by 1%, the ERPT increases by .13%. Based on this result, foreign country firms exporting into small countries have a higher chance of gaining a large market share, or market power, thus these firms can adjust destination currency prices when the exchange rate changes.

From a policy perspective a downside for small economies is that exporters have a better chance exporting inflation into the respective small destination economy. By a way of example, let me bring the Indian basmati exporters back into the picture. If an Indian basmati firm is exporting to Malta and the Indian Rupee appreciates, the Indian basmati exporter can fully pass through the price change without worrying about losing market share or demand. In that case the Indian basmati exporter can fully pass through inflation into Malta, which is not good for the economy and its consumers. In large economies this would not be a problem, because an appreciation of the Indian Rupee will make the Indian basmati exporter price-to-market.

Another interesting issue from a policy stand point is: would it be better to export to a small country, where there is a large ERPT, or a large country, where there is a small ERPT? Indian basmati rice exporters incur all their costs in the Indian Rupee. Thus they would like a constant stream of Rupees in return to: one, pay for their costs, and two, make a profit. When trading into large countries, like the US, where PTM exists, it would be hard for basmati exporters to earn Rupees when their currency appreciates. In the event of a currency appreciation, Indian exporters would not be able to increase prices because they would lose demand and market share for their rice. However, when trading into small economies where ERPT is strong, the basmati rice exporters can pass through the exchange rate changes.
Of course, all exporters want a steady revenue stream, which can be found in small economies. Large exporters can easily get loans and tap into the capital markets which allow them to practice pricing-to-market in large economies, and take on the risk associated with PTM. Small exporters are financially constrained and have a harder chance of getting capital, so they are better off in a small country where they can pass through exchange rate changes, than entering large economies where pricing-to-market would make their cash flows riskier. In conclusion, I recommend that small exporters target exporting into small economies.


Appendix

Appendix A

Figure 1

Foreign Firms Trading into a Large Country, with a Small Market Share

- Foreign Supply After Appreciation
- Total Supply Curve = Constant MC
- Domestic Supply = 99,000 units
- Foreign Supply = 1000 units

Demand

99,000

100,000

Q

$100

$50
Figure 2

Foreign Firm Trading into a Small Country, with a Large Market Share

- Foreign Supply Curve, after appreciation
- Total Supply Curve = Constant MC
  - Domestic Supply = 1000 units
  - Foreign Supply = 99,000 units

P

$100

$50

1000

100,000

Q

Demand
Figure 3

Trading into a country with a relatively elastic demand curve
Figure 4

Trading into a country with a relatively inelastic demand curve
### Appendix B

Table 1: Regression 1 – Estimation Equation 1

<table>
<thead>
<tr>
<th>Destination Country</th>
<th>GDP (USD in Billions)</th>
<th>$\beta_{1i} - \ln(e_{it})$</th>
<th>$\beta_{2i} - \ln(c_{it}^2)$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>$6,320$</td>
<td>-.74*** (.10)</td>
<td>.12*** (.01)</td>
<td>.21</td>
</tr>
<tr>
<td>Japan</td>
<td>$3,142$</td>
<td>.09*** (.01)</td>
<td>.32*** (.02)</td>
<td>.18</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>$1,040$</td>
<td>-.85*** (.01)</td>
<td>.30*** (.01)</td>
<td>.21</td>
</tr>
<tr>
<td>South Africa</td>
<td>$210$</td>
<td>-.14*** (.01)</td>
<td>.81*** (.02)</td>
<td>.81</td>
</tr>
<tr>
<td>Argentina</td>
<td>$100$</td>
<td>-.02*** (.01)</td>
<td>.01* (.01)</td>
<td>.01</td>
</tr>
<tr>
<td>Singapore</td>
<td>$43$</td>
<td>-.43*** (.03)</td>
<td>.83 (.03)</td>
<td>.02</td>
</tr>
<tr>
<td>Iceland</td>
<td>$5.7$</td>
<td>-.30*** (.04)</td>
<td>.25*** (.08)</td>
<td>.79</td>
</tr>
<tr>
<td>Malta</td>
<td>$2.0$</td>
<td>-.50*** (.09)</td>
<td>.77*** (.02)</td>
<td>.70</td>
</tr>
</tbody>
</table>

The above table refers to estimation equation (1). The actual correlation was determined to be -.01, and was not significant. Sample size was 4,848 observations, from 1960:Q1 to 2010:Q3. The standard error is in parentheses.

***p<.001, **p<.01, *p<.1
The above graph shows the correlation between ERPT and lnGDP, which came out to -.01. ERPT is on the y-axis and lnGDP is on the x-axis.

Table 2: Regression 1, Part 2/Estimation Equation (2)

<table>
<thead>
<tr>
<th>$\beta_1 - \ln(e_{ij})$</th>
<th>$\beta_2 - \ln(e_{ij}^{c})$</th>
<th>$\beta_3 - \ln(Y_{it}^{a})\ln(e_{ij})$</th>
<th>$\beta_4 - \ln(Y_{it}^{a})$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-.35***</td>
<td>.17***</td>
<td>.24***</td>
<td>-.39***</td>
<td>.32</td>
</tr>
<tr>
<td>(.04)</td>
<td>(.03)</td>
<td>(.04)</td>
<td>(.01)</td>
<td></td>
</tr>
</tbody>
</table>

Above table refers to estimation equation (2), where a new interaction term is introduced, $\ln(Y_{it}^{a})\ln(e_{ij})$. The data is yearly from 1960 to 2010, and there were 1323 observations. Destination countries include: US, Japan, UK, South Africa, Argentina, Singapore, Guatemala, Iceland, and Malta. There was country fixed effects as well as time fixed effects (by including time dummies). Standard error in parentheses.

***p<.001, **p<.01, *p<.1
<table>
<thead>
<tr>
<th>Destination Country</th>
<th>Exporting Country</th>
<th>Average Share (2001-2010)</th>
<th>Import Share</th>
<th>$\beta_{1i} - \ln(e_{ij})$</th>
<th>$\beta_{2i} - \ln(e_{ij}^{\lambda})$</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>Canada</td>
<td>16.35%</td>
<td>-0.42***</td>
<td>1.42***</td>
<td>0.97</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>United States</td>
<td>13.3%</td>
<td>-0.90***</td>
<td>1.59***</td>
<td>0.98</td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>Mexico</td>
<td>10.76%</td>
<td>-0.76***</td>
<td>1.08***</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>Japan</td>
<td>8.19%</td>
<td>-0.30***</td>
<td>2.69***</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>Indonesia</td>
<td>4.18%</td>
<td>-0.58***</td>
<td>0.27***</td>
<td>0.90</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>Thailand</td>
<td>2.97%</td>
<td>-0.86***</td>
<td>-0.43***</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>Malaysia</td>
<td>1.81%</td>
<td>-0.27*</td>
<td>0.74***</td>
<td>0.96</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>Canada</td>
<td>1.81%</td>
<td>-0.45***</td>
<td>0.53***</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>Venezuela</td>
<td>1.77%</td>
<td>-0.08</td>
<td>0.21***</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>India</td>
<td>1.18%</td>
<td>-0.59***</td>
<td>0.68***</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>Chile</td>
<td>0.96%</td>
<td>-0.53***</td>
<td>0.08***</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>Mexico</td>
<td>0.51%</td>
<td>-0.65***</td>
<td>0.58***</td>
<td>0.98</td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>Pakistan</td>
<td>0.2%</td>
<td>-0.57***</td>
<td>0.62***</td>
<td>0.90</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>Argentina</td>
<td>0.1%</td>
<td>-0.38***</td>
<td>0.47***</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>Egypt</td>
<td>0.1%</td>
<td>-0.21***</td>
<td>0.49***</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>Kazakhstan</td>
<td>0.06%</td>
<td>-0.18***</td>
<td>0.27***</td>
<td>0.97</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>Poland</td>
<td>0.04%</td>
<td>-0.20***</td>
<td>-0.23***</td>
<td>0.96</td>
<td></td>
</tr>
</tbody>
</table>

The above table refers to estimation equation (3). The correlation between ERPT and import share was determined to be -.02***. The sample size was 3232, and it was quarterly data from 1960:Q1 to 2010:Q3. Standard error in parentheses.

***p<.001, **p<.01, *p<.1
The above graph shows the correlation of ERPT and market share from equation (3). The correlation was -.02.

Table 4: Regression 4/Part 2- Estimation Equation (4)

<table>
<thead>
<tr>
<th>( \beta_1 - \ln(e_{it}) )</th>
<th>( \beta_2 - \ln(c_{it}) )</th>
<th>( \beta_3 - \ln(e_{it}) \times \ln(s_{it}) )</th>
<th>( \beta_4 - \ln(s_{it}) )</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-.65*** (.08)</td>
<td>.65*** (.04)</td>
<td>-.13* (.07)</td>
<td>.023** (.01)</td>
<td>.27</td>
</tr>
</tbody>
</table>

The above table refers to estimation equation (4), where the new interaction term was introduced. The sample size was 153, and the year analyzed was 2001 to 2010. The destination countries analyzed were the US and Japan. Country fixed effects and time fixed effects (using time dummies) were included in the model. Standard error in parentheses.

***p<.001, **p<.01, *p<.1
Table 5: Regression 5 – Estimation Equation (5)

<table>
<thead>
<tr>
<th>$\beta_1 - \ln(e_{ij})$</th>
<th>$\beta_2 - \ln(e_{ij}^{\prime})$</th>
<th>$\beta_3 - \ln(e_{ij}) \cdot \ln(CPI_{ti}^{\prime})$</th>
<th>$\beta_4 - \ln(CPI_{ti}^{\prime})$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-.23***</td>
<td>.05***</td>
<td>.19***</td>
<td>-.03</td>
<td>.74</td>
</tr>
<tr>
<td>(.01)</td>
<td>(.02)</td>
<td>(.01)</td>
<td>(.02)</td>
<td></td>
</tr>
</tbody>
</table>

The above table refers to estimation equation (5), where the elasticity hypothesis is tested. The sample size was 5453, and it was yearly data from 1960:Q1 to 2010:Q3. Destination countries analyzed were: US, Japan, UK, South Africa, Argentina, Singapore, Guatemala, Iceland, and Malta. Country fixed effects and time fixed effects (using time dummies) were included in the model. Standard error in parentheses

***p<.001, **p<.01, *p<.1

Table 6: Regression 6 – Estimation Equation (6)

<table>
<thead>
<tr>
<th>$\beta_1 - \ln(e_{ij}) \cdot \ln(Y_{ti}^{\prime})$</th>
<th>$\beta_2 - \ln(e_{ij})$</th>
<th>$\beta_3 - \ln(Oil)$</th>
<th>$\beta_4 - \ln(Y_{ti}^{\prime})$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>.22***</td>
<td>-.12***</td>
<td>-.75</td>
<td>.08</td>
<td>.68</td>
</tr>
<tr>
<td>(.03)</td>
<td>(.03)</td>
<td>(.03)</td>
<td>(.05)</td>
<td></td>
</tr>
</tbody>
</table>

The above table refers to estimation equation (6), where the consumer demand in destination country is large proportion of world demand tested. Sample size is 1030, with yearly data from 1960 to 2010. Countries analyzed were: US, Japan, UK, South Africa, Singapore, Iceland, and Malta. Country fixed effects and time fixed effects (using time dummies) were included in the model. Standard error in parentheses

***p<.001, **p<.01, *p<.1
Appendix C

Table 7: First Differences – Estimation Equation (1)

<table>
<thead>
<tr>
<th>Destination Country</th>
<th>GDP (USD in Billions)</th>
<th>$\beta_1 - \ln(e_{ij})$</th>
<th>$\beta_2 - \ln(C_{ij})$</th>
<th>$\beta_3 - \ln(Y_{it}D_{t})\ln(e_{ij})$</th>
<th>$\beta_4 - \ln(Y_{it}D_{t})$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>$6,320$</td>
<td>-.24*** (.01)</td>
<td>1.4*** (.01)</td>
<td>.98*** (.05)</td>
<td>-.32*** (.05)</td>
<td>.95</td>
</tr>
<tr>
<td>Japan</td>
<td>$3,142$</td>
<td>.06*** (.01)</td>
<td>.41*** (.02)</td>
<td>.98*** (.05)</td>
<td>.66</td>
<td>.42</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>$1,040$</td>
<td>-.68*** (.02)</td>
<td>.36*** (.02)</td>
<td>.94</td>
<td>.12</td>
<td>.81</td>
</tr>
<tr>
<td>South Africa</td>
<td>$210$</td>
<td>-.13*** (.01)</td>
<td>1.06*** (.02)</td>
<td>.75</td>
<td>.12</td>
<td>.89</td>
</tr>
<tr>
<td>Argentina</td>
<td>$100$</td>
<td>.02** (.01)</td>
<td>.03** (.01)</td>
<td>.94</td>
<td>.12</td>
<td>.64</td>
</tr>
<tr>
<td>Singapore</td>
<td>$43$</td>
<td>-.17*** (.01)</td>
<td>.57*** (.02)</td>
<td>-.28*** (.05)</td>
<td>.12</td>
<td>.75</td>
</tr>
<tr>
<td>Iceland</td>
<td>$5.7$</td>
<td>-.17*** (.02)</td>
<td>.50*** (.04)</td>
<td>.89</td>
<td>.12</td>
<td>.64</td>
</tr>
<tr>
<td>Malta</td>
<td>$2.0$</td>
<td>1.25*** (.08)</td>
<td>-.28*** (.05)</td>
<td>.64</td>
<td>.12</td>
<td>.75</td>
</tr>
</tbody>
</table>

The above table refers to estimation equation (1), however this was regressed using first differences. The actual correlation was determined to be -.11, and was not significant. Sample size was 4,848 observations, from 1960:Q1 to 2010:Q3. Standard error in parentheses

***p<.001, **p<.01, *p<.1

Table 8: First Differences, Part 2/Estimation Equation (2)

<table>
<thead>
<tr>
<th>$\beta_1 - \ln(e_{ij})$</th>
<th>$\beta_2 - \ln(C_{ij})$</th>
<th>$\beta_3 - \ln(Y_{it}D_{t})\ln(e_{ij})$</th>
<th>$\beta_4 - \ln(Y_{it}D_{t})$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1.0*** (.06)</td>
<td>.15*** (.03)</td>
<td>.98*** (.05)</td>
<td>-.32*** (.05)</td>
<td>.66</td>
</tr>
</tbody>
</table>

Above table refers to estimation equation (2), using first differences. The data is yearly from 1960 to 2010, and there were 1323 observations. Destination countries include: US, Japan, UK, South Africa, Argentina, Singapore, Guatemala, Iceland, and Malta. Standard error in parentheses.

***p<.001, **p<.01, *p<.1
<table>
<thead>
<tr>
<th>Destination Country</th>
<th>Exporting Country</th>
<th>Average Import Share (2001-2010)</th>
<th>$\beta_{1i} - \ln(e_{ij})$</th>
<th>$\beta_{2i} - \ln(c_{ij}^E)$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>Canada</td>
<td>16.35%</td>
<td>-.71*** (.05)</td>
<td>1.54*** (.11)</td>
<td>.91</td>
</tr>
<tr>
<td>Japan</td>
<td>United States</td>
<td>13.3%</td>
<td>-.63*** (.09)</td>
<td>1.70*** (.12)</td>
<td>.91</td>
</tr>
<tr>
<td>United States</td>
<td>Mexico</td>
<td>10.76%</td>
<td>-.79*** (.09)</td>
<td>1.94*** (.42)</td>
<td>.68</td>
</tr>
<tr>
<td>United States</td>
<td>Japan</td>
<td>8.19%</td>
<td>-.01*** (.09)</td>
<td>2.41*** (.22)</td>
<td>.61</td>
</tr>
<tr>
<td>Japan</td>
<td>Indonesia</td>
<td>4.18%</td>
<td>-.42*** (.04)</td>
<td>.65*** (.12)</td>
<td>.82</td>
</tr>
<tr>
<td>Japan</td>
<td>Thailand</td>
<td>2.97%</td>
<td>-.71*** (1.08)</td>
<td>-.41*** (.18)</td>
<td>.88</td>
</tr>
<tr>
<td>United States</td>
<td>Malaysia</td>
<td>1.81%</td>
<td>-.19 (.15)</td>
<td>1.37*** (.13)</td>
<td>.85</td>
</tr>
<tr>
<td>Japan</td>
<td>Canada</td>
<td>1.81%</td>
<td>-.56*** (.03)</td>
<td>1.24*** (.15)</td>
<td>.95</td>
</tr>
<tr>
<td>United States</td>
<td>Venezuela</td>
<td>1.77%</td>
<td>.15 (.11)</td>
<td>-.32 (.25)</td>
<td>.05</td>
</tr>
<tr>
<td>United States</td>
<td>India</td>
<td>1.18%</td>
<td>-.52*** (.12)</td>
<td>1.77*** (.24)</td>
<td>.70</td>
</tr>
<tr>
<td>Japan</td>
<td>Chile</td>
<td>0.96%</td>
<td>-.63*** (.04)</td>
<td>.80*** (.11)</td>
<td>.89</td>
</tr>
<tr>
<td>Japan</td>
<td>Mexico</td>
<td>0.51%</td>
<td>-.62*** (.02)</td>
<td>1.21*** (.19)</td>
<td>.96</td>
</tr>
<tr>
<td>United States</td>
<td>Pakistan</td>
<td>0.2%</td>
<td>-.64*** (.13)</td>
<td>1.18*** (.12)</td>
<td>.73</td>
</tr>
<tr>
<td>Japan</td>
<td>Argentina</td>
<td>0.1%</td>
<td>-.39*** (.06)</td>
<td>.62*** (.14)</td>
<td>.52</td>
</tr>
<tr>
<td>United States</td>
<td>Egypt</td>
<td>0.1%</td>
<td>-.24*** (.10)</td>
<td>.70** (.09)</td>
<td>.66</td>
</tr>
<tr>
<td>United States</td>
<td>Kazakhstan</td>
<td>0.06%</td>
<td>-.06 (.09)</td>
<td>.36*** (.03)</td>
<td>.82</td>
</tr>
<tr>
<td>Japan</td>
<td>Poland</td>
<td>0.04%</td>
<td>-.50*** (.03)</td>
<td>1.10*** (.04)</td>
<td>.87</td>
</tr>
</tbody>
</table>

The above table refers to estimation equation (3), using first differences. The correlation between ERPT and import share was determined to be -.09. The sample size was 3232, and it was quarterly data from 1960:Q1 to 2010:Q3. Standard error in parentheses.

***p<.001, **p<.01, *p<.1
Table 10: First Differences/Part 2- Estimation Equation (4)

<table>
<thead>
<tr>
<th>$\beta_1 - \ln(e_{ij})$</th>
<th>$\beta_2 - \ln(c_{itj})$</th>
<th>$\beta_3 - \ln(e_{ij}) \cdot \ln(s_{ij})$</th>
<th>$\beta_4 - \ln(s_{ij})$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-.01 (.01)</td>
<td>.28*** (.01)</td>
<td>.0001 (.03)</td>
<td>-.02 (.02)</td>
<td>.34</td>
</tr>
</tbody>
</table>

The above table refers to estimation equation (4) with first differences, where the new interaction term was introduced. The sample size was 153, and the year analyzed was 2001 to 2010. The destination countries analyzed were the US and Japan. Standard error in parentheses.

***p<.001, **p<.01, *p<.1

Table 11: First Differences – Estimation Equation (5)

<table>
<thead>
<tr>
<th>$\beta_1 - \ln(e_{ij})$</th>
<th>$\beta_2 - \ln(c_{itj})$</th>
<th>$\beta_3 - \ln(e_{ij}) \cdot \ln(CPI_{it}^{D})$</th>
<th>$\beta_4 - \ln(CPI_{it}^{D})$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-.18*** (.01)</td>
<td>.32*** (.01)</td>
<td>.09*** (.01)</td>
<td>.26*** (.02)</td>
<td>.67</td>
</tr>
</tbody>
</table>

The above table refers to estimation equation (5) using first differences, where the elasticity hypothesis is tested. The sample size was 5453, and it was yearly data from 1960:Q1 to 2010:Q3. Destination countries analyzed were: US, Japan, UK, South Africa, Argentina, Singapore, Guatemala, Iceland, and Malta. Standard error in parentheses.

***p<.001, **p<.01, *p<.1

Table 12: First Differences – Estimation Equation (6)

<table>
<thead>
<tr>
<th>$\beta_1 - \ln(e_{ij}) \cdot \ln(Y_{it}^{D})$</th>
<th>$\beta_2 - \ln(e_{ij})$</th>
<th>$\beta_3 - \ln(Oil_{ij})$</th>
<th>$\beta_4 - \ln(Y_{it}^{D})$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.13*** (.03)</td>
<td>-1.10*** (.03)</td>
<td>-.02 (.03)</td>
<td>.06 (.10)</td>
<td>.69</td>
</tr>
</tbody>
</table>

The above table refers to estimation equation (6) using first differences, where the consumer demand in destination country is large proportion of world demand tested. Sample size is 1030, with yearly data from 1960 to 2010. Countries analyzed were: US, Japan, UK, South Africa, Singapore, Iceland, and Malta. Standard error in parentheses.

***p<.001, **p<.01, *p<.1