



Impacts of exchange rate fluctuations on imports and domestic economy in Rwanda

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- In this project, we explore how exchange rate fluctuations affect firms' import and domestic activities.
- Our analysis takes advantage of the transaction-level Customs data and the newly available Electronic Billing Machines (EBM) data, which covers the universe of the firm-to-firm and firm-to-consumer transactions by VAT registered firms in Rwanda.
- Using the Customs data, we find that exchange rate fluctuations significantly affect import prices. Currency depreciation also reduces the quantity of imports.
- Using the EBM data, we find evidence of import substitution, i.e., importers increase domestic purchases in response to an increase in exchange rate. Furthermore, we find limited pass-through of exchange rate fluctuation to domestic prices.
- Our analysis suggests that a weaker Rwandan Franc is not necessarily leading to higher domestic prices that Rwandan consumers face.

Motivation and overview

In recent years, the Rwandan Franc (RWF) has depreciated significantly against a wide basket of currencies (NBR 2018): in the most recent fiscal year 2017/18, the RWF experienced a depreciation of 3.6% against the US Dollar, 5.5% against the Euro, and 4.4% against the GB Pound Sterling. With respect to regional currencies, the RWF depreciated against the Kenyan Shilling, Tanzanian Shilling and Burundian Franc by 6.3%, 1.7%, and 1.5%, respectively. The RWF shows a similar pattern of depreciation in the previous fiscal years (NBR 2016, 2017). The current account deficit, largely driven by the trade deficit, is accounted as the main driver of this nominal depreciation (World Bank Group, 2019).

Given this recent extended period of depreciation of the RWF, an important question from the policy perspective of the National Bank of Rwanda (NBR) is the extent to which this has affected import activity as well the domestic activity of firms in Rwanda. We would expect such a nominal depreciation to lead to an increase in import prices in RWF terms, which would affect firms' importing behaviour. This may propagate to the domestic economy through importers' domestic sales and purchasing decisions.

This study provides an empirical investigation of this question by studying the impacts of exchange rate fluctuations on import volume and prices, as well as importers' domestic activity and prices. To do so, we mainly utilise two data sets in Rwanda: (1) the Customs data that records the universe of import transactions by Rwandan firms, and (2) the EBM (Electronic Billing Machines) data, which records the item-level firm-to-firm and firm-to-consumer transactions by VAT-registered firms in Rwanda. The latter is a particularly unique data set that can potentially provide new insights on exchange-rate pass-through. In Rwanda, VAT-registered businesses are mandated to submit itemised receipts of all of their sales through Electronic Billing Machines (EBMs). The itemised price information contained in the EBM receipts can be a potentially useful data source to guide monetary and exchange rate policies. For our purpose, the micro-data sheds light on the heterogeneity of firm-level responses to nominal exchange rate shocks, which the previous studies relying on macro-level data have not been able to address.

Data

The customs data contains the universe of import and export transactions in Rwanda from 2008 to 2018. For the purpose of this project, we focus on imports. For each import transaction over this period, the data reports the importing firm (TIN), date of transaction, the type of product (including its HS classifications), country of origin, the value of the transaction (CIF amount), the

net weight of the transaction, the product quantity and units, the number of packages, the invoice currency of the transaction, the exchange rate recorded at the time of the transaction, among many other variables. The information for origin country and invoice currency is missing for the early years of 2008 to 2011. Therefore, for most of our regression analysis, we focus on the period of 2012 to 2018. Our final analysis data set contains 2,551,085 import transactions of 53,214 firms from 207 countries, spanning 4,929 HS 6-digit product sectors.

We also use the EBM (Electronic Billing Machines) data, which records the item-level firm-to-firm and firm-to-consumer transactions by VAT-registered firms in Rwanda. In 2013, Rwanda mandated the use of Electronic Billing Machines (EBM) for all VAT-registered businesses. For every transaction a business makes, it must provide the customer with an EBM receipt. The EBM's Sales Data Controller regularly transmits the receipt data to the Rwanda Revenue Authority (RRA), and all the receipt information is available at the RRA server. We construct a harmonised database from this EBM receipts data and classify industries from text information in the receipts.

One important caveat for our analysis is that our analysis is based on the customs data and VAT data, implying that the informal sector is dropped from the samples. Studying how the informal economy responds differently from the formal sector is left for future research.

Summary of research findings

Our results are summarised as follows: we document an exchange-rate pass-through to import prices of 10% to 40% depending on the price measure used and depending on whether we use exchange rates based on the country of import origin or invoice currency. Further exploring the richness of the micro-level data, we document various heterogeneity patterns across time periods, sectors, and firms. In particular, we find that small firms and firms importing intermediate goods appear to be affected more (i.e., experience higher pass-through) by exchange rate shocks. The results on high-frequency versus low-frequency importers are mixed, depending on how we define the frequency measure. We have also examined whether the impacts of exchange rate fluctuations are different across different periods and did not find evidence on that. Finally, on the extensive margins, we document suggestive evidence that firms reduce the number of products they import and the number of countries they source from in response to currency depreciation, and some degree of substitution may happen across the origin countries.

We then study importers' domestic purchases and sales, as well as their domestic prices, using the aforementioned EBM data. There are mainly two takeaways from this exercise. First, we find that importers respond by imperfectly substituting to domestic purchases as a response to the exchange

rate fluctuations: importers that are more strongly hit by exchange rate shocks reduce import expenditures more, and in compensation, increase domestic purchases more. However, this substitution is imperfect - for a one percentage point reduction of import expenditure, the domestic purchase increases by about 0.3 percentage points. Second, the pass-through of exchange rate fluctuations to importers' buyers is limited. There are no impacts of exchange rate fluctuations on sales prices. This is partly because of the import substitution as indicated above. Third, we find that large firms, and firms in commerce industries, are less affected by the exchange-rates fluctuations. Together, the results suggest that importers act as a "shock absorber" in mediating the pass-through of exchange rate fluctuations to the domestic economy and downstream consumers.

Policy discussions

The first and foremost policy relevance of this project is to provide a comprehensive understanding of the implication of the devaluation of the Rwandan Franc on import and domestic prices. Some argue that the depreciation of the Rwandan Franc has led to the increase of domestic prices, while others argue that there are no substantial impacts on consumer prices because firms can effectively substitute to domestic intermediate goods suppliers. Which of these arguments are close to reality is ultimately an empirical question. Our results show that the latter is the case.

Beyond the implication of the devaluation, this project provides evidence of strong substitution by Rwandan firms between domestic and foreign inputs. This finding suggests that there is a large scope for import substitution policies (e.g., "Made-in-Rwanda Initiative").

Lastly, our analysis provides a first case of effectively using the EBM data set for policy analysis. We develop a code to process EBM receipts to a harmonised data. We also provide an algorithm and a code to classify products into harmonised product classification system based on machine learning algorithms. Our analysis shows that this type of rich administrative data set can be effectively utilised in policymaking.