Journal of Money and Economy
Vol. 17, No. 3, Summer 2022
pp. 275-296
DOI: 10.29252/jme.17.3.275

Original Research Article

Exchange Rate Pass-Through Effect on the Price of Imported Medical Goods in Iran: A Nonlinear Autoregressive Distributed Lag (NARDL) Approach

Mehdi Shirafkan Lemso[*] **Mehrdad Alirezaei Shahraki**[†]
Zahra Jalili[‡]

Received: 09 Sep 2021 Approved: 18 Mar 2023

This study investigates the effect of Exchange Rate Pass-Through (ERPT) on the price of imported medical goods in Iran by utilizing the nonlinear autoregressive distributed lag (NARDL) method. The obtained results showed that the coefficient of positive and negative exchange rate fluctuations, in the long term, is less than one unit. In the long term, the price of imported medical goods is also affected by the positive fluctuations of domestic production. With positive fluctuations in domestic production and rising incomes, the demand for imported medical goods tends to increase, leading to higher prices for imported medical goods. Negative fluctuations in the degree of economic openness have negative effects on the price of imported medical goods. Eventually, the effect of the positive and negative fluctuations of trading partners' final cost variables on the price index of imported medical goods is positive. Given the increase in the exchange rate and the subsequent devaluation of the national currency, the increase in the price of imports, and, consequently, the cost of imported inputs, the increase in import prices can be one of the causes of domestic inflation.

Keywords: Exchange Rate Pass-Through (ERPT), NARDL, Price of Imported Medical Goods
JEL Classification*:* F31, I10

1 Introduction

Exchange rate changes are among the most important factors affecting the macroeconomic variables of any country. Therefore, by considering the

[*] Faculty of Manegment and Humanities, Chabahar Maritime University, Chabahar, Iran; shirafkan@cmu.ac.ir (Corresponding Author)
[†]Faculty of Management and Human Science, Chabahar Maritime University, Chabahar, Iran; m.alirezaei.sh@gmail.com
[‡] General Directorate of Economic Affairs and Finance ,East Azerbaijan Province,Tabriz, Iran; Jalili_zahra@ymail.com

[DOI: 10.61186/jme.17.3.275]

fundamental role of the exchange rates in determining economic performance, we can understand that the adoption of exchange rate policies is essential, and any mistake in this regard may lead to irreparable costs for the economy. The exchange rate can naturally influence the domestic prices by changing the price of imported inputs or final imported goods (Doojav, 2009). With the increase in the exchange rate and subsequent devaluation of the national currency, the price of imports and, consequently, the cost of imported inputs will increase. Therefore, rising import prices due to the devaluation of the national currency can be one of the causes of domestic inflation. In other words, the strength and weakness of inflation due to rising import values are attributed to the number of imported goods and services in the society (Tayebi et al., 2015).

The exchange rate pass-through (ERPT) of import prices is the percentage of change in the import price due to a 1% change in the exchange rate. The pass-through of exchange rate to import prices is a Keynesian view and refers to short periods[1]. In this situation, if the value of the domestic currency decreases, it will proportionally improve the country's exchange rate. The completeness of the ERPT means that the import price in foreign currency and the export price in domestic currency are stable (Devereux & Engle, 2002).

International studies have shown that, for small single-product countries where the bulk of whose exports is comprised of one single product, the ERPT can only be traced through imports. Thus, when it comes to the ERPT, it refers to the changes in the general level of prices through which imports are imposed on the economic system (Tayebi et al., 2015).

Behrman (1993) shows that the health and well-being of the society, directly and indirectly, affect labor productivity because healthier people are likely to be more productive than unhealthy people with a certain amount of capital and other inputs (Hadian et al., 2006). Labor health also leads to a reduction in the disease recovery costs, which makes new investments possible and leads to more economic growth by increasing production capacity (Sarlak & Hozhabr Kiani, 2015). On the other hand, considering that medical equipment plays an essential role in the diagnosis, treatment, and prevention of diseases and a significant share of hospital costs is allocated to the purchase of medical equipment from inside and outside the country, having enough quality medical equipment in the hospital properly ensures the

[1] It is worth noting that in the Keynesian view, prices are stuck together. Hence, when the national currency depreciates, foreign export firms cannot pay their prices (in their own currency). As a result, the ERPT to the import price (domestic currency) is complete.

[DOI: 10.61186/jme.17.3.275]

success of providing the best healthcare as well as prompt and accurate diagnostic services to the patients. Medical equipment has become an integral part of modern hospitals, accounting for one-third to one-half of all hospital costs. Knowing and providing high-tech medical materials and equipment can help in improving the provision of better and more useful services and even enhancing the level of health and well-being of the country (Jafari Samimi et al., 2012).

Currency developments and different exchange regimes during the last five decades of Iran's economy and the conditions of international competitiveness have made the factors affecting the exchange rate and the ERPT in Iran to be critically important. A complete ERPT can explain the trade balance's short-term dynamics, while an incomplete ERPT allows trade flows to remain relatively insensitive to exchange rate fluctuations despite high demand elasticity. The intensity of ERPT fluctuations can also be shown thorough the way a nominal devaluation translates into a real depreciation (Shajari et al. 2005). On the other hand, given the importance of importing medical and pharmaceutical products in Iran, it is crucial to identify the factors affecting the import of such products. Undoubtedly, the exchange rate is one of the said factors; and it is a variable that is more directly and closely related to the economy's external sector than other variables. Considering the exchange rate changes and the necessity of properly managing the effects of such changes on the healthcare sector, the current study aims to investigate the import of pharmaceutical products and medical equipment in terms of exchange rate changes. The main question of the research is whether exchange rate changes have a significant effect on the import of drugs and medical equipment or not. In line with this, after introducing the subject and its importance, the theoretical foundations and a succinct review of the studies conducted in this area are presented. Then, the methodology and the results of the present study are provided, followed by a discussion of the findings and the conclusion.

2 Research Literature

One of the critical issues related to the exchange rate is explaining the relationship between exchange rate fluctuations and price adjustment of foreign goods, which is called "exchange rate pass-through" (ERPT). Generally, the degree of ERPT ranges from zero to one (Pishbahar & Baghestani, 2014). ERPT on imported goods is defined as the percentage of increase in the price of imported goods in terms of domestic currency due to a 1% increase in the exchange rate, while ERPT on the price of exported goods is defined as the percentage of decrease in the price of exported goods in

[DOI: 10.61186/jme.17.3.275]

foreign currency. Thus, ERPT examines the relationship between changes in the value of a country's currency and the exchange relationship of that country. The low exchange rate can explain the insensitivity of trade volume to changes in the value of the national currency (Jalaei Esfandyari, 2005). In other words, ERPT is defined as the percentage of the change in the domestic price to the import price that results from a 1% change in the exchange rate between export and import flows (Sek & Kapsalyamova, 2008). Understanding EPRT is essential for two reasons: first, EPRT is a concept for optimizing monetary policy and macroeconomic transfers at the international level; second, ERPT at the industry level will provide a perspective on the global market power in the industry (Sahminan, 2014).

In economics theories, the exchange rate and import goods are inversely related. As the exchange rate rises, the price of imported goods increases and the demand for imported goods decreases. ERPT has two phases: in the first one, exchange rate fluctuations are transferred to the price of imported goods; and in the second one, changes in the price of imported goods are transferred to the prices of significant selling and consuming goods. The size of the changes reflected in the consumer price index depends on the share of imports in the consumer basket, while in the wholesale price index, it depends on the share of imported raw materials used in the production process (Moosavi Mohseni & Sobhanipoor, 2007). Besides, exchange rate changes are transferred to the domestic price through the following items: the price of imported consumer goods, the price of imported intermediate goods, and the price of domestically produced goods priced in foreign currency. While the effect of exchange rate changes in the first two paths is direct, in the third path, exchange rate changes due to domestic prices or changes in production costs are less effective through the direct path (Sahminan, 2014). In the direct paths, the effect of exchange rate changes on domestic prices can be observed through changes in import prices of final goods and inputs. However, the indirect effect of the devaluation of the domestic currency on the domestic price is through the effect of substitution or income (Pishbahar & Baghestani, 2014). In the indirect path, any increase in the prices of capital goods, raw materials, and intermediate goods of the industry due to exchange rate changes will create cost pressure on domestic producers, which in turn will increase the prices of domestically made goods. (Jabara, 2009). A rise in the in the exchange rate reduces imports and increases the export potential of domestic products. Conversely, a low exchange rate reduces the cost of purchasing intermediate goods and imported capital on which domestic production depends in terms of the domestic currency. Due to the advantages and

[DOI: 10.61186/jme.17.3.275]

disadvantages of each type of exchange rate change, there are serious disagreements about following the policy of stabilizing or increasing the exchange rate (Heydari & Ahmadzadeh, 2015).

There is a hot debate over spending in the health sector. To be more exact a group of economists argue that government spending in health sector can affect the output growth negatively because it is part of the consumer spending, hence reducing the investment opportunities. On the contrary, when other conditions are stable, improving the general health of society allows us to spend fewer resources on treatment in the future. Thus, some of these resources which will be needed for treatment in future can be allocated for other aims (Islambolchi, 2014).

Moreover, some recent studies introduce the concept of health capital and the effect of health on economic growth. Most of them are studies indicating health can have a direct and indirect positive effect on labor productivity (Ghobadi et al, 2016). These studies are important because they will have exchange rate reactions due to the import of some items. The extent of these reactions can be defined depending on the circumstances. The economy faces a complete exchange rate transition when the domestic price response to exchange rate changes is one-to-one; in other words, an incomplete or partial ERPT occurs when the price response to exchange rate changes is less than one-to-one (Sahminan, 2014).

3 Research Background

In Iran, Zanganeh (2002) analyzed the effects of ERPT in Iran on export prices, using the ordinary least squares method and concluded that ERPT on export prices is not complete. Shajari et al. (2005) determined the exchange rate in Iran using the vector autoregressive (VAR) model. The results showed that the exchange rate in Iran is incomplete, and changes in the real exchange rate positively affect the import price index and are less than one. In another study, Moosavi Mohseni & Sobhanipoor (2007) investigated the effects of exchange rate changes on import, wholesale, and consumer prices using a recursive vector model. Their findings indicated that exchange rate fluctuations have little effect on prices; in other words, the ERPT is incomplete. The variance experience also shows that exchange rate changes explain part of the inflation variability. Shahbazi & Asadi (2011) studied the effects of increasing exchange rates on importing drugs and medical equipment from 1977 to 2000, using the shore test approach. Their study showed that the exchange rate is an essential and influential factor in importing medical and pharmaceutical products in the short and long terms

[DOI: 10.61186/jme.17.3.275]

(Shahbazi & Asadi, 2011). Asgharpour and Mahdiloo (2014) studied the effect of ERPT on import prices in Iran in an inflationary environment, using Markov switching approach during the period from 1976 to 2000. The results indicated that the degree of ERPT in Iran is incomplete, and inflationary environments have an asymmetric effect on the degree of ERPT on import prices. In other words, the degree of ERPT in high inflationary environments is higher than the degree of ERPT in low inflationary environments. Finally, the final cost variables of trading partners had a positive effect and the degree of trade openness had a negative effect on the price index of imported goods (Asgharpour & Mahdiloo, 2014).

Kazerooni et al. (2016) studied the effect of ERPT on the domestic price of the Iranian car market, emphasizing the effect of the share of imports in the domestic market. Their study showed a significant relationship between market share and the degree of exchange rate transfer in terms of the effect on domestic prices; indicating that by increasing the share of imports, the degree of exchange rate transfer's effect on domestic prices decreases (Kazerooni et al. 2016). Mesbahi et al. (2017) examined the degree of ERPT in import prices in Iran, focusing on the role of instability of oil revenues (nonlinear approach). It was shown that nominal currency, the final cost of goods in expenditures, domestic demand pressure, and trade openness exert a positive effect on the price of imported goods. Also, the degree of ERPT in both regimes is more than 1, and the instability of oil revenues has an asymmetric effect on the degree of regimes (Mesbahi et al. 2017).

Several foreign researchers have also conducted studies in this regard. Kent (1993) examined the impact of ERPT on Australia's industrial import and export prices and estimated the exchange rate dynamics in Australia's industrial import and export prices. The estimated short-term and long-term relationships for exports and imports showed that Australia, as a small open economy, is price-receiving in imports in the long term; therefore, the ERPT is almost complete (Kent, 1993). McCarthy (2000) examined the effect of exchange rate and import prices on domestic inflation in New York using the VAR model from 1976 to 1998, and the results showed that the ERPT had a relatively small effect on domestic price inflation. Choudhri et al. (2005) examined Taylor's proposed hypothesis that a non-inflationary environment would lead to a slight ERPT on domestic prices. The study results justified the existence of a positive and significant relationship between currency exchange and the average inflation rate between countries and periods. Gueorguiev (2003) conducted a study on the Romanian economy and showed that the exchange rate in this country is incomplete, but its formation depends on the

[DOI: 10.61186/jme.17.3.275]

type of currency system. Naz et al. (2018) used quarterly data from 1982 to 2010 and the structural vector autoregression (SVAR) model to examine exchange rate changes in consumer prices in Pakistan. Their study showed that ERPT had a relatively small effect on domestic prices and the exchange rate elasticity was 0.42 and 0.137 in the short term and long term, respectively. Also, 90% of price changes are explained by variable changes in the long term (Naz et al. 2018).

Bangura et al. (2012) used the SVAR model to investigate the effect of ERPT on consumer prices. Their findings showed that although the ERPT is incomplete, it has a significant effect, and the devaluation of the currency is an essential source of inflation in Sierra Leone. evaluated the impact of ERPT on import prices among Euro Area countries, indicating a complete asymmetric crossing of the effective exchange rate in the short and long terms (Bangura et al., 2012). Hara et al. (2015) conducted a study, focusing on exchange rate pass-through in Japan, and showed that the degree of ERPT and the consumer price index have increased since the late 2000s. Hong & Zhang (2016) examined the degree of ERPT on the total import price of China and eleven industries under the Harmonized System (HS) Classification. The short-term and long-term estimation of China's import price by the autoregressive distributed lag (ARDL) method showed that the degree of ERPT on China's total import price is very high and the short- and long-term coefficients are relatively different for different industries. Kilic (2016) evaluated the relationship between ERPT on import prices in the United States, the United Kingdom, Germany, Japan, Canada, and Australia using a mild transition regression and showed that import price elasticity is asymmetric.

Given the above, it is important to know what effect the ERPT has on the import of medical goods in Iran, whether exchange rate changes will decrease or increase the import of medical and pharmaceutical products in Iran, and how ERPT affects domestic prices in the form of ERPT on import prices and, then, ERPT on consumer and producer prices.

4 Model Specification and Methodology

The pricing behavior of importing firms determines the model of ERPT in a country. For a firm with relative domestic pricing power as an importer, the domestic import price is determined by the following equation:

[DOI: 10.61186/jme.17.3.275]

$$P_t^{IM} = E \times P_t^{EX} \quad (1)$$

In this equation, P_t^{IM}, E, and P_t^{EX} indicate the price of goods in the country in terms of domestic currency, nominal exchange rate, and the price of goods abroad in terms of foreign currency, respectively. Since the price of a commodity abroad is a function of its final cost (MC_t) and profit margin (μ_t), the first equation can also be rewritten as follows:

$$P_t^{IM} = E \times \mu_t \times MC_t \quad (2)$$

By taking the logarithm and writing the above equation in regression, we will have:

$$P_t^{IM} = \alpha + \beta_0 e_t + \beta_1 m_t + \beta_2 mc_t + \varepsilon_t \quad (3)$$

In the above equation, P_t^{IM}, e_t, m_t, mc_t, and ε_t represent the logarithm of the price of each commodity group in the country, nominal exchange rate, import firm profit margin, producer final cost abroad, and the error term, respectively. In this equation, the degree of ERPT is discussed based on whether β_0 is greater than, equal to, or less than one. If β_0 is greater than one, the price stability affects the import market of the importing country; if β_1 is equal to 1, the ERPT is complete; and if β_0 is less than 1, the ERPT is incomplete (Sarlab et al. 2019).

The exchange rate, the cost of production in the country of origin, and the profit margin of the importing firm are the three main factors influencing the price of imported goods. By increasing the exchange rate and the cost of production in the country of origin and assuming the stability of other conditions, the price of imported goods increases. Therefore, the most important variable affecting the price of goods imported into the country is the profit margin of the importing firm. The profit margin of the importing firm is also affected by variables such as the degree of trade freedom and the level of income of the importing country (Mesbahi et al., 2017).

On the other hand, the quantity of imports of the host country is affected by the level of income of the importing country and, thus, the level of income of the importing country is effective on the profit margin of the importing firm. Another variable affecting the profit margin and, consequently, the ERPT is the trade openness of the importing country. The more commercially open an economy is, the more competitive it is, which means that as competition increases, the general level of domestic prices decreases. In this case, firms have the incentive to prevent rising prices for imported goods by

[DOI: 10.61186/jme.17.3.275]

increasing costs at a profit margin. Thus, there is an inverse relationship between trade openness and the degree of ERPT. As trade volumes increase, sharp exchange rate fluctuations will be transferred to the prices of imported and consumer goods, resulting in an increase in the exchange rate. As a result, as the exchange rate rises, so does the degree of EPRT. Therefore, the final effect of trade openness on the degree of ERPT depends on the outcome of these two effects (Mesbahi et al., 2017).

Based on what variables affect the degree of ERPT, the model can be expressed as follows:

In this equation, gdp_t and op_t represents the logarithm of the GDP of the importing country and the logarithm of the degree of trade openness of the country of origin, respectively. P_t^{IM} is equal to the logarithm of the import price index of Iranian medical goods at a fixed price of the current price in 10 billion Iranian Rials. This statistic is obtained from the website of the Islamic Republic of Iran's Customs Administration (IRICA). This equation is used to estimate the degree of exchange rate logarithm (the price of each U.S. currency in terms of Iran's domestic currency), the statistics of which were collected from the website of the International Monetary Fund (IMF). Also, gdp_t is equal to the logarithm of the degree of trade openness of the country of origin in 10 billion Iranian Rials. These statistics have been obtained from the website of the Central Bank of Iran. Moreover, op_t is also equal to the logarithm of the degree of trade openness of the country, which is obtained by dividing the total exports and imports by GDP. Data are also collected from the economic time series database of the Central Bank of Iran. Finally:

$$p_t^{IM} = \alpha + \beta_0 e_t + \beta_1 mc_t + \beta_2 gdp_t + \beta_3 op_t + \varepsilon_t \quad (4)$$

In this equation, gdp_t and op_t represents the logarithm of the GDP of the importing country and the logarithm of the degree of trade openness of the country of origin, respectively. This equation is used to estimate the degree of ERPT.

The relevant statistics are extracted from the website of the IMF. Here is how to calculate it:

$$mc_t = \frac{NEER_t \times CPI_t}{REER_t} \quad (5)$$

Here, $NEER_t$ is the effective exchange rate, CPI_t is the domestic consumer price index, and $REER_t$ is the real effective exchange rate. The nominal effective exchange rate expresses the relative value of the domestic currency relative to the currencies of major trading partners (Sarlab et al., 2019).

[DOI: 10.61186/jme.17.3.275]

To study the positive and negative fluctuations of exchange rate variables, GDP, degree of trade openness, and the final cost of business partners on the price of medical supplies, which is considered here as a measure of household health expenditures, are examined using the NARDL method. Before presenting the model, the asymmetric long-term regression model is defined as follows:

$$p_t^{IM} = \beta_0^+ e_t^+ + \beta_0^- e_t^- + \beta_1^+ mc_t^+ + \beta_1^- mc_t^- + \beta_2^+ gdp_t^+ + \beta_2^- gdp_t^- + \beta_3^+ op_t^+ + \beta_3^- op_t^- + \varepsilon_t \quad (6)$$

The generalized form of these relationships and the static linear combination between the positive and negative components of the independent variables are defined as follows:

$$z_t = \beta_0^+ e_t^+ + \beta_0^- e_t^- + \beta_1^+ mc_t^+ + \beta_1^- mc_t^- + \beta_2^+ gdp_t^+ + \beta_2^- gdp_t^- + \beta_3^+ op_t^+ + \beta_3^- op_t^- \quad (7)$$

In this respect, z_t is static and is stacked to zero. In case, independent variables e, mc, gdp and op are asymmetrically co-integrated, and if the relationships $\beta_0^+ = \beta_0^- = \beta_1^+ = \beta_1^- = \beta_2^+ = \beta_2^- = \beta_3^+ = \beta_3^-$ are established, cointegration is symmetric. Shin et al. (2014) developed the NARDL model by applying the $\beta_0^+ = \beta_0^- = \beta_0$ constraint to equation (8). By separating the positive and negative components of the independent variables and inserting them into an ARDL model (p, q), it becomes the NARDL model (p, q) that we will have (Shin et al. 2014). The equation is written in the form of error correction as follows:

5 Model Estimation Results and Discussion

Before estimating the model and avoiding false regression, the results of the unit root test are reviewed. Since the existence of a unit root in most time series variables is due to a lack of attention to structural failure in the process of these variables, unit root tests for the failure of the Zivot-Andrews and Lee-Strazicich structure are used to prevent such a problem (Lee & Strazicich, 2003; Zivot & Andrews, 2002). The Zivot-Andrews unit root test concerning one endogenous structural failure and the Lee-Strazicich unit root test concerning two endogenous structural failures examine the stationary state of the variable. According to the results of the Zivot-Andrews unit root test reported in Table (1), except for the logarithm of the import price index of medical goods and the final cost of trading partners, the other variables are at the stationary level. The Lee-Strazicich unit root test results concerning two

[DOI: 10.61186/jme.17.3.275]

structural failures are given in Table (2). In this test, K is the maximum number of pattern interruptions, and TB_1 and TB are the failure times endogenously determined in the model. If the absolute value of the computational values for patterns A and C is greater than the absolute value of the critical value, the null hypothesis that there is a unit root is rejected. The Lee-Strazicich unit root test shows that except for the variable of the degree of economic openness, all other variables are at a stationary level.

Table 1
Results of Zivot-Andrews Unit Root Test with a Structural Failure

Variables	In level of	With one Difference	Year of Failure	Degree of Cointegration
ln p IM	-2.774	-9.462***	2014q1	I(1)
ln e	-7.726***	-	2013q2	I(0)
mc	-3.936	-4.777*	2016q2	I(1)
ln GDP	-7.532***	-	2013q1	I(0)
ln op	-4.894**	-	2012q4	I(0)

The symbols ***, **, and * indicate significance at the level of 1%, 5%, and 10%, respectively.
***Source*:** Research Findings (Stata 14 software output)

p I.M.: Logarithm of the import price index of Iranian medical goods at a fixed price
p and q: represent the optimal number of interrupts of dependent and independent variables
mc: The logarithm of the profit margin of the importing firm
ln op: The logarithm of the degree of commercial openness of the country

Table 2
Results of Lee-Strazicich Unit Root Test

Variables	K	TB1	TB	Model	Calculated Value	Degree of Co-integration
ln p^{IM}	6	2012q3	2015q3	C	-6.3637	I(0)
ln *e*	4	2011q3	2013q4	C	-6.6216	I(0)
mc	7	2013q1	2017q2	C	-6.6253	I(0)
ln *GDP*	5	2012q3	2016q2	C	-5.4555	I(0)
ln *op*	0	2011q2	2012q1	A	-3.5343	I(1)

The critical value of L.S. at the 5% level is -3.842 for model A and -5.286 for model C.
***Source*:** Research Findings (Gavus Software Output 14)

Also, according to the seasonal data used in the model, the HEGY seasonal unit root test is used to evaluate the cointegration of variables. The results of

[DOI: 10.61186/jme.17.3.275]

the study are reported in Table (3). According to the results of this test, except for the logarithm of the import price index of medical goods, the rest of the variables are all of the first degrees.

ln GDP: The logarithm of the real GDP of the country at a fixed price of the year

Table 3
Results of HEGY Seasonal Root Test

Variables	The Value Calculated at the Level	Value Calculated with One Time Difference	Degree of Co-integration
ln p^{IM}	-2.890**	-	I(0)
ln *e*	-2.406	-2.990**	I(1)
mc	-1.758	-3.603**	I(1)
ln *GDP*	-2.066	-4.500***	I(1)
ln *op*	-0.997	-4.706***	I(1)

The symbols ***, **, and * indicate significance at the level of 1, 5, and 10%, respectively.
***Source*:** Research Findings (EViews10 software output)

Since the cointegration degrees of the variables vary according to the results of the unit root tests, the cointegration relationship between the variables is investigated. For this purpose, the Gregory-Hansen test, which examines the cointegration relationship between variables in terms of structural failure in a single equation, is used. In this test, three models are considered to investigate the correlation of variables. The first model (C) only considers a change in level, the second model (C/T) considers changes in level and trend, and the third model (C/S) considers regime change. In this test, if the ADF statistic obtained is greater than the critical values, it indicates a correlation relationship. The results reported from the Gregory-Hansen test in Table (4) show that there is a cointegration relationship between the variables in terms of structural failure in all three models.

Table 4
Gregory-Hansen Test Results

Model	ADF Statistics	Critical Value at the Level of 1%	Critical Value at the Level of 5%	Critical Value at the Level of 10%	Year of Failure
C	06.57***	-6.05	-5.56	-5.31	1388q2
C/T	-8.25***	-6.92	-6.41	-6.17	1389q1
C/S	-9.39***	-7.31	-6.48	-6.58	1392q3

The symbols ***, **, and * indicate significance at the level of 1%, 5%, and 10%, respectively.
***Source*:** Research Findings (Stata 14 software output)

[DOI: 10.61186/jme.17.3.275]

According to the results obtained from unit root tests and the existence of cointegration between variables, the NARDL method is used to estimate the model. The boundary test (F) is used to check a long-term relationship in this method. To test the boundaries, the lower bound is used for explanatory variables I (0) and the upper bound for explanatory variables I (1). If the F-value is higher than that of the critical value of the upper bound, the null hypothesis is rejected. If the F-test value is less than that of the critical value of the lower bound, the null hypothesis is accepted. Also, if the computational F statistic is a number between the critical values of the upper and lower bounds, the result is not certain and the hypothesis cannot be accepted or rejected. Considering that the computational F statistic is 4.5073 and is greater than the critical value above the upper limit of the F test at the level of 5%, therefore, regardless of the cointegration of variables, the null hypothesis that there is no long-term relationship can be rejected and there is a long-term relationship between variables. The results of model estimation by the NARDL method are reported in Table (5).

Table 5
Results of Model Estimation by the NARDL Method

Variables	Coefficient	Probability Value	Variables	Coefficient	Probability Value
$\ln p^{IM}(-1)$	-1.451798	0.000	$\Delta \ln GDP^{+}(-2)$	0.1480914	0.502
$\ln e^{+}(-1)$	0.243546	0.017	$\Delta \ln GDP^{-}$	0.0751044	0.778
$\ln e^{-}(-1)$	0.7836975	0.139	$\Delta \ln GD^{+}(-2)$	-0.5495467	0.008
$\mathrm{Ln}^{+}GDP(-1)$	0.5235627	0.021	$\Delta \ln op^{+}$	-0.1689866	0.160
$\ln GDP^{-}(-1)$	0.1735608	0.529	$\Delta \ln op^{+}(-2)$	-0.1266695	0.328
$\ln op^{+}(-1)$	-0.1371757	0.282	$\Delta \ln op^{-}$	0.1268886	0.381
$\ln op^{-}(-1)$	0.4386665	0.018	$\Delta \ln op^{-}(-2)$	-0.1517538	0.344
$\ln mc^{+}(-1)$	0.0155783	0.000	$\Delta \ln mc^{+}$	0.0075566	0.169
$\ln mc^{-}(-1)$	-0.0180469	0.003	$\Delta \ln mc^{+}(-2)$	-0.0034315	0.546
$\Delta \ln p^{IM}(-1)$	-0.0546104	0.774	$\Delta \ln mc^{-}$	-0.0104167	0.130
$\Delta \ln e^{+}$	0.145349	0.191	$\Delta \ln mc^{-}(-2)$	0.0093054	0.131
$\Delta \ln e^{+}(-2)$	0.2735212	0.021	Dum 2015q3	-0.0220344	0.533
$\Delta \ln e^{-}$	0.7707865	0.088	Dum 2015q3	-0.1121053	0.019
$\Delta \ln e^{-}(-2)$	-0.8766818	0.091	Intercept	18.14105	0.000
$\Delta \ln GDP^{+}$	0.3753709	0.031			

***Source*:** Research Findings

[DOI: 10.61186/jme.17.3.275]

Table 6
Long-term Coefficients

Variables	Coefficient(+)	F-Stat	Probability Value	Coefficient(-)	F-Stat	Probability Value
ln *e*	-0.141	8.667	0.007	-0.540	2.93	0.099
ln *GDP*	0.361	7.746	0.010	-0.120	0.414	0.526
ln *op*	-0.094	1.455	0.239	-0.302	4.991	0.035
mc	0.011	33.55	0.000	0.012	14.23	0.001
(W_{SR}) Asymmetry in the Short-Term			**(W_{LR})Asymmetry tn the Long-Term**			
Variables	**F-Stat**		**Probability Value**		**F-Stat**	**Probability Value**
ln *e*	5.876		0.023		0.614	0.441
ln *GDP*	5.476		0.028		4.475	0.045
ln *op*	13.25		0.001		0.7059	0.409
mc	28.19		0.000		0.1714	0.682

***Source*:** Research Findings

Table 7
Asymmetry in the Long- And Short- Term

R	0.9431	Modified R□	0.8793
Top Edge at 1% Level	Down Edge at 1% Level	Computational F-PSS Statistics	Computational T-BDM Statistics
4.37	3.29	4.5073	-4.5207

***Source*:** Research Findings

Table 8
Diagnostic Tests

Tests	Statistics	Probability Value	Tests	Statistics	Probability Value
Serial autocorrelation	25.51	0.2848	Inequality of variance	1.004	0.3164
Ramsey reset test	0.8713	0.4709	Normality (Jarque-Bera)	0.08228	0.9597

***Source*:** Research Findings (Stata 14 software output)

The negative exchange rate fluctuations coefficient in the short term was 0.77, which is also statistically significant. In the long term, the coefficient of positive and negative exchange rate fluctuations has a negative sign and is statistically significant. The coefficient of positive exchange rate fluctuations, in the long term, is -0.141, which shows that for a 1% increase in the value of a domestic currency compared to foreign currencies (devaluation of foreign currencies), the price index of imported goods decreases by 0.141%. In other

[DOI: 10.61186/jme.17.3.275]

words, with the decrease of the exchange rate (an increase of the average value of each foreign currency unit), the import cost in terms of domestic currency has increased, as a result of which the price of imported medical goods also increases. As a result, the degree of ERPT in Iran in the case of positive exchange rate fluctuations is less than one, and the effects of increasing the value of a foreign currency on the import price are transmitted. According to the results, about a 0.141% increase in the value of a foreign currency is transferred to the import price of medical goods. The existence of transportation costs, customs restrictions, etc. is effective in incomplete ERPT (Asgharpour & Mehdiloo, 2014).

On the other hand, due to the lack of foreign exchange resources in the country, negative fluctuations in exchange rates cause importers to take advantage of the situation to import more medical goods into the country, which in turn causes a rise in the prices of imported medical goods due to increased demand. The findings show that the ERPT is incomplete in the long term. This finding is consistent with the results of studies by Zanganeh (2002), Shajari et al. (2005), Moosavi Mohseni & Sobhanipoor (2007), and Asgharpour and Mahdilou (2014).

The coefficient of the positive fluctuations of the logarithm of the GDP in the short term is 0.378, which shows that for a 1% increase in GDP, about 0.38% is added to the price of imported medical goods. Also, the coefficient of the negative fluctuations of the logarithm of the GDP variable is not statistically significant in the short term, which shows that people keep adhering to consumption, and with negative fluctuations in GDP, the consumption of medical goods is not reduced to a certain level. In the short term, the price of imported medical goods is less affected by negative changes and fluctuations in GDP and is even statistically meaningless. In the long term, the price of imported medical goods is affected by the positive fluctuations of the logarithm of GDP and the long-term coefficient for the positive fluctuations of the GDP logarithm is 0.361, which is statistically significant. Demand for goods is expected to increase with positive fluctuations and an increase in a country's income, thereby increasing import prices. The obtained result is consistent with the findings of findings of Ceglowski (2010), Jafari Samimi et al. (2013), Mesbahi et al. (2017), and Sarlab et al. (2019). On the other hand, the long-term coefficient for the negative fluctuations of the logarithm of the GDP variable is not negative and is not statistically significant. The price of imported medical goods has not been significantly affected by the negative fluctuations of the logarithm of GDP due to adherence to consumption, and therefore its values are statistically meaningless.

[DOI: 10.61186/jme.17.3.275]

The degree of economic openness can have a direct and indirect effect on the degree of ERPT: Regarding the direct effect of the degree of economic openness on the degree of ERPT, sharp exchange rate fluctuations in the price of imported goods are expected with increasing trade volume, where consumption is transferred and, as a result, the degree of exchange rate increases. However, as regards the indirect effect, increasing the degree of openness of the economy can lead to lower prices for imported goods by increasing imported goods and capital by producers. In the present study, in the long term, the effect of the negative fluctuations of the degree of economic openness on the price of imported medical goods is negative and statistically significant, which shows that the expansion of trade increases import goods and capital by manufacturers in the industry to lower the price of these products. This finding follows the results of the study of Asgharpour and Mahdilo (2014).

The coefficient of the positive fluctuations of the final cost of business partners is positive and statistically significant in the short term. The estimated coefficient shows that in exchange for a positive change and an increase in the final cost of trading partners, the price index of imports of medical goods also increases. Regarding the positive effect of the final cost of production on the import price of medical goods, it can be said that with increasing final production costs, the price of medical products in the country of origin increases, and therefore, this causes an increase in import prices. The obtained result is in line with studies such as Sarlab et al. (2019) and Mesbahi et al. (2017). Also, the coefficient of the negative fluctuations of the final cost of trading partners is negative and statistically significant. As the final cost of trading partners decreases, so does the price index of imports of medical goods. Regarding the short-term relationship, for a 1% change in the positive fluctuations of the final cost of trading partners, about 0.007% is added to the price of imported medical goods.

Also, in this regard, in exchange for a 1% change in the negative fluctuations of the final cost of trading partners, the price of imported medical goods decreases by about 0.01%. In the long term, the effect of positive and negative fluctuations on the final cost of trading partners and the price index of imports of medical goods is positive and statistically significant. This is because the final production costs may decline in the long term for the producers themselves. Also, due to the nature of the industry, which requires active and up-to-date research, development, and technology, it is so costly that countries importing medical products should always have double costs. Therefore, the final production costs in this part of the industry increase the

[DOI: 10.61186/jme.17.3.275]

price of medical goods in the country of origin and, therefore, increase the import price of medical goods.

The Wald test in the table examined the symmetry or asymmetry of the positive and negative effects of the variables on the import price of medical goods in the short and long terms. The significance of the Wald test statistic in the short- and long-term relationship for the GDP variable showed that the null hypothesis, which states that the positive and negative GDP affects the import price of medical goods in the short and long terms are equal, is rejected and the effect of positive and negative changes of GDP on import prices of medical goods is asymmetric in the short and long terms. Also, the statistic of the Wald test in the short term for the variables of the exchange rate, degree of economic openness, and the final cost of trading partners are not statistically significant, indicating that the null hypothesis that the effect of positive and negative changes of these variables on the import price of medical goods are equal cannot be rejected in the short term. Thus, the effect of their positive and negative changes on the import price of medical goods is symmetrical in the short term. However, in the long term, the statistic of the Wald test is statistically significant for these three variables and indicates that the null hypothesis, which states that the effect of positive and negative changes of these variables on the import price of medical goods is equal in the long term, can be rejected. Thus, the effect of their positive and negative changes on the import price of medical goods is asymmetric in the long term.

In addition, the results of the reported diagnostic tests indicated the absence of the problem of serial autocorrelation and variance heterogeneity. The Ramsey reset test showed the existence of an appropriate consequential model. The Jarque-Bera test also indicated the normal distribution of the regression error term, which indicates that a suitable model has been specified that confirms the robustness of the model.

6 Conclusion

Knowing how exchange rate fluctuations can affect the price of commercial goods in the foreign trade sector can be very useful for policy-making and the implementation of operational plans. Some products and consumer goods for domestic consumption are supplied through imports, thus the exchange rate is one of the main factors determining the price of raw materials, intermediate goods, capital equipment, and final imported goods. Therefore, the ERPT on the price of imported goods finds its way to the price of domestic and imported products and influences government executive policies.

[DOI: 10.61186/jme.17.3.275]

Given that community health is one of the most important issues in Iran because of the social and human costs it imposes on society, the present research was an attempt to study the effects of ERPT on the price of medical goods in Iran, using quarterly data from 2005 to 2018. For this purpose, the NARDL method was used to investigate the asymmetric effects of ERPT on the price of medical goods.

The results of the HEGY, Zivot-Andrews, and Lee-Strazicich seasonal unit root tests showed that the variables considered in the stationary model are of different degrees. For this purpose, the Gregory-Hansen cointegration test was used to examine the existence of a long-term relationship. Results in this phase showed the existence of a long-term relationship between variables. The NARDL method was used to estimate the model, and the results showed that the ERPT was incomplete. The coefficient of positive and negative exchange rate fluctuations, in the long term, indicated that the price index of imported medical goods decreased by a 1% increase in the value of the domestic currency compared to foreign currencies (devaluation of foreign currency). In other words, with the decrease in the exchange rate, the cost of imports has increased in terms of domestic currency; as a result, the price of imported medical goods also increased. Therefore, the exchange rate in Iran is less than one, and the effects of increasing foreign exchange value on import prices are transferred.

7 Suggestions for Future Studies

Due to the dependence of some national products and consumptions on imported exchange rates, it has been considered as one of the determining factors of the price of imported raw materials, intermediate goods, capital goods, and final goods. The control causes some changes in the exchange rate through the price of imported goods, opens the way to the price of national and imported products, and affects the administrative policies of the government. Hence, future researchers are recommended to implement operational plans in stabilization in order to counteract territorial fluctuations in the foreign trade sector of the countries.

[DOI: 10.61186/jme.17.3.275]

References

Asgarian, F., Khodadadi, M. R. & Sarlab. R. (2017). Modeling of Sports Goods Imports into Iran with ARMA Model (1992–2012). *Journal of Sport Management Studies*, *9* (41), 97- 110.

Asgharpour, H., & Mahdiloo, A. (2014). Inflationary Environment and the Impact of Exchange Rates on Import Prices in Iran: Markov- Switching Approach. *Quarterly Journal of Economic Research and Policy*, 22(70), 75-105 [In Persian].

Bangura, M., Caulker, E., & Pessima, S. (2012). Exchange rate pass-through to inflation in Sierra Leone: A structural vector autoregressive approach. *Journal of Monetary and Economic Integration*, 12(1), 93-123.

Behrman, J. (1993). Health and economic growth: Theory, evidence and policy. *Macroeconomic environment and health*, Geneva: World Health Organization.

Ceglowski, J. (2010). Exchange rate pass-through to bilateral import prices. *Journal of international money and finance*, 29(8), 1637-1651.

Choudhri, E. U., Faruqee, H., & Hakura, D. S. (2005). Explaining the exchange rate pass- through in different prices. *Journal of International Economics*, 65(2), 349-374.

Devereux, M., & Engle, C. (2002). Exchange Rate Pass-Though Exchange Rate Volatility and Exchange Rate Disconnect. *Journal of Monetary Economics, 49*(5), 913-940.

Doojav, G.-O. (2009). Exchange rate pass-through to inflation in Mongolia. Working paper.

Ghobadi, S., & Alipour, B. (2016). An Investigation on the Impact of Different Sectors' Pollutants of Economy on Hygiene Expenditure. *Journal of Environmental and Natural Resource Economics*, 1(2), 59-80. [In Persian]. doi:10.22054/eenr.2016.8407

Gueorguiev, N. (2003). Exchange rate pass-through in Romania. Working paper.

Hadian, M., Shojaee, S., & Rajabzadeh, D. (2006). The impact of health expenditure on the economic growth in IRAN (1980-2004). *Journal of Health Administration*, 9(24), 39-44. Retrieved from http://jha.iums.ac.ir/article-1-311-fa.html.

Hara, N., Hiraki, K., & Ichise, Y. (2015). Changing exchange rate pass-through in Japan: does it indicate changing pricing behavior? Working paper.

[DOI: 10.61186/jme.17.3.275]

Heydari, H., & Ahmadzadeh, A. (2015). Exchange rate changes and its effect on the price chain in Iran. Iranian journal of Trade Studies, 74, 1-28.

Hong, P., & Zhang, F. (2016). Exchange rate pass- through into china's import prices: An empirical analysis based on ARDL model. *Open Journal of Social Sciences*, 4(04), 13.

Islambolchi, S. (2014). Butterfly of Sultans, the Effect of Environmental Quality on Health Economics in Selected Countries. *Journal of Environmental Science and Technology*, 18(1), 107-121. [In Persian].

Jabara, C. (2009). How Do Exchange Rates Affect Import prices? Recent Economic Literature and Date Analysis. Working paper.

Jafari samami, A., Monfared, M., & Heydarzade, N. (2013). The impact of exchange rate uncertainty on Iran's imports. *Quarterly Journal of Business Research*. 18 (72): 1-24.

Jalaei Esfandyari, A. M. (2005). Analysis of the Exchange Rate and Determining Its Relationship with Monetary Policy and the Openness of the Economy in Iran by Neural Fuzzy Systems. University of Isfahan.

Kazerooni, A., Asgharpur, H., & Farzi, N. (2016). The Effect of Exchange Rate Pass-Through on the Domestic Price of Iranian Vehicle Market with Emphasis on the Import Share of the Domestic Market Impact. *Journal of Economic Research (Tahghighat- E- Eghtesadi)*, 51(1), 205-228. [In Persian]. doi:10.22059/jte.2016.57602

Kent, D. (1993). Pass-Through Exchange Rate. *IMF Working Paper*, 12.

Kiliç, R. (2016). Regime-dependent exchange-rate pass-through to import prices. *International Review of Economics & Finance*, 41, 295- 308.

Lee, J., & Strazicich, M. C. (2003). Minimum Lagrange multiplier unit root test with two structural breaks. *Review of economics and statistics*, 85(4), 1082-1089.

McCarthy, J. (2000). Pass-through of exchange rates and import prices to domestic inflation in some industrialized countries. Eastern Economic Journal, *33*(4), 511- 537.

Mesbahi, M., Asgharpour, H., Haghoghat, J., Kazerooni, A., & Falahi, F. (2017). Degree of ERPT on import prices in Iran with emphasis on the role of instability of oil revenues (nonlinear approach). *Economic Modelling*, 11(1), 77-100. [In Persian].

Moosavi Mohseni, R., & Sobhanipoor, M. (2007). A Study of Exchange Rate Transition in the Iranian Economy. *IJEFI*, 129-149. [In Persian].

Naz, F., Mohsin, A., & Zaman, K. H. (2018). Exchange rate pass-through into inflation: New insights to the cointegration relationship from Pakistan. *Economic Modelling*, 29(12), 2205-2221.

[DOI: 10.61186/jme.17.3.275]

Pishbahar, E., & Baghestani, M. (2014). Investigating the Economic Effects of Oil and Food Price Shocks on Macroeconomic Variables in Iran. *The Economic Research*, 14(3), 45-64. Retrieved from http://ecor.modares.ac.ir/article-18-3612- en.html

Sahminan, M. (2014). *Exchange rate pass-through into import prices: empirical evidences*. The University of North Carolina at Chapel Hill, Working paper.

Jafari Samimi, A., Adibpour, M., & Heydarizadeh, N. (2012). Exchange rate uncertainty and imports: evidence from Iran. *Middle-East Journal of Scientific Research*, 11(2), 167-172. [In Persian].

Sarlab, R., Askariyan, F., & Asgharpour, H. (2019). The effect of exchange rate regimes on the rate of ERPT on the index of prices of imports of sports goods of Iran and business partners. *Journal of Sport Management*, 11(2), 339-358.[In Persian].

Sarlak, A., & Hozhabr Kiani, K. (2015). The Impact of Health Expenditures on the Economic Growth of the Provinces of the Country. *IJES*, 13, 171-185.

Sek, S. K., & Kapsalyamova, Z. (2008). Exchange rate pass-through and volatility: Impacts on domestic prices in four Asian countries. Working paper.

Shahbazi, K., & Asadi, F. (2011). The effect of exchange rate increase on imports of drugs and medical equipment. *Journal of Economic Policy*, 1(11), 35-54. [In Persian].

Shajari, H., Tayebi, S. K., & Jalaei, S. A. A. M. (2005). Analysis of Exchange Rate Pass - Through in Iran. *Knowledge and Development*, - (16), 51-76. [In Persian]. Retrieved from https://www.sid.ir/en/Journal/ViewPaper.aspx?ID=40226

Shin, Y., Yu, B. & Greenwood-Nimmo, M. (2014). Modelling asymmetric cointegration and dynamic multipliers in a nonmineral framework. *Festschrift in Honor of Peter Schmidt. Springer Science & Business Media*, New York, 281-314. https://doi.org/10.1007/978-1-4899-8008-3_9 .

Tayebi . S. K., Nasrollahi . KH., Yazdani , M. & Malekhosseini. S.H. (2015). Analyzing the Effect of Exchange Rate Pass- Through on Inflation in Iran (1991-2012). *Iranian Journal of Economic Research*, 20 (63), 1- 36.

Zanganeh, M. (2002). *A Study of the Effects of Exchange Rates on the Relationship of Exchange in Iran*. (Master Thesis). University of Tehran. [In Persian].

[DOI: 10.61186/jme.17.3.275]

Zivot, E., & Andrews, D. W. K. (2002). Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. *Journal of business & economic statistics*, 20(1), 25-44.

[DOI: 10.61186/jme.17.3.275]