German Economic Team Moldova

Technical Note [TN/03/2018]

How do exchange rate fluctuations affect Moldovan import demand?

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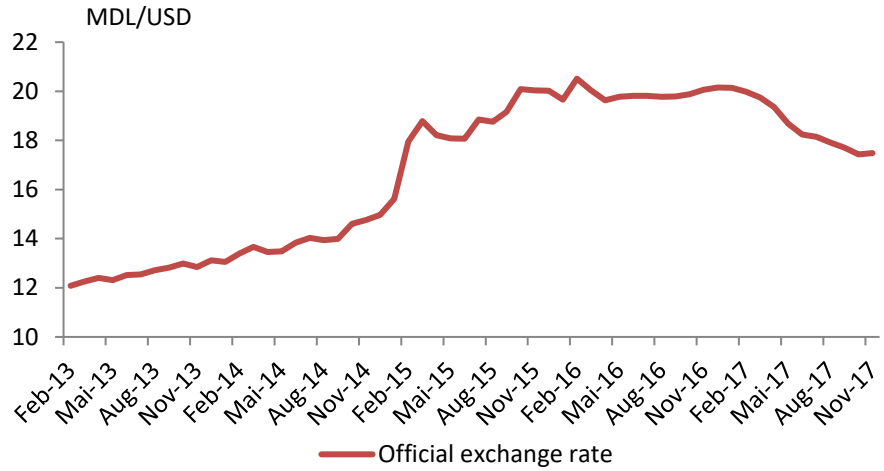
1 Introduction

At the beginning of 2015, following the bank fraud scandal, the Moldovan Leu experienced a significant depreciation against the currencies of its main trading partners. The bilateral exchange rate against the US Dollar depreciated from around 15 MDL/USD in January 2015 to around 19 MDL/USD in March 2015 (Figure 1).

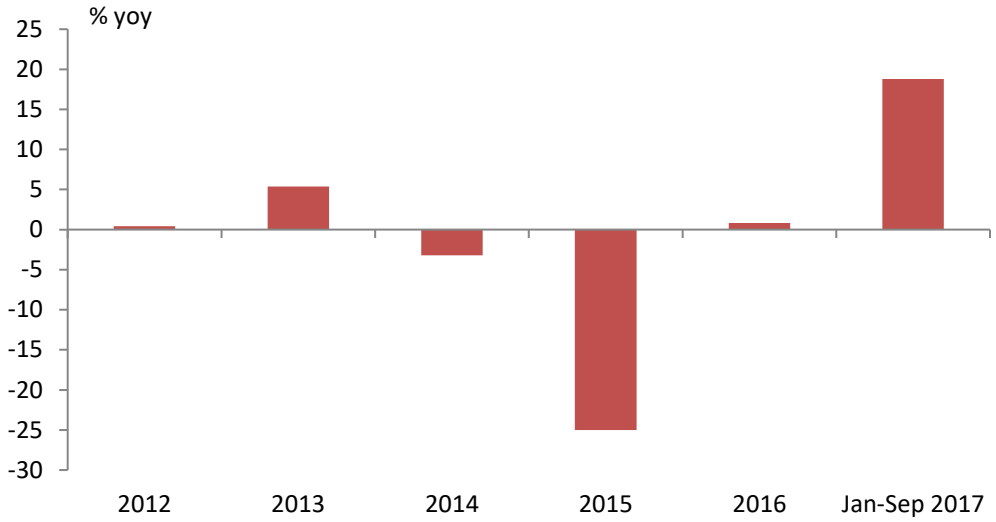
Figure 1: Exchange rate development



Source: National Bank of Moldova

The currency crisis of 2015 coincided with a strong decline of imports which fell by 25% (nominal, in US Dollar). This raises the question, if the import decline is at least partially a result from the devaluation of Moldovan Leu. In contrast, since the beginning of 2017, the Moldova Leu has shown a gradual appreciation against the US Dollar and other major currencies. Although the appreciation is more gradual and smaller in magnitude compared to the 2015 depreciation, there is the relevant question how this could affect import demand, the trade deficit and overall economic growth.

Figure 2: Imports annual growth



Source National Statistics; note: merchandise trade

Research objective: This technical note analyses how exchange rate movements impact Moldovan trade activity, especially aggregated import demand. In particular, we seek to establish a range for the elasticity of Moldovan import demand with respect to exchange rate changes. Additionally, we examine the main factors influencing Moldovan import demand elasticity.

Method: To answer the research question, we carry out a review of relevant empirical research analysing the link between exchange rate movements and trade activity. Our literature review focusses in particular on existing research for Moldova as well as on econometric analyses which cover a large number of countries.

Why is this important? Reliable estimates of the exchange rate elasticity of import demand (and trade activity in general) are important for an informed policy analysis in a number of areas:

- **Monetary policy** as the link between the exchange rate, import prices and trade activity can be an important driver of short-term inflation.
- **Macroeconomic stability** as the strength of the link between the exchange rate and trade activity influences the ability of policy makers to use the exchange rate to absorb economic shocks.
- **Economic policy** which relies on reliable macroeconomic forecasts.
- **Fiscal policy** as imports are an important basis for taxation.

2 Theoretical background

2.1 Import demand

Import demand is considered to be part of domestic demand (i.e. consumer, investment, government, intermediate demand) which is satisfied by buying goods outside of Moldova – as opposed to buying domestic goods.

Basic demand models assume that demand depends on two factors: prices and income. Additionally, according to the new trade theory imported goods and domestic goods are assumed to be imperfect substitutes. Therefore, the import demand model does distinguish between prices for domestically produced goods and prices for imported goods. A simple import demand function could be written as:

$$M = D(Y, p, p_{im})$$

Y – national income in domestic currency

p – prices of domestically produced goods

p_{im} – prices of imported goods (in domestic currency)

While the exchange rate is not directly part of the import demand model, it may impact import demand as a change of the exchange rate may increase or reduce the prices of imported goods. Thus, the link between the exchange rate and imports can be separated into:

- Exchange rate pass through: The extent to which foreign companies (or their Moldovan intermediaries) pass on exchange rate changes to consumers.
- Price elasticity of import volumes: The change of import demand following the change in prices of the imported good.

In order to establish a range for Moldovan import reaction to exchange rate changes, both the pass through and the price elasticity need to be examined.

2.2 Exchange rate pass through and import elasticity

Import demand elasticity with respect to exchange rate changes, which we want to establish for Moldova in this paper, states how import demand reacts in response to a change in in the exchange rate. In order to analyse the strength of the elasticity of import demand to exchange rate changes in Moldova, we need to investigate the combined effect of exchange rate pass through and import price elasticity. Indeed, the extent of the pass through determines directly how demand reacts to exchange rate changes. If hardly any of the exchange change is reflected in the prices of imported goods, the demand reaction will be rather muted.

The question to what extent do foreign firms pass on the effect of an exchange rate depreciation or appreciation to Moldovan consumers is central to understanding how it affects import demand. In a perfectly competitive market and with Moldova only accounting for a rather small share of demand, one would expect that each exchange rate fluctuation is completely passed through to the prices for

imported goods. However, it has been shown in empirical research that exchange rate changes only partially translate into changes of prices of imported goods – that is, pass through is incomplete.

Fundamentally, the extent of the exchange rate pass through depends on the market power of the firm. Even if similar goods are available on the domestic market, importers may have some market power as imported goods are considered different from domestic ones. Additionally, if distribution companies are involved, large trade margins may act as buffer to exchange rate changes reducing the pass through rate and impact on prices. Another factor which reduces pass-through can be a high import intensity of exports as imports may be an important input for exports regardless of the cost. Light manufacturing such as the wire harness production in Moldova serves as a good example here. Finally, the pass through may be determined by the expectations about the duration of the exchange rate change in question.

Empirical studies which estimate trade elasticities are technically demanding. The main problem facing empirical studies is endogeneity: a loop of causality between the independent and dependent variables of a model. For example, in a simple supply and demand model, when predicting the quantity demanded in the equilibrium, the price is endogenous because producers change their price in response to demand and consumers change their demand in response to price.

Furthermore, multi-country studies which are the main focus of our literature review, may suffer from an omitted variable bias as they typically use simple standard specifications of demand models for all the countries. This one size fits it all approach may miss important country specific factors and consequently over- or understating the elasticity. A related problem is aggregation: Price elasticity which is estimated at a much aggregated level may be understated as some information is lost in the aggregation process or not all the relevant factors are reflected in the estimation.

3 Review of empirical evidence

There exist a large number of empirical studies investigating the link between exchange rate and import prices (pass through) and import prices and import demand which typically employs econometric models. The objective of this chapter is to provide an overview of the most relevant empirical studies in order to establish a reasonable estimate of the parameters for:

- Exchange rate pass through,
- Price elasticity and
- Exchange rate elasticities.

In this review we focus on studies with large samples of different countries in order to obtain a representative average of import elasticities and a sense for the deviation of the parameters across countries and studies. To our knowledge there is no study specifically dedicated to estimating the link between exchange rate and import demand for Moldova. However, wiiw (2016) present price elasticity estimates for Moldova.

3.1 Exchange rate pass through to import prices

As explained above, exchange rate pass through describes to what extend an exchange rate fluctuation translates into changes of the prices for imported goods. Generally the studies reviewed find that pass through of exchange rate fluctuations to import prices is incomplete.

Leigh et al. (2016) estimated both the *exchange rate pass through* to prices of imported goods in local currency and the *price elasticity of import and export demand*. The analysis is quite broad as it encompasses 88 countries which allows a comparison between developed and emerging economies. Elasticities are estimated using both aggregated trade as well as sectoral trade data. The authors find that **a 10% depreciation leads on average to 6% increase in relative import prices.** The pass through to export prices is similar in magnitude with a pass through rate of 0.5.

A recent Bank of Canada (2017) multi-country study also finds that exchange rate pass through is incomplete with a **10% depreciation estimated to lead to 5% increase of import prices**. On the export side the pass through is stronger with 70% of exchange rate change passed on to export prices.

Consequently, based on the existing research for Moldova we would assume that pass through is incomplete with a pass-through rate of 0.5 to 0.6.

3.2 Price elasticity of import demand

Then there is the question how a change in import prices affects demand for imported goods – the price elasticity of import demand.

A recent wiiw (2016) study estimated the price elasticity of import demand for 167 countries and more than 5.000 different products - a very disaggregated level. For Moldova they estimate a **price elasticity of import demand of -1.0** which is at a similar level to the price elasticities obtained for other countries. The average elasticity for all country was -0.95. However, in general the price elasticities presented in this study are higher in magnitude than the elasticities of other studies. This is due to the high level of disaggregation with elasticities estimated for large number of products as opposed to aggregated import demand. Indeed, price elasticities estimates are usually larger when such a disaggregated approach is

used. This effect is called an aggregation bias and reflects, among other things, that at a more aggregated level, there is much less option for substituting imports with domestic products.

In comparison Hong (1999), who surveys empirical results for about 80 countries at a high level of aggregation based on the United Nations LINK modelling, finds rather smaller price elasticities. They obtain **price elasticities of demand of about -0.6** across the models reviewed. However, there is quite a deviation across countries with an elasticity of -1.1 for the United States – suggesting a strong reaction to price changes – while for Chile only an elasticity of -0.2 (for consumer goods) is obtained.

Crane (2007) also estimates an aggregated demand function for each of the G7 countries. They obtain an **average price elasticity of import demand of -0.4**. This again confirms that price elasticity at aggregated level is comparatively small. However, here also price elasticities vary considerably across countries with -0.2 for Japan up to -1.2 for Canada. What is more, the estimated elasticities vary also depending on the sample period used.

Bussiere at al. (2013) also estimate an aggregated demand function but with an adjusted measure of GDP to account for import content of exports. The study considers all OECD countries. With **price elasticities of around 0.2 the demand reaction to price changes is rather small** which again confirms that price elasticity at aggregated level is rather weak. What is interesting is their finding that price elasticity differs depending on the business cycle. The authors estimate that the price elasticity during recessions reaches about 0.5 while during expansionary periods the elasticity is only 0.15.

Given the large range of estimates and variations across countries it is difficult to settle for definite number in the case of Moldova. However, there is clear indication that price elasticities of aggregated import demand are well below 1.0 in absolute terms probably somewhere in the range of -0.7 to -0.4.

3.3 Exchange rate elasticity of import demand

There are also a number of studies which directly estimated the link between exchange rate fluctuations (usually the real effective exchange rate) and trade activity. The studies reviewed find a strong link between exchange rate and trade activity both on the exports and import side. Most of the trade effect materialises within one year following exchange rate shock. The link between exchange rate and demand is quite stable over time, which means that the exchange rate remains an effective policy tool.

Leigh at al. (2016) estimated directly the link between exchange rate and import demand and obtained an elasticity of 0.3[1]. A **10% depreciation of the real exchange rate leads to 3% decline in import volumes**. The exchange rate elasticity of exports is also found to be around 0.3.

A recent Bank of Canada (2017) study arrives at similar results. The authors estimate the link between import quantities and the bilateral exchange rate (and importers GDP). The estimates are based on disaggregated data at the six-digit HS code product level and later aggregated in order to achieve country averages. They obtain an **exchange rate elasticity of import demand between 0.2 and 0.4**. For exports demand the elasticity is found to lie around 0.35.

The findings of Quere (2018) are interesting as the author compares the impact of currency rate changes with the effect of tariff rate changes on export demand. The authors find that export demand reacts much stronger to tariff changes than to exchange rate changes. For export demand they obtain an **exchange rate elasticity of 0.5** – quite similar to the findings above. However, export demand reacts

[1] Dependent variable: import volume M; independent variables: real exchange rate eP/P*, exports X, domestic demand

much stronger to tariff changes with a 10% tariff-induced price increase estimated to reduce demand by 14%. This suggests that exchange rate changes may only have a limited impact on demand if they are viewed as temporary. In comparison, tariff changes – which are viewed as permanent – quickly translate into mark-ups and price adjustments with corresponding demand changes.

As such, existing research suggests an **elasticity of import demand with respect to exchange rate changes of between 0.2 – 0.4.** A 10% depreciation of real effective exchange rate is likely to lead to 2% to 4% decline of import volumes.

This is in line with the implied elasticity of import demand with respect to the exchange rate from the ranges of price elasticity and pass through effects found above. If pass through is in the range of 0.5 to 0.6 and price elasticity of import demand in the range of -0.7 to -0.4, **this implies an exchange rate elasticity of import demand of 0.2 – 0.4.**

Table 1 provides an overview of the results of the literature review.

Table 1: Overview table literature review

			Imports			Exports		
Study	**Countries covered**	**Approach**	**Exchange rate**	**Prices**	***FX pass through***	**Exchange rate**	**Prices**	***FX pass through***
Leigh et.al. 2016	88 countries	Aggregated	-0.3	n/a	*0.6*	0.3	n/a	0.6
Bank of Canada 2017	51 countries	Disaggregated (product groups)	-0.25	n/a	*0.5*	0.4	n/a	0.7
Hong 1999	80 countries	Aggregated	n/a	-0.6	n/a	n/a	n/a	n/a
Crane 2007	7 industrialised countries	Aggregated	n/a	-0.4	n/a	n/a	-0.7	n/a
Quere 2018	110 countries	Disaggregated	n/a	n/a	n/a	0.5	n/a	n/a
Bussiere 2013	OECD	Aggregated	n/a	-0.2	n/a	n/a	n/a	n/a
Kee 2005	115 countries	Disaggregated, product level	n/a	-1.1	n/a	n/a	n/a	n/a
Takagi, Ciubotaru 2013	Moldova	Aggregated	n/a	-0.3	n/a	n/a	n/a	n/a
WIIW 2018	Moldova	disaggregated for HS 6 digit product group	n/a	-0.99	n/a	n/a	n/a	n/a
Average			-0.3	-0.6	0.6	0.4	-0.7	0.7

4 Conclusion for Moldovan import demand elasticity

The literature review conducted here suggests a strong link between exchange rate fluctuations and trade activity for most economies. There is no reason to believe that Moldova is different. Based on the literature review **for Moldova an exchange rate elasticity of import demand in the range of -0.2 to -0.4** can be assumed. That is, a depreciation (of the effective exchange rate) of 10% is likely to lead to a decline in aggregated import volumes of 2% to 4%. The main effect of any exchange rate change on Moldova's trade is likely to materialise in the first year.

The literature review indicates that exchange rate changes are only partially passed through to import prices. In the case of Moldova, it is reasonable to assume that a 10% depreciation is still likely to lead to 5% to 6% increase in prices of imported good in Moldovan Leu. Thus, an exchange rate depreciation can have a considerable effect on short-term inflationary pressures while a sudden appreciation may reduce short-term price pressures.

It is important to highlight that here are large variations of the estimates across different countries and even across different studies for the same country. This reflects the technical difficulties in estimating the link between the exchange rate and trade activity. But it also highlights that many factors influence how a particular exchange rate movement affects trade activity. For example, there seems to be a strong impact on the elasticity from the business cycle. During expansionary periods the link between the exchange rate and trade seems to be much weaker. Additionally, a large, sudden movement (e.g. the currency crisis after the bank scandal) is likely to lead to a proportionately larger response than, for example, the gradual shift observed since the beginning of 2017. This suggests that the current appreciation of the Leu against other major currencies is not likely to cause a large increase of imports.

To sum up, the exchange rate has a significant impact on Moldova's trade activity and thus remains an effective instrument for economic policy.

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