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Research Article
Exchange Rate Pass-through into Vietnam's Import Prices: Empirical Evidences from six Main Trading Partners' Data

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Abstract

Background and Objective: The State Bank of Vietnam (SBV) announced it would adopt the flexible exchange rate mechanism commencing Jan 4th, 2016. The exchange rate is regarded as one of the crucial issues affecting the macroeconomic stability of the economy, along with other issues such as the budget deficit, trade deficit and inflation. The objective of this paper was to investigate in greater detail than had previously been considered the degree of exchange rate pass-through (ERPT) into Vietnam's import prices from its main trading partners. **Materials and Methods:** Examination of the degree of ERPT into 261 commodities at the HS 4 digit level belonging to major categories of Vietnam imports by conducting Fixed Effects Model and using monthly highly disaggregated data of Korea, Japan, EU-28, Taiwan, Thailand, Singapore and China. **Results:** The analysis showed that exporters tend to highly pass-through into the import prices in the categories of "Electric machinery" and "Machinery and mechanical appliances". Besides the prevalence of the U.S. dollar in payment invoices for imports into Vietnam, Japanese Yen (JPY), Euro (EUR) and Singapore dollar (SGD) also appeared in the bill of commodities imported from Japan, EU-28 and Singapore. **Conclusion:** This paper supported the decision of the SBV in moving toward a more flexible exchange rate regime allowing the daily reference rate based on a weighted average of Vietnamese dong prices in the interbank market in the previous day's trading against prices of major foreign currencies. However, the VND should only be anchored to a basket of 5 currencies, namely USD, JPY, CNY, EUR and SGD, rather than the 8 currencies announced by the SBV on December 31st, 2015.

Key words: Exchange rate pass-through, import prices, fixed effects model, state bank of Vietnam (SBV), currencies

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

The problem of inflation has been of central concern to Vietnamese policy makers because Vietnam has experienced many high and prolonged periods of inflation that caused its economic instability. Especially after the global economic crisis in late 2007, Vietnam's inflation increased and lasted from November 2007-September 2008, causing a sharp rise in the inflation rate from 6.7% in 2006 to 12.7% in 2007 and 22.3% in 2008, respectively. By the end of 2010 inflation rebounded and lasted for 13 months from September 2010 to October in 2011, causing the annual inflation rate to reach 11.75% in 2010 and 18.13% in 2011 (according to data from the General Statistics Office of Vietnam (GSO)). Since 2012, although inflation has been well controlled, there is still the potential risk for inflation to rebound. According to GSO's data, the CPI in June 2018 increased by 0.61% compared to May 2018 and increased by 4.67% over the same period last year, contributing to a rise in the average CPI in the first 6 months of 2018 to 3.29% over the same period in 2017. This fact raises concerns over whether targeting inflation below the 4% level planned by the Vietnamese government at the beginning of the year of 2018 is achievable. Meanwhile, according to the results of Tran[1], one of the causes of inflation in Vietnam is the increase in import prices caused by exchange rate fluctuations. Tran[1] suggested that limiting the pass-through of exchange rate into import prices will help control inflation in Vietnam.

The empirical analysis of exchange rate pass-through (ERPT) has attracted the attention of researchers over the last few decades. In terms of the macro approach, many studies[1-10] applied the new open-economy macroeconomic model for investigating the ERPT by using aggregated import from total world import data. However, by only calculating the degree of ERPT into the aggregated import price from total world data it would be difficult to propose concrete measures to control inflation because employing the data set of macroeconomic fundamentals tends to mask the country-specific factors. Therefore, in order to have a clearer picture of the ERPT into import prices a board of previous studies examined the ERPT in terms of the micro approach.

The studies applying the micro approach investigated the ERPT by looking at exporters and importers' behavior and can be classified into 3 groups. The first group uses the aggregated import/export prices from various source countries[11-13]. However, using this kind of data it is still not possible to answer which industry and which kind of goods are most/least affected by the fluctuations of exchange rate. Therefore, by investigating the degree of ERPT into import prices at the highly disaggregated data level, appropriate implications for policy makers will become apparent. The second group studied the ERPT into import/export prices by using the disaggregated commodity or industry-breakdown data of imports of a particular country[14-18]. However, using only a few commodities at the HS 9-digit level to consider the extent of ERPT at an industry level gave biased results. For example, Takagi and Yoshida[14] analyzed only 11 commodities, Parsons and Sato[15,16] selected 27 commodities, Sato[17] collected 13 commodities and Nguyen[18] conducted 18 commodities. It is considered that in order to make a sound and comprehensive conclusion about the ERPT the maximum number of commodities possible should be selected for investigation. To achieve this purpose, the last group uses the maximum number of highly disaggregated commodities from various source countries for their estimation the ERPT[19-22].

Only a few studies in the last group have so far investigated the exchange rate pass-through into Vietnam's import prices by applying the micro approach. Tran and Nguyen[21] examined the ERPT into Vietnam's import price by using bilateral trade data from China in the period of 2000 to 2015. However, Vietnam also imports from other major trading partners which should also be considered in order to more fully understand the ERPT into import prices. Nguyen and Tran[22] used the Fixed Effects Model to investigate the ERPT into Vietnam's import prices by 5 industries by 7 major trading partners including China, Japan, Korea, EU-28, Taiwan, Thailand and Singapore. Unfortunately, Nguyen and Tran[22] only based the study on the same number of identical commodities at the HS 9 digit level imported from partners across 5 industries to examine the ERPT into Vietnam's import prices. By doing it this way there are a lot of commodities at the HS 9-digit level which were not investigated. Consequently the empirical results of Nguyen and Tran[22] only provided a comparison of the different degree of ERPT into Vietnam's import prices for the identical commodities across exporters.

In view of this gap in research, this paper aimed to provide a more comprehensive measure of the ERPT into Vietnam's import prices by pooling 908 imported commodities from its main trading partners at the HS 9-digit level (or HS 6-digit level) into 261 groups of commodities at the HS 4-digit level. Using the results of this paper and incorporating the results of Tran and Nguyen[21], it generalized conclusions in discussing ERPT in a broader perspective and provided the empirical evidence to determine criteria for pegging the Vietnam Dong to a currency basket that includes USD, JPY, CNY, SGD and EUR rather than anchoring to the 8 currencies announced by the SBV on December 31st, 2015.

MATERIALS AND METHODS

The ERPT defined as the percentage change in the import prices of the importer's currency resulting from 1% change in the exchange rate between exporting and importing countries[23]. This definition was considered from the perspective of the importer. However, investigating the ERPT can be conducted from both importer and exporter sides. As argued by Takagi and Yoshida[14], the ERPT to import prices is full if a change in the exchange rate is completely transmitted into the import price with the ratio of 1-1. Calculating the degree of ERPT into import prices will infer the degree of ERPT into export prices. In contrast, the determination of the level of ERPT into export prices will help to show the level of the ERPT into import prices.

This paper investigated the ERPT into the import price based on the approach from the exporter's view as done by Knetter[24] who demonstrated that export prices were affected by the bilateral exchange rate of the exporters' currency vis-à-vis the importers' currency. The relationship between the export price and the relevant variables is shown as below:

$$\ln P^{E}_{ijt} = \alpha+\beta_1 \ln E_{jt}+\beta_2 \ln PPI_{ijt}+\beta_3 \ln IPI_{it}+\epsilon_{ijt} \quad (1)$$

Research design: Up to now the U.S. dollar still widely used as an invoicing currency in international trade. Therefore, this study not only investigates the exporters' pass-through behavior into Vietnam's import prices but also examines the degree of the prevalence of the U.S. dollar in invoice payments for imports of Vietnam from its main trading partners. Thus, Eq. (1) is developed into Eq. (1a) and (1b) to obtain:

$$\ln P^{TPR}_{ijt} = \alpha+\beta_1 \ln E^{TPR/VND}_{jt}+\beta_2 \ln PPI^{TPR}_{ijt}+\beta_3 \ln IPI^{VND}_{t}+e_{ijt} \quad (1a)$$

$$\ln P^{TPR}_{ijt} = \alpha+\beta_1 \ln E^{TPR/USD}_{jt}+\beta_2 \ln PPI^{TPR}_{ijt}+\beta_3 \ln IPI^{VND}_{t}+e_{ijt} \quad (1b)$$

where, P^{TPR} is the export price in the currency of the exporter; $E^{TPR/VND}$ and $E^{TPR/USD}$ is the bilateral nominal exchange rate of the trading partners' currency vis-à-vis VND and the bilateral nominal exchange rate of the trading partners' currency vis-à-vis USD, respectively; PPI^{TPR} is the producer price index of the trading partners of Vietnam; IPI^{VND} is the price index of industrial production of Vietnam. As for the categories of "pharmaceutical products" imported from EU-28, instead of using the industrial production index of Vietnam to represent the demand for these products in the importing country, this paper uses the producer price index of Vietnam for a proxy because these products are imported to serve consumption rather than industrial production.

For Eq. (1a) if the null hypothesis $\beta_1 = 0$ cannot be rejected it means that the export prices invoiced in the exporters' currency are not influenced by exchange rate fluctuations. This may imply that exporters tend to fully pass-through exchange rate changes to Vietnamese importers. In that case Vietnamese importers have to bear the full risk from movements of the exchange rate. This indicates that the currency used in the payment can only be the exporter's currency. If the results of β_1 in both Eq. 1a and 1b are zero and statistically significant, it means that the U.S. dollar is used in payment.

In the case where the test results are statistically significant and $\beta_1 \neq 0$ and it will have two possible outcomes. Firstly, $0<\beta_1<1$ means exporters incompletely pass-through into import prices. If only the result of β_1 in Eq. 1a is statistically significant, the exporter's currency is used in payment. If only the result of β_1 in Eq. 1b is statistically significant, the U.S. dollar is used in payment. If the results of β_1 in both Eq. 1a and 1b are statistically significant, it cannot conclude.

Secondly, $\beta_1 = 1$ means the movements of exchange rate pass-through into export price is full and the fluctuations of exchange rate do not affect import prices. This was the behavior of Pricing to Market (PTM) (According to the theory of PTM in Krugman[25]). If only the result of β_1 in Eq. 1a is statistically significant, the currency used in payment depends on the market power of importer and trading partner to decide to choose importer's currency or exporter's currency. If only the result of β_1 in Eq. 1b is statistically significant, the U.S. dollar will be used in payment. If the results of β_1 in both Eq. 1a and 1b are statistically significant, it cannot conclude[26].

The values of β_1 presented above corresponded to the theoretical aspect. Meanwhile empirical studies[16,18-21] provided the results of β1 with values larger than unity. The explanation for this issue was due to the use of the unit values proxy for the export prices (the total value of the imported commodity divided by the total volume/quantity). This was the same limitation of the studies approaching this methodology. Therefore, the cases of the results of β_1 with values larger than unity were still acceptable and it can be concluded that there was no pass-through into import prices, which means that exporters choose to PTM. In some cases, the results of β_1 were statistically significant but negative and so proved that these results had no economic significance.

Data collection: All data used for regression was monthly. Based on the available data of each main trading partner, the

sample period for Japan, EU-28 ranges from January, 2000 to December, 2015 (192 months), for Korea is January, 2005 to December, 2015 (132 months); for Taiwan from January, 2003 to December, 2015 (156 months); for Singapore from January, 2006 to December, 2015 (120 months) and for Thailand from 2007 to December, 2015 (108 months). This paper used highly disaggregated commodity data at the HS 6 digit level for all main trading partners (except for highly disaggregated commodity data at the HS 9 digit level for Japan). The purpose of using data to December, 2015 is to test: (1) whether the decision of the SBV moving toward a more flexible exchange rate regime, effected on January 4th, 2016, is appropriate or not and (2) whether the VND announcement to anchor in a basket of 8 currencies instead of only the U.S. dollar as before 2016 is appropriate or not. The answers of these questions can be found through the results of Eq. 1a and 1b.

Source of data

+P (export price): The price data of the exported commodity are not available. In order to obtain the data of total export value and total export volume for calculating the unit values, the data was collected from the various sources including Japan Customs, International Trade Centre for Singaporean and Thailand data, Eurostat, Korea International Trade Association and Taiwan Custom Administration.

+ E: The bilateral nominal exchange rate of exporters' currency vis-à-vis the U.S. dollar is obtained from IFS-IMF (International Financial Statistics), then the nominal cross exchange rates of exporters' currencies against VND is calculated.

+ PPI: The data of producer price indexes were obtained as following: Korea (2010 = 100) from Economic Statistics System, The Bank of Korea, Japan (2010=100) from Bank of Japan, EU-28 (2010=100) from Eurostat, Taiwan (2011=100) from Directorate-general of Budget, Accounting and Statistics, Executive Yuan, R.O.C. (Taiwan), Singapore (2012=100) from Department Statistics Singapore, Thailand (2010=100) from Bureau of Trade and Economic Thailand and Vietnam (2010=100) from CEIC database. The data of Vietnam's PPI is at the aggregate level, PPI of Japan is at the HS-9 digit level, the PPI data of other countries are at the HS-6 digit level.

+ IPI: Vietnam's industrial production index is collected from the CEIC database (2010 = 100).

All first order linear differential equations were used to estimate the ERPT into Vietnam import prices because the results of the Augmented Dickey Fuller (ADF) test shows that most of the variables are non-stationary in natural logarithm levels but stationary in the first differences. The results of F-test and Hausman test supported the use of the Fixed Effect Model (FEM) data model for this paper.

RESULTS

For the Korean case: The regression results shown in Table 1 revealed that the KRW did not appear but the U.S. dollar dominated in most trade payment invoices between the two countries. The common slope coefficients of β_1 in Eq. 1b are positive and statistically significant for many commodity groups. It means that South Korean exporters tend to pass-through into Vietnam's import prices and the U.S. dollar is widely used in trade payment invoices. As a result, when importing commodities from South Korea, Vietnamese importers need to pay attention to the volatility of the exchange rate of VND/USD.

For the Japanese case: The results in Table 2 revealed that the U.S. dollar was popularly used in payment transactions for Vietnam's imported commodities in the category of "Electric machinery" from Japan. However, for the category of "Transport Equipment", the Japanese exporters tended to pass-through into Vietnam's import prices and requested JPY in the bill of payment. For the commodity category of "Machinery and mechanical appliances", the degree of the ERPT is relatively high in the commodity groups of 8409, 8413, 8415, 8428, 8477 and 8481, while Japanese exporters tend to incompletely pass-through into import prices of the commodity groups of 8424, 8425, 8427, 8452 and 8482. This study found that JPY also appeared in the trading in the category of "Machinery and mechanical appliances".

For the Taiwan case: The estimated results of the ERPT into Vietnam's import prices by using Taiwan trade data (Table 3) showed that the U.S. dollar is widely chosen by Vietnamese importers for making payment to Taiwan exporters. The results in Eq. 1b showed that few Taiwanese exporters fully pass-through the volatility of the exchange rate into the import prices but many cases are PTM. The trend of the ERPT into the import prices is incomplete for the commodity groups of 3902, 3920 and 3921 in the category of "Plastics",

Table 1: Estimates of pass-through coefficients using south Korean trade data

			2005M1-2015M12		2005M1-2015M12	
			KWR/VND		KWR/USD	
HS4	HS6	Code description	β	SE	β	SE
Plastics						
3901	4	Polymers of ethylene, in primary forms	0.394	0.216	0.511**	0.229
3902	2	Polymers of propylene, in primary forms	-0.079	0.140	-0.054	0.148
3903	4	Polymers of styrene, in primary forms	0.287	0.203	0.252	0.215
3904	2	Polymers of vinyl chloride, in primary forms	0.545	0.789	0.315	0.835
3907	4	Polyacetals, other polyether, ecocide resins, primary forms	0.961	0.280	1.147***	0.296
3917	2	Tubes, pipes and hoses and fittings therefor	1.056	1.824	1.061	1.936
3919	2	Self-adhesive plates, sheets and other flat shapes, of plastics	0.005	0.798	-0.337	0.846
3920	4	Plates, sheets of non-cellular plastics, not reinforced	0.249	0.760	0.019**	0.806
3921	3	Plates, sheets and cellular plastic, merely surface-worked	-1.415	0.941	-1.147	0.992
3923	3	Articles for packaging of goods, of plastics	0.513	1.117	0.549***	1.185
3926	2	Articles of plastics and other materials of 3901-3914	0.755	1.444	0.691***	1.531
Iron and steel						
7208	4	Flat-rolled products of iron, width ≥600mm, hot-rolled, not clad	-2.177	2.389	-2.021	2.540
7209	2	Flat-rolled products of iron, width ≥600 mm, cold-rolled, not clad	3.097	2.497	2.458	2.963
7210	3	Flat-rolled products of iron, width ≥600 mm, clad, plated or coated	1.828	2.116	1.365	2.569
7216	2	Angles, shapes and sections of iron	4.461	1.448	5.094	2.144
7217	3	Wire of iron or non-alloy steel	3.663*	2.212	3.978*	2.357
7219	2	Flat-rolled products of stainless steel, width ≥600 mm	1.088	2.056	1.183	2.401
Machinery and mechanical appliances						
8413	4	Pumps for liquids; liquid elevators	2.372	4.444	2.113	4.758
8414	5	Air, vacuum pumps; hoods incorp a fan	4.284	3.852	4.528	4.140
8415	2	Air conditioning machines, with motor-driven elements	-0.959	6.697	-2.499	7.190
8418	3	Refrigerator, freezer	3.039	2.268	2.654**	2.422
8419	3	Machinery, plant or laboratory equipment	-4.877	5.230	-5.647	5.564
8421	4	Centrifuges, filtering/purifying machinery	0.557	4.488	0.865***	4.796
8424	2	Mechanical appliance for proj/dispersing/spray	-0.279	5.938	0.154***	6.326
8428	2	Lifting, handling, loading or unloading machinery	-0.443	6.305	-1.206	6.730
8431	3	Machinery part used for 84.25-84.30	3.204	3.360	2.742	3.593
8448	3	Auxiliary machinery	-0.949	3.761	-0.020	4.015
8451	5	Machinery for washing/clean/ironing/impreg tax yarn	0.107	2.858	0.416**	3.048
8452	4	Sewing machine and furniture	2.345	3.537	2.849**	3.763
8453	3	Machinery for preparing, working hide, leather or repairing footwear	-0.833	3.749	-0.560	3.992
8466	2	Machinery parts accessories for 84.56-84.65	7.152	5.355	8.797	5.706
8468	2	Machineries and appliances for soldering, brazing	4.886	5.917	6.430	6.302
8471	3	Automatic data processing machines, optical reader	-2.396	4.423	-4.798	4.715
8477	3	Machinery for working rubber, plastic	0.083	4.944	0.369**	5.279
8479	4	Machines, appliances having individual functions	0.027	4.322	0.056***	4.612
8480	2	Molding boxes for metal foundry	-2.771	3.685	-2.751	3.929
8481	3	Tap, cock, valve for pipe, tank	0.611	3.848	0.979**	4.102
8482	2	Ball or roller bearings	0.596	3.330	0.581*	3.550
8483	2	Transmission shafts, cranks, gearing	-0.421	5.132	-0.419**	5.486
Electric machinery						
8501	2	Electric motors and generators	-4.233	4.465	-4.249	4.698
8515	5	Electric, laser/photon beam/plasma arc solders	3.418	3.583	0.934**	3.787
8516	2	Electric instantaneous water heater, hair dryer	2.514	5.371	3.037	5.690
8518	4	Microphones and stands, loudspeaker	-0.680	2.971	-1.056	3.131
8531	2	Electric sound or visual signaling apparatus	1.623	5.280	0.613***	5.547
8532	2	Electrical capacitors, fixed, variable or adjustable	-2.552	5.271	-2.512	5.586
8535	2	Electrical apparatus for switching or protecting electrical circuits	0.763	4.362	0.882***	4.620
8536	7	Electrical app for switch, not exceed 1000 volt	1.216	1.780	0.938*	1.874
8544	2	Insulated wire or cable	-0.806	3.528	-1.195	3.729
Transport equipment						
8703	3	Motor cars, other motor vehicles for the transport of persons	1.060	4.124	0.733***	4.382
8704	2	Trucks, motor vehicles for the transport of goods	-0.845	4.999	-0.122	5.304
8708	3	Parts and accessories of 8701-8705	1.772	2.770	1.676**	2.935

*10%, **5% and ***1%, β1 denotes the common slope pass-through coefficient for each HS 4-digit level, SE: Standard errors, HS6 (HS9) indicates the number commodity at the HS 6-digit (9-digit) level pooled of each of HS4-digit classification

Table 2: Estimates of pass-through coefficients using Japanese trade data

			2000M1-2015M12		2000M1-2015M12	
			JPY/VND		JPY/USD	
HS4	HS9	Code description	β	SE	β	SE
Iron and steel						
7204	2	Ferrous waste and scrap	-0.350	0.848	-0.095	0.891
7214	2	Bars and rods, non-alloy steel, hot-rolled	-5.325**	2.141	-4.806**	2.214
7215	2	Bars and rods, non-alloy steel, cold-finished	-0.393	0.675	-0.834	0.707
7217	2	Wire of iron or non-alloy steel	-0.083	0.671	-0.453	0.700
Machinery and mechanical appliances						
8407	2	Spark-ignition reciprocating or rotary internal	1.755	1.942	2.021	2.007
8409	4	Part for use principally with the motor engines	0.145**	1.257	-2.559*	1.305
8413	5	Pumps for liquids; liquid elevators	0.147**	2.154	3.030	2.239
8414	7	Air, vacuum pumps; hoods incorp a fan	2.693**	1.359	2.556*	1.408
8415	2	Air conditioning machines	0.212***	2.499	2.581	2.575
8419	4	Machinery, plant or laboratory equipment	1.497	1.374	0.720	1.427
8421	5	Centrifuges, filtering/purifying machinery	1.492	0.977	1.096	1.016
8424	2	Mechanical appliance for proj/dispersing/spray	0.717***	2.932	0.827	3.041
8425	2	Pulley tackle and hoists other than skip hoists	0.659***	2.307	1.020	2.389
8427	3	Fork-lift trucks	1.051	0.916	0.479***	0.953
8428	3	Lifting, handling, loading or unloading machinery	0.347	1.655	0.006**	1.722
8448	2	Auxiliary machinery	-5.138*	2.692	-6.425**	2.797
8451	2	Machinery for washing/ ironing/impure tax yarn	-0.994	2.044	-0.885	2.119
8452	6	Sewing machine and furniture	0.478	0.863	0.752**	0.897
8458	2	Lathes	-0.828	1.216	-0.852	1.262
8462	4	Machine-tool for working metal by hammer	-2.082	1.553	-1.934	1.612
8465	2	Mach-tool for working wood/ bone/hard rubber	3.115	2.912	3.350	3.029
8466	3	Machinery parts accessories for 84.56-84.65	1.370	2.102	1.220	2.184
8467	2	Tool with self-contained non-elect motor	1.544	1.408	2.040	1.462
8477	3	Machinery for working rubber, plastic	0.520	1.969	0.284**	2.048
8479	4	Machines, appliances having individual functions	-1.981	1.375	-2.103	1.429
8480	2	Mounding boxes for metal foundry	-2.332	2.044	-1.297	2.125
8481	8	Tap, cock, valve for pipe, tank	-0.416	0.916	0.311**	0.952
8482	2	Ball or roller bearings	0.496	0.936	0.971***	0.972
8483	9	Transmission shafts, cranks, gearing	1.434	1.051	1.097	1.091
8484	3	Gaskets combined with other material	-0.370	2.406	1.053	2.492
Electric machinery						
8501	4	Electric motors and generators	1.416	1.882	2.157*	1.967
8502	3	Electric generating sets and rotary converters	1.998*	1.489	2.063***	1.567
8504	4	Electric transformer, static converter	-0.302	1.163	-0.775	1.220
8511	2	Electrical ignition or starting equipment	-1.692	1.362	-0.857	1.430
8515	4	Electric, laser/photon beam/plasma arc solders	0.067	2.106	0.571***	2.210
8529	2	Part suitable for use with televisions, appliance	1.711	0.774	2.139***	0.809
8532	2	Electrical capacitors, fixed, variable or adjustable	-0.016	1.323	-0.039	1.387
8533	2	Electrical resistor	-0.097	1.206	1.110	1.265
8536	9	Electrical app for switch, not exceeding 1000 volt	0.671	0.448	1.025**	0.469
8538	2	Parts suitable for use with 8535-8537	0.445	0.214	0.664***	0.223
8539	2	Electric filament or discharge lamps	1.026	2.559	-0.267	2.672
8541	6	Diodes and similar semiconductor devices	0.395	0.791	1.166	0.829
8544	2	Insulated wire, cable	-1.065	1.242	-1.066	1.279
8545	2	Carbon electrodes, carbon brushes, lamp carbons	3.749*	2.169	4.754***	2.270
Transport equipment						
8704	2	Trucks, motor vehicles for the transport of goods	0.851***	0.315	0.674	0.333
8708	5	Parts and accessories of 8701-8705	0.175**	0.355	0.381	0.373
8714	2	Parts and accessories of 8711-8713	-0.108	1.247	-0.425	1.297

*10%, **5% and ***1%, β1 denotes the common slope pass-through coefficient for each HS 4-digit level, SE: Standard errors, HS6 (HS9) indicates the number commodity at the HS 6-digit (9-digit) level pooled of each of HS4-digit classification

Table 3: Estimates of pass-through coefficients using Taiwanese trade data

			2003M1-2015M12		2003M1-2015M12	
			TWD/VND		TWD/USD	
HS4	HS6	Code description	β	SE	β	SE
Plastics						
3901	4	Polymers of ethylene, in primary forms	-0.030	0.455	-0.358	0.549
3902	2	Polymers of propylene, in primary forms	-0.366	0.546	0.731***	0.657
3903	5	Polymers of styrene, in primary forms	-0.505	0.397	-0.688	0.479
3904	2	Polymers of vinyl chloride, in primary forms	0.740	0.676	1.187**	0.814
3906	2	Acrylic polymers, in primary forms	-1.089	0.769	-1.187	0.927
3907	8	Polyacetals, other polyether, ecocide resins, in primary forms	-0.228	0.352	-0.534	0.424
3908	2	Polyamides, in primary forms	1.015	1.207	1.405*	1.455
3909	4	Amino, phenol resins, in primary forms	-0.486	0.511	-0.155	0.617
3912	2	Cellulose and its chemical derivatives, in primary forms	1.895	2.229	2.838	2.686
3917	3	Tubes, pipes and hoses and fittings therefor	-1.401	3.328	-2.846	2.012
3919	2	Self-adhesive plates, sheets and other flat shapes, of plastics	1.192	1.532	1.648	1.847
3920	5	Plates, sheets of non-cellular plastics, not reinforced	0.308	1.310	0.171**	1.580
3921	4	Plates, sheets of plastics, un-worked or merely surface-worked	0.465	1.587	0.329***	1.914
3923	7	Articles for packaging of goods, of plastics	0.120	0.992	-0.133	1.196
3924	2	Kitchenware, other household articles, of plastics	-1.696	1.935	-1.758	2.334
3926	5	Articles of plastics and other materials of 3901-3914	-1.039	1.900	-1.234	2.290
Machinery and mechanical appliances						
8402	2	Steam or other vapor generating boilers	2.346	2.411	0.886**	2.918
8412	4	Engines and motors	-1.806	2.392	-0.479	2.338
8413	5	Pumps for liquids; liquid elevators	0.681	1.562	3.106	2.624
8414	6	Air, vacuum pumps; hoods incorp a fan	-1.135	1.193	-5.662	3.457
8417	2	Industrial/laboratory furnaces ovens, non-electric	4.701	2.689	3.443	1.561
8418	2	Refrigerator, freezer	2.214	2.252	2.771	2.713
8419	4	Machinery, plant or laboratory equipment	2.479	2.411	3.955	2.806
8421	4	Centrifuges, filtering/purifying machinery	-2.013	2.878	-3.946	2.542
8422	2	Dish washing machines, machinery for cleaning	-1.520	1.983	3.555	2.210
8424	4	Mechanical appliance for proj/dispersing/spray	-0.388	3.587	0.718***	2.662
8428	3	Lifting, handling, loading or unloading machinery	0.652	1.170	2.907	3.581
8431	4	Machinery part used for 84.25-84.30	-1.024	2.138	1.014	2.954
8441	3	Machinery for making paper pulp, paper or papered	2.445	2.081	5.931	2.013
8448	6	Auxiliary machinery	-4.108	2.796	-3.215	2.414
8451	4	Machinery for washing/clean/ironing/impure tax yarn	2.650	2.978	3.905	2.695
8452	3	Sewing machine and furniture	-1.051	2.621	-3.653	2.839
8453	3	Machinery for preparing, leather or repairing footwear	0.659	1.548	1.689**	2.443
8458	2	Lathes	-5.624	4.214	-7.572	2.657
8459	3	Mach tools, for drilling, boring, milling	-0.733	3.941	2.799	2.219
8460	3	Mach tools for debarring, sharpening, grinding, polishing	-1.980	4.279	-1.878	2.755
8462	4	Machine-tool for working metal by forging/ hammer	0.448	3.634	0.346***	1.736
8465	6	Mach-tool for working wood/cork/bone/hard rubber	-1.981	1.640	-0.037	2.590
8466	5	Machinery parts accessories for 84.56-84.65	0.212	3.634	0.094	1.736
8467	5	Tool with self-contained non-elect motor	-2.889	3.822	0.895*	2.044
8471	2	Automatic data processing machines, optical reader	3.745	4.436	0.808**	2.010
8477	5	Machinery for working rubber, plastic	2.660	2.621	1.037**	2.140
8479	3	Machines, appliances having individual functions	0.641	2.466	2.605	2.470
8480	6	Mounding boxes for metal foundry	-1.708	2.219	1.825	2.504
8481	6	Tap, cock, valve for pipe, tank	2.025	2.447	1.398***	1.864
8482	2	Ball or roller bearings	2.950	3.766	3.600	1.947
8483	2	Transmission shafts, cranks, gearing	-6.338	2.033	1.404	2.599
8484	2	Gaskets combined with other material	0.821	3.001	5.908	2.465
Electric machinery						
8501	6	Electric motors and generators	2.062	3.461	0.606***	2.539
8504	4	Electric transformer, static converter	3.287	1.129	2.771	2.206
8512	2	Electrical lighting equip, windscreen wipers, defrosters	1.603	2.628	3.546	1.191
8514	2	Industrial, laboratory electric furnaces and ovens	-3.118	2.144	0.032	2.848
8515	3	Electric, laser/photon beam/plasma arc solders	-0.393	3.775	0.211**	2.641

Table 3: Continued

			2003M1-2015M12		2003M1-2015M12	
			TWD/VND		TWD/USD	
HS4	HS6	Code description	β	SE	β	SE
8532	2	Electrical capacitors, fixed, variable or adjustable	2.747	2.002	2.187	1.400
8536	6	Electrical app for switch, not exceeding 1000 volt	-0.719	2.360	0.162***	2.776
8539	3	Electric filament or discharge lamps	-1.270	2.869	4.643	1.013
8541	2	Diodes/transistors and similar semiconductor devices	3.650	2.320	0.912**	2.526
8544	4	Insulated wire, cable	-0.117	2.060	-4.649	3.291

*10%, **5% and ***1%, β1 denotes the common slope pass-through coefficient for each HS 4-digit level, SE: Standard errors, HS6 (HS9) indicates the number commodity at the HS 6-digit (9-digit) level pooled of each of HS4-digit classification

the groups of 8402, 8424 and 8467 in the "Machinery and mechanical appliances" category and the groups of 8501 and 8541 in the category "Electric machinery". As a result, the estimated results indicated that Taiwan exporters decide to PTM in commodity groups of 3904 and 3908 in the category of "Plastics", in the groups of 8453, 8477 and 8481 in the "Machinery and mechanical appliances" category. Except for two commodity groups of 8515 and 8536 in the "Electric machinery" category which bear high ERPT into the import prices, it can be said that both Vietnamese importers and Taiwanese exporters have to pay attention to the fluctuations of the U.S. dollar in order to reduce the exchange rate exposure.

For the EU-28 case: The estimated results of the degree of the ERPT into import prices using the EU-28 trade data (Table 4) demonstrate two distinct directions for four commodity categories. In the "Pharmaceutical products" category, EU 28 exporters tend to high pass-through the exchange rate fluctuations into import prices for two groups of 3004 and 3006 and requested Vietnamese importers to make payment in EUR.

In the "Machinery and mechanical appliances" category, the degree of the ERPT into import prices is full for the commodity groups of 8414 and 8419 and incomplete for the commodity groups of 8422, 8471, 8481, 8483 and 8484.

The regression results for the "Electric machinery" category show that the common slope coefficients β_1 are relatively lower than that of the category of "Machinery and mechanical appliances". The degrees of the ERPT into Vietnam's import prices are high for the commodity groups of 8531 and 8544, but low for the groups of 8504, 8516, 8535, 8539.

In the last category of the "Optical, medical or surgical instruments and apparatus", EU-28 exporters tend to highly pass-through the exchange rate fluctuations into the commodity groups of 9018, 9025 and 9030 and push the exchange rate risks to Vietnamese importers.

For the Thailand case: The results of estimated pass-through coefficients are presented in Table 5. Thailand exporters invoiced in USD and tended to highly pass-through into the import prices of category of "Plastics" and "Electric machinery". Meanwhile, the degree of the ERPT into import prices in the category of "Machinery and mechanical appliances" and "Transport equipment" is very low. As a result, it can be concluded that the U.S. dollar dominates in currency invoices of Thailand exports to Vietnam.

For the Singapore case: The regression results in Table 6 showed SGD was widely used in Vietnam's import bill from Singapore for the category of "Plastics". For the two remaining categories, Singaporean exporters tend to pass-through the exchange rate changes into Vietnamese import prices. The U.S. dollar is prevalent in the payments for the "Electric machinery" category. The degrees of the ERPT into the import prices are full for the groups of 8501, 8504, 8516 and 8518 and incomplete for the groups of 8531, 8532 and 8541.

DISCUSSION

Unlike the previous studies based on the macro approach[1-10], this study can explain the detailed behaviors of each main exporter into Vietnam's import prices. By conducting a much larger numbers of commodities at disaggregated HS 6 digit level (HS 9 digit level for Japanese exports) compared to previous studies[14,16,18,21,22], the results of this study provided more general and reliable empirical

Table 4: Estimates of pass-through coefficients using European trade data

			2000M1-2015M12		2000M1-2015M12	
			EUR/VND		EUR/USD	
HS4	HS6	Code description	β	SE	β	SE
Pharmaceutical products						
3002	4	Human, animal blood for therapeutic, prophylactic	-0.121	1.518	-0.281	1.624
3004	7	Medicaments for therapeutic or prophylactic uses	0.268***	0.756	0.128	0.809
3006	3	Pharmaceutical preparations	0.382*	1.760	2.615	1.891
Machinery and mechanical appliances						
8409	2	Part for use solely/principally with the motor engines	-2.542	1.910	-2.453	2.014
8413	6	Pumps for liquids; liquid elevators	-2.031	1.366	-2.196	1.461
8414	5	Air, vacuum pumps; hoods incorp a fan	-0.814	1.104	0.077**	1.183
8416	2	Furnace burners for liquid fuel, pulverized solid fuel or gas	-1.638	2.031	-1.678	2.134
8418	3	Refrigerator, freezer	0.844	1.462	1.031**	1.571
8419	6	Machinery, plant or laboratory equipment	-0.198	1.102	0.172**	1.175
8421	7	Centrifuges, filtering/purifying machinery	-1.150	1.149	-0.876	1.232
8422	3	Dish washing machines, machinery for cleaning	1.087	1.868	0.505**	2.006
8424	4	Mechanical appliance for proj/dispersing/spray	-0.635	2.145	-0.604	2.309
8428	2	Lifting, handling, loading or unloading machinery	0.361**	3.175	0.436**	3.453
8431	5	Machinery part used for 84.25-84.30	1.758	1.312	1.863	1.406
8448	5	Auxiliary machinery	2.774	1.912	2.613	2.055
8451	2	Machinery for washing/clean/ironing/impure tax yarn	1.240	1.941	1.203	2.081
8452	2	Sewing machine and furniture	-2.358	3.703	-1.747	3.917
8466	3	Machinery parts accessories for 84.56-84.65	-3.545	3.110	-2.016	3.324
8471	6	Automatic data processing machines, optical reader	-0.212	2.367	0.951**	2.539
8479	4	Machines, appliances having individual functions	0.344	1.549	1.689	1.660
8481	6	Tap, cock, valve for pipe, tank	0.957**	1.358	0.463	1.455
8483	4	Transmission shafts, cranks, gearing	-0.155	1.880	0.669***	2.017
8484	2	Gaskets combined with other material	1.740	2.692	0.384**	2.860
Electric machinery						
8501	3	Electric motors and generators	-2.645	2.371	-3.717	2.529
8504	5	Electric transformer, static converter	0.159	1.580	0.642**	1.686
8514	2	Industrial, laboratory electric furnaces and ovens	-1.592	2.221	-2.229	2.369
8516	2	Electric instantaneous water heater, hair dryer	-0.974	2.144	0.404***	2.294
8529	2	Part suitable for use with televisions, receipt appliance	-1.175	2.556	-2.794	2.719
8531	2	Electric sound or visual signaling apparatus	-5.329	3.343	0.155*	3.560
8535	4	Electrical apparatus for protecting electrical circuits	0.441	1.180	0.595**	1.259
8536	7	Electrical app for switch, not exceeding 1000 volt	-0.711	0.974	-0.373	1.036
8537	2	Boards, panels and other bases used with 8535 or 8536	2.637	1.665	1.878	1.777
8538	2	Parts suitable for use with 8535-8537	2.572	2.408	1.976	2.567
8539	3	Electric filament or discharge lamps	1.509	2.095	0.668***	2.238
8544	3	Insulated wire or cable	0.312	1.927	0.277**	2.055
Optical, photographic, cinematographic measuring, checking, precision, medical or surgical instruments and apparatus						
9018	7	Instruments, appliances used in medical, surgical, dental	0.339	1.274	0.128**	1.391
9024	2	Machines, appliances for testing properties of materials	1.598	2.843	3.854	3.090
9025	2	Hydrometers, aerometer and similar floating instruments	-2.475	2.762	0.321**	3.042
9026	4	Instruments, apparatus measuring flow, pressure of liquids	0.902***	1.702	0.921**	1.851
9027	6	Instruments and apparatus for physical or chemical analysis	-0.290	1.308	-0.574	1.424
9030	5	Oscilloscopes, spectrum analyzers	-1.078	2.071	0.421***	1.639
9031	2	Measuring, instruments not elsewhere specified in chapter 90	1.720	1.828	0.438	2.796
9032	3	Regulating or controlling instruments and apparatus	-0.284	2.314	-0.772	2.531

*10%, **5% and ***1%, β1 denotes the common slope pass-through coefficient for each HS 4-digit level, SE: Standard errors, HS6 (HS9) indicates the number commodity at the HS 6-digit (9-digit) level pooled of each of HS4-digit classification

evidences to determine criteria for pegging the Vietnam Dong to a currency basket. While Nguyen and Tran[22] suggested that Vietnamese importers need to pay attention to the volatility of the exchange rate of VND/USD for importing commodities from South Korea and Japan. This study found that Japanese exporters tended to pass-through into

Table 5: Estimates of pass-through coefficients using Thailand trade data

			2007M1-2015M12		2007M1-2015M12	
			THB/VND		THB/USD	
HS4	HS6	Code description	β	SE	β	SE
Plastics						
3901	4	Polymers of ethylene, in primary forms	0.793	1.050	-0.406	1.221
3902	2	Polymers of propylene, in primary forms	0.015	0.772	-0.202	0.898
3903	2	Polymers of styrene, in primary forms	0.436	0.896	0.621**	1.043
3904	2	Polymers of vinyl chloride, in primary forms	0.517	1.132	0.818***	1.341
3906	2	Acrylic polymers, in primary forms	0.130	1.122	1.606	1.318
3907	8	Polyacetals, other polyether, ecocide resins, in primary forms	-0.272	0.565	0.286**	0.660
3908	2	Polyamides, in primary forms	1.233	0.945	1.082*	1.120
3909	2	Amino, phenol resins, in primary forms	-0.107	0.859	0.085***	1.000
3917	4	Tubes, pipes and hoses and fittings therefor	-3.319	3.500	-2.798	4.085
3919	2	Self-adhesive plates, sheets and other flat shapes, of plastics	0.480	1.025	-0.500	1.193
3920	7	Plates, sheets of non-cellular plastics, not reinforced	0.219	0.618	0.122***	0.723
3921	3	Plates, sheets of plastics, un-worked or merely surface-worked	1.198	1.700	1.571	1.982
3923	6	Articles for packaging of goods, of plastics	0.729	1.044	1.280	1.212
3924	2	Kitchenware, other household articles, of plastics	2.097	1.270	2.235	1.480
3926	2	Articles of plastics and other materials of 3901-3914	-1.500	1.731	-2.831	2.009
Machinery and mechanical appliances						
8414	2	Air, vacuum pumps; hoods incorp a fan	-5.099	4.466	-3.461	5.285
8415	2	Air conditioning machines, with motor-driven elements	-0.844	1.122	0.445**	1.329
8424	2	Mechanical appliance for proj/dispersing/spray	-0.798	6.658	0.845***	2.892
8431	3	Machinery part used for 84.25-84.30	1.511	5.222	1.369	2.311
8450	2	Household or laundry-type washing machines	1.157	2.307	0.909***	2.734
8480	3	Molding boxed for metal foundry	3.432	3.933	3.750	2.670
8481	5	Tap, cock, valve for pipe, tank	-2.031	1.826	-1.485	2.152
8482	4	Ball or roller bearings	0.121	2.032	2.122	2.409
8483	4	Transmission shafts, cranks, gearing	2.029	2.056	1.012**	2.437
8484	2	Gaskets combined with other material	2.109	3.817	2.785	2.521
Electric machinery						
8504	3	Electric transformer, static converter	0.368	2.700	0.149***	3.198
8505	2	Electro-magnets; permanent magnets; magnetic chucks	-4.984	2.343	-2.207	2.165
8506	2	Primary cells/batteries, electrical (excluding spent)	4.000	2.718	3.974	3.099
8507	3	Electric accumulator	2.487	2.727	3.461	3.233
8511	6	Electrical ignition or starting equipment	1.834	1.482	2.074	1.760
8512	4	Electrical lighting equip, windscreen wipers, defrosters	-0.171	1.190	0.036**	1.409
8516	3	Electric instantaneous water heater, hair dryer	-0.260	1.337	-0.434	1.579
8529	2	Part suitable for use with televisions, receipt appliance	-0.422	3.287	0.401***	3.892
8536	7	Electrical app for switch, not exceeding 1000 volt	-0.188	0.984	0.053**	1.165
8537	2	Boards, panels and other bases used with 8535 or 8536	1.971	5.279	5.613	5.995
8539	3	Electric filament or discharge lamps	-1.593	2.818	-0.263	3.350
8542	3	Electronic integrated circuits; parts thereof	0.324	3.297	1.223**	3.904
8544	6	Insulated wire, cable	-0.978	1.095	-1.310	1.304
8547	2	Insulating fitting for electric machines, appliances	3.005	3.334	3.487	3.981
Transport equipment						
8707	13	Bodies of motor vehicles for the transport of >=10 people	0.444	0.482	0.588**	0.564
8714	2	Parts and accessories of 8711-8713	0.450	2.396	1.281*	2.812

*10%, **5% and ***1%, β1 denotes the common slope pass-through coefficient for each HS 4-digit level, SE: Standard errors, HS6 (HS9) indicates the number commodity at the HS 6-digit (9-digit) level pooled of each of HS4-digit classification

Vietnam's import prices and requested JPY in the bill of payment in the trading in the category of "Machinery and mechanical appliances" and "Transport Equipment". EU 28 exporters tend to high pass-through the exchange rate fluctuations into import prices for all groups. Incorporated the results of Tran and Nguyen[21], it can be seen that Vietnamese importers should pay attention to by monitoring the movements of the VND/SGD, VND/JPY, VND/CNY and VND/EUR exchange rate to limit exchange rate risks.

Table 6: Estimates of pass-through coefficients using Singaporean trade data

			2006M1-2015M12		2006M1-2015M12	
			SGD/VND		SGD/USD	
HS4	HS6	Code description	β	SE	β	SE
Plastics						
3901	4	Polymers of ethylene, in primary forms	0.579**	0.386	0.232	0.462
3902	2	Polymers of propylene, in primary forms	0.608***	0.996	1.238	1.191
3903	2	Polymers of styrene, in primary forms	1.021	0.916	1.253	1.096
3905	3	Polymers of vinyl acetate, in primary forms	0.552*	0.693	0.810	0.830
3906	2	Acrylic polymers, in primary forms	-0.593	0.735	-1.146	0.880
3907	4	Polyacetals, ecocide resins, in primary forms	0.725**	1.008	1.000	1.205
3909	3	Amino-resins, polyurethanes, in primary forms	-0.093	1.612	1.289	1.932
3919	2	Self-adhesive plates and other flat shapes, of plastics	-2.427	2.844	0.340	3.475
3920	2	Plates, sheets of non-cellular plastics, not reinforced	1.655	1.677	2.513	2.041
Machinery and mechanical appliances						
8413	3	Pumps for liquids; liquid elevators	-2.981	5.563	-7.395	6.706
8414	4	Air, vacuum pumps; hoods incorp a fan	-7.490	4.712	-5.470	5.673
8421	5	Centrifuges, filtering/purifying machinery	7.018	5.681	7.421	6.856
8424	2	Mechanical appliance for proj/dispersing/spray	1.361	1.890	3.842	3.362
8427	2	Fork-lift trucks	1.724	4.785	3.208	2.709
8452	2	Sewing machine and furniture	-2.146	4.757	-0.360	5.790
8471	5	Automatic data processing machines, optical reader	3.222	2.153	5.076**	2.584
8481	4	Tap, cock, valve for pipe, tank	2.807	5.845	3.540	2.044
Electric machinery						
8501	3	Electric motors and generators	4.634	2.569	0.292***	2.958
8504	3	Electric transformer, static converter	-3.282	4.706	0.187**	2.883
8506	2	Primary cells/batteries, electrical (excluding spent)	2.158	3.099	1.582	2.394
8507	2	Electric accumulator	-3.364	1.540	-3.937	3.280
8516	6	Electric instantaneous water heater, hair dryer	0.151**	1.935	0.478	2.396
8518	6	Microphones and stands, loudspeaker	1.987	3.422	0.188***	2.264
8531	3	Electric sound or visual signaling apparatus	-1.912	2.965	0.419***	2.470
8532	3	Electrical capacitors, fixed, variable or adjustable	-1.117	2.408	0.617**	3.012
8533	4	Electrical resistor	-0.895	2.746	-1.676	3.434
8541	6	Diodes/transistors and similar semiconductor devices	-0.890	3.323	0.519**	2.177
8544	3	Insulated wire, cable	2.733	2.267	1.439	2.847

*10%, **5% and ***1%, β1 denotes the common slope pass-through coefficient for each HS 4-digit level, SE: Standard errors, HS6 (HS9) indicates the number commodity at the HS 6-digit (9-digit) level pooled of each of HS4-digit classification

CONCLUSION

The degree of the ERPT is high for the categories of "Electric machinery" and "Machinery and mechanical appliances" and the U.S. dollar is widely used in Vietnam's import bills for "Electric machinery". The JPY is also commonly used in payment bills for "Machinery and mechanical appliances" and "Electric machinery". The EU-28 exporters tend to invoice in EUR for "Pharmaceutical products", while SGD is used to make payment for Singapore exporters in the category "Plastics". As a result, only the currencies appearing in the invoice of Vietnam's imports should be selected rather than using the basket of 8 currencies as the SBV proposed.

SIGNIFICANCE STATEMENT

Understanding the degree of exchange rate pass-through into Vietnam's import prices is necessary for Vietnamese importers to prevent the risks of the volatility of currencies and stabilize the prices of imported goods to operate stably and increase their revenue. The results of this study support for SBV to regulate the central exchange rate of VND/USD based on a weighted average of VND prices in the interbank market in the previous day's trading against prices of a basket of currencies. However, the VND should only be anchored to a basket of 5 currencies including USD, JPY, CNY, EUR and SGD, rather than the 8 currencies announced by the SBV.

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