Box 2. The impact of the real effective exchange rate on manufacturing exports: a microeconomic assessment

The widening of current account imbalances before the Great Recession and, in some cases, their persistence during the crisis were important sources of concern for economic policy makers in many countries (IMF, 2016). More recently, in Romania, the pandemic crisis caused a significant worsening of the existing current account deficit (from 4.9 percent of GDP in 2019 to 7.2 percent in 2021 and over 9 percent in 2022), owing mainly to the trade balance. In addition, the hike in energy prices, the bottlenecks in global value chains and the broad-based increases in prices, especially for goods, are likely to affect price competitiveness, given that the pandemic crisis also involved a shift from services to goods (durables, in particular). In this context, the discussion on the impact of the real effective exchange rate (REER) on export dynamics came into focus once again. REER is a key parameter in macroeconomic models, the variable reflecting the effects on price competitiveness, and implicitly on exports, from both the changes in the nominal exchange rate (in relation to a basket of foreign currencies) and the relative price dynamics. This box aims to provide alternative evidence on the elasticity of exports to a REER change for Romania, based on data at company level and NACE divisions in manufacturing[1].

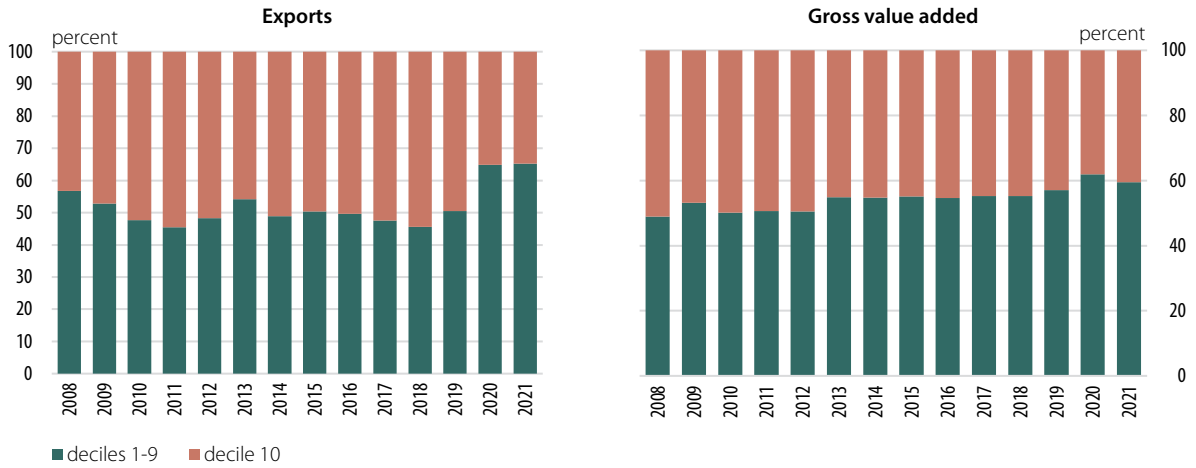
The estimates based on macroeconomic time series showed that the aggregate volume of exports tends to have a relatively low response to a change in the REER dynamics (Goldstein and Khan, 1985; Hooper *et al.*, 1998); the outcomes were more recently confirmed by using also data at company level (Fitzgerald and Haller, 2014; Berthou and Dhyne, 2018). In addition, the estimates for different countries indicate there is substantial heterogeneity (Morin and Schwellnus, 2014; IMF, 2015), with values of export elasticity to REER changes ranging between 0 and -1.5.

Literature (Rodriguez-Lopez, 2011; Berman *et al.*, 2012) reveals that the heterogeneity of exporting companies plays a significant role in the incomplete exchange rate pass-through into export prices. This is significantly lower for large companies, which are overall more productive than the sector average. According to Berthou and Dhyne (2018), this finding has two important implications. First, the higher concentration of exports in more productive companies is expected to mitigate the elasticity of exports to a change in the exchange rate. Second, changes in the REER have a heterogeneous impact across countries, due to differences in productivity distributions among exporters. Alternative explanations for an incomplete exchange rate pass-through into export prices could be linked to companies' integration in global value chains. In this case, exchange rate developments in a country will objectively entail considerably less traction on these companies' pricing policies.

[1] The real effective exchange rate is calculated as follows: $REER_{jt} = \prod_{l=1}^{n}(S_{lt} * P_{jt}^{RO} / P_{jt}^{l})^{w_{lt}}$, where S_{lt} is the nominal exchange rate (foreign currency units for leu 1) in relation to a given trading partner (l) in a given year (t), P_{jt}^{RO} is the price index (GVA deflator) of a NACE manufacturing division $(j = 10, \ldots 33)$ in Romania, P_{jt}^{l} is the GVA deflator in a given year of a NACE division for the trading partner, while wlt stands for the share of a given trading partner in Romania's total exports in that year. Thus, in this box, an increase in REER indicates an appreciation, which implies, according to economic theory, a loss of price competitiveness and, *ceteris paribus*, a decrease in exports.

The estimations in this box were based on annual balance sheet data for the 2008-2019 period for exporting non-financial corporations with majority private capital, having more than 25 employees and operating in the Romanian manufacturing sector. The 2020-2021 period was left out of the estimate sample (and included only in the descriptive presentation of data) for specific reasons: 2020 was the year when the pandemic broke out and export volumes displayed significant adjustments, while data for 2021 may be affected by underreporting issues[2].

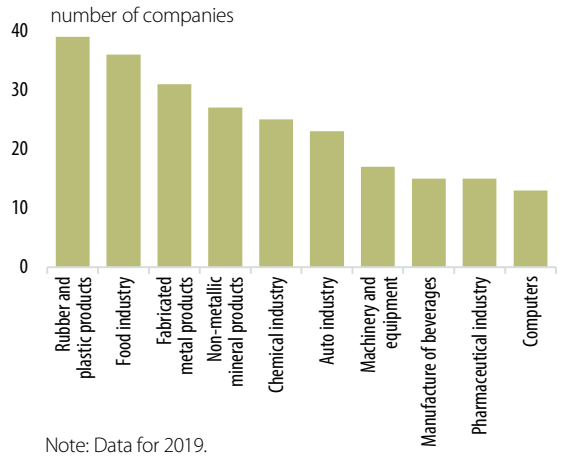
Chart A. The proportion of the most productive 10 percent (decile 10) exporting companies with more than 25 employees in manufacturing compared to the remaining 90 percent (deciles 1-9) in total exports and GVA, respectively, of this category of companies



Note: Data for 2021 are provisional.

Source: MF, NIS, NBR calculations and data processing

Chart B. The number of exporting companies with more than 25 employees in manufacturing, in the 10th productivity decile, based on the NACE division (top 10 divisions)



Note: Data for 2019.

Source: MF, NIS, NBR calculations and data processing

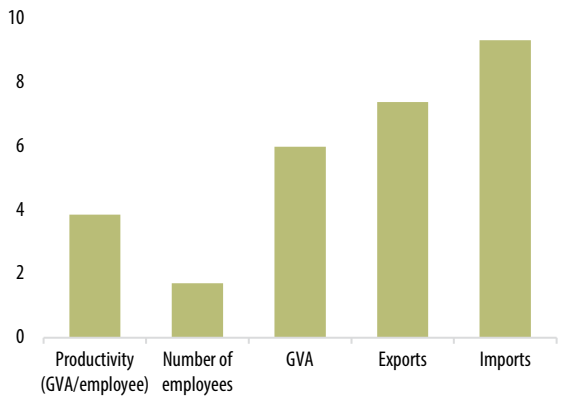
In descriptive terms, the analysis of the distributions of exports and gross value added (GVA) reveals the high share of the most productive[3] 10 percent of companies in total exports/GVA (Chart A). Specifically, the share of exports of the most productive decile increased after the Great Recession, as 2009 saw a significant nominal (corrective) depreciation of the leu. The pandemic period is characterised by a lower share of exports of the most productive decile, which may be associated with their higher exposure to bottlenecks in value chains. As for the proportion of the most productive 10 percent of the exporting manufacturers in the total GVA of this category, it stood at around 40-50 percent throughout the period under review, receding somewhat recently.

2 Anticipated to be remedied once the reporting for 2022 comes to an end.

3 Productivity was calculated as the ratio of GVA at company level to the number of employees. Based on this indicator, for each year, the companies were divided into 10 productivity groups (deciles).

Chart B shows, for 2019, the number of exporting companies with more than 25 employees in the 10th productivity decile by NACE division (top 10 divisions, covering about 80 percent of the total exporting companies in the 10th productivity decile). It notes the mix of low-tech (e.g., food industry), medium-tech (e.g., auto industry) and high-tech sectors (e.g., manufacture of computers), the number of firms in each division reflecting also the concentration of a specific business sector/area.

Chart C. Average statistics by exporting firm with more than 25 employees, the 10th productivity decile, relative to the average of deciles 1-9



Note: Data for 2019.

Source: MF, NIS, NBR calculations and data processing

Chart C shows the values of some indicators regarding the size and relative performance of an average exporting firm with more than 25 employees, belonging to the 10th productivity decile relative to one belonging to deciles 1-9 in 2019. It notes that, on average, exporting firms in the most productive decile: (i) have almost twice as many employees as those in productivity deciles 1-9; (ii) produce about six times more gross value added; and (iii) report almost quadruple productivity levels.

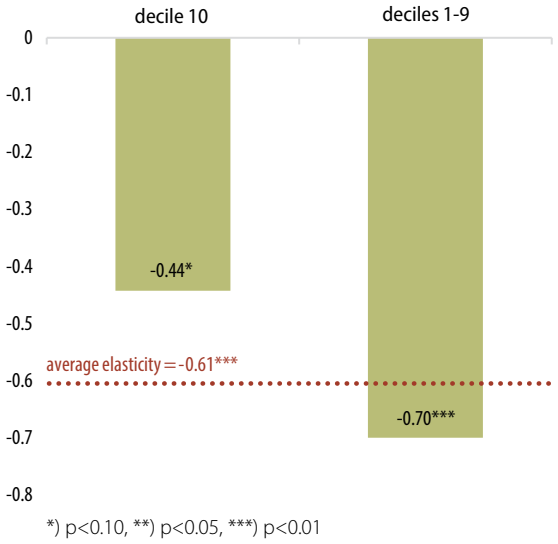
In order to build the REER per subsector, the nominal exchange rate and the ratios of GVA deflators in every NACE division for Romania and a group comprising 15 of Romania's euro-area trading partners were used[4]. Estimations included the following control variables: foreign demand (the annual average of manufacturing managers' expectations on export performance – DG ECFIN survey, data by NACE division; with a theoretically direct impact on exports), ownership structure (private-domestic, private-foreign, mixed; the shareholding is relevant for exports in terms of foreign shareholders' possible trade links), company size (larger companies benefit from potential scale effects) and company age (an older business enjoys an important learning curve relative to exports), and whether exports held a significant share (>30 percent) of turnover in a given year (strongly export-oriented firms are interested in maximising their exports), concentration in a certain sector (the Herfindahl-Hirschman index; sectors with a higher concentration indicate the presence of businesses with significant market shares that can have a notable influence on price-setting).

The outcome of estimations shows an average elasticity of exports to REER of -0.61 (the dotted line in Chart D), i.e. a 1 percent appreciation of the real effective exchange rate in the previous year is correlated with an approximately 0.61 percent decline in export volume in the reference year. Other statistically significant factors considered in these estimations and positively correlated with

4 Belgium, Germany, Greece, Estonia, Spain, France, Italy, Cyprus, Latvia, the Netherlands, Austria, Portugal, Slovenia, Slovakia and Finland. The share of the 15 countries in Romania's total exports of goods surpasses 50 percent. Methodologically, for the REER calculation, the shares of each partner in Romania's exports were rescaled so that they add up to 100 percent.

export dynamics are: foreign demand, the (pre-existing) large share of a company's exports, as well as productivity. Although statistically significant, estimates are surrounded by some uncertainty, as the level of elasticity also depends on other factors such as the degree of integration in global value chains (IMF, 2015), which was not quantified in this analysis. Ahmed *et al.* (2017) underscore that export elasticity to REER shows a downward trend in time, due chiefly to an increase in integration into global value chains. More recently, though, with the emerging risk of the fragmentation of international trade in the post-pandemic period, there are concerns that value chains could undergo changes leading to a certain global disintegration (Aiyar *et al*., 2023).

Chart D. Elasticity of exports to changes in REER [104]



*) p<0.10, **) p<0.05, ***) p<0.01

Source: MF, NIS, NBR estimates

For the most productive 10 percent of manufacturing firms, estimations suggest that export elasticity to REER stands at approximately -0.44[6] (Chart D, left-hand side) compared to around -0.7 (Chart D, right-hand side) for the other 90 percent of businesses classified by productivity. Specifically, productivity plays not only a direct export-boosting role, but also cushions the impact of REER fluctuations on exports. In line with Berthou and Dhyne (2018), the results suggest that, with the increase in Romanian companies' productivity (correlated with several determinants such as the conduct of public investment, the quality of infrastructure, firms' resources directed to innovation and digitalisation, a substantial contribution to their improvement coming also from the use of EU funds), the impact of REER changes on export dynamics could decrease. Even though the estimated value of the average export elasticity to REER is similar to that obtained by Berthou and Dhyne (2018)[7], the differences between the elasticities of companies with/in distinct productivity levels/deciles are lower in the current estimates than those in the cited study. A factor that could explain this result, alongside a number of methodological differences in the REER construction, is the generally weaker productivity of Central and Eastern European exporters compared to those in Western Europe.

5 The dependent variable shows the exports of each company in manufacturing with more than 25 employees (logarithmatised) and the explanatory variable of interest is the REER (logarithmatised and used with a lag, according to literature specifications). All estimates include company fixed effects and control variables for foreign demand (expectations of managers regarding the performance of exports - DG ECFIN Survey), size and age, ownership structure (private-domestic, private-foreign or mixed), concentration of the sector to which the company belongs (Herfindahl-Hirschman index), and whether exports held a significant share (>30%) of turnover in a given year. Estimates also contain a control variable for the productivity decile in which the company is located relative to all exporting companies in manufacturing with more than 25 employees in a given year. The results of the estimations are robust to heteroscedasticity and autocorrelation effects. The statistical significance is given by the ranges of p-value associated with each coefficient.

6 The approximately 0.26 percentage point difference between the elasticity of productivity deciles 1-9 and that of decile 10 stems from the coefficient for the interaction term between the REER (lag) and the presence of companies in the 10th productivity decile, the latter variable acting as a moderator of the REER-exports relationship. However, the statistical significance of the coefficient for the interaction term is lower than that of other coefficients.

7 The paper also includes data on companies in Central and Eastern Europe.

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