# Exchange Rate Pass-Through in Thailand's Import Industries

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## I. INTRODUCTION

Since the collapse of the Bretton-Woods exchange rate system in 1973, thousands of articles have been published about studies of the law of one price, purchasing power parity, exchange rate pass-through, and pricing-to-market. However, the term exchange rate pass-through, referring to the response of import prices to exchange rate change, has evolved considerably over time. Initially, the model of balance of payments assumed a one-for-one response of import/export prices to exchange rates as a "full" or "complete" exchange rate pass-through. However, several studies suggest that exchange rate pass-through is less than complete where the price of foreign products sold in the domestic market changes by a lower percentage than do exchange rates.[1] After a long period of debate over the law of one price, beginning in the late 1980s exchange rate pass-through studies in industrial organization emphasized the role of segmentation and price discrimination across geographically distinct product markets. The rise of imperfect competition and strategic trade theory led researchers to estimate exchange rate pass-through at the industry level. Incomplete pass-through occurs when the markup of prices over marginal costs changes with exchange rate changes and performs as a non-zero markup. Because the non-zero markup is a deviation from conditions of perfect competition, an incomplete exchange rate pass-through validates the shift toward models of imperfect competition.

Besides the industrial organization approach, understanding the properties of exchange rate pass-through has been extended to explain appropriate monetary policy and exchange rate regime optimality. This concept explains that, when prices are not very responsive to exchange rates or a lower degree of exchange rate pass-through, monetary policymakers cannot rely on exchange rates to provide the necessary monetary expansion. As a result, customers in that country do not interpret exchange rate changes as relative price changes, which makes policy ineffective for stabilizing growth.[2] Exchange rate pass-through is also important for trade economists with regard to whether or not currency devaluation would improve a country's trade balance. With the small extent of pass-through, the nation's balance of trade may not improve as a result of that government's currency devaluation. Economists argue that the reason that the trade balance does not improve immediately after the devaluation of a domestic currency may be related to the lag or gradual adjustment of trade flow, which is explained as the *J-Curve* Model.

Exchange rate pass-through in Thailand, however, does not gain much consideration, even though there were huge fluctuations in the value of the Thai Baht after the 1997 crisis. The floating Baht regime nonetheless had an impact on prices through trade and expectations, in the external sector, on financial stability, and on the functioning of foreign exchange markets. Figure 1 presents high volatility of Thailand after the 1997 financial crisis. This after-shock effect after 1997-crisis should therefore play an important role on country's international pricing. For these reasons, the purpose of this paper is threefold. First, it implements the estimation procedure of exchange rate pass-through coefficients of Thai import industries of both short-run and long-run coefficients. Second, this paper determines how the degree of exchange rate pass-through has been affected by the high volatility of the Baht currency since the 1997 crisis. Third, the policy implications and the policy debate are discussed in the context of pass-through rates as an effective indicator of three major economic policies: 1) policy development to foster market competition, 2) monetary policy, and 3) international trade policy.

The next section of this paper provides exchange rate pass-through estimation on short-term and long-term bases. Section III discusses the policy implications and policy debate, and Section IV concludes the paper.

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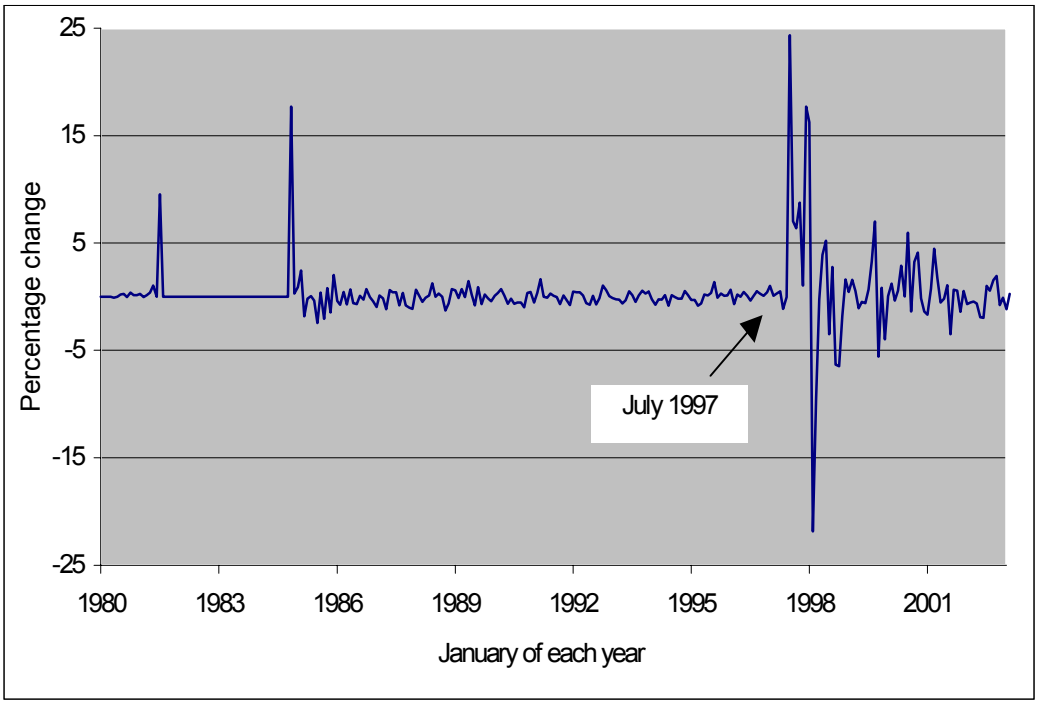
**Figure 1 Monthly Percentage Change of the Baht/US$ Exchange Rate: January 1980 – June 2003**




*Source:* International Financial Statistics, IMF: January 1980 – June 2003.

## II. DATA AND ESTIMATION

This pricing framework refers to a simple model of the international price-cost margin in which import prices are affected by three components: (i) changes in exporters' marginal costs, (ii) changes in the markup of prices over marginal costs (price elasticity), and (iii) changes in exchange rates.[3]

$$P = e.MC.\frac{\varepsilon_t}{\varepsilon_t - 1} \quad \text{..... (1)}$$

where $P$ is the price in the import currency unit, $e$ is the exchange rate, and $MC$ is the foreign exporters' marginal cost.

Thai monthly data from January 1996 to May 2003 used in this study are based on the above international price-cost margin. However, before proceeding to make estimates, it is necessary that each time series be stationary. The Augmented Dickey-Fuller (ADF) tests on the natural logarithm of the import price index and exchange rates show that most of the time the null hypothesis of a unit root cannot be rejected at the 95 percent confidence level for the AR(1) process. Given that the existing time series is non-stationary, ordinary least squares estimation has been applied to data that were transformed into natural logarithm differences based on Campa and Goldberg (2002).

The dependent variable $p_t$, collected from the Bank of Thailand, is the Thailand's import price index in Baht classified according to nine major import industries, and $p_{t-1}$ is its one-period lag; $e_t$ is the nominal effective exchange rate provided by *International Financial Statistics*. There are two control variables: $c_t$, which is a proxy for foreign export costs, and $y_t$, which is another proxy of the productivity index representing domestic demand conditions. The last independent variable, *Crisis*, denotes a dummy variable, which equals "zero" when referring to pre-July 1997 crisis and equals "one" when referring to post-July 1997 crisis.

$$\Delta ln\, p_t = \beta_0 + \beta_1.\Delta ln\, e_t + \beta_2.\Delta ln\, p_{t-1} + \beta_3.\Delta ln\, c_t + \beta_4.\Delta ln\, y_t + \beta_5.Crisis + \varepsilon_t \quad \text{.....(2)}$$

Again, based on Campa and Goldberg (2002), the exporters' cost, $c_t$, is the conversion of the Baht import price into a foreign currency price, adjusted by the real effective exchange rate as calculated below:

$$c_t = \frac{re_t}{ne_t}.p_t, \quad \text{.....(3)}$$

where $ne_t$ and $re_t$ are the nominal and real effective exchange rates, respectively.

In the above model, $\beta_1$ is the short-run exchange rate pass-through elasticity with expected positive sign (i.e., the percentage increase in the import price index for a 1 percent depreciation in the Baht) and $\beta_1/1-\beta_2$ is its long-run coefficient. The effect of the 1997 crisis on pass-through elasticity in the short run is therefore measured by $\beta_1 + \beta_5$ in the short run and by $(\beta_1 + \beta_5)/1-\beta_2$ in the long run.[4] $\beta_3$ is an estimated

coefficient of a control variable accounting for the exporters' cost effect and $\beta_4$ accounts for the demand effect. Total import industries comprise 6,034 import items under the Harmonized System covering more than 90 percent of total import values. The Bank of Thailand compiles data as a chained index with 1995 as the base year. Then it groups those items into nine industries based on the Standard International Trade Classification (SITC) scheme. The results of this regression over the sample period on the nine industries are presented in Table 1. In addition, Table 2 shows the estimated coefficients classified into the short-run and long-run effects of both the pre-1997 crisis and the post-1997 crisis.

With regard to the results shown in the tables below, we can find evidence, first, that the exchange rate pass-through coefficients of Thailand's import industries are quite low. The low degree of pass-through plays somewhat of a determinant role for policymakers to be concerned less about the effectiveness of monetary policy in stabilizing growth and international trade policy in boosting trade volume. The lower the extent of pass-through, the less is the substitution between import goods and domestic consumption; also, this situation generates market inefficiency in that there is a non-zero markup of import prices relative to the exporters' costs. This implies that the price of imported products is considerably higher compared with the exporters' costs. The pass-through coefficients are found to be the lowest in the crude materials industry, and the animal and vegetable oils and fats industry; they are the highest in the machinery industry. However, the pass-through coefficients are not significant in the mineral fuels and lubricants industry.

**Table 1: Regression of Exchange Rate Pass-through Coefficients of Nine Major Industries**

| Industry | Constant | $e_t$ | $p_{t-1}$ | $c_t$ | $y_t$ | *Crisis* | Adjust $R^2$ |
|---|---|---|---|---|---|---|---|
| - Food | 0.099*** *(3.56)* | 0.395*** *(5.97)* | 0.690*** *(14.35)* | 0.112** *(1.97)* | -0.215*** *(-4.42)* | -0.115*** *(-4.12)* | 0.925 |
| - Beverages and tobacco | 0.123** *(2.00)* | 0.450*** *(4.45)* | 0.670*** *(9.95)* | 0.213* *(1.67)* | -0.334*** *(-4.23)* | -0.143*** *(-3.89)* | 0.895 |
| - Crude materials | 0.039 *(1.29)* | 0.170*** *(2.73)* | 0.839*** *(17.33)* | 0.157** *(1.96)* | -0.033 *(-0.74)* | -0.050* *(-1.76)* | 0.879 |
| - Mineral fuels and lubricants | -0.037 *(-0.70)* | -0.079 *(-0.71)* | 0.965*** *(30.44)* | 0.234** *(2.01)* | 0.062 *(0.78)* | 0.046 *(0.92)* | 0.857 |
| - Animal and vegetable oils and fats | 0.048 *(1.48)* | 0.104* *(1.64)* | 0.998*** *(32.76)* | 0.132 *(1.45)* | -0.005 *(-0.06)* | -0.051 *(-1.59)* | 0.873 |
| - Chemicals | 0.091*** *(3.26)* | 0.358*** *(5.11)* | 0.703*** *(14.25)* | 0.324 *(1.00)* | -0.032 *(-0.80)* | -0.093*** *(-3.30)* | 0.934 |
| - Manufactured goods | 0.008 *(0.35)* | 0.297*** *(6.07)* | 0.712*** *(17.73)* | 0.435* *(1.65)* | 0.014 *(0.40)* | -0.035 *(1.61)* | 0.965 |
| - Machinery | 0.122*** *(4.61)* | 0.527*** *(7.29)* | 0.722*** *(20.70)* | 0.274 *(0.98)* | 0.021 *(0.53)* | -0.122*** *(-4.66)* | 0.981 |
| - Miscellaneous manufactured goods | 0.027* *(1.77)* | 0.496*** *(12.91)* | 0.578*** *(20.47)* | 0.184 *(1.11)* | 0.120*** *(4.57)* | -0.021 *(1.41)* | 0.992 |

Note: Values enclosed in parentheses represent *t-statistics*. *$p$ < 0.10, **$p$ < 0.05, ***$p$ < 0.01.

**Table 2: Exchange Rate Pass-through Coefficients of Thai Import Industries**

| Industry | Short-run Coefficients | | Long-run Coefficients | |
|---|---|---|---|---|
| | Pre-crisis | Post-crisis | Pre-crisis | Post-crisis |
| Food | 0.395*** | 0.280*** | 1.274*** | 0.903*** |
| Beverages and tobacco | 0.450*** | 0.307*** | 1.363*** | 0.930*** |
| Crude materials | 0.170*** | 0.120*** | 1.055*** | 0.745*** |
| Mineral fuels and lubricants | -0.079 | -0.033 | -2.257 | -0.942 |
| Animal and vegetable oils and fats | 0.104* | 0.063 | 52.000 | 31.500 |
| Chemicals | 0.358*** | 0.265*** | 1.205*** | 0.892*** |
| Manufactured goods | 0.297*** | 0.262*** | 1.031*** | 0.909*** |
| Machinery | 0.527*** | 0.405*** | 1.895*** | 1.456*** |
| Miscellaneous manufactured goods | 0.496*** | 0.475*** | 1.175*** | 1.125*** |

Note: *$p$ < 0.10, **$p$ < 0.05, ***$p$ < 0.01.

The second result of this estimation also shows that the degree of exchange rate pass-through to Thailand's import prices decreased after the 1997 crisis when the Baht was highly volatile. One reason for this is that exporters, who are forward-looking and face uncertainty in predicting exchange rate volatility, would decide to hedge their export commodities toward forward-currency contracts. With such forward contracts, price setting would be more stable, not changing as much as the changes in the currency. Another reason from the exporters' perspective is whether the currency changes would be temporary or permanent. A floating exchange rate may require exporters to frequently adjust their prices, which would cost them higher "menu costs." If foreign exporters would like to avoid such menu costs, they would choose not to adjust their prices.[5]

Finally, the third result shows that a long-run pass-through is higher than a short-run pass-through, which means that the speed of adjustment to Thailand's import prices appears to be quite rapid. The price adjustment of a one-month period lagged is very responsive to exchange rates.

The next section will discuss the policy debate and the policy implications of a partial degree of exchange rate pass-through.

## III. POLICY DEBATE AND IMPLICATIONS

Understanding the determinants of exchange rate pass-through is an important contribution to the policy debate. The first policy discussed here is the development policy toward market competition. The low degree of pass-through implies the market power of foreign exporters in the Thai market, that market power generates market inefficiency and market distortion, both of which are disadvantageous for customers and domestic producers. With regard to this economic development, policymakers should be concerned with improving market competition between imported goods and domestic goods, where the improvement in competition is the result of a number of policy initiatives such as production subsidies, and import substitution, among others.

Compared with other policies, the extent of exchange rate pass-through is of great concern to the Bank of Thailand in deciding to launch a monetary policy with the purpose of GDP-targeting stabilization. Obviously, the optimal monetary policy depends on a fundamental way on the type of price stickiness. In a low exchange rate pass-through context, where prices are stickier and not responsive to exchange rates, monetary policymakers cannot rely on the exchange rate to provide the necessary adjustment to real shocks. To the extent that consumers do not interpret exchange rate changes as relative price changes in the short run, monetary policy can achieve only an inferior outcome in which it is unable to control GDP targeting. Therefore, when there is a low pass-through to the price level, as noted by Devereux (2001), monetary policymakers should choose a different approach to inflation targeting, which is much easier to implement than the GDP-targeting approach. Moreover, if import prices are highly correlated with consumer prices, there will be less distinction between import prices and government control over consumer prices. Therefore, this will help in reducing the effects of low pass-through coefficients to consumer demand and cause monetary policy to be more effective. In summary, implementing a central role for intermediary agents would absorb some of the exchange rate fluctuations, as indicated by the greater degree of exchange rate pass-through to import prices than to consumer prices.

Exchange rate pass-through not only reflects the debate in policy development with regard to competitiveness and monetary policy, but it also is important in international trade policy. One of the main questions to be answered is whether devaluation of the Baht would improve Thailand's balance of trade and its implications for welfare. The limited degree of exchange rate pass-through in import goods implies less success for the currency-devaluation policy. Trade policymakers on concerning the success of such policy should therefore consider a relatively low exchange rate pass-through. Nevertheless, Tille (1999, 2000) explains that a country can benefit from the depreciation of its domestic currency depending on the degree of substitutability between goods produced domestically and those produced internationally. If the cross-country substitutability is high, domestic customers still pay higher prices for imports when the currency has been devalued, which makes it impossible to improve the trade balance. Government policy toward production subsidies and import substitution for domestic producers in Thailand may, therefore, decrease the degree of cross-country substitutability by encouraging Thai people to purchase more domestic products and less imported goods.

## IV. CONCLUSION

Over the past two decades, interest in assessing the impact on prices of changes in exchange rates has increased significantly. Exchange rate pass-through, referring to the degree of response of import prices to a 1 percent change in exchange rates, is an important consideration in this relationship. A number of monthly data on the period from January 1996 to May 2003 were collected to estimate the exchange rate pass-through coefficients of Thailand's import industries. The purpose of this paper is threefold: 1) to estimate the exchange rate pass-through of Thailand's import industries in both short-run and long-run effects, 2) to investigate how the 1997 crisis should affect the degree of pass-through and price-setting behavior, and 3) to discuss the policy debate and the implications of how a low degree of exchange rate pass-through should be of concern to policymakers.

First, the estimations of nine major Thailand's import industries show that the extent of exchange rate pass-through to Thai imports is quite low, i.e., between 0.104 for the animal and vegetable oils and fats industry and 0.527 for the machinery industry. The low degree of pass-through, therefore, would be of concern to policymakers in deciding whether to launch policy initiatives. Second, the degree of exchange rate pass-through to Thailand's import industries has been found to decrease after the 1997 crisis when the Baht was highly volatile and its trends hard to predict. The prediction of a long-run pass-through is higher than a short-run pass-through, which means that the speed of adjustment of a month lagged to Thailand's import prices appears to be quite high. At the end of this paper, the policy debate and the implications of development policies toward competitiveness, optimal monetary policy, and currency devaluation policy are discussed in light of the low extent of pass-through.

## ENDNOTES

1 See, for example, Dornbusch (1987), Mann (1986), and Marston (1990).

2 See, for example, Corsetti and Pesenti (2001) and Devereux and Engel (2000).

3 $P = e.Markup.MC^{*}$, where P is price in import currency unit, Markup is convexity of domestic demand function (price elasticity), and MC is the exporters' marginal cost.

4 This long-run determinant, however, captures the effect of a one-month lagged period. This procedure may be more relevant for quarterly or annual data.

5 See Piriya (2002) for the theoretical supports and arguments.

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