



National bank of Serbia

WORKING PAPERS BULLETIN

March
2026

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Foreword by the Governor

The period since the previous Bulletin was marked by a decline in inflation as a result of, primarily, the government measures which temporarily limited the margins of major retail chains and a large part of their purchase prices. Although these measures expired at the beginning of March, our expectations are that margins will remain at a lower level than before the introduction of the Decree, which will probably be analysed in some future research paper in the Bulletin. On the other hand, immediately before the closing of the new issue of the Bulletin, there was a sharp increase in global oil prices under the influence of escalating geopolitical tensions and the outbreak of the conflict in the Middle East, which could have significant consequences for both global and domestic inflation. At this moment, it is difficult to assess what the effects of this shock will be, as they will also depend on its duration and intensity, as well as on the extent to which it spills over onto the prices of other primary commodities, supply chains, demand, etc. This means that inflation will remain in focus in the coming period, not only in the research and analyses of central banks, whose primary mandate is price stability, but also of the wider professional public.

In this sense, our future analyses will also largely focus on inflation and its factors, as is the case with this issue of the Bulletin, where we analysed the price pass-through from primary producers to final consumers, and the impact of inflation on the standard of various income categories of households. These are all topics that have frequently been tackled in public in the previous period.

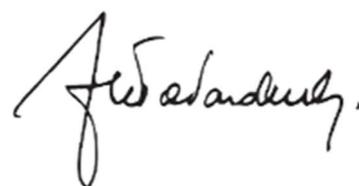
Specifically, the first paper in the Bulletin analyses the price pass-through in the industrial-food chain in Serbia, from primary agricultural commodities, through producer prices, to the prices paid by the final consumer. By applying the NARDL model, it was established that there is a statistically significant and asymmetrical pass-through of prices along the entire chain. Put differently, price changes from an earlier phase pass through to prices in the next phase, the pass-through being stronger and faster when prices rise than when they fall – which can be linked to the phenomenon of downward nominal price rigidity. The estimated pass-through and asymmetry are more pronounced in the retail stage (from producer to consumer prices) than in the processing stage (from primary commodity prices to producer prices).

The next paper looks into the impact of divergent growth in different groups of prices on different income categories of the Serbian population between the pandemic in 2020 and 2025. Though robust food price growth during the inflationary cycle (in the latter half of 2022 and in 2023) hit lower-income categories the hardest – due to the accelerated rise in food prices – over the entire observed period these categories saw higher real income growth of 35% (compared to 30% for higher-income groups). This outcome was largely driven by the stabilisation of inflation in 2024–2025 (along with slower food price growth) and strong growth in nominal wages, particularly the minimum wage.

The third paper analyses developments in the foreign exchange market over the past six years, with a particular focus on the recent depreciation episode that began in late November 2025. The pressures observed during that period, driven by uncertainty related to the operations of NIS, were significant but short-lived and limited in scope. Although households purchased foreign currency and foreign cash to a considerable extent, there was no withdrawal of deposits from the banking system; on the contrary, an increase in total savings was recorded. At the same time, through a mix of foreign exchange interventions, timely communication, and regulatory and operational measures aimed at ensuring the smooth functioning of the exchange market, the National Bank of Serbia managed to ease psychological pressures and secure a gradual return of the market to normal conditions.

The final paper deals with an accounting topic, namely the conceptual and quantitative differences in the way the same categories are recorded in financial accounting and in national accounts. Using the example of a fictitious newly established company, the paper systematically demonstrates the reasons for discrepancies between financial accounting results and the corresponding measures reported in the Government Finance Statistics, highlighting differences in conceptual scope, valuation principles, and recording conventions. Also, the paper provides some additional perspectives for improving the new financial reporting system on the national level under the new IFRS 18, starting from 2027.

As can be seen, the papers constituting our new Bulletin continue to address a wide range of topics. Going forward, we will strive to present papers containing in-depth analyses of links between different economic and non-economic variables, and applying complex quantitative techniques and other analytical tools. We hope that these papers will contribute to a better understanding of macroeconomic developments, factors that significantly influence monetary policy decision-making, as well as numerous issues and solutions pertaining to other functions of the National Bank of Serbia. .



Dr Jorgovanka Tabaković, Governor

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Working Papers describe research in progress by the author(s) and are published to encourage discussion and suggestions for future work.

National Bank of Serbia

WORKING PAPER

**ANALYSIS OF THE DEGREE AND DYNAMICS
OF INPUT PRICE PASS-THROUGH TO
OUTPUT PRICES ALONG THE INDUSTRIAL-
FOOD PRODUCT CHAIN IN SERBIA**

Andrea Jović, Stojan Janković and Lazar Radivojević

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Analysis of the degree and dynamics of input price pass-through to output prices along the industrial-food product chain in Serbia

Andrea Jović, Stojan Janković and Lazar Radivojević

Abstract: The research examines price transmission within the industrial-food chain in Serbia, investigating the relationships between exchange prices of primary agricultural commodities, producer prices, and consumer food prices, with a focus on the dynamics and asymmetry in this pass-through. Applying the NARDL model to monthly data, an assessment was made of the short-term and long-term effects of positive and negative price shocks, with appropriate control variables included in the models to capture specific influences from the international environment. The obtained results indicate the existence of a statistically significant and economically relevant asymmetric price pass-through along the entire chain, with the intensity of asymmetry differing between individual stages. In the processing stage, a 1% increase in the exchange prices of primary agricultural commodities leads to a 0.62% increase in producer prices, while a 1% decrease in exchange prices results in a 0.51% reduction in the prices of primary agricultural commodities, indicating incomplete transmission with moderate asymmetry. Stronger asymmetry and a more powerful pass-through effect were estimated in the retail stage, where a 1% increase in producer prices raises consumer prices by 1.12%, while a decrease in producer prices leads to a 0.71% reduction in consumer prices. The findings suggest that price shocks intensify as we approach the final consumer, and that increases in input costs have a stronger and more complete impact on raising retail prices than on their reduction, which can be associated with the phenomenon of downward nominal price rigidity. The findings in the paper have significant implications for understanding price dynamics in the food sector and for formulating economic policy measures aimed at mitigating and controlling inflationary pressures.

Key words: Asymmetry, industrial-food chain, producer prices, consumer prices, NARDL.

[JEL Code]: E31, Q11, C32

Non-Technical Summary

Theoretical and empirical literature concur on the assessment that cost-push pressures are transmitted throughout the entire production chain – from processing to retail – but that the pass-through is neither complete nor symmetrical. While the supply-side approach emphasizes that increases in input prices stimulate rises in output prices, the demand-side approach indicates that increased consumer demand can also lead to higher prices in production. Numerous studies confirm that producer prices often precede consumer prices, but there are also findings of bidirectional influences, depending on market characteristics and the observed period. Particular attention in the literature is devoted to asymmetric price pass-through, i.e. the phenomenon whereby increases in input costs are transmitted to final prices more quickly and strongly than their decreases. This phenomenon is explained by specific market structure, differing bargaining power of participants in the production chain, concluded long-term contracts, and downward nominal price rigidity, and has been empirically demonstrated precisely in the food sector, where the retail segment plays a decisive role in forming final prices for consumers.

Empirical analysis shows that price shocks along the industrial-food chain in Serbia are transmitted asymmetrically and with varying dynamics – more strongly when input costs rise than when they fall, and to a greater extent in the retail stage. In the processing stage, an increase in the prices of primary agricultural products (wheat, corn, soybean) on the domestic market leads to a rise in producer food prices of approximately 0.62%, while a decrease in these same costs leads to a price reduction of 0.51%, which is statistically significantly lower than in the case of an increase. In the retail stage, the asymmetry is even more pronounced, as the increase in producer prices on average passes through more than proportionally to consumer prices (1.11%), while the effect of their decrease is significantly weaker (0.71%). In addition to movements on the domestic market, global factors also play a significant role in the formation of food prices. Movements in global energy prices and the exchange rate of the dinar against the euro and the dollar affect the dynamics of producer and consumer food prices, while world prices of certain raw materials (such as cocoa and coffee) are relevant for specific production segments. The obtained results confirm the existence of a stable long-term relationship between the observed variables, but also relatively slow adjustment following price shocks, given that approximately 5–7% of deviations from equilibrium are corrected each month, meaning that the effects of shocks extend over a period longer than one year.

Overall, the findings suggest that cost transmission in the food sector is asymmetrical in both stages of the industrial-food chain, with it being complete and more pronounced in the retail stage. This has significant implications for understanding food and overall inflation dynamics, as it indicates that global and domestic cost-push pressures can have a more lasting and stronger effect on consumer prices.

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1 Introduction

Price dynamics in the food sector significantly determines overall inflation, given that food has a relatively high share in the household consumption basket, particularly in emerging and developing economies such as Serbia. After reaching record highs during 2021 and 2022, cost-push pressures in the food market were gradually eased from the beginning of 2023 to mid-2025. Nevertheless, they remained elevated compared to pre-crisis levels, primarily due to adverse weather conditions affecting below-average agricultural seasons, as well as rising energy prices and high real wage growth, which influenced higher labour costs. In addition to the aforementioned factors, the persistent increase in food prices at the retail level on the domestic market was also influenced by the continuous increase in trade margins of leading retail trade chains in recent years.

Understanding the mechanism of price pass-through from agricultural producers through processors to retailers is an important issue for both economic theory and the economic policy making. A number of authors agree in their assessment that the pass-through is often neither complete nor symmetrical, but rather depends on a range of structural and institutional factors, such as the degree of market concentration and competition, the level of participants' bargaining power, the regulatory framework, characteristics of consumer demand and consumer habits, and others. Therefore, this paper examines the phenomenon of asymmetric price pass-through in the processing and retail stages of the industrial-food chain in the case of Serbia, under the assumption that increases in input prices are transmitted to output prices more strongly and quickly than their decreases. In the literature, this psychological-economic phenomenon is most often associated with *downward nominal price rigidity*, which implies that prices adjust downwards more slowly and to a lesser extent than upwards. This is particularly pronounced in the retail stage, where relatively high market concentration and unequal bargaining power between market participants lead to prices rarely being reduced even under conditions when procurement costs are decreasing. Such margin dynamics directly affect the movement of consumer food prices, as well as the perception of inflation by corporates and households, which creates an additional challenge for economic policymakers. The paper applies the Nonlinear Autoregressive Distributed Lag (NARDL) model, which enables the separation of positive and negative changes in input prices and the estimation of their short-term and long-term effects on output prices. The application of the NARDL model allows for a more precise insight into differences in the degree of pass-through and price dynamics, which cannot be captured by linear models. The obtained results can serve to interpret the dynamics of food and overall inflation in Serbia, as well as for creating measures aimed at preserving the living standard and purchasing power of the population, such as the current Decree.

The paper is structured as follows. The second chapter provides an overview of the relevant theoretical and empirical literature on price pass-through along the industrial-food product chain. The third chapter presents movements in the index of exchange prices of agricultural commodities, as well as producer and consumer food prices on the domestic market. The fourth chapter shows the data and the methodological framework used for the research, while the fifth chapter interprets the results of the empirical analysis. Also in the fifth chapter, the effects to date of the adopted Serbian Government's Decree are considered, while

the final chapter summarises the main theoretical-empirical findings and their practical value for economic policymakers.

2 Theoretical framework and an overview of empirical literature

The concept of inflation in economic literature is most often defined as the rise in the general price level of goods and services, which is why it represents one of the key macroeconomic determinants and indicators of the real sector. Inflation is of exceptional importance for economic policymakers, primarily when it comes to monetary policy, bearing in mind that in the inflation targeting regime applied by Serbia, the central bank's primary goal is maintaining price stability. Also, the level and dynamics of prices are of essential importance for the economy, as they affect profitability through the relationship between input and output prices, as well as for households, since they directly determine real purchasing power and the living standard.

In practice, inflation is most often measured by changes in the consumer price index, which represents the prices from the basket of goods and services purchased by households. From the perspective of the economy, movements in the producer price index are also important, as it represents the prices at which producers sell their products to other participants in the production chain. When analysing the relationship between these two indices, the producer price index is usually used as a leading indicator for the consumer price index, i.e. **it is expected that increases in producer prices will pass through to increases in consumer prices**. However, the relationship between these two indices is more complex and does not necessarily imply a one-way link, because their mutual interaction is also possible, and in certain circumstances changes in consumer prices can, through feedback, affect producer prices. In this regard, Asik (2024) cites two leading approaches in interpreting inflationary pressures and their transmission: (1) the supply-side approach and (2) the demand-side approach.

Within the supply-side approach, inflation is viewed as a consequence of rising cost-push pressures (cost-push inflation), which are passed through via producer prices to consumer prices. In other words, an increase in input costs encourages producers to pass this increase partially or completely onto final product prices (Tiwari, 2012). This transmission mechanism occurs through multiple stages of the production process, as primary raw materials are first incorporated into intermediate goods, which then serve as inputs in the production of final goods intended for consumption. In contrast, **within the demand-side approach, an increase in consumer prices arising from increased demand can also be reflected in producer prices**. Consumer preferences for certain products indirectly result in greater demand for raw materials and intermediate goods involved in their production chain, leading to price increases for those products (Caporale et al, 2002).

Numerous authors have analysed the pass-through between producer and consumer prices. In one of the first studies on this topic, a one-way relationship from producer to consumer prices was confirmed in the USA (Silver & Dudley, 1980). Similar results were obtained by Caporale et al. (2002) using the example of G7 member countries, analysing price movements in developed economies during the period Q1 1976 – Q4 1999. More recent papers have shown

that the relationship between producer and consumer prices may be conditioned by special components such as food and energy prices, whereby if these components are excluded, the observed relationships weaken significantly (Belton & Nair-Reichert, 2007). Similar research has also been conducted in developing countries, where a one-way relationship between producer and consumer prices has been confirmed in various macroeconomic environments. The impact of producer on consumer prices was demonstrated by Ghazali et al. (2008) using the example of Malaysia for the period January 1986 – April 2007, with confirmed cointegration. The same results were obtained in the case of Mexico, where it was emphasized that the inclusion of producer prices in models could significantly improve inflation projections (Sidaoui et al., 2009). As for countries in the region, Katsouli et al. (2002) using the example of Greece, with the help of an error correction model (ECM), confirmed cointegration between the two indices, whereby changes in producer prices cause changes in consumer prices. Similarly, Su et al. (2016) using the example of Slovakia confirmed a one-way relationship, with the authors emphasizing that in certain periods there is a two-way relationship between these two indices. An analysis of ten Central and Eastern European countries determined that producer prices, in the Granger sense, cause consumer prices in most observed countries in the panel (Latvia, Lithuania, Romania, Slovakia and Slovenia), with the exception of Hungary, where reverse causality was confirmed, i.e. the influence of consumer on producer prices (Khan et al., 2018).

In addition to the approach that emphasizes the role of cost-push pressures, empirical research also employs the demand-side approach, which proceeds from the assumption that movements in consumer prices determine producer prices. The first authors to question the conventional supply-side approach were Colclough and Lange (1982), who, using the example of the USA for the period January 1945 – December 1979, established that consumer prices cause producer prices. A similar analysis showed that in the period before the outbreak of the global financial crisis (January 2001 – August 2008), inflation in China was mainly driven by demand-side factors, given that changes in consumer prices caused changes in producer prices, with a lag of one to three months (Fan et al., 2009). Such research has also been conducted for Australia and Pakistan, where a relationship from consumer prices to producer prices was also observed (Tiwari, 2012; Shahbaz et al., 2012). Although most studies indicate a one-way relationship between producer and consumer prices, some research demonstrates the existence of a bidirectional causal relationship between these two indices in certain macroeconomic environments (Jones, 1986; Shahbaz et al., 2009; Kwon & Koo, 2009; Ozpolat, 2020). Such findings indicate that in certain periods, consumer prices can influence producer prices and vice versa, highlighting the complexity of the transmission mechanism of inflationary pressures throughout the entire value chain – from production, through processing and distribution, to retail. Although there is no consensus in the economic literature regarding the direction of causality between producer and consumer prices, as it primarily depends on the specific circumstances of the observed countries and periods, the cost-push supply-side approach is nevertheless more frequently represented.

Bearing in mind that price formation takes place throughout the entire production chain – from the stage of raw material procurement, through their processing, to wholesale and retail trade – **changes in input prices represent a key transmission channel through which cost-push pressures are passed on to final product prices.** In this regard, the literature includes

research dealing with the degree of input pass-through to product sales prices, whereby this transmission is not necessarily symmetrical. Meyer & Cramon-Taubadel (2004) showed that increases in input costs often lead more quickly and completely to rises in output prices than cost reductions affect their decrease. This psychological-economic phenomenon is explained in the literature by the concept of **downward nominal price rigidity, which indicates the tendency of prices to adjust faster upwards than downwards** (Rotemberg, 1982). The asymmetric price pass-through results from multiple factors, including market concentration and the degree of competition, unequal bargaining power of participants in the chain, as well as the existence of fixed costs, long-term contracts, and various pricing strategies and policies. Particularly in the final retail stage of the production chain, participants with greater bargaining power relatively quickly incorporate increases in input costs into sales prices, while cost reductions in their operations are transmitted more slowly and incompletely to final consumers. Considering these theoretical mechanisms, the empirical analysis of the degree of price pass-through requires the application of a methodological approach that enables distinguishing the effects of positive and negative cost changes, as well as identifying long-term and short-term effects in price pass-through along the entire chain.

One of the more comprehensive studies dealing with this topic concerns the analysis of asymmetry in the pass-through of crude oil prices to retail petrol prices in the USA, whereby it was empirically determined that petrol prices adjust more quickly and intensely to increases in crude oil prices than to their decreases (Borenstein et al., 1997). **Analyses of asymmetric price pass-through are particularly prevalent in food market research, given the complexity of vertically integrated production chains, as well as the key role of the retail segment in forming final prices.** Examining the dynamics of wholesale and retail prices in the US butter market, Chavas and Mehta (2004) confirmed strong short-term and long-term asymmetry in price pass-through, with imperfect competition in retail being the determining factor. Similarly, asymmetric transmission in the vertical value chain in the USA was also observed for pork prices during the period 1987–1998 (Goodwin & Harper, 2000). Using the example of Greece, Reziti (2005) examined price pass-through for potatoes, tomatoes, oranges and milk across the production, wholesale and retail stages. Empirical results showed that there is strong asymmetry between producer and consumer prices for all observed products, while transmission from producer to wholesale prices is symmetrical, indicating the key role of retail in generating price asymmetries in the vertical chain. Using the examples of Indonesia, South Africa and Turkey, it was shown that there is short-term asymmetry in pass-through between producer and consumer prices, while in Brazil and India symmetrical price adjustment dynamics were determined (Mert, 2023).

3 Price dynamics in Serbia's food product market

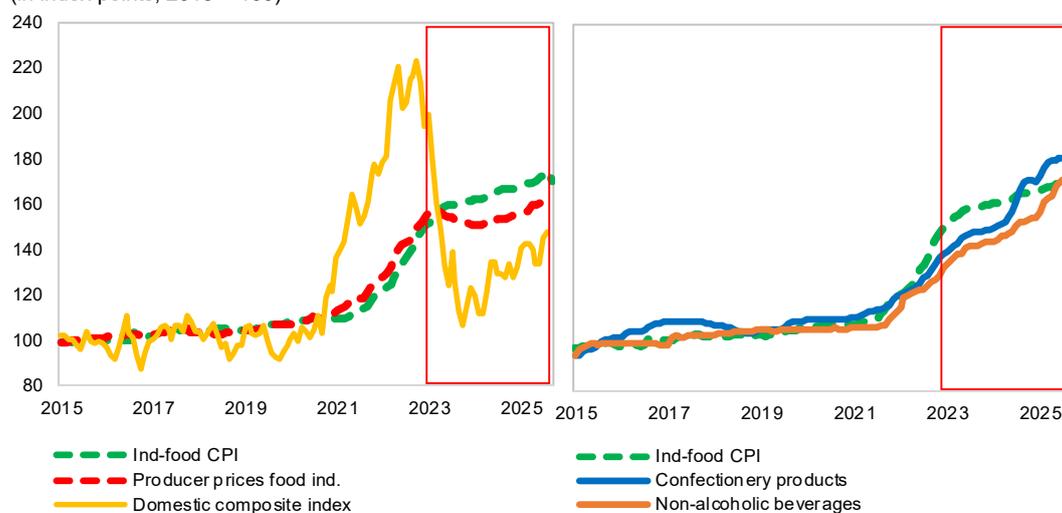
Prices in the domestic industrial-food product chain moved relatively steadily during the period from 2015 to 2020, due to low cost-push pressures in the domestic and international markets. Following the recovery from the pandemic, there was an increase in demand, which, under conditions of disruptions in global supply chains, had an inflationary effect on world prices of primary commodities. The strong rise in world food and energy prices since end-

2021 was transmitted to the domestic market, whereby the stimulus for price increases on the domestic market also came from poorer agricultural seasons at home in two consecutive years (real decline in agricultural production of 2.4% in 2021 and 7.4% in 2022).

In the period from January 2023 to August 2025, cost-push pressures eased compared to the record levels of 2021 and 2022, but remained present (Chart 1), as evidenced by the domestic composite exchange index, which is at a level one-third higher compared to the pre-crisis period of 2015–2020. Food prices, both in production and consumption, still remain above the levels recorded before the pandemic due to the effect of various structural factors, making it difficult to expect their return to pre-pandemic levels. On the supply side, persistent price increases are driven by factors such as climatic conditions, geopolitical tensions, logistical disruptions and labour costs, while on the demand side, the cumulative growth of real wages of approximately 18% in the observed period, which meant greater disposable income for the population.

In the period from January 2023 to August 2025, consumer prices of industrial-food products cumulatively increased by 15.7%, with the price growth in the category of non-alcoholic beverages and confectionery products, which were influenced by higher global prices of coffee and cocoa, being almost twice as fast and amounting to approximately 30%.

Chart 1 Dynamics of prices in the domestic chain of industrial-food products
(in index points, 2015 = 100)



Sources: SORS, Novi Sad Commodity Exchange and author's calculation.

4 Research data and methodology

For the purposes of this research, monthly data were used for the period January 2013 – August 2025, up to and including the month preceding the entry into force of the Decree on Special Conditions for Trade in Certain Types of Goods (hereinafter: Decree), which, for a period of six months starting from September 2025, limited trade margins for an initial 23 product categories to a maximum rate of 20%. As dependent variables in the empirical analysis, consumer prices of industrial-food products (*cpi_preh*) were used, as well as

producer prices in the food industry (*ppi_preh*), which data are published by the Statistical Office of the Republic of Serbia. In addition, the analysis used the composite index of primary agricultural commodities (*domaci_kmp*), consisting of the prices of wheat, corn and soybean from the Novi Sad Product Exchange, as well as world cocoa prices (*kakao*), expressed in US dollars per tonne, taken from the FRED database. To capture the impact of international factors on price transmission, the World Bank world energy price index (*eng*), composed primarily of crude oil prices, followed by natural gas and coal prices, was used, as well as the nominal effective exchange rate of the dinar (*neer*), observed in relation to a currency basket (euro and dollar), whereby an increase in the index indicates a strengthening of the dinar. All variables were initially transformed into logarithmic form to reduce heteroscedasticity and enable the interpretation of the estimated parameters as elasticity coefficients.

The following section shows that all observed series are integrated of order $I(0)$ or $I(1)$, which is why we consider the Autoregressive Distributed Lag (ARDL) model, developed by Pesaran et al. (2001), to be an adequate econometric model for estimating the causal relationships among the observed variables. The original ARDL model was subsequently extended by Shin et al. (2014) with a nonlinear variant (NARDL), through which, in our empirical analysis, we examined the effects of cumulative positive and negative shocks in the independent variables on the dependent variable in the long run, as well as the (a)symmetry of these effects on the dependent variable in terms of the degree and intensity of their transmission. The general form of the model is as follows:

$$y_t = \sum_{j=1}^p \phi y_{t-j} + \sum_{j=0}^g (\theta_j^+ x_{t-j}^+ + \theta_j^- x_{t-j}^-) + \varepsilon_t \quad (1)$$

where:

- y_t – the dependent variable,
- x_{t-j}^+ – decomposed positive changes of the independent variable,
- x_{t-j}^- – decomposed negative changes of the independent variable,
- ε_t – the stochastic error.

Cumulative positive and negative changes of the independent variable are defined as follows:

$$x_t^+ = \sum_{j=0}^t \Delta x_j^+ = \sum_{j=0}^t \max(\Delta x_j, 0); \quad x_t^- = \sum_{j=0}^t \Delta x_j^- = \sum_{j=0}^t \min(\Delta x_j, 0) \quad (2)$$

The advantage of this approach is reflected in a more adequate capture of short-run and long-run interactions between variables, whereby the inclusion of their estimated values mitigates the problem of serial correlation of residuals. Additionally, the NARDL model enables simultaneous testing of cointegration in the presence of asymmetry, i.e. examining the long-run equilibrium relationship between variables without the need for all series to be integrated of the same order. In this regard, within the empirical analysis, we conducted the Bounds Test, as well as the Wald test for long-run and short-run asymmetry.

5 Results of the empirical analysis

In the following section, unit root tests – ADF and KPSS – were conducted, and their results are presented in Table 1. For the time series *cpi_preh*, *ppi_preh*, *domaci_kmp* and *kakao*, the tests agree in indicating that they do not contain a unit root, whereas for the time series *eng* and *neer*, the findings are mixed. Specifically, the ADF test suggests that the aforementioned series contain one unit root, which is eliminated by applying the first difference, while the KPSS test indicates the absence of a unit root, i.e. that the series are stationary in levels. Such findings justify the use of the NARDL model.

Table 1 Results of unit root tests on the series of observed variables

Variable	Variable level	ADF (k) test	Unit root	KPSS test	Unit root	Determ. comp.	Order of integration
<i>cpi_preh</i>	<i>cpi_preh_t</i>	-1.48 (3)	yes	0.33	yes	const. + trend	I(1)
	Δcpi_preh_t	-3.62 (15)	no	0.09	no		
<i>eng</i>	<i>eng_t</i>	-2.53 (1)	yes	0.22	no	const.	I(1) / I(0)
	Δeng_t	-8.44 (0)	no	-	-		
<i>neer</i>	<i>neer_t</i>	-2.15 (12)	yes	0.21	no	const.	I(1) / I(0)
	$\Delta neer_t$	-8.01 (0)	no	-	-		
<i>ppi_preh</i>	<i>ppi_ind_t</i>	-2.27 (6)	yes	0.31	yes	const. + trend	I(1)
	Δppi_ind_t	-4.66 (1)	no	0.11	no		
<i>kakao</i>	<i>kakao_t</i>	-0.53 (1)	yes	0.55	yes	const.	I(1)
	$\Delta kakao_t$	-9.52 (0)	no	0.25	no		
<i>domaci_kmp</i>	<i>domaci_kmp_t</i>	-1.74 (1)	yes	0.72	yes	const.	I(1)
	$\Delta domaci_kmp_t$	-9.67 (0)	no	0.15	no		

Source: Author's calculation and overview using the statistical package EViews.

Note: A logarithmic transformation was applied to the series. Deterministic components were chosen by applying the Stock-Watson procedure, and critical values at the 5% significance level amount to: -2.88 (for τ_a) and -3.44 (for τ_b) in ADF test, and 0.46 (for τ_a) and 0.15 (for τ_b) in KPSS test. Designation *k* in the ADF test relates to the number of correction terms that need to be added in order to eliminate autocorrelation up to a specified lag.

The results of the Granger causality tests, presented in Table 2, show that price movements in the industrial–food chain are primarily driven by changes in input prices in production and sales. Unidirectional causality was established from world energy prices to consumer prices of industrial–food products, as well as from the composite index of agricultural product prices on the domestic commodity exchange to producer prices. Moreover, a bidirectional causality was identified between consumer and producer prices of industrial-food products, **with the influence of producer prices on consumer prices being statistically significant at all conventional significance levels (1%, 5%, and 10%) and stronger than in the opposite direction**. This finding indicates a strong price linkage between the processing and retail stages within the industrial-food chain, where price movements in one segment of the chain precede and influence movements in the other, further justifying the analysis of the price transmission mechanism.

Table 2 Results of Granger causality tests on the series of observed variables

Null hypothesis	Probability	Findings
<i>ppi_preh</i> does not cause <i>cpi_preh</i>	0.0000	Bidirectional causality between consumer and producer prices of industrial-food products
<i>cpi_preh</i> does not cause <i>ppi_preh</i>	0.0153	
<i>eng</i> does not cause <i>cpi_preh</i>	0.0275	Unidirectional causality from world energy prices to consumer prices of industrial-food products
<i>cpi_preh</i> does not cause <i>eng</i>	0.9625	
<i>neer</i> does not cause <i>cpi_preh</i>	0.3640	No causality was established between the variables
<i>cpi_preh</i> does not cause <i>neer</i>	0.3985	

Null hypothesis	Probability	Findings
<i>kakao</i> does not cause <i>ppi_preh</i> <i>ppi_preh</i> does not cause <i>kakao</i>	0.0053 0.0086	Bidirectional causality between world cocoa prices and the producer price index of industrial-food products
<i>domaci_kmp</i> does not cause <i>ppi_preh</i> <i>ppi_preh</i> does not cause <i>domaci_kmp</i>	0.0000 0.7959	Unidirectional causality from the composite index of wheat, corn, and soybean prices on the Serbian market to the producer price index of industrial-food products

Source: Author's calculation using the EViews statistical package.

Based on the observed relationships, we consider it justified to model consumer prices of industrial-food products as a function of food producer prices, world energy prices, and the nominal exchange rate, and to model producer prices as a function of world cocoa prices and the domestic composite index of primary agricultural commodity prices. The optimal number of lags was determined based on an auxiliary VAR model, with most information criteria agreeing that including two lags in the model is sufficient. Based on the conducted tests, the appropriate NARDL models were specified. The established Granger causality indicates short-term interaction between prices in the industrial-food chain but does not imply the existence of a long-term relationship, which was further examined using the F-bounds test. The focus on the long-term impact is emphasized because the transmission of price shocks along the industrial–food chain typically occurs gradually. According to Kozłowska & Awantang (2023), food product markets often cannot fully adjust to shocks in input prices in the short term, because the pass-through of world prices to domestic prices is conditioned by the level of infrastructure development, the exchange rate regime and trade policy, the adequacy of commodity reserves, and other factors.

Building on the presented theoretical framework and comparable empirical literature, we examined the extent and dynamics of input price pass-through to output prices along the industrial-food chain in Serbia. In this regard, the null and alternative hypotheses were formulated (Table 3) to test whether the effects of increases and decreases in commodity exchange prices on producer prices (at the processing stage) and of producer prices on consumer food prices (at the retail stage) are of equal magnitude, with the rejection of the null hypothesis at any stage implying the presence of asymmetry in the transmission of price shocks.

Table 3 Research hypotheses

Industrial-food chain	Null hypothesis	Alternative hypothesis
Processing stage	$\beta^+_{domaci_kmp} = \beta^-_{domaci_kmp}$	$\beta^+_{domaci_kmp} \neq \beta^-_{domaci_kmp}$
Retail stage	$\beta^+_{ppi_preh} = \beta^-_{ppi_preh}$	$\beta^+_{ppi_preh} \neq \beta^-_{ppi_preh}$

Source: Author's overview using the EViews statistical package.

5.1 Analysis of the extent and dynamics of input price pass-through to output prices in the processing stage of the industrial-food chain

In the *processing stage*, we examined the impact of the composite index of wheat, corn, and soybean prices, derived from data from the Commodity Exchange in Novi Sad, on producer prices in the food industry in the long run. The composite index was used as an indicator of cost-push pressures in the production of the majority of food categories on the domestic market, while the world cocoa price index was additionally included in the analysis to capture its effect on confectionery prices, which have recorded prolonged high growth on the domestic market. In this context, we estimated the following NARDL specification:

$$\Delta \ln ppi_preh_{\tau} = \beta_0 + \sum_{j=1}^{p-1} \lambda_j \Delta \ln ppi_preh_{\tau-j} + \sum_{i=0}^q \delta_i^+ \Delta \ln domaci_kmp_pos_{\tau-i} + \sum_{i=0}^q \delta_i^- \Delta \ln domaci_kmp_neg_{\tau-i} + \sum_{i=0}^q \gamma_i \Delta \ln kakao_{\tau-i} + \rho \ln ppi_preh_{\tau-1} + \Phi^+ \ln domaci_kmp_pos_{\tau-1} + \Phi^- \ln domaci_kmp_neg_{\tau-1} + \theta_1 \ln kakao_{\tau-1} + \varepsilon_{\tau} \quad (3)$$

Where:

- β_0 – the constant in the model,
- λ_j – short-term coefficient of the model's autoregressive component,
- δ_i^+ and δ_i^- – short-term coefficients for the partial sums of positive and negative changes in the composite index of primary agricultural product prices, respectively,
- γ_i – short-term coefficient for world cocoa prices,
- ρ – long-term coefficient of the model's autoregressive component,
- Φ^+ and Φ^- – coefficients for the long-term effects of positive and negative cumulative shocks in the composite index of primary agricultural commodity prices, respectively,
- θ_1 – long-term coefficient for world cocoa prices.

Table 4 Long-term effects of input price changes on output prices in the processing stage

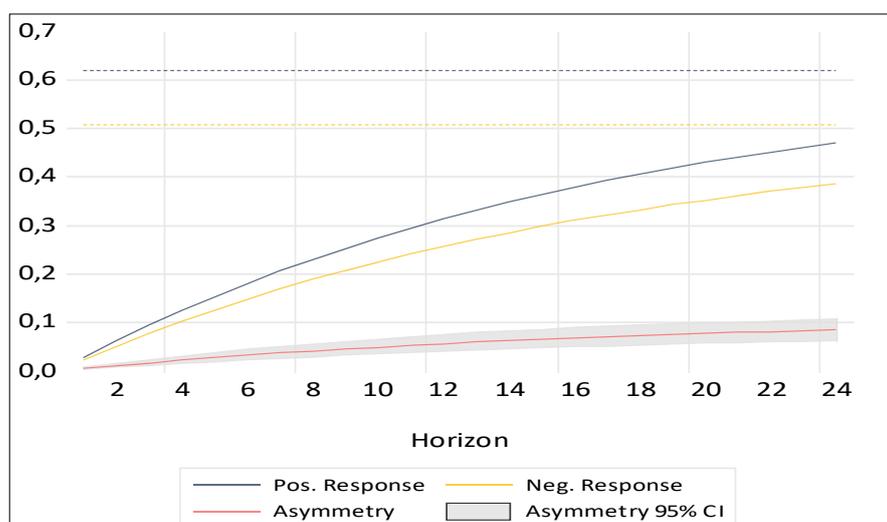
Variables	Results of the estimated equation
Dependent variable: ppi_preh_t	
$domaci_kmp_t$ (cumulative positive effects)	0.6202 ***
$domaci_kmp_t$ (cumulative negative effects)	0.5082 ***
$kakao_t$	0.0677 * **
c	4.3664 ***
F-Bounds test statistics	15.7893 ***
Adjustment speed coefficient ECT_{t-1}	-0.0474 ***
Analysis period	January 2013 – August 2025
*** Statistically significant at the 1% significance level	
** Statistically significant at the 5% significance level	
* Statistically significant at the 10% significance level	

Source: Author's calculation using the EViews statistical package.

Notes: All analysed variables were previously logarithmically transformed. The estimated coefficients were obtained from the cointegration equation.

The results of the estimated NARDL model, presented in Table 4, indicate the existence of a statistically significant long-term relationship between, on the one hand, domestic prices of primary agricultural commodities and world cocoa prices, and on the other, producer prices in Serbia's food industry. The cumulative coefficient for positive changes in the composite index of domestic commodity exchange prices is statistically significant at all significance levels and is larger than the corresponding coefficient for negative changes, confirming a stronger pass-through of input price increases in the food processing stage compared to their decreases. Specifically, **a 1% increase in the exchange prices of wheat, corn, and soybean is associated with an approximately 0.62% rise in producer prices, while the effect of their decrease is slightly weaker, amounting to 0.51%.**

Chart 2 Asymmetry of the cumulative effect of shocks in exchange prices on food producer prices in Serbia



Source: Author's calculation using the EViews.

The same conclusion is supported by the Wald test result, which rejects the null hypothesis of equality of long-term coefficients and confirms the presence of long-term asymmetry in the pass-through of exchange prices to food producer prices in the processing stage. The curve of asymmetry between positive and negative price shocks is positive and increasing (Graph 2), and the 95% confidence interval does not include the abscissa over a 24-month horizon, indicating that the observed long-term asymmetry is statistically significant. Given that the estimated parameters for the domestic composite index are less than one, the transmission of price changes is incomplete, meaning that a portion of these changes, both positive and negative, is absorbed in producers' profits. World cocoa prices also show a statistically significant positive effect on producer prices of 0.07%. The intensity of this effect is considerably weaker, which is expected given the narrower production use of cocoa compared to staple cereals.

The statistics F-bounds test value (15.79) significantly exceeds the upper critical value at all significance levels, confirming the existence of a stable long-term equilibrium relationship among the observed variables. At the same time, the estimated adjustment speed coefficient ECT_{t-1} has a negative sign, which means that the system returns to long-term equilibrium after a short-term deviation caused by a shock (Sendhil et al., 2013, Olipra, 2020). The obtained value of -0.05 indicates that approximately 5% of the deviation of the dependent variable from the long-term equilibrium is corrected each month. This means that after a price shock in one month, the effects of that shock spill over into the processing phase for almost the next two years. This is influenced by the existing rigidities in the setting and adjustment of prices by retailers, long-term contractual relationships within the production chain, frequent price shocks that prevent a faster return to long-term equilibrium, as well as the specific characteristics of the domestic food market. The estimated model is stable and correctly specified, as it satisfies the basic statistical assumptions of no autocorrelation, homoscedasticity, and normally distributed residuals (Table 5). Overall, the **results suggest that producer prices in the food industry are strongly influenced in the long run by movements in the prices of primary agricultural products, with this price transmission**

being incomplete and asymmetric, and more pronounced in the case of cost increases than in the case of their decline.

Table 5 Results of conducted statistical tests

Assumptions	Test	p-value
Normality	Jarque-Bera	0.0145
Autocorrelation	Breusch-Godfrey	0.1523
Heteroscedasticity	Glejser	0.1950
Model specification	Ramsey RESET	well specified
Model stability	CUSUM	stable

Source: Author's calculation using the EVIEWS.

5.2 Analysis of the degree and dynamics of input price pass-through to output prices in the retail phase of the industrial-food chain

In the retail phase of the industrial-food chain, we examined the impact of producer prices on consumer prices of industrial-food products in the long run. As an indicator of cost-push pressures from the global market, the World Bank's index of world energy prices was used. Since most world prices of primary commodities are expressed in dollars, the model also includes the nominal effective exchange rate of the dinar against a currency basket consisting of the euro and the dollar. In this context, we estimated the following NARDL specification:

$$\Delta \ln cpi_preh_t = \beta_0 + \sum_{j=1}^{p-1} \lambda_j \Delta \ln cpi_preh_{t-j} + \sum_{i=0}^q \delta_i^+ \Delta \ln ppi_preh_pos_{t-i} + \sum_{i=0}^q \delta_i^- \Delta \ln ppi_preh_neg_{t-i} + \sum_{i=0}^q \gamma_i^1 \Delta \ln eng_{\tau-i} + \sum_{i=0}^q \gamma_i^2 \Delta \ln neer_{\tau-i} + \rho \ln ppi_preh_{\tau-1} + \Phi^+ \ln ppi_preh_pos_{\tau-1} + \Phi^- \ln ppi_preh_neg_{\tau-1} + \theta_1 \ln eng_{\tau-1} + \theta_2 \ln neer_{\tau-1} + \varepsilon_t \quad (4)$$

Where:

- β_0 – the constant in the model,
- λ_j – short-term coefficient with the model's autoregressive component,
- δ_i^+ and δ_i^- – short-term coefficients for the partial sums of positive and negative changes in the producer price index of industrial food products, respectively,
- γ_i^1 – short-term coefficient for world energy prices,
- γ_i^2 – short-term coefficient for the nominal effective exchange rate,
- ρ – coefficient of the model's autoregressive component in the long run,
- Φ^+ and Φ^- – coefficients of the long-term effects of positive and negative cumulative shocks in producer prices of industrial food products, respectively,
- θ_1 – coefficient for world energy prices in the long run, and
- θ_2 – coefficient for the nominal effective exchange rate in the long run.

Table 6 Effects of changes in input prices on output prices in the retail phase in the long run

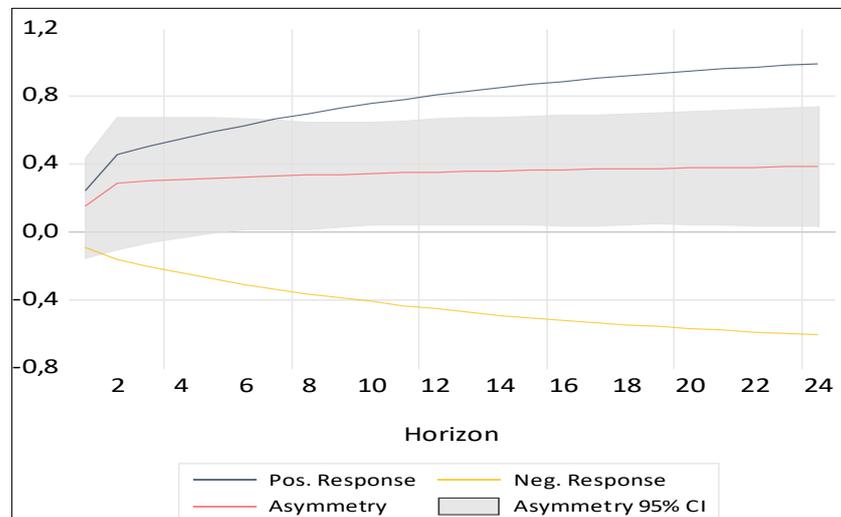
Variables	Results of the estimated equation
Dependant variable: cpi_preh_t	
ppi_preh_t (cumulative positive effects)	1.1163 ***
ppi_preh_t (cumulative negative effects)	0.7081 * **
eng_t	0.0877 ***
$neer_t$	-0.6212 ***
c	7.0387 ***
F-Bounds test statistics	13.2844 ***
Adjustment speed coefficient ECT_{t-1}	-0.0732 ***
Analysis period	January 2013 – August 2025
*** Statistically significant at the 1% significance level ** Statistically significant at the 5% significance level * Statistically significant at the 10% significance level	

Source: Author's calculation using the EViews statistical package.

Note: All the analysed variables were previously log-transformed. The estimated coefficients were obtained from the cointegration equation.

Even in this phase of the industrial-food chain, a positive and statistically significant long-term relationship between producer and consumer prices was established, with the parameters presented in Table 6. Specifically, the cumulative effect of positive changes in producer prices (1.11%) is noticeably larger than the cumulative effect of negative price changes (0.71%), with the Wald test confirming the presence of pronounced asymmetry in the pass-through of input prices to output prices. The asymmetry curve in price transmission is statistically significant in the long run, with the transmission of positive cost shocks being considerably stronger and faster compared to negative shocks (Chart 3).

Chart 3 Asymmetry of the cumulative effects of shocks in producer prices on food consumer prices in Serbia



Source: Author's calculation using the EViews.

Thus, the increase in producer prices of industrial-food products has a greater impact on the rise of retail prices than their decline has on price reductions. Moreover, the degree of pass-through of food producer prices to consumer prices is complete in the case of higher producer prices, and incomplete in the case of their decline. These findings are consistent with economic theory and are most often interpreted in the literature as the economic-psychological phenomenon of downward nominal price rigidity. The impact of the nominal effective exchange rate on food consumer prices is also statistically significant and of

the expected sign, in the sense that a depreciation of the domestic currency against the currency basket leads to an increase in consumer prices of industrial food products, while an appreciation has the opposite effect. Given the relative stability of the dinar against the euro over the past eight years, it can be concluded that its movements are largely determined by the dynamics of the euro–dollar exchange rate. Moreover, higher energy prices in the previous month are reflected in the increase of retail prices in the current month, mainly through higher transportation and logistics costs.

The statistics F-bounds test value (13.28) significantly exceeds the upper critical value at all significance levels, confirming the existence of a stable long-term equilibrium relationship among the observed variables. Negative and statistically significant adjustment speed coefficient ECT_{t-1} of -0.07 suggests that around 7% of the deviation of the dependent variable from the long-term equilibrium is corrected each month. These estimates suggest that the effects of price shocks are transmitted slowly through the retail phase as well, over a horizon of approximately 14 months. In practice, the effects of price shocks are gradually transmitted from the production to the retail segment as well, due to constraints in short-term price adjustments, contractual relationships with suppliers, consumer market habits, retail business models, and so on. **Overall, the increase in food producer prices strongly affects food inflation in Serbia, while a decrease in production prices leads to only a partial reduction in consumer food prices**, which can be linked to market concentration in retail, that is, to the degree of market competition and the bargaining power of participants in the production chain. The results of the conducted tests show that the residuals are normally distributed, not autocorrelated, and that their variances are homoscedastic (Table 7).

Table 7 Results of conducted statistical tests

Assumptions	Test	p-value
Normality	Jarque-Bera	0.8279
Autocorrelation	Breusch-Godfrey	0.0855
Heteroscedasticity	Glejser	0.4208
Model specification	Ramsey RESET	well specified
Model stability	CUSUM and CUSUM Sq.	stable

Source: Author's calculation using the EViews.

5.3 Comparison of the degree and dynamics of input price pass-through to output prices in the processing and retail phases of the industrial-food chain

The empirical analysis showed that there is asymmetry in price transmission both in the processing phase and in the final phase of the food supply chain, i.e. the effect of rising input costs on output prices is more pronounced than the effect of their decline (Chart 4). In the case of the domestic market, it is observed that price transmission asymmetry is more pronounced in the retail phase than in the processing phase, and that transmission is not complete in the processing phase. In other words, as we move closer to the final consumer, increases in input costs are increasingly and more fully reflected in higher final food prices, while their decline is reflected much more slowly and to a lesser extent in food price reductions. This phenomenon is often referred to in the economic literature as the “rockets and feathers effect,” meaning that price increases are often compared to the speed of a rocket, while price decreases move at the speed of a feather (Tappata, 2009). Asymmetric price adjustment is often explained by the existence of information asymmetry, that is, the

incomplete awareness of consumers about relevant market prices and production costs, which allows companies at all stages of the production chain to transmit increases in input costs more quickly and fully than their reductions. According to Peltzman (2000), this market distortion is present in both concentrated and atomized markets, which means that the level of competition is not a decisive factor for price asymmetry. In terms of overall inflation dynamics, negative price shocks, such as a sharp decline in world prices of primary commodities and producer prices, are not reflected to the same extent in the reduction of consumer prices, which contributes to the persistence of inflationary pressures, even when the effects of exogenous shocks fade.

As previously shown, the degree of input price pass-through to output prices differs between the processing and retail phases (Chart 4). Specifically, **in the processing phase, an increase in exchange prices of primary agricultural commodities is not fully passed through to higher producer prices of industrial food products (0.6%), whereas in the final phase of the food supply chain, the increase in producer prices, which represent input costs for retailers, is fully passed through to higher consumer prices (1.1%).** Moreover, a coefficient of elasticity above one indicates not only full but also amplified transmission, which may be a consequence of the way trade margins are formed, as these have significantly increased in recent years alongside rising inflationary pressures. This finding confirms that in the industrial-food chain there is limited price flexibility and an unequal market position between food producers and retailers. Overall, along the value chain, the intensity of transmission increases as we approach the final consumer: while the processing sector acts as a “buffer” for a part of the price shocks, the retail segment incorporates them to a greater extent and more quickly into final prices.

6 Conclusion

Our research focused on analysing price pass-through in the industrial-food chain in Serbia, with a particular emphasis on asymmetry in this process. The importance of the analysis stems from the fact that the prices of industrial-food products we purchase daily have a significant share in the overall inflation structure, as well as a direct impact on household living standards. In this paper, using the NARDL model, we examined the effects of changes in the composite index of primary agricultural commodity prices on producer prices in the food industry, and subsequently the impact of producer prices on consumer prices of industrial-food products, with an emphasis on long-term effects. The main objective was to assess the strength of the channels and the dynamics of price shock transmission, as well as to estimate the degree of asymmetry in different phases of the chain.

The research confirmed the existence of a two-way relationship between producer and consumer prices in Serbia’s food sector, with the impact of producer prices on consumer prices being complete and of greater intensity. This finding is consistent with the theoretical supply-side approach to inflation and the concept of cost-push inflation, according to which an increase in input prices generates pressure for higher output prices. The results obtained indicate the existence of asymmetric transmission of exchange prices of primary agricultural commodities to producer prices in the food industry, whereby increases in these prices lead to

a stronger rise in producer prices than equivalent decreases lead to a reduction in producer prices. The asymmetry is even more pronounced in the retail phase, where transmission occurs from producer to consumer prices: increases in producer prices are more strongly reflected in the rise of consumer prices of industrial-food products than their decreases are in lowering consumer prices. From this, it can be concluded that retailers possess greater market and bargaining power compared to other participants in the industrial-food supply chain. Additionally, it is observed that increases in world energy prices, as well as depreciation of the domestic currency, have a statistically significant impact on the rise of consumer prices of food products in Serbia. At the level of the entire industrial food chain, a stable long-term equilibrium relationship between the observed variables was confirmed, which means that price shocks, although of different intensities, are gradually integrated into the long-term dynamics of food prices in production and consumption. Future research could focus on a disaggregated analysis by product groups or individual products.

Based on the findings of the conducted empirical analysis, it is possible to propose specific measures for economic policymakers, aimed at improving the living standards of the population and creating a more competitive business environment in the food sector. In this regard, it is necessary to strengthen the institutional and regulatory framework to prevent excessive market power of individual participants, especially in the retail segment, which would help mitigate the observed price asymmetries and provide more effective consumer protection. Moreover, systematic and continuous monitoring of the price formation process, together with closer cooperation between policymakers and relevant market participants, would enable more accurate tracking of inflationary pressures, timely responses to market disruptions, and stabilisation of consumers' inflation expectations. Furthermore, additional promotion of competition in the food sector and the entry of new market participants could lead to a self-regulating limitation of profits, increased efficiency, and greater symmetry in price transmission along the entire production chain.

Overall, the results of this research contribute to a better understanding of the price pass-through mechanism in Serbia's food sector and, as such, provide a useful basis for designing economic policy measures that would help stabilise food prices and overall inflation, as well as preserve the living standards of the population.

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WORKING PAPERS

ANALYSIS OF THE HETEROGENOUS IMPACT OF INFLATION ON HOUSEHOLDS IN SERBIA IN THE 2020–2025 PERIOD

Dragan Dživdžanović and Konstantin Sorak

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Analysis of the heterogenous impact of inflation on households in Serbia

Dragan Dživdžanović and Konstantin Sorak

Abstract: This paper aims to examine the heterogeneity of the redistributive effects of inflation on different household categories in Serbia, observed by their level of consumption and income, in the period between the outbreak of the coronavirus pandemic and 2025. For this purpose, specific consumer price index indicators were constructed for different household categories using data on consumption patterns from the Household Budget Survey of the Statistical Office of the Republic of Serbia, where the weights for products and services were adjusted in line with their relative shares in consumption for each of the five equal groups (quintiles) ranked by consumption level. Based on the obtained indices, we analysed the unequal impact of inflation through the relative consumption channel. Subsequently, the income channel was examined by deflating wages using group-specific inflation indices. The results of the analysis of the relative consumption channel show that, in the initial part of the period of high inflationary pressures, there were no significant differences between inflation indicators according to the consumption patterns of different groups, because the increase in food prices, which affects lower-consumption households more strongly, was partly offset by rising transport prices, which have a larger share in the consumption of higher-consumption households. However, in the latter half of 2022 and throughout 2023, lower-consumption households were relatively more exposed to price increases, while in 2024 and 2025 the effects of this channel largely operated in the opposite direction. Observed through the income channel, the inflationary shock in 2022 and 2023 led to a significant slowdown in real wage growth, with wages of the lowest-income households declining somewhat in 2022, and stagnating in 2023. However, as inflation stabilised in 2024 and 2025 and real wages posted robust growth, the income channel came to have an overall positive impact on households' purchasing power. Consequently, in the 2020–2025 period, real wage growth in the lower-income quintiles exceeded 35%, while in the higher-income quintiles it was slightly below 30%.

Key words: consumer price index, inflation inequality, consumption pattern, quintiles, relative consumption channel, income channel

[JEL Code]: E47, E58, E37

Non-Technical Summary

The use of aggregate inflation measures, such as the general consumer price index, is important for the conduction of macroeconomic policy. This index, however, reflects the habits of an average consumer and does not capture the different effects of price growth on different household categories depending on their income and consumption levels. For this reason, it is useful to observe inflation in terms of groups of households with different consumer habits.

In this paper, based on the data from the Household Budget Survey, households are classified into five groups (quintiles), the first of which includes 20% of the lowest-consumption households and the fifth – 20% of the highest-consumption households. Then, for all groups, the weights of the COICOP categories of products and services in their contribution to inflation were adjusted using data from the Survey. Data on monthly price growth of these categories were used and transformed into indices with 2015 as the base year. Finally, specific inflation rates were calculated for each group, together with the individual contributions of each of the categories in order to assess whether inflationary pressures affected different households differently.

The results show that, in the initial part of the period of strong inflationary pressures, there were no major differences among the groups. The reason for this is that food price growth, which affects lower-consumption households in particular, was partly offset by the increase in transport prices fuelled by global oil price growth, which has a larger share in the consumption of higher-consumption households. As food price growth accelerated in the latter half of 2022, however, the differences in inflation intensified, peaking in mid-2023, with inflation in the first quintile topping inflation in the fifth quintile by around 2.6 pp. From 2024 onwards, as food price growth subsided and the contribution of industrial products and services to inflation went up, inflation most often became relatively lower for lower-consumption households and declined further in late 2025 under the impact of the decree on the capping of margins.

Observed through the income channel, the inflationary shock in 2022 and 2023 led to a significant slowing of real wage growth, while the lowest-income households saw some decline, followed by stagnation. Real income growth ensued as inflation levelled off in 2024 and 2025, and was the sharpest for lower-income groups. If we observe the entire period of the multidimensional crisis (2020–2025), it can be concluded that all groups saw a substantial increase in their purchasing power, with real wage growth in the lower-income quintiles slightly topping 35% and measuring less in higher-income quintiles, at slightly under 30%.

This result is also confirmed by the indicator of coverage of the minimum consumer basket with minimum wages, which deteriorated in the 2022–2023 period, only to improve greatly in the subsequent years. In 2025, the minimum wage almost fully covered the minimum consumer basket for the first time.

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1 Introduction

Inflation is one of the topics that has received the greatest deal of attention from the economic science. From the aspect of practical and applied economics, the regulation of inflation is one of the key economic policy objectives and the principal goal of monetary policy. Such amount of interest among economists and the importance they attach to the issue of inflation have spawned a large number of different approaches to its analysis. Nonetheless, almost all agree that price growth does not affect all market participants in the same way. Research of the redistributive effects of inflation has been undertaken from various perspectives, such as the redistribution of wealth from creditors to debtors (Fisher, 1911) or inflation as a form of “hidden” taxation (Friedman, 1969). One of the many perspectives is the analysis of the unequal impact of price growth on households. Although the use of an aggregate measure of inflation is the most common approach in models and analyses, it is clear that at times of inflationary pressures prices of all goods do not rise at the same intensity, and that households do not share identical consumer choices and habits.

Research most often uses data from household consumption surveys in order to account for the differences in the structure of consumer baskets and to construct inflation rates for different population categories (Hobijn & Lagakos, 2003). There are also cases of using more detailed microdata to track differences in the prices paid by different groups for the same products (Kaplan & Schulhofer-Wohl, 2017), as well as incorporating additional components in the calculation of the “true” price index, such as substitution tendencies and consumer habits (Argente & Lee, 2020). Interest in this topic increased with the emergence of strong inflationary pressures during the recovery of the global economy after the COVID-19 pandemic, which were further intensified by the escalation of the conflict in Ukraine. From a sectoral perspective, inflationary pressures were felt more asymmetrically in the areas of energy and food, particularly in Europe, where inflation was driven to a greater extent by supply-side shocks compared to other parts of the world (Firat & Hao, 2023). The uneven nature of inflationary pressures has therefore prompted various studies aimed at assessing the heterogeneous effects of inflation. This paper presents research conducted for Serbia, focusing on the channels of relative consumption and income (Ferreira, Leiva, et al., 2022).

The research covers the period from 2020 to 2025. To calculate inflation rates by household categories, we applied the methodological approach used in Gautier and Montornès (2022). Its core idea consists of adjusting the homogeneous weights assigned to product and service categories in the aggregate CPI consumer basket, based on data from the Household Budget Survey which captures different consumption structures depending on households’ total expenditure levels. In this way, inflation rates are obtained separately for each quintile, ranging from the first quintile, which includes the 20% of households with the lowest level of consumption, to the fifth quintile, comprising the 20% of households with the highest level of consumption.

The analysis of the relative consumption channel shows that during the first phase of inflationary pressures intensified by the energy shock, their effects were evenly distributed, and there were no significant deviations in inflation trends across different household categories, despite the high inflation rate. In addition, the main driver of higher inflation for

the first quintile was food price growth, and for the fifth quintile – the rise in transport prices due to the hike in global prices of oil. In the latter half of 2022, after oil prices stabilised – which also reflected on transport prices – the inflation gap began to widen, with lower-consumption households being relatively more affected, since food prices continued to rise driven by second-round effects. At its peak, the gap in inflation between the first and fifth quintiles ranged between 0.7 and 2.6 pp. In the subsequent period, from Q4 2023 onwards, the inflation gap was neutralised thanks to the base effect and the rising contribution of industrial goods and services to inflation. In 2024 and 2025, inflation was generally lower in the first than in the fifth quintile, a trend that intensified in particular from September 2025 as a result of adoption of the decree capping trade margins.

With regard to the income channel, the inflationary shock in 2022 and 2023 led to a significant slowing of real wage growth, while the lowest-income households saw some decline in 2022, followed by stagnation in 2023. Real wages rose substantially in 2024 and 2025, supported by decelerating inflation and higher minimum wages. Recovery ensued with the stabilisation of inflation in 2024 and 2025, when real wage growth was the most pronounced among lower-income groups. Compared to 2019, the wages of households in the first two quintiles (40% of the lowest-income households) increased by over 35% in real terms by 2025, while those of the highest-income households rose by slightly less than 30%. This resulted in the minimum wage almost fully covering the minimum consumer basket, indicating an improvement in the purchasing power of this population segment.

2 Methodology

The purpose of this analysis is to examine the heterogeneity of the redistributive effects of inflation on households through two mechanisms: (1) the relative consumption channel, which refers to differences in the structure of the consumer basket, and (2) the income channel, which relates to differences in the dynamics of real wage growth resulting from unequal inflation, as well as nominal wage growth.

The Consumer Price Index (CPI) is published by the Statistical Office of the Republic of Serbia (SORS). The CPI is based on the average consumer basket, where the prices of product groups classified according to COICOP are weighted by their share in total consumption. The SORS also publishes the Household Budget Survey (HBS), which contains data on the consumption of the same product groups. These data serve as one of the bases for determining the weights used in the calculation of the CPI. The Survey also provides information on the consumption patterns of households according to their level of expenditure, with households divided into ten equal deciles (the first decile representing households with the lowest consumption, and the tenth decile those with the highest consumption). For the purposes of this analysis, we have averaged each pair of adjacent deciles in order to obtain quintile-level data, ensuring greater clarity and transparency of the analysis.

To calculate inflation by household groups, we applied the methodological approach developed in Gautier and Montornès (2022). A similar approach was used for European countries in Claeys et al. (2022), as well as in Charalampakis et al. (2022). The methodological framework employed in this paper makes it possible to link consumer price indices and official

CPI weights with the structure of household consumption from the Household Budget Survey¹ by quintiles. The weights of product groups in the CPI are adjusted based on the relative shares of those same groups in consumption by quintiles. The weight of a product group for a given quintile is obtained by adjusting the official CPI weight according to the relative consumption shares. Specifically, the ratio of the share of a given group in the consumption of that quintile and total consumption for that group is taken into account:

$$w_{j,q}^g = wCPI_j^g * \frac{HBS_{j,q}^g}{HBS_j^g} \quad (1)$$

where:

j - COICOP groups of products/services

q – quintile

g – year

$w_{j,q}^g$ - derived weight of product group j for selected quintile q in year g

$wCPI_j^g$ - official CPI weight of product group j in year g

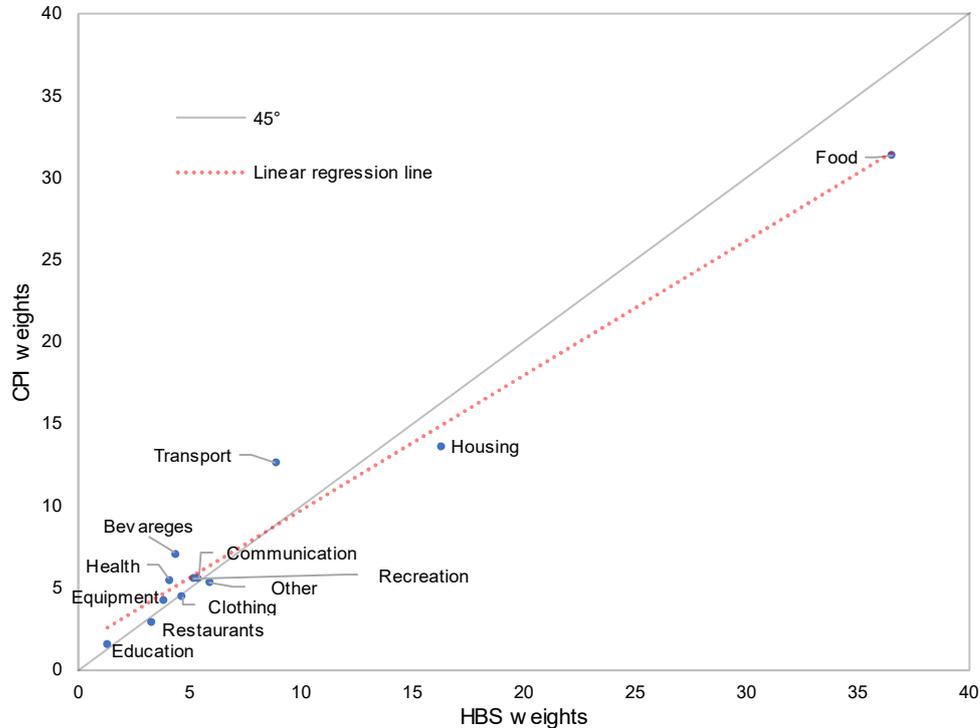
$CPI_{j,q}^g$ – share of product group j in the consumption of quintile q , from the Household Budget Survey for year g

HBS_j^g – share of product group j in the consumption of all quintiles, from the Household Budget Survey for year g

It is important to note that the structures of consumption obtained from the Household Budget Survey and the weights used in CPI slightly differ, despite the fact that the Household Budget Survey is the basis for determining the CPI weights. These differences can, to a limited effect, affect the level of inflation rates calculated by quintiles.

¹ The Household Budget Survey was not published for 2020, so we used the arithmetic mean of weights for 2019 and 2021.

Chart 1 Share of COICOP product group in total consumption in 2024 in CPI and HBS (in %)



Source: Authors' illustration based on Michael Marencak and Giang Nghiem (2025). SORS data.

Using data for 2024 as an example, deviations can be observed between the shares of certain product groups in the HBS and the official CPI weights. The most pronounced difference is recorded for food, which accounts for 31.4% of total consumption according to CPI, compared to 36.6% according to the HBS. In contrast, the respective shares for transport are 12.7% and 8.9%. For the categories of housing and alcohol, beverages and tobacco, the shares amounted to 13.6% and 7.1%, respectively, within CPI, compared to 16.3% and 4.4% according to the HBS. Regarding differences in consumption structure across quintiles based on HBS data, the share of food in the consumption of the first quintile is significantly higher than the HBS average, amounting to 45.5%. By contrast, the shares of housing, transport, and recreation are higher in the fifth quintile, measuring 18.7%, 9.8%, and 8.2%, respectively.

The quintile weights obtained in this way (equation 1) are used for calculating the contribution of individual COICOP groups to the total annual inflation rate of each quintile (equation 2). As the weights in the CPI and the Household Budget Survey are updated once a year, to calculate y-o-y inflation we have applied a formula which captures changes of weights from one successive year to another (OECD, 2022). The first element of the equation (2) captures price change in the current year applying the weight from a year earlier, while the second element performs the adjustment resulting from the change of the weight from one successive year to another.

$$c_{j,q}^{g,m_t} = \left[\left(\frac{pCPI^{g-1,m_{12}}}{pCPI^{g-1,m_t}} * w_{j,q}^{g-1} \right) * \left(\frac{pCPI_j^{g,m_t} - pCPI_j^{g-1,m_{12}}}{pCPI_j^{g-1,m_{12}}} \right) \right] + \left[\left(\frac{pCPI^{g-2,m_{12}}}{pCPI^{g-1,m_t}} * w_{j,q}^{g-2} \right) * \left(\frac{pCPI_j^{g-1,m_{12}} - pCPI_j^{g-1,m_t}}{pCPI_j^{g-2,m_{12}}} \right) \right] \quad (2);$$

Symbol definition:

m_t – observed month t in year g , where $t \in \{1, \dots, 12\}$

m_{12} - December

$pCPI^{g,m_t}$ – total price index in year g , month m_t

$pCPI_j^{g,m_t}$ – price index of product group j in year g , month m_t

$w_{j,q}^g$ – share of product group j in the consumption of quintile q in year g from the equation (1)

$c_{j,q}^{g,m_t}$ – contribution of growth in prices of product group j to total y-o-y inflation of quintile q , in month m_t , year g

The total inflation rate π for the given quintile in the observed month is obtained as the sum of contributions of price growth of all product groups according to COICOP classification:

$$\pi_q^{g,m_t} = \sum_j c_{j,q}^{g,m_t} \quad (3).$$

Based on the indices constructed in this way, it is possible to compare inflation across quintiles and assess the degree of unequal exposure of different household categories to inflation due to differences in consumption patterns.

After constructing the inflation indicators by quintiles, we analysed the extent to which different inflation rates affect real wage growth and, by extension, the purchasing power of households. For these purposes, we used SORS data on wages by deciles, which we also transformed into quintiles. Real wage growth by quintiles was obtained by deflating the nominal y-o-y growth:

$$g_{w,q}^{real} = \frac{1 + g_{w,q}^{nom}}{1 + \pi_q} - 1 \quad (4),$$

where $g_{w,q}^{real}$ and $g_{w,q}^{nom}$ are real and nominal y-o-y growth in the average wage of a quintile, respectively, and π_q is the average y-o-y inflation by quintiles, calculated as the arithmetic mean of y-o-y inflation growth rates by quintiles for all months in a year.

It is important to note that consumption quintiles from HBS are formed based on total household consumption, regardless of the source of income, while data on wages are grouped according to the wage level. For this reason, consumption observed in HBS is not necessarily financed entirely by wages, but may also include other income sources, especially pensions. For this reason, the results do not represent an accurate mapping of the same households, but an approximation based on the distributions of consumption and wages. For this reason, the

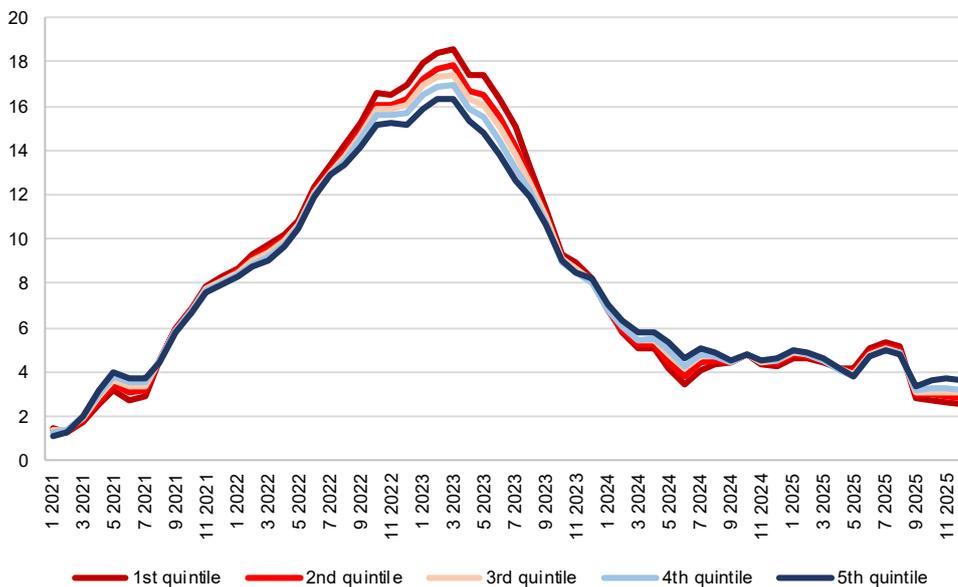
results should be interpreted as an indicative assessment of the differences in the purchasing power of different consumption and income groups. An advantage of this approach is that it allows us to perceive differences in real wage growth across quintiles and estimate whether they are primarily a consequence of nominal wage growth dynamics or of different growth in the prices of products within the consumer basket.

3 Relative consumption channel

3.1 Results

This chapter analyses the development of inflation inequality across household categories in Serbia over the 2020–2025 period. Two factors influence differences in households’ exposure to inflation: differences in price growth across products and services, and differences in household consumption patterns. If the prices of all products grew at the same rate, there would be no inflation inequality, regardless of differences in consumer baskets. Similarly, if all households had an identical, average consumer basket, the differences in price growth among products would not lead to unequal inflationary experiences. The constructed inflation indicators for five equally sized household groups (Chart 2) show that several specific periods can be distinguished in their dynamics.

Chart 2 Inflation movements across groups of households with different consumption levels (y-o-y growth rates, %)

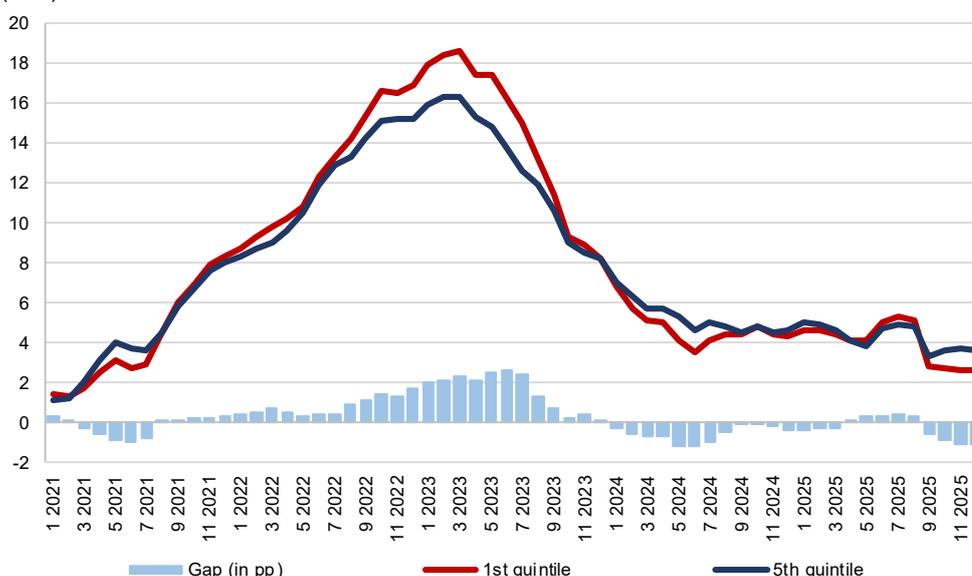


Sources: HBS and NBS calculations.

During the emergence and intensification of inflationary pressures, there was no major and unequivocal difference in inflation movements across quintiles and such dynamics continued in the first half of 2022 as well, despite double-digit inflation. From August 2022 onwards, the inflation gap widened, with inflation rising more in the quintiles representing lower-consumption household categories. This trend continued until Q4 2023. Observing the first and the fifth quintiles in isolation (Chart 3), it can be noted that the inflation gap peaked

in mid-2023 at around 2.6 pp and narrowed steadily thereafter. Since early 2024, y-o-y consumer price growth was mostly lower for lower-consumption households, partly reflecting the high base effect from a year earlier, and, since September 2025, the adoption of the decree capping retail and wholesale margins at 20%, which led to a decline in food prices. The only exception is the period between April and August 2025, i.e. immediately before the decree was adopted, when food prices rose more quickly than headline inflation due to adverse weather, resulting in higher y-o-y growth in consumer prices for lower-consumption households.

Chart 3 Inflation movements in the 1st and the 5th quintile and inflation gap between them (in %)

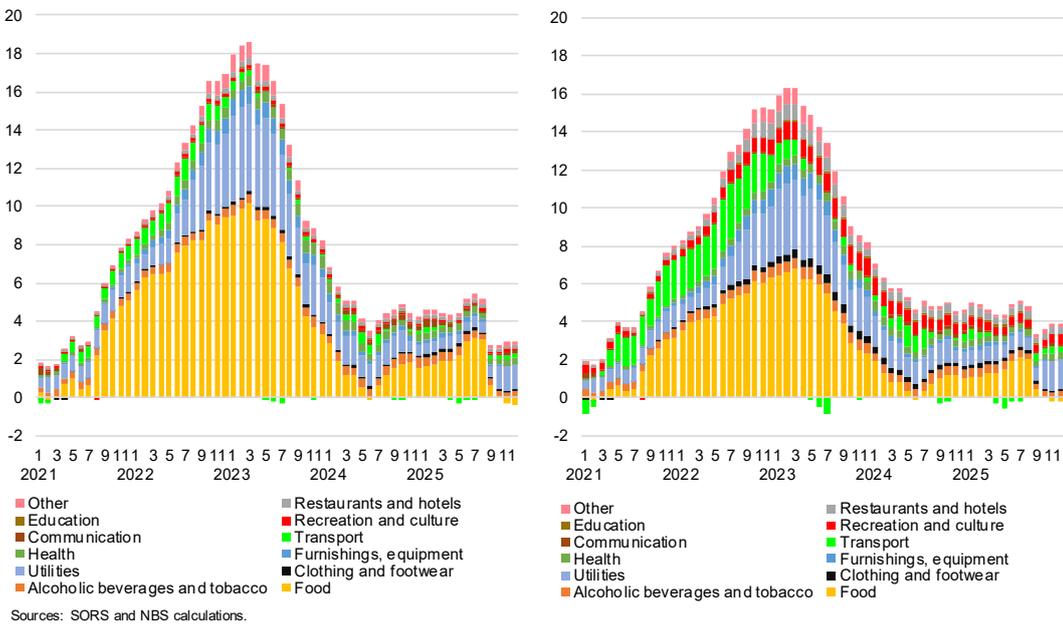


Sources: HBS and NBS calculations.

3.2 The impact of differences in the structure of the consumer basket and growth in prices of products and services on the relative consumption channel

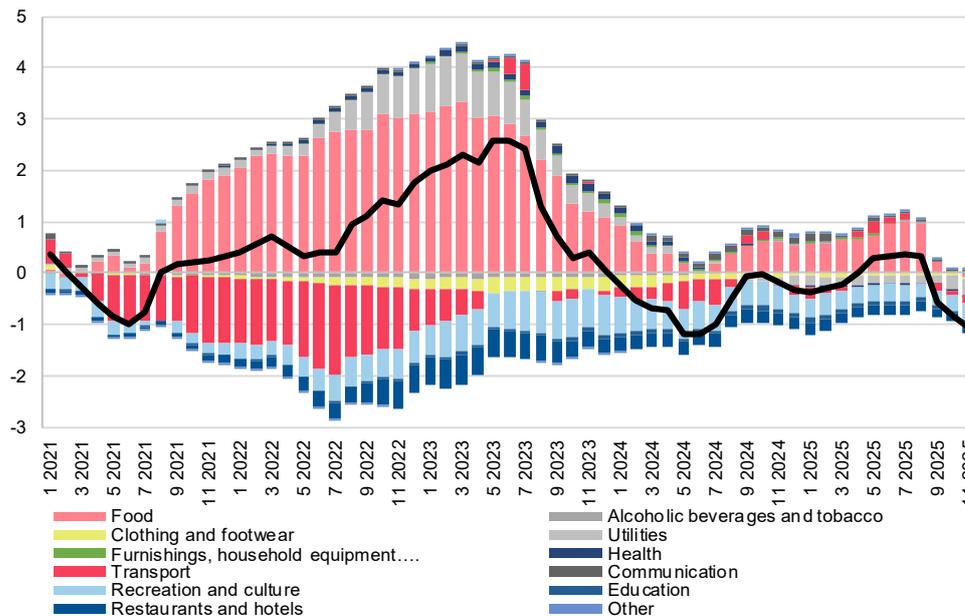
In order to better understand the dynamics of inflation differences across quintiles, it is necessary to link the nature and the evolution of inflation drivers with the consumption patterns of the respective quintiles. Price growth in 2021 was mostly driven by energy and food prices, resulting from the recovery of global demand, weaker agricultural production globally and supply-side disruptions (IR, 2021). Such nature of inflation in the initial period was directly reflected in the food and transport categories of the COICOP classification, along with a gradual increase in utility prices. As the conflict in Ukraine escalated, price growth within these three categories continued to accelerate. It should also be noted that there was additional pressure on rental prices due to the arrival of people from war-affected areas.

Chart 4 Structure of inflation in the 1st and the 5th quintile, according to COICOP classification
(in pp)



Observed from the perspective of the consumer basket structure (Chart 4), during the period of strong inflationary pressures – when there were nevertheless no major differences in inflation dynamics across quintiles – food had a significantly larger role in explaining inflation for the first quintile. Namely, its contribution to total inflation between end-2021 and August 2022 was in the range of 55–66%, compared to inflation for the fifth quintile where the contribution of food was in the interval of 35–45%. The situation was exactly opposite for the

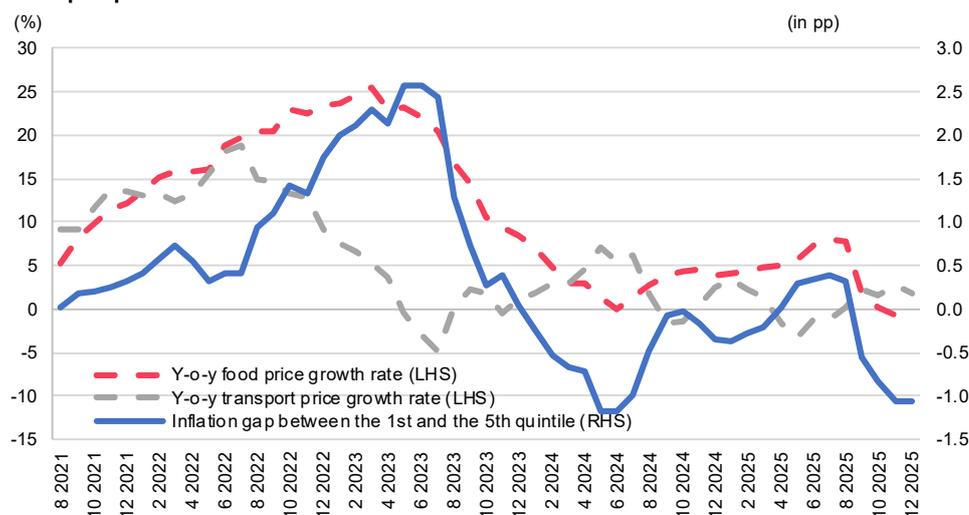
Chart 5 Inflation gap between the 1st and the 5th quintile and contributions to this gap by COICOP category
(in pp)



contribution of transport prices. The share of growth in transport prices in total inflation for the fifth quintile mostly moved between 20% and 25%, compared to a much lower share of around 10% for the first quintile. It is important to note that during this period there was a roughly similar dynamic in the growth of food and transport prices. Therefore, the structure of the shares of food and transport was the determining factor behind the absence of a significant inflation gap (Chart 5).

The difference in the dynamics of movement in the above prices will be the main cause of widening of the inflation gap in the subsequent period, as it is precisely from August 2022 that y-o-y growth in the prices of food and transport starts to diverge, and the inflation gap between the first and the fifth quintile to widen (Chart 6). Food prices continued up and stayed above 20% all the way until July 2023, while transport prices slowed steadily, only to eventually decline in y-o-y terms. Such dynamics correspond to a change in the structure of contributions to inflation following the stabilisation of the global energy market, alongside prevailing second-round effects of the pass-through of previously accumulated cost pressures to food prices. In 2023, there was also a delayed adjustment of utility prices, which affected the first quintile to a greater extent.

Chart 6 Inflation gap between the 1st and the 5th quintile and y-o-y growth rates of food and transport prices



Sources: SORS and NBS calculations.

Transport prices picked up again in late 2023, while food prices slackened notably. As a result, the inflation gap was such that fifth-quintile inflation was higher than first-quintile inflation. The structure of contributions to inflation shifted again. Inflation became much more moderate, but guided by its core components, as reflected in the fact that on average prices of many services now increased faster than food prices. It is important to note that during the time period of this analysis there was also a relative change in the contribution of utilities by quintiles, as this item started to affect higher-consumption households more from 2024 onwards. The most important event, however, was the adoption of the Decree on the Capping of Trade Margins (RS Official Gazette, 76/25, 78/25 and 93/25), which led to a decline in food prices and the absence of this category's contribution to inflation until end-2025. This development played a much more significant role in reducing inflation for the first quintile,

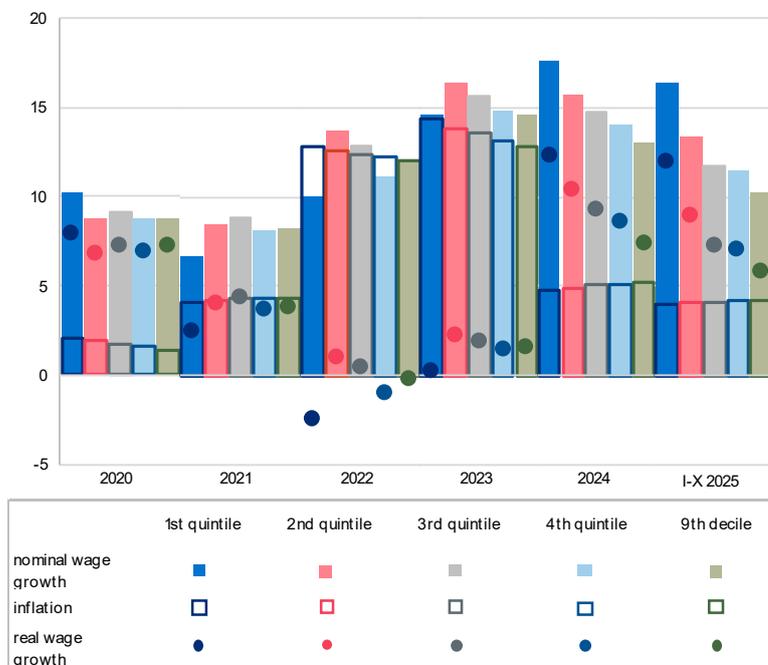
where inflation was nearly halved, compared to the fifth quintile where the decrease was also substantial, but more moderate (around 30%) due to the higher share of services whose prices continued up.

It should be noted that the scope of this research covers the monitoring of differences in the structure of the consumer basket and the variations in price growth across types of products and services, while different price growth within the same products falls outside the scope of the analysis. However, one of the previous studies (Dživdžanović, 2025) showed that during the period of the most intense inflationary pressures, price growth was heterogenous, with prices of cheaper brands increasing more on average than those of costlier brands. Therefore, the impact of this channel can be used in a complementary manner for a comprehensive assessment of the heterogeneous effects of inflation.

4 Income channel

Inflation measures by population categories divided according to consumption can also be used to examine the income channel, by applying them to deflate the nominal wage dynamics across income groups, in order to approximate the impact of inflation on the real income of different population groups. It should also be borne in mind that the movement of nominal wages in the first quintile, and likely in the second quintile as well, is largely determined by minimum wage dynamics.

Chart 7 Average annual inflation and average annual nominal and real wage growth (in %)

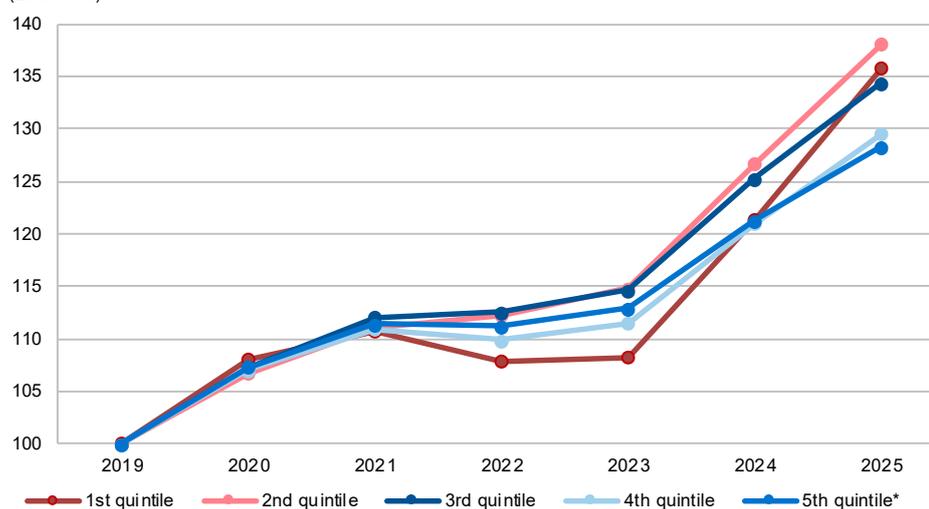


Sources: SORS and NBS calculations.

In the period of relatively low inflation (2020–2021), the constructed indicator of real wage growth did not point to the presence of pronounced redistributive effects across quintiles. However, starting in 2022, variations began to emerge in both the intensity and direction of real wage growth rates (Chart 7). In 2022, in real terms, wages in almost all five household categories recorded stagnation or a decline, which was the most pronounced in the case of the 20% of households with the lowest income. A decomposition of the real wage decline in the first quintile in 2022 shows that nominal wage growth largely determined this outcome. In 2023, the first quintile continued to lag behind, but the structure of contributions changed: nominal wage growth in this group was no longer lower than in the others, while the more pronounced increase in the prices of goods with a larger share in the consumption of poorer households led to a stagnation in real wages. In contrast, the other quintiles recorded moderate real growth.

During 2024 and 2025, a shift in distributive dynamics occurred, as real wages increased more strongly for the 40% of households with the lowest incomes. Cumulatively, over those two years, real wage growth amounted to around 25% for the first quintile and about 20% for the second quintile. This was supported by more substantial increases in the minimum wage and a slowdown in inflation, particularly in food prices. Looking at the entire period of the multidimensional crisis since 2020 (Chart 8), real wage growth for households in the first two quintiles was slightly above 35%, while for the highest quintile it was somewhat below 30%. Although the dynamics of real growth were more favourable for lower-income households, it should be noted that the absolute effects were smaller due to differences in wage levels between the groups.

Chart 8 Cumulative real growth in real wages of groups with different income levels (2019=100)

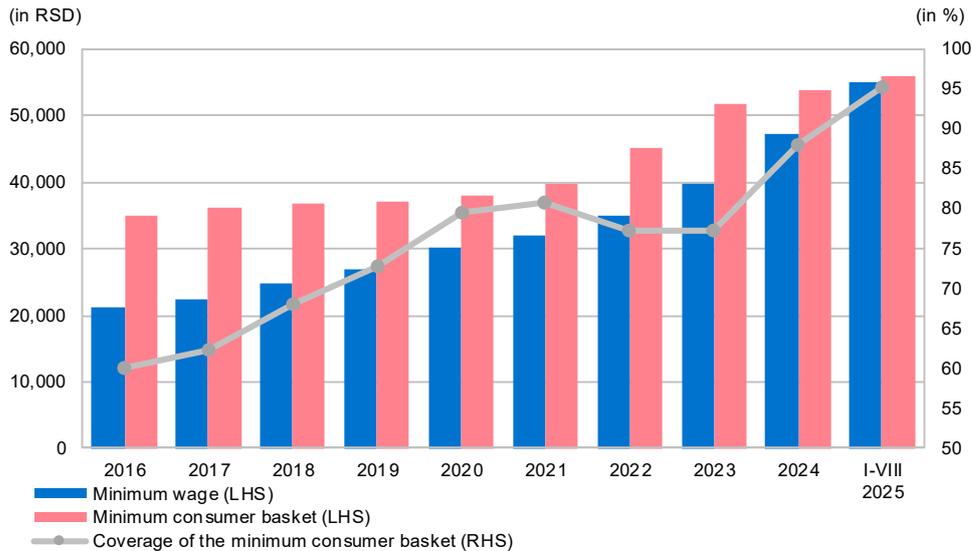


*Data on wages published on the SORS website refer to the 9th decile.
Sources: SORS and NBS calculations.

Further insight into purchasing power movements among lower-income households is provided by the indicator of coverage of the minimum consumer basket by the minimum wage (Chart 9). Between 2016 and 2021, this indicator rose steadily, reaching 81%. The dynamics of the minimum consumer basket coverage indicator during the period of accelerated inflation

are consistent with our findings on the real wage decline in the first quintile in 2022, as the coverage recorded a slight decrease (to 77%) and remained unchanged in 2023, which also corresponds to the wage stagnation identified in our research. This synchronization continued in 2024 and throughout 2025, when a more significant improvement occurred, driven by a combination of stronger minimum wage growth and a slowdown in inflation. As a result, the coverage of the minimum consumer basket first rose to 88%, and then reached nearly 95%.

Chart 9 Coverage of the minimum consumer basket



Sources: SORS and NBS calculations.

5 Conclusion

Aggregate measures of inflation, such as the consumer price index, are an indispensable macroeconomic policy tool. Aggregate indices, however, cannot capture the redistributive effects of inflation that arise from its differing impact on households under conditions of varying consumption patterns and income levels. Therefore, one way to more closely explain the effects of inflation, particularly during periods of strong inflationary pressures, is to monitor inflation inequality among households with different consumer basket structures.

Based on data from the Household Budget Survey, the weights of different categories of goods and services in the Consumer Price Index were adjusted in accordance with the COICOP classification. In this way, separate inflation indicators were constructed for five equal groups of households – quintiles – where the first quintile refers to the 20% of households with the lowest consumption, and the fifth quintile to those with the highest. These indicators were then used to examine the heterogeneity of inflation effects, first directly through the relative consumption channel and then indirectly through the income channel.

The results show that, from the perspective of the relative consumption channel, significant inflation heterogeneity was absent during the first phase of the strongest inflationary pressures. This was largely due to the fact that the rise in food prices – which has a more dominant share in the consumption of the first and second quintiles – was offset by the increase in transport prices, which account for a larger share in the consumption of the fourth

and fifth quintiles. However, in the second half of 2022, under the influence of faster growth in food prices relative to transport prices, the inflation gap began to widen. By mid-2023, this difference reached its peak, with inflation for the first quintile being higher by about 2.6 pp. From 2024 onwards, food price growth slowed, and in Q4 2025 this was further supported by the introduction of the decree capping trade margins, which resulted in the inflation rate for lower-consumption households being lower than that for higher-consumption households.

With regard to the income channel, deflation of nominal wages by inflation measures specific to individual quintiles shows that the inflationary shock in 2022 and 2023 led to a significant slowdown in real wage growth, while households with the lowest incomes recorded a certain decline, followed by stagnation. On the other hand, during the inflation stabilisation phase in 2024 and 2025, real wage growth was relatively stronger among lower-income groups. As a result, when observing the entire 2020–2025 period, real wage growth for lower-income quintiles increased by more than 35%, while for higher-income groups it remained below 30%. The findings related to the income channel are also confirmed by the movement of the indicator measuring the coverage of the minimum consumer basket by the minimum wage. This indicator points to a deterioration during 2022–2023, followed by a significant improvement in subsequent years, with 2025 being the first time that the minimum consumer basket was almost fully covered.

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WORKING PAPERS

SPECIFICITIES OF FACTORS AFFECTING THE FX MARKET OF THE REPUBLIC OF SERBIA IN 2025

Mladen Vukmirović

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Specificities of factors affecting the FX market of the Republic of Serbia in 2025

Mladen Vukmirović

Abstract: The past few years have witnessed three different crisis episodes which deeply affected the domestic FX market: the coronavirus pandemic of 2020, the geopolitical-energy crisis caused by the escalation of the Ukraine conflict in 2022 and, finally, the depreciation pressures of 2025 fuelled by the deepening of uncertainties related to the operation of the Serbian Oil Company NIS. While differing in their origin and working mechanisms, what these crises hold in common is that they have put to the probe the resilience of the FX market and the effectiveness of economic policies. The paper analyses the factors which affected the movements in the domestic FX market in 2025, the first year after the pandemic 2020 in which the NBS turned out the net seller of foreign currency. The paper underscores the specificities of the factors in play: a considerably lower FX supply by residents, largely prompted by the strong FX demand of natural persons late in the year, as well as high FX demand by non-residents, reaching the highest level since 2017. A particular focus is placed on the period since end-November, when a significant FX demand of natural persons was recorded, as well as on the way the NBS responded in order to help normalise movements in the FX market and maintain a relative stability of the dinar exchange rate.

Key words: FX market, FX interventions, transparency, monetary policy, exchange rate of the dinar

[JEL Code]: F31

Non-technical summary

The paper analyses movements in the FX market of the Republic of Serbia over a six-year period (2020-2026) and the NBS's role within the managed floating exchange rate regime. The managed floating exchange rate regime assumes that the exchange rate of the dinar against the euro is formed in the market, where the NBS can intervene through purchase or sale of foreign currency, to alleviate excessive short-term volatility of the exchange rate, with a view to preventing disturbances that might jeopardise price and/or financial stability.

The paper first indicates the role and importance of FX interventions as an auxiliary monetary policy instrument in conditions of high euroisation and pronounced pass-through effect from the exchange rate to inflation. It further places emphasis on transparency in carrying out and communicating FX interventions, with the comparative analysis showing that the NBS's practice is more transparent than those of the majority of central banks in the region which also intervene in the FX market to a greater or lesser extent.

The analysis of long-term trends points to a clear demarcation between the period concluding with 2016 and the one starting in 2017. While the period until 2016 was marked by the dinar's weakening against the euro and net FX sale by the NBS, as of 2017 the pressures toward the dinar's strengthening became dominant, coupled with the NBS's net FX purchase. In that context, the year 2025 marks a turning point in the buying trend, as the NBS was a net FX seller, for the first time since the pandemic 2020. In 2025, movements in the FX market were rather volatile, with three subperiods coming to the forefront, covered by a detailed analysis in the paper.

The paper places a special focus on the final quarter of 2025, i.e. the period since end-November, when a more substantial FX demand of natural persons was recorded. The NBS's response aimed at normalising the movements in the FX market and maintaining a relative stability of the dinar exchange rate is particularly analysed. The paper shows that these pressures were pronounced, but short-term and of limited volume. While households bought a substantial amount of foreign exchange and foreign cash, there was no withdrawal of deposits from the banking system. On the contrary, total savings went up, signalling the preserved household confidence in the banking system. At the same time, through a combination of FX interventions, timely communication and regulatory and operational measures aimed at unhindered functioning of the exchange market, the NBS managed to soothe psychological pressures and ensure the market's gradual return to its usual course.

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1 Introduction

The contemporary global economy is marked by frequent crisis episodes of varying intensity, whose effects, directly or indirectly, spill over to small and open economies as well. The Republic of Serbia, as an economy with pronounced external trade openness, is not exempt from these processes. The FX market, as one of the key segments of a country's financial system, represents the first channel through which external and internal shocks materialize.

The exchange rate is determined by the laws of FX supply and demand¹, with some of the basic factors impacting the exchange rate formation being a country's macroeconomic indicators, the terms of trade, the interest rate differential, expectations regarding monetary policy, the inflation rate, geopolitics, and sentiment in financial markets. When there is greater demand for a particular currency, its price increases relative to another currency, meaning that the given currency strengthens (appreciates), and vice versa. In economic theory, the foreign exchange market represents the meeting point of real and financial flows between the domestic and international economy².

In times of crisis, disruptions in the global environment are most often transmitted through several main channels. In most cases, these channels operate simultaneously. The first is the **financial** channel, which includes capital movements, changes in risk premiums, and investor behaviour under conditions of increased uncertainty. During crisis periods, there is a marked increase in risk aversion and a flight of capital toward safer assets, which creates depreciation pressure on the domestic currency in small economies. The second channel is the **foreign trade channel**, through which changes in global demand, energy and commodity prices, as well as supply chain disruptions, are directly reflected in export and import flows. A deterioration in terms of trade, and consequently in the foreign trade balance – especially when import prices are rising – increases the demand for foreign currency and creates depreciation pressures. The third channel relates to the **expectations of economic agents**. The foreign exchange market is highly sensitive to risk perception and the credibility of economic policy. Regarding this channel, previous experiences of economic agents – especially of households – have a significant influence, and under such conditions, the impact of psychological factors on their behaviour becomes evident. If there is trust in institutions and the central bank is considered a credible institution, the negative effects of a crisis can be mitigated.

The past few years have been marked by three different crisis episodes with a pronounced impact on the domestic foreign exchange market: the coronavirus pandemic in 2020, the geopolitical-energy crisis triggered by the escalation of the conflict in Ukraine in 2022, and, finally, the depreciation pressures of 2025 fuelled by the heightened uncertainty regarding the

¹ This applies to regimes of floating (fluctuating) or managed floating exchange rates, given that in pegged exchange rate regimes the value of the currency is primarily determined by the decision of the monetary authority (administratively), rather than by the free operation of market supply and demand forces.

² Paul R. Krugman, Maurice Obstfeld, and Marc J. Melitz (2012), "International Economics: Theory & Policy"-9th ed, chapter 14, Addison-Wesley/Pearson.

operations of the NIS company. Although these crises differ in origin and mechanism of impact, their common denominator is that they have tested the resilience of the FX market and the effectiveness of economic policies.

The previous year, 2025, was in many ways exceptional when it comes to movements in the domestic FX market, and the factors influencing these movements (mostly on the **FX demand side**) reached the highest levels observed in the past few years. In 2025, **FX demand exceeded the supply by EUR 405 mn**, which resulted in the NBS being a **net seller of foreign currency** at the annual level **for the first time since the pandemic year of 2020**, in the amount of **EUR 580 mn**. Since 2017, the NBS has faced largely appreciation pressures, i.e. pressures towards the strengthening of the domestic currency against the euro, and over the past nine years, only during two – 2020 and 2025 – did the NBS achieve a net sale of foreign currency, while in the other seven years it was a net buyer of foreign currency for dinars. **Over the nine years, net FX purchases amounted to EUR 11.3 bn.**

This paper aims to explain the NBS's role in the domestic FX market, i.e. FX interventions and their purpose within the NBS's monetary framework and to analyse the specificities of working of the factors in the FX market in prior period, with a special emphasis on depreciation pressures in 2025. The main thesis of the paper is that the intensity and nature of the spillover effects of global crises on the FX market of the Republic of Serbia depend on the structure of external connectedness, the nature of the global shock, and the degree of pre-established macroeconomic stability.

2 FX interventions as an auxiliary monetary policy instrument

According to surveys on central bank FX interventions regularly conducted by the Bank for International Settlements (BIS), although central banks cite different motives for intervening in the FX market, a common feature is the clear distinction between the ultimate and intermediate objectives of interventions. The ultimate goal of interventions is most often the preservation of price and financial stability, while intermediate objectives, such as mitigating excessive exchange rate volatility, are used as an operational mechanism to achieve the ultimate goals.

This understanding of the role of FX interventions is fully applicable to Serbia, where, **due to the pronounced pass-through effect of the exchange rate on inflation and the relatively high degree of euroization, exchange rate stability is an important element in maintaining macroeconomic stability**. In this context, the NBS's interventions in the FX market do not represent an alternative to the inflation-targeting regime, but rather a complementary instrument aimed at limiting short-term exchange rate fluctuations and preventing unwanted second-round effects on inflation expectations, price and financial stability.

BIS survey results show that FX interventions are most often a response to undesirable conditions in the financial system, such as sudden changes in risk aversion, declines in liquidity, and deteriorating market sentiment – factors that are also relevant for the domestic FX market. Under such circumstances, the goal of interventions is not to maintain a specific

exchange rate level, but to prevent excessive volatility that could undermine the effectiveness of the monetary policy transmission mechanism.

Reducing excessive exchange rate volatility has proven to be an optimal intermediate objective for achieving the ultimate goal of price stability in conditions similar to those present in Serbia. Increased exchange rate volatility can influence the pricing policies of economic agents, raise import-driven inflation, and weaken the monetary policy transmission mechanism. In this sense, the practice of the NBS aligns with contemporary theoretical and empirical findings, which recognize foreign exchange interventions as a legitimate and effective supplementary instrument within an inflation-targeting regime in developing countries.

2.1 Compatibility of FX interventions with the inflation targeting regime

The global financial crisis (2007/08) highlighted that developing countries are particularly exposed to volatile capital flows and external shocks that do not necessarily originate in the domestic economy. Sudden exchange rate changes in these economies carry significantly greater risks than in developed countries, primarily due to limited protection of the economy against foreign exchange risk and greater exposure to this type of risk in balance sheets, which can turn a domestic currency depreciation into a serious financial and macroeconomic problem. For this reason, central banks of developing countries attach great importance to exchange rate stability, in addition to maintaining price stability.

Although inflation targeting has been adopted as the dominant monetary regime due to its ability to anchor inflation expectations, the literature raises questions about its compatibility with FX interventions (e.g. Ito 2007; Ostry etc. 2019; Adler, Chang and Wang 2020). The classical approach assumes that the key policy rate should respond exclusively to deviations of inflation from the target, even in situations where such a policy may lead to excessive exchange rate fluctuations and negative effects on financial stability. The resulting view is that inflation targeting is not compatible with FX interventions, because a single instrument cannot achieve multiple objectives simultaneously. However, **under conditions of limited financial integration, high euroization, and increased sensitivity to capital flows, FX interventions represent an important supplementary monetary policy instrument in developing and emerging countries.** By combining the key policy rate with FX market interventions, central banks in developing and emerging countries can more effectively achieve their primary objective: maintaining low and stable inflation.³

The experiences of the global financial crisis have further encouraged the adoption of an approach that involves using a broader set of instruments to maintain macro-financial stability. Although excessive central bank activity in the FX market entails certain costs, contemporary practice and theory indicate that relying on a single instrument is not an adequate response in conditions of complex and interconnected risks.

³ D. Hofman, M. Chamon, P. Deb, T. Harjes. U. Rawat and I. Yamamoto (2020), „*Intervention Under Inflation Targeting - When Could It Make Sense?*“, IMF Working Paper 20/09.

2.2 NBS's interventions in the FX market

Interventions in the FX market represent an **auxiliary instrument** in the implementation of the NBS's monetary policy. Considering the long-standing experience of businesses and households with high inflation (including the hyperinflation at the end of the 20th century), as well as numerous devaluations of the dinar exchange rate, Serbia remains a highly euroized country, characterized by a high level of euro-indexed loans⁴, predominant euro savings and *de facto* expression of prices of some goods in euros (real estate market, automobile market and markets of other products with relatively high prices⁵).

Given the still high level of Serbian economy's euroisation, the exchange rate stability bears high importance for the preservation of general financial stability in Serbia. The NBS thus monitors and analyses movements in the domestic and international financial markets, and in order to alleviate short-term fluctuations in the dinar exchange rate, intervenes in both directions, as needed – both on the sale and demand side, depending on FX supply and demand in the domestic FX market. Additionally, daily volumes of NBS interventions depend on intensity and nature of pressures on the dinar's exchange rate against the euro, with the main goal to buffer (reduce daily volatility) and an additional to maintain an adequate level of FX reserves.

2.3 Transparency regarding the publishing of data related to FX market interventions

The transparency in conducting and communicating monetary policy is one of the key elements of central banks' credibility and an important channel impacting the shaping of expectations of economic agents⁶. In the context of the FX market, **a clear and regular communication about interventions can contribute toward reducing the information asymmetry, alleviating uncertainties and preventing panic reactions**, especially in periods of heightened market turbulence⁷. In this way, transparency acts as a complementary instrument to the very conduct of FX interventions, amplifying their effectiveness and signalling role.

The NBS applies a relatively high degree of transparency regarding the disclosure of data on FX interventions. Within regular monthly releases on the stock and flow of FX reserves and activities in the interbank FX market, in mid-month the NBS publishes data on FX net purchase or net sale during the previous month and cumulative amounts since the start of the

⁴ Currency (euro) indexed loans that are approved and repaid in dinars, but the amount of borrower's liabilities and receivables of the creditor bank are expressed in a foreign currency (euro).

⁵ The applicable Trade Law of the Republic of Serbia stipulates that prices on the domestic market are expressed in dinars, with narrowly defined exceptions (certain tourist services, vehicle trade, and specific cases provided for by special regulations).

⁶ A.S. Blinder, M. Ehrmann, M. Fratzscher, J. de Haan, and D. Jansen (2008), „*Central Bank Communication and Monetary Policy: A Survey of Theory and Evidence.*”, ECB Working Paper Series No. 898.

⁷ P. Chiu (2003), „*Transparency versus constructive ambiguity in foreign exchange intervention*“, BIS Working Paper No. 144.

year. The continuous publishing of monthly data enables market participants to timely grasp the general direction and intensity of central bank activities in the FX market, whereby information asymmetry between monetary authorities and all participants in the FX market is reduced.

A comparative analysis of the practices of central banks in Central, Eastern, and Southeastern Europe indicates that the **degree of transparency regarding FX interventions is limited in most cases**⁸. The Czech central bank is an exception, as it publishes monthly data on spot foreign exchange market transactions with a time lag of just over one month. On the other hand, the central banks of Hungary, Poland, and Romania do not have a practice of publishing data on FX interventions. In some cases, such as in Poland, the public is informed on the day of the intervention only about its direction, without quantitative data, while some central banks, like the National Bank of Romania, do not release any information about interventions at all, not even with a time lag. A moderately more transparent approach is applied by the Bank of Albania, which publishes data on interventions on a quarterly basis, but with a lag of one quarter.

Viewed in this context, it can be concluded that **the NBS's practice** regarding the regular and clear publication of data on FX interventions **is more transparent compared to most central banks in the region**, which, to a lesser or greater extent, intervene in the foreign exchange market. The NBS's approach contributes to strengthening the credibility of monetary policy, stabilizing expectations, and reducing the risk of excessive and unwarranted market reactions, especially under conditions of heightened uncertainty. Transparency proved to be a particularly important mechanism during 2025, as timely communication about the activities of the NBS and the set of measures and instruments aimed at the FX market directly contributed to easing psychological pressures and stabilizing movements in the domestic FX market.

3 Specificities of working of the factors in Serbia's FX market

In order to understand the specificities of working of individual factors in Serbia's FX market, it is useful to clearly distinguish between two periods, from 2010 to 2016, and from 2017 onwards, which essentially differ both by dominant macroeconomic movements and the nature of pressures on the dinar exchange rate and the NBS's role in the FX market. In analysing the long-term movements of the dinar exchange rate against the euro, it is important to consider the period from 2010 until the end of 2016, which was characterized by the recovery from the global financial crisis, the outbreak of the sovereign debt crisis in the euro area, and the implementation of fiscal consolidation. This period was marked by the dinar's depreciation against the euro and throughout most of it, the NBS was a net FX seller in the FX

⁸ The analysis was conducted by the author, based on a systematic search and qualitative review of the official online presentations of central banks of the countries observed (available press releases, reports, and statistics related to FX interventions).

market. In the given period, the dinar depreciated against the euro by 22.3% (from RSD 95.89 to RSD 123.47 for 1 euro), and the NBS net sold EUR 4.8 bn in the FX market (Table 1).

Table 1 The exchange rate of the dinar against the euro, the nominal change in the exchange rate and NBS's interventions in the period 2010-2016

Year	Exchange rate	Nominal change in the dinar's value against the euro	NBS interventions in the FX market*
2009	95.8888		
2010	105.4982	-9.1%	-2,333
2011	104.6409	0.8%	-45
2012	113.7183	-8.0%	-1,343
2013	114.6421	-0.8%	180
2014	120.9583	-5.2%	-1,620
2015	121.6261	-0.5%	520
2016	123.4723	-1.5%	-160
Total		-22.3%	-4,802

* in EUR mn (+ purchase / - sale); net amount.
Source: NBS.

Fiscal consolidation carried out from 2014 to 2017 resulted in a fiscal balance and significant improvement in macroeconomic indicators. Following an average fiscal deficit of around 5% of GDP in the period 2010–2015, Serbia achieved an almost balanced fiscal outcome between 2016 and 2019, with an average surplus of 0.1% of GDP. At the same time, alongside accelerated economic growth (an average growth rate of 3.6%, compared with 0.9% in 2010–2015), the share of public debt in GDP was significantly reduced – from around 70% in 2015 to 51.9% in 2019.

Fiscal discipline was maintained in the subsequent period, with the exception of the pandemic years 2020 and 2021, so that the fiscal deficit up to 2025 did not deviate significantly from the Maastricht criterion, while the share of public debt in GDP continued to decline, reaching 43.4% in November 2025. In parallel, foreign trade imbalances also narrowed, with the current account deficit falling from almost 11% of GDP in 2012 to below 3% of GDP in 2016, partly aided by the depreciation of the dinar exchange rate. Although external imbalances widened again from 2017 onwards, the current account deficit was fully covered by FDI inflows, which recorded continuous growth since 2012 and reached a record-high level in 2024 (EUR 4.6 bn net, or EUR 5.2 bn gross). These processes marked a **key turning point, whereafter the fundamental characteristics of the factors affecting the FX market**, as well as the role of the exchange rate in the overall macroeconomic framework, changed. Alongside the improvement in macroeconomic indicators and bolstered financial stability, the NBS maintained low and stable inflation during this time (except for the period of the global inflationary shock associated with rising energy prices and the escalation of the Ukraine conflict), largely supported by a relatively stable dinar exchange rate.

Since 2017, the NBS has mostly faced appreciation pressures, i.e. the dinar has been gaining ground against the euro. Over the past nine years, the NBS carried out net FX sales only in 2020 and 2025, while in the other seven years it was a net buyer of FX for dinars. **During these nine years, net FX purchases amounted to EUR 11.3 bn, with the dinar appreciating by 5.3% against the euro (Table 2).**

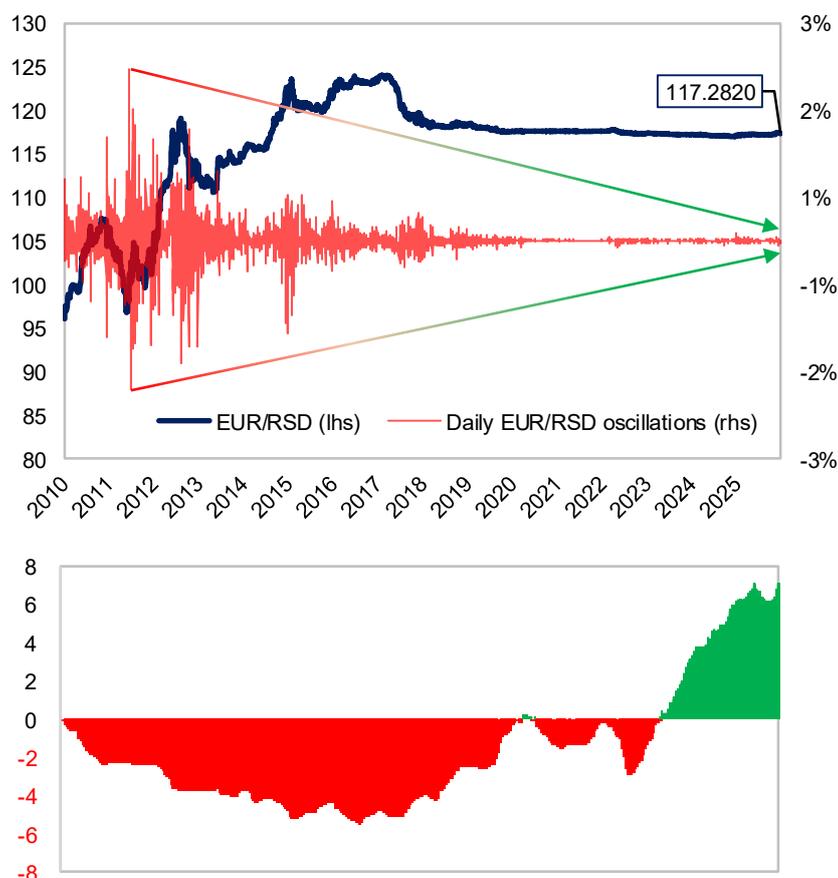
Table 2 Dinar-euro exchange rate, nominal exchange rate changes, and NBS interventions in the period 2017–2025

Year	Exchange rate	Nominal change in the dinar's value against the euro	NBS interventions in the FX market*
2017	118,4727	4.2%	725
2018	118,1946	0.2%	1,580
2019	117,5928	0.5%	2,695
2020	117,5802	0.0%	-1,450
2021	117,5821	0.0%	645
2022	117,3224	0.2%	1,000
2023	117,1737	0.1%	3,940
2024	117,0149	0.1%	2,725
2025	117,2820	-0.2%	-580
Total		5.3%	11,280

* In EUR mn (+ purchase / - sale); net amount.

Source: NBS.

Chart 1 Movements of the dinar-euro exchange rate and daily exchange rate fluctuations (upper panel) and cumulative amount of NBS FX interventions (in EUR bn; lower panel)



Sources: NBS, author's calculations.

An additional argument for clear differentiation between these two periods is the **performance of the dinar exchange rate in terms of volatility**. While the period from 2010 to 2016 was characterised by increased daily volatility and gradual depreciation, from 2017 onwards there has been a marked reduction in short-term fluctuations, alongside persistent appreciation pressures on the dinar (Chart 1). It is important to note that the past five years were marked by three distinct crisis episodes, each having a significant impact on the domestic FX market: the Covid-19 pandemic in 2020, the geopolitical and energy crisis triggered by the Ukraine war in 2022, and, finally, 2025, which was marked by depreciation pressures amid deepened uncertainty regarding the future operations of NIS, following the sanctions imposed on the company by the US administration.

3.1 Factors influencing the dinar exchange rate in 2025

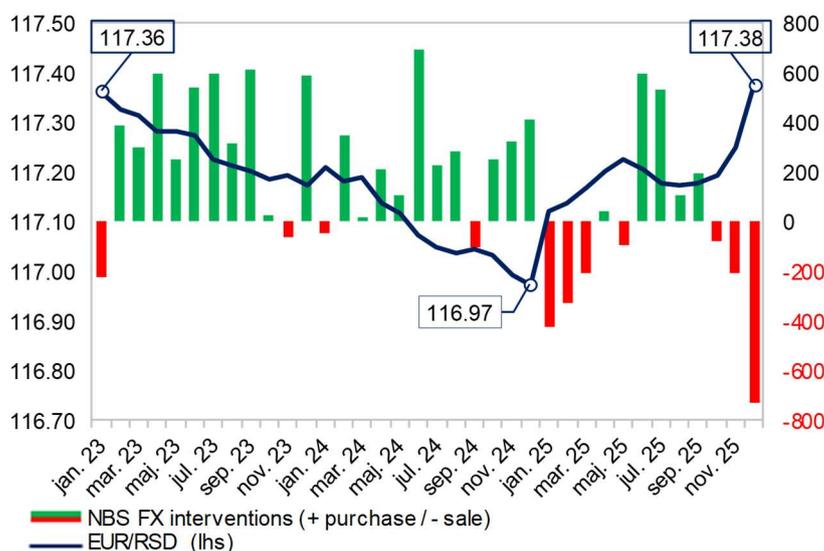
The year 2025 was, in many respects, specific in regard to developments in the domestic FX market, and the factors influencing these developments – largely affecting the **FX demand** side – reached their highest levels in recent years. In 2025, **FX demand exceeded supply by EUR 405 mn**, resulting in the **NBS being a net FX seller for the first time since the pandemic year 2020**, at an annual level of **EUR 580 mn**.

The beginning of 2025 was marked by heightened challenges for the Serbian economy. In January 2025, the US Office of Foreign Assets Control (OFAC) of the Department of the Treasury added NIS to its sanctions list as part of measures targeting the Russian company Gazpromneft and the Russian Federation. The sanctions did not take immediate effect but were postponed several times, until early October 2025, when OFAC declined to extend the licence for NIS operations, resulting in the full application of sanctions on the company due to its majority Russian ownership.

In this environment, 2025 saw a turning point in FX market developments. The new circumstances reversed the trend present since 2017, during which the NBS predominantly purchased FX in the domestic market to prevent excessive strengthening of the dinar. **In 2023 and 2024 alone, the NBS net purchased EUR 6.7 bn**, with the **amounts bought in these two years being the first and second largest ever recorded**. The main drivers of these developments were improved macroeconomic indicators and favourable balance-of-payments trends, particularly record FDI inflows, but also inflows from exports, remittances, and tourism. These factors, combined with the country's increased resilience to shocks, contributed to Serbia receiving an investment-grade credit rating from Standard & Poor's in October 2024, which was also recognised by other rating agencies and international institutions.

Following such developments during 2023 and 2024, **the NBS was a net FX seller in 2025 for the first time since the pandemic year 2020, at EUR 580 mn, while the dinar nominally weakened by 0.2% against the euro**. Regarding the factors affecting the domestic FX market and the dinar exchange rate in 2025, three sub-periods can be identified:

Chart 2 **Movements of the dinar-euro exchange rate and NBS FX interventions in 2023–2025** (monthly average EUR/RSD exchange rate and net amount of NBS interventions for the given month)



Source: NBS.

- **January–May 2025:**

Expected seasonal⁹ depreciation pressures due to increased energy imports were intensified by the **news of the introduction of sanctions on NIS early in the year**, along with additional growth in FX demand to replenish energy stocks. During this period, FX supply from other domestic companies was lower, partly due to a reduced FDI inflow amid the NIS situation, heightened global trade and geopolitical tensions, and weaker investment sentiment because of the domestic socio-political situation in the country. **Elevated FX demand** was also noted from **households** and non-residents (foreign banks and other financial institutions, companies).

All these factors acted in concert, reinforcing depreciation pressures, while the NBS played a more active role in the FX market, intervening with **net sales of EUR 1 bn** during the first five months.

- **June – end-September 2025:**

This period was characterised by **appreciation pressures on the dinar**, although uncertainty regarding the final outcome of the NIS sanctions continued to influence the behaviour of economic agents. Appreciation pressures arose primarily from **stepped-up euro-indexed lending to businesses and households**, aided considerably by subsidised housing loans for young people, as well as greater FX supply from domestic companies, with reduced FX demand from energy-importing companies also playing a role. **By mid-July, in just a month and a half, the NBS offset the net FX sales from the first five months and moved**

⁹ In general, the first and fourth quarters of each year have a seasonal character due to the heating season and the increased FX need for energy imports. The fourth quarter is also characterised by the payment of dividends/profits by foreign-owned banks and companies.

into net purchases. During this four-month period, the NBS net purchased EUR 1.43 bn, including banks' foreign cash from natural persons and authorised exchange dealers.

- **Q4 2025:**

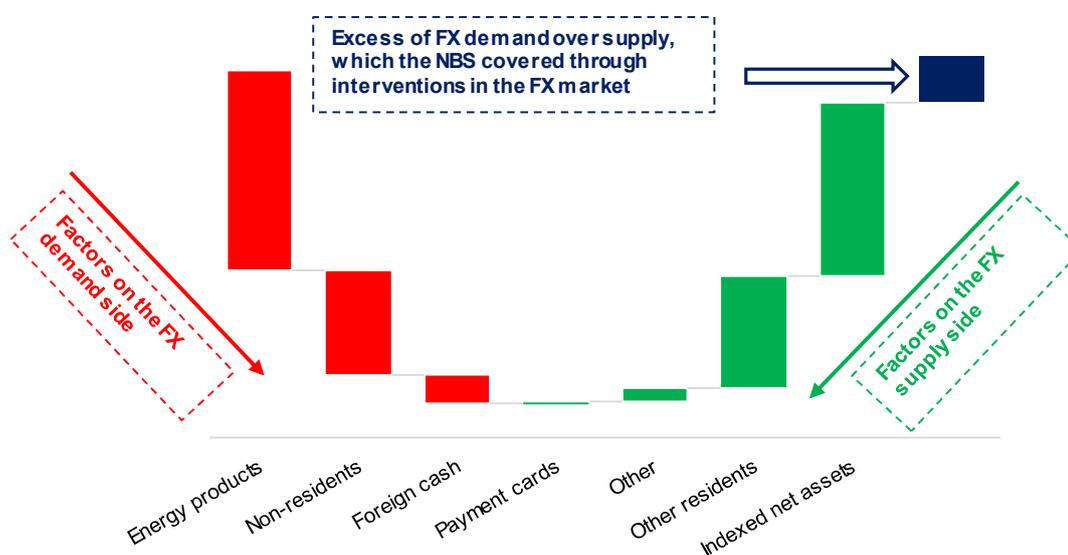
Following OFAC's refusal to extend NIS's licence after 8 October, sanctions formally took effect, triggering a new wave of pressures on the FX market, mainly through the expectations channel and psychological factors, which increased household FX demand. Seasonal factors also contributed – the heating season onset, increased energy imports, and dividend payments by foreign-owned banks and companies. Throughout the last quarter, all market factors, except for continued strong euro-indexed lending to corporates and households, acted on the demand side.

From the last ten days of November, despite NBS assurances and press releases that the NIS situation would not jeopardise financial stability, households purchased FX and foreign cash from banks in large volumes, driven by panic, significantly increasing FX demand in exchange offices and deepening depreciation pressures. **From end-November to year-end, natural persons purchased over EUR 660 mn net. The NBS responded with a combination of market, regulatory, and operational measures and instruments to ensure smooth FX market functioning.** Interventions via FX sales in the interbank FX market, aimed at maintaining relative stability of the dinar exchange rate against the euro, were complemented by measures ensuring smooth functioning of the channel of supplying the market with foreign cash, and other measures aimed at protecting the citizens' interests and safeguarding financial stability: amendments to the regulations defining the conditions and manner of performing exchange operations, which facilitated the supply of foreign cash to authorised exchange offices by banks, and the abolishing of commission for exchange transactions. **During Q4 2025, the NBS intervened** in the FX market with **net sales amounting to EUR 1.01 bn**, thereby returning to a net seller position cumulatively from the start of the year. **From mid-December until the end of the year, as a result of these measures, household demand for FX and foreign cash significantly decreased, gradually returning to normal flows.**

Movements in the FX market in 2025 (Chart 3) were characterised by an imbalance between FX demand and supply factors, with certain traditional sources of supply weakened, while sources of demand were stronger than in previous years. In terms of individual factors affecting the domestic FX market, despite the largest annual growth in indexed bank assets (EUR 2.1 bn) ever recorded – a specific factor on the FX supply side – other key factors generated a depreciation effect, contributing to strong FX demand. For the first time, foreign cash, which banks traditionally net purchase from authorised exchange dealers and natural persons, acted on the side of increased demand in 2025 – banks net sold foreign cash amounting to EUR 356.4 mn. **Residents** (domestic legal and natural persons) were **net FX buyers** (EUR 1,088.7 mn) in 2025, following two years of net FX sales, while **non-residents** (foreign persons) remained **traditionally** on the **FX demand side**, now with net purchases of EUR 1,273 mn – **the highest amount since 2017.**

Among residents, the customary net FX purchase by the largest energy importers (EUR 2,453.2 mn) did not differ significantly from the amount in 2024 (EUR 2,524.1 mn), but the **net FX sale by other residents** (EUR 1,364.8 mn) was **as much as 65% lower (by EUR 2.5 bn) than in 2024.** This was largely due to **strong end-of-year FX demand by natural persons.** For both groups (residents and non-residents), the payout of 2024 profits to foreign owners also contributed to increased FX demand, while non-residents purchasing FX to exit from dinar-denominated bonds or to hedge their dinar investments further added to demand.

Chart 3 Factors determining movements in the domestic FX market in 2025



Source: NBS.

It is important to emphasise that, although 2025 saw pronounced pressures on the dinar exchange rate due to increased household FX and foreign cash demand, these **pressures were not accompanied by deposit withdrawals from the banking system**. On the contrary, during the year there was significant growth in both dinar and FX savings, indicating that the majority of purchased FX and foreign cash remained deposited in banks. This dynamic confirms citizens' preserved confidence in the banking system and suggests that depreciation pressures did not have the character of a systemic crisis, but were primarily driven by factors of uncertainty and expectations and were of a short-term character.

3.2 Similarities and differences compared with 2020 and 2022

Although 2020, 2022, and 2025 were marked by significant pressures on the Serbian FX market, the nature of the shocks that triggered these pressures, as well as the channels through which they spilled over, were different. These differences reflect both changes in the international environment and the gradual evolution of the domestic macroeconomic framework, financial stability, and the behaviour of economic agents. At the same time, certain common features can be observed across all three episodes.

The Covid-19 pandemic in 2020 was a global, symmetrical, and highly exogenous shock, which in a short period led to a sharp decline in economic activity, disruptions in global supply chains, and increased uncertainty in financial markets. Investor behaviour was dominated by a "flight to safety" phenomenon, resulting in heightened depreciation pressures on the currencies of emerging economies, including the dinar. By contrast, the 2022 crisis episode, triggered by the war in Ukraine, had a pronounced geopolitical and energy-related character. This shock was not symmetrical at a global level but disproportionately affected central and eastern European countries more, including Serbia, due to their energy dependence and geographical proximity to the conflict. The transmission channels included rising energy prices, accelerating inflation, and a significant increase in uncertainty, which in the first months after the outbreak of the war led to marked depreciation pressures and panic behaviour among the population – similar to the behaviour observed in Serbia in late 2025. Unlike the

previous two episodes, events in 2025 were primarily specific to the domestic economy and related to heightened uncertainty regarding the future operations of NIS following the imposition of sanctions. Depreciation pressures in this period mainly arose through the channel of expectations and the behaviour of residents, particularly households. A common feature across all three years was panic behaviour of citizens, driven primarily by psychological factors, which led to increased FX demand.

After the outbreak of the war in Ukraine at end-February 2022, household demand for foreign cash reached a historic monthly peak, generating extremely strong short-term pressure on both the FX and exchange markets. At certain points, temporary shortages of foreign cash occurred in exchange offices, primarily due to logistical constraints in supply, including the geographic dispersion of bank and exchange office branch networks and the complexity of importing cash from abroad. The NBS responded promptly and decisively, enabling banks to convert FX holdings into foreign cash under more favourable conditions, while clearly communicating that both FX liquidity and the level of FX reserves were more than adequate.

By contrast, although there was also increased household FX demand at the end of 2025, the intensity of pressures was significantly lower. However, in the initial phase of this period, the channel of supply to exchange offices was not fully operational, so for a brief period in December, some authorised exchange offices faced difficulties in obtaining foreign cash. These challenges were quickly resolved through amendments to regulations by which the NBS further facilitated the supply to exchange offices by banks, while also abolishing fees for exchange operations – all aimed at protecting the interests of citizens. Furthermore, **unlike in 2022, when deposit outflows from the banking sector were observed in the first months of the crisis, at the end of 2025 there were no deposit withdrawals** (overall household savings increased), indicating a **higher level of confidence in the banking system**.

Despite these pressures, the dinar exchange rate against the euro remained relatively unchanged across all three years, indicating the **effectiveness of NBS interventions in the FX market**. A particularly indicative example is from 2022, when, despite strong depreciation pressures in the first months following the outbreak of the war in Ukraine and net sales of EUR 2.3 bn during the first four months of 2022, the second half of the year saw a shift towards appreciation pressures and a gradual return to normal market flows. In this way, the NBS offset the FX sold during the first four months of the year, ending the year 2022 as a net FX buyer of EUR 1 bn.

4 Conclusion

An analysis of developments in the Serbian FX market over the past fifteen years points to a significant change in the nature of pressures on the dinar exchange rate, as well as an evolution of the NBS's role in maintaining macroeconomic and financial stability. While the period up to 2016 was marked by structural imbalances, pronounced depreciation pressures, and the role of the NBS as a net FX seller, after 2017 a more stable macroeconomic framework was established, bringing a shift in the impact of factors on the FX market. Improvements in the fiscal position, a reduction in public debt, economic growth, and continuous FDI inflows enabled the emergence of more durable appreciation pressures on the dinar, with NBS generally acting as a net FX buyer, preventing excessive strengthening of the dinar while accumulating FX reserves. At the same time, the reduction in short-term exchange rate volatility contributed to the stabilisation of inflation expectations and thereby strengthened the credibility of monetary policy.

The crisis episodes in 2020, 2022, and 2025 represented an important test of the resilience of this system. While 2020 and 2022 were predominantly under the sway of by global and regional factors – the pandemic and the geopolitical-energy crisis – the depreciation pressures in 2025 were primarily the result of specific domestic uncertainty and the influence of the expectations channel. A common feature across all three crisis episodes was heightened, partly panic-driven, behaviour of households and increased FX demand. However, 2025 stands out for the intensity of this behaviour, reflected in the fact that, for the first time since comparable data exist, banks were net sellers of foreign cash on an annual basis. At the same time, the absence of deposit withdrawals and the growth of total (dinar and FX) savings indicate that these pressures did not have the character of a systemic crisis, but were predominantly driven by uncertainty and psychological factors. It is particularly noteworthy that, despite these pressures, the dinar exchange rate against the euro remained relatively stable throughout all three crisis periods. This fact highlights the effectiveness of the NBS FX interventions and their role in cushioning short-term shocks.

Developments during 2025, which posed challenges to the domestic economy due to simultaneous pressures from the international environment and internal factors, clearly demonstrated both the resilience of the domestic FX market and the effectiveness of economic policy conduct amid heightened uncertainty. Thanks to timely and well-calibrated interventions in the FX market, as well as a combination of regulatory and operational measures, the NBS succeeded in preserving the relative stability of the dinar exchange rate against the euro and mitigating pronounced depreciation pressures. This once again confirmed the importance of the exchange rate as a key pillar of financial stability under conditions of increased uncertainty, and, by extension, its significance for overall macroeconomic stability and economic growth. NBS FX interventions have proven to be an effective and flexible instrument within the inflation-targeting regime, whose role lies in mitigating excessive short-term volatility and preserving financial stability, rather than in maintaining a specific level of the exchange rate.

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WORKING PAPER

COMPARING NET PROFIT IN FINANCIAL ACCOUNTING WITH THE GOVERNMENT FINANCE STATISTICS RESULTS FOR THE ASSOCIATED ITEM: “A FICTIOUS COMPANY CASE STUDY”

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Comparing Net Profit in Financial Accounting with the Government Finance Statistics Results for the Associated Item: “A Fictitious Company Case Study”

Tomo Vujović

Abstract: This paper explores both the conceptual and quantitative differences between financial accounting outcomes and macroeconomic accounting indicators, using a hypothetical newly established public non-financial company as an illustrative case. In particular, it compares the financial accounting measure of performance, net profit, with its counterpart in the Government Finance Statistics (GFS) framework, namely net lending/borrowing (NLB), along with the associated balancing item, financing. The GFS framework is closely related to the national accounts’ framework (NA).

The analysis is based on a simplified accounting model of a newly established enterprise, represented by eleven journal entries, which provides the analytical foundation for the economic interpretation presented in the paper. The study systematically demonstrates the reasons for discrepancies between financial accounting results and the corresponding measures reported in the Government Finance Statistics, highlighting differences in conceptual scope, valuation principles, and recording conventions. Also, the paper provides some additional perspectives for improving the new financial reporting system on the national level under the new IFRS 18, starting from 2027.

Key words: financial accounting – FA, trial balance, accounting equation, net profit, net lending/borrowing – NLB, national accounts – NA, government finance statistics – GFS, financing.

[JEL Code]: M41, E01, G30

Non-Technical Summary

This paper explains why a company's net profit reported in its financial statements may differ from its net lending/borrowing as recorded in government finance statistics (GFS) and national accounts (NA), even when both measures are derived from the same underlying economic activity. The concept is particularly relevant in relation to GFS from the aspect of the paper. Using a simplified example of a fictitious company, the paper illustrates that these two indicators serve particular analytical purposes.

Net profit measures a company's accounting profitability and reflects its performance from a financial reporting perspective. In contrast, net lending/borrowing captures the company's position vis-à-vis the rest of the economy, indicating whether it is a net provider of financial resources to other sectors or a net recipient of financing from them.

Comparing net profit with net lending or borrowing can be particularly relevant in certain institutional contexts. For statistical purposes, some public non-financial corporations are classified within the general government sector. In such cases, their net lending/borrowing contributes directly to the overall financial balance of the general government. At the same time, these corporations report their net profit through financial statements submitted to the Business Registers Agency, thereby influencing aggregate corporate profitability statistics.

The primary objective of this comparison is to clarify the sources of divergence between these two financial measures. The most significant difference arises from the treatment of fixed assets. Further differences result from the treatment of dividends, provisions, foreign exchange gains and losses, and some other types of transactions, calculations and recordings. These items may be recognized and recorded differently in financial accounting compared with government finance statistics and national accounts, leading to additional discrepancies between net profit and net lending or borrowing.

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1 Introduction

The paper is written¹ from an economic perspective, with a focus on the financial accounting framework, as well as financial reporting standards under IPSAS² and especially IFRS. In parallel, it examines the statistical framework used in government finance statistics (GFS) and national accounts (NA).

This paper clarifies the distinction between calculating the financial result in financial accounting, specifically net profit, a concept widely recognized by economists, and deriving a related measure in government finance and national accounts statistics: net lending/borrowing and its corresponding balancing item, financing, at the level of a single corporation. In addition, it offers perspectives on optional, but potentially valuable, enhancements to the national financial reporting framework in light of the forthcoming IFRS 18 reporting standard, which becomes effective in 2027. The potential adoption of these enhancements could provide more useful information for economic analysis and research, while also facilitating the work of statisticians by enabling more effective use of financial reporting data for producing high-quality statistics consistent with international statistical standards.

According to available sources, various statistical manuals, particularly the United Nations System of National Accounts (SNA) manual, as well as guides and handbooks used by national statistical offices, explain how business accounting data prepared under IFRS can serve as input for national accounts compilation, and what types of adjustments or "bridge tables" statisticians have to apply to translate such data into SNA or ESA aggregates.

In Serbia, according to the author's knowledge, this paper represents the first attempt to connect financial accounting with the GFS/NA framework and to provide an accessible and popular explanation of the key conceptual differences between these systems, using a simple and easily understandable approach. It includes basic financial accounting tools, such as the trial balance and the accounting equation, and employs straightforward calculations from the perspective of government finance statistics and national accounts.

In many countries, certain public non-financial corporations, such as road and railway companies, as well as other corporations that benefit from government guarantees and other government supportive measures, are classified within the general government sector for statistical purposes because they do not operate on a market basis. For these entities, it is both relevant and informative to compare financial results prepared under financial accounting standards with those derived from the government finance statistics (GFS) framework closely aligned with the national accounts framework (SNA 2008/2025 and ESA 2010/2025).

Such a comparison illustrates how financial outcomes can differ across the two reporting frameworks. This is particularly important because these corporations affect aggregate statistics in two ways: their net lending/borrowing contributes directly to the overall financial balance of the general government sector, while their net profit is included in corporate sector statistics through financial statements submitted to the Business Registers Agency.

¹ This paper is primarily methodological in nature and does not contain direct quotes from the literature list. It focuses on the topic stated in the title and provides clarifications, including additional perspectives on the possible improvement of the financial reporting framework on the national level under the new IFRS 18, effective from 2027. The literature listed, along with numerous other sources not included in the list, has informed the author's understanding of key financial accounting concepts and frameworks in finance and economics.

² IPSAS represents the acronym for International Public Sector Accounting Standards.

Essentially, net profit and net lending/borrowing represent two different approaches to assessing financial outcomes, each reflecting distinct perspectives and analytical frameworks.³

To illustrate these two measures of economic performance, the author presents a very simple example of a fictitious public non-financial company (accrual method applied). The example consists of eleven basic journal entries and intentionally excludes complicating elements such as VAT input/output, i.e. taxation, dividend declaring, adjustments for payables and receivables, accrued interest, closing temporary accounts at year-end, and other similar expected items. It begins with the company's establishment and follows its operations through year T, aiming to simplify the discussion and highlight the core principles.

In the government finance statistics framework, net lending or borrowing indicates whether a company is a net provider or user of financial resources over a given period, reflecting the difference between its savings and investments. Financing refers to the actual financial instruments, such as loans, equity, or securities, used to allocate surpluses or cover deficits. Net profit is a measure of accounting profitability, but net lending/borrowing shows how well the company is able to fund investments or meet financial obligations. A company can report profits and yet be a net borrower or incur losses while remaining a net lender, depending on capital expenditures, dividends, and other financial flows. Together, these measures provide a comprehensive view of both the financial and economic performance of the company.

2 Financial accounting perspective

From a financial accounting perspective, two types of consistency checks are demonstrated before calculating net profit, based on all journal entries presented in Box 1 at the end of the text.

First, vertical consistency is verified through the Trial Balance (Table 1), which ensures that the total of all debit accounts equals the total of all credit accounts, confirming internal consistency in the accounting records.

Second, horizontal consistency is validated using the Accounting Equation (Table 2), which confirms that total assets are equal to total liability plus equity (*comprising capital contributions plus net profit*).

The example is deliberately kept simple and does not include complex accounting operations or detailed transaction recordings. This approach allows the analysis to focus clearly on the conceptual differences between the two financial outcomes rather than on technical accounting complexity.

The calculation of net profit is shown in Table 3, which presents a simplified version of the P&L statement, adapted for the purposes of this paper. The resulting net profit is 5.

³ Economic aggregates derived from the frameworks of National Accounts (NA) or Government Finance Statistics (GFS), the concept closely related to NA, are primarily calculated for the entire economy and the government sector, respectively. These aggregates are also produced at the sector level, including sectors such as corporate, banking, central or local government, etc. Also, similar aggregates can be computed for individual entities, such as a specific corporation.

Table 1 **Trial balance for the year T** (amounts are in EUR)

TRIAL BALANCE YEAR T		
	DEBIT	CREDIT
EQUIPMENT	180	
INVENTORY	50	
CASH	1000	
A/RECEIVABLE	50	
LOAN RECEIVABLE	75	
LOAN PAYABLE		200
A/PAYABLE		100
WAGES PAYABLE		50
EQUITY		1000
SALES REVENUE		130
COST OF GOODS SOLD	50	
WAGES EXPENSE	50	
DEPRECIATION EXPENSE	20	
FOREIGN EXCHANGE GAIN/LOSS	5	
	1480	1480

Table 2 **Accounting equation for the year T** (amounts are in EUR)

ACCOUNTING EQUATION YEAR T			
ASSET	=	LIABILITY +	EQUITY
1355		350	1005

Table 3 **P&L Statement for the year T** (amounts are in EUR)

P&L STATEMENT YEAR T		
1	SALES REVENUE	130
2	COST OF GOODS SOLD	50
3=(1-2)	GROSS PROFIT	80
4	WAGES EXPENSE	50
5	DEPRECIATION EXPENSE	20
6	FOREIGN EXCHANGE GAIN/LOSS	5
7=(3-4-5-6)	NET PROFIT	5

Finally, all journal entries from Box 1 are summarized in the Trial Balance, Accounting Equation and P&L Statement, making it unnecessary to present the data separately in balance sheet format for this type of analysis.

Summarizing the aforementioned, from the theoretical point of view and perspective of financial reporting analysis and the design of the double-entry accounting system, two forms of consistency are essential: vertical and horizontal consistency.

Vertical consistency applies within a single accounting period and is verified through the trial balance, where total debits must equal total credits. Accounts with normal debit balances include dividends, expenses and assets, while accounts with normal credit balances include liabilities, equity, and revenues (*DEALER is a most used acronym for all accounts in asset and liability according to the order given in the previous part of the sentence*). The equality of debits and credits ensures that all transactions have been recorded completely and accurately before financial statements are prepared.

Horizontal consistency applies across multiple accounting periods and ensures that the same accounting methods and policies are applied from year to year. This form of consistency is grounded in the perpetual accounting equation, $Assets = Liabilities + Equity$, which must remain in balance at all times. Since every transaction affects both sides of this equation, financial information remains internally coherent, comparable across time, and suitable for trend analysis.

Together, vertical and horizontal consistency support the reliability and analytical usefulness of financial reporting: vertical consistency ensures internal accuracy within the current period, while horizontal consistency maintains continuity and comparability across periods.

3 Government finance statistics perspective

From the perspective of government finance statistics, the calculation of financial results and the presentation of tables are structured differently to make the outcomes easier to interpret. From this viewpoint, two distinct results are calculated.

First, net lending/borrowing can be calculated using the GFS framework. It's computed as **Sales revenue – (Cost of goods sold + Wages expense + Depreciation expense) – Net acquisition of non-financial assets** yielding a result of -220 as calculated from the following numbers presented in Table 4 (130-120-230). The number of 120 is equal to Cogs + Wages Expenses + Depreciation Expenses (50+50+20), while the number of 230, the net acquisition of a non-financial asset, is equal to the stock from the Equipment T account + stock from the Inventory T account, i.e. 180+50, presented in Table 1.

Also, a non-real but some kind of very rough proxy formula is acceptable only under the strict simplifying assumptions just for illustrative purposes in this paper. For the simple example that is given in the paper for calculating the financial result from the national account's perspective, the outcome may be: **Net profit + Non-cash expenses⁴ – Gross acquisition of fixed asset – Inventory change** (5+25-200-50 = -220). In this formula for the calculation, items of financial assets and liabilities which are shown below the line are not considered. They are taken into account in the calculation of financing in the next paragraph.

Second, financing, which appears below the line,⁵ represents the difference between **net transactions in financial assets and financial liabilities**. This is indicated in Table 5 Assets (1000 + 80 + 50=1130) - Liabilities (200 + 100 + 50 + 1000=1350) = -220

The results of both calculations are presented in Table 4, while Table 5 serves as a supportive table to aid in the visualization of the concept, which is helpful and, in practice, unavoidable.

⁴ Even if we take 20 instead of 25 and release the remaining 5, which represents a loss due to foreign exchange rate fluctuations, the total is -225. This is very close to -220 and does not change the overall context significantly.

⁵ Below the line is an expression which represents all the calculations of balance sheet items between two periods. It does not affect the P&L statement.

Table 4 **NLB and Financing calculation for the year T** (amounts are in EUR)

1	REVENUES	130
2	EXPENSIES	120
3 (1-2)	NET OPERATING BALANCE	10
4	NET ACQUISITION OF NON-FINANCIAL ASSETS	230
5 (3-4)	NET LENDING BORROWING GFS PERSPECTIVE	-220
1	NET PROFIT	5
2	NON-CASH EXPENSE	25
3	ACQUISITION OF EQUIPMENT GROSS	200
4	INVENTORY CHANGE	50
5(1+2-3-4)	PROXY FORMULA FOR NET LENDING BORROWING NA PERSP.	-220
1	NET FINANCIAL TRANSACTIONS IN ASSET	1130
2	NET FINANCIAL TRANSACTIONS IN LIABILITY	1350
3(1-2)	FINANCING	-220

The results from both calculations should match because they represent the same underlying balance viewed from two different but complementary angles. This equivalence is easy to demonstrate in a simple, hypothetical example. However, demonstrating it becomes much more challenging when working with detailed company data or with aggregated data covering many real-world entities. For example, the set of public non-financial corporations classified in the general government sector for statistical purposes.

Table 5 presents a simplified form of the balance sheet to facilitate the visualization of the financial result “below the line,” calculated as net transactions in financial assets minus net transactions in liabilities. The table begins with beginning stocks, which are zero for all items since the company is assumed to start from scratch. Next, net transactions, revaluations, and other changes in volume (*such as unilateral write-offs or reclassification*) are recorded based on journal entries.⁶ In this example, we did not calculate other changes in volume through an example.

Under the fixed assets row, the value of 230 (calculated as $200 + 100 - 50 - 20$) is given, representing net acquisitions of fixed assets. If we adjust the number 230 by adding depreciation expense and excluding inventory stock from the calculation, we obtain 200 (calculated as $230 + 20 - 50$), which represents a rational estimation of the Gross Fixed Capital Formation (GFCF) aggregate for the company in this paper.

Gross Fixed Capital Formation is the most important component of the investment (I) part of GDP. Formally: $I = GFCF + \text{Change in Inventories} + \text{Acquisition less disposal of valuables}$. Among these, Gross Fixed Capital Formation is usually the largest and most economically significant component of Investment in most economies. It reflects spending on durable assets that contribute to future production.

⁶ Net transactions, revaluation, and other changes in volume items all together make the flow between the beginning and ending stock position. The flow is equal to Net Transaction (*Increase – decrease transactions*) + Reevaluation + other changes in volume, i.e. OCV. Revaluation primarily relates to foreign exchange gains or losses arising from exchange-rate differences on foreign-currency-denominated financial assets and liabilities.

Table 5 **Beginning and ending balance sheet position for starting and year T with flow between them**
(amounts are in EUR)

Description Asset/Liability	Stock T-1	Net transactions	Revaluation	OCV	Stock T
	1	2	3	4	5(1+2+3+4)
FIXED ASSET	0	230	0	0	230
CASH	0	1000	0	0	1000
LOAN RECEIVABLE	0	80	-5	0	75
ACCOUNTS RECEIVABLE	0	50	0	0	50
TOTAL ASSET	0	1360	-5	0	1355
LOAN PAYABLE	0	200	0	0	200
ACCOUNTS PAYABLE	0	100	0	0	100
WAGES PAYABLE	0	50	0	0	50
EQUITY	0	1000	0	0	1000
RETAINED EARNINGS	0	5	0	0	5
LIABILITY+EQUITY	0	1355	0	0	1355

4 Review - possible improvements under the new IFRS 18 standard on the national level

When it comes to the new possible concept of improving the P&L statement, the author takes into account the new P&L scheme starting from 2027. Beginning in 2027, the introduction of IFRS 18 provides a significant opportunity to improve the national financial reporting system, still respecting the new structure of the P&L statement that is presented within the aforementioned standard.

For example, the potential application of the residency concept, where and if feasible, within the new profit-and-loss structure would enable companies to more clearly identify their export and import-related activities. Based on the above, at least two potential and useful positions could be derived:

1) Net Export/Import Position from Sales

This can be calculated as: Revenue from Sales to Non-residents – Cost of Goods Sold related to Imports.

2) Broader Net Export/Import Position

A more comprehensive measure includes additional foreign-related operating expenses. It can be calculated as: revenue from sales to non-residents, minus cost of goods sold related to imports and other non-resident operating expenses, excluding investing and financing expenses. Together, these measures provide a more transparent view of how an individual firm contributes to the external sector of the economy.

In addition to the two suggested measures, the total revenues and expenses for residents and non-residents, including revenues and expenses from other categories of the new P&L statement can also be calculated. This allows us, at the level of a single corporation, to distinguish between the portions of revenue and expenses attributable to residents versus non-residents.⁷

⁷ When it comes to the new possible concept of improving the P&L statement, the author takes into account the new P&L scheme starting from 2027.

By splitting revenues and expenses by residency in the new 2027 P&L statement, it will be possible to clearly determine each non-financial corporation's net export or import position from sales and broader net export or import position on an accrual basis, fully aligned with the new IFRS standards. This could be particularly important for the macroeconomic indicator GDP, because it provides an additional and a very interesting perspective for tracking this component of the indicator.

Since exports minus imports are a one of a key component of the GDP equation ($GDP = C + I + G + (X - M)$)⁸, an enhanced P&L statement structured in this way could become a more useful source of information for macroeconomic analysis than is currently the case.

If we take into account that the Business Registers Agency on the national level provides free or partly free publicly aggregated data from the financial reports of non-financial corporations, the value of the residency concept applied in the new P&L statement could just be a great benefit for the Ministry of Economy, Ministry of Finance, National Bank, Statistical Office, economic institutes, economists and different state or private associations related to economic affairs for different kinds of economic analyses and research.

It is important to note that the above-mentioned net export/import positions can be calculated under IAS and the new IFRS 2027 accounting standards. The author does not generally assess the degree of correspondence between these accounting-based measures and the Balance of Payments framework outlined in the IMF's Balance of Payments and International Investment Position Manual, sixth edition (BPM6) or seventh edition (BPM7), where applicable. Consequently, the accounting figures may not fully align with official Balance of Payments classifications. However, the overall trends are expected to be very similar. In fact, if the residency criterion is applied consistently, the correlation between the values derived from this P&L statement and the corresponding Balance of Payments figures for the same sample of corporations should be close to 1.

Also, it is very relevant to emphasize that under the new IFRS 18 framework, there is a clear need to improve the presentation of the balance sheet in the financial reporting framework. Some of the key aspects may include:

- where feasible and possible, precisely categorize each balance-sheet entry within the financial assets and liabilities segment into distinct financial instruments, such as loans, deposits, securities, shares and other equity, accounts payable or receivable, accrued revenues or expenses, advance payments or receipts, following the National Accounts methodology (ESA2010/2025) for financial instruments categorization. While most items are readily identifiable, there remains scope for improvement in certain areas, particularly where balance sheet items are grouped under broad labels such as "Other something."

These categories often combine multiple heterogeneous components, making it difficult to determine their precise nature without consulting the Notes. In some cases, even the Notes provide limited clarification. Notes are a very important part of the financial statement report package, very informative and transparent with a lot of useful designated information and descriptions. The only so-to-say obstacle is that it has to be looked at one by one, as there is no possibility for any kind of aggregation for a group of companies in certain aspects or context, whatsoever.

⁸ In the GDP equation, C represents the Consumption, personal consumption expenditure, I – Investment, Gross private domestic Investment, G – Government spending and (X – M) – Export minus Import.

Generally speaking, if it is possible, efforts should be invested in the direction that core financial statements should contain a disaggregated set of information and release the Statistical Annex, for example, as much as possible, feasible and reasonable.⁹ Of course, in that case, the maximum of rational treatment has to be implemented;

- thoughtfully applying residency principles to correctly classify accrued revenues and expenses, accounts receivable/payable, advances given and received, loans receivable or payable, securities receivable or payable, and other financial instruments respectively;

- improving transparency by disclosing detailed information, such as accrued but not paid interest on securities and loans, separately on the balance sheet, especially in the liability section. This interest may also be segmented by residency. By including this interest in the balance sheet as a separate position, the calculation of the whole amount of debt, not just principal debt, which is dominant, of course, could be done easily and directly from the company balance sheet.

Just one simple example for the illustration.¹⁰ Let us assume that a corporation issues a bond on 1 February with a principal amount of EUR 1,000 million at par, a coupon rate of 5%, and annual coupon payments are settled. Over the 12 months, the bond generates EUR 50 million in interest ($5\% \times 1,000$ million). For eleven months until the end of the year, the accrued but unpaid interest amounts to $(EUR\ 50\ \text{million} \div 12) \times 11 = EUR\ 45.83$ million. This amount represents interest that has been accrued but not yet paid. Under the new, potentially improved IFRS 18 on the national level, the visible amount presented as debt at year-end would be 1,000 million in principal, but also EUR 45.83 million of accrued interest would be visible as a separate item, resulting in a total carrying amount of EUR 1,045.83 million. This reflects the full obligation of the issuer. Whenever debt exists, there is almost always accrued but not paid interest, which is a balance sheet item; the only question is the magnitude of that amount at a given reporting date.

In conclusion, the residency concept should be applied uniformly across the balance sheet, P&L statement, and cash flow statement to ensure consistency.

One of the author's indirect intentions in this chapter is to give a perspective that information extracted from core financial statements under the new IFRS 18 potentially improved frameworks, such as the balance sheet, the profit and loss statement, and the cash flow statement, should, as much as possible, enable comparability with other data sources within the same dataset. For example, deposits receivable reported as assets by corporations should be reconcilable with bank deposits payable reported as liabilities on the banking side, allowing corresponding amounts to be identified within the financial reporting framework. A similar approach applies to securities and loans, where cross-checks are both logical and expected to the extent possible.

Also, at the EU level, the CCR (Central Credits Registry) project has been introduced across all member states. It represents a highly informative and useful initiative that provides detailed information on loans granted by the banking sector, particularly to non-financial corporations. This data may support reconciliation processes between different reporting frameworks. For instance,

⁹ The Statistical Annex is not part of the external audit procedure, and removing certain figures from the basic financial statements and putting in Annex may compromise data quality and reliability, which are critical for both financial reporting and national accounting frameworks.

¹⁰ It is common for large corporations all over the world, especially in high-profit sectors like telecommunications, transportation & infrastructure, energy & utilities and others, to issue significant amounts of corporate bonds. They typically do this to finance their operations and investment projects.

comparing loans payable in the liability section of a corporation's balance sheet with records of the same loans in the CCR database, if these databases exist in a country.

Beyond the core financial statements, supplementary reports such as the Statistical Annex¹¹ play an important role by providing a more detailed breakdown of items contained in the primary financial reports. The Statistical Annex is particularly valuable because it includes additional information on non-financial assets, which constitute a significant category within the balance sheet. It also provides further details on equity structure, dividends, interest expenses, loans receivable and other relevant components that expand upon the disclosures found in the primary statements. Its relevance is expected to increase once IFRS 18 is implemented, as the new disclosure requirements may improve the presentation and treatment of these items.

In addition, the Statistical Annex offers data elements and reporting structures not available in the primary statements, thereby serving as an important bridge between financial reporting and macroeconomic statistical frameworks such as the System of National Accounts (SNA 2008/2025) and the European System of Accounts (ESA 2010/2025). In particular, it can facilitate linkages with the classification of fixed assets, non-financial transactions, and financial instruments within these systems.

To support its role in macroeconomic statistics, the figures disclosed in the Statistical Annex must remain fully consistent with those in the primary financial statements. Such alignment is essential to ensure data reliability, coherence across reporting frameworks, and the accurate integration of financial reporting with national accounts and government finance statistics.

5 Closing remarks

By comparing a company's net profit from financial accounting with its net lending/borrowing from government finance statistics, a concept closely related to national accounts, this paper presents a simple corporate example and finds that the treatment of fixed assets is the main source of differences between the two approaches. In addition to this primary divergence, other methodological differences exist, including the treatment of dividends and provisions, treatment of gains (revenues) or losses (expenses) from foreign currency exchange rate fluctuations as well as several other factors that affect the calculation of financial results from each perspective.

In financial accounting, the purchase of a fixed asset is capitalized and then expensed gradually through depreciation, meaning that the initial purchase has no direct impact on net profit. Government finance statistics and national accounts frameworks operate differently; they treat the acquisition of fixed assets as an expenditure with a direct impact on the net lending/borrowing aggregate.

Under the financial accounting framework, dividends do not affect net profit because they are not considered operational transactions. Conversely, within the government finance statistics (GFS) and national accounts frameworks (NA), dividends do affect the calculation of the financial result, i.e. NLB. Furthermore, while provisions¹² impact net profit in financial accounting, they are excluded

¹¹ In Serbia, the Statistical Annex forms part of the financial reporting package submitted by companies to the Business Registers Agency, together with the Balance Sheet, Income Statement, and other mandatory reports.

¹² Provisions for compensation and other employment benefits, provisions for costs incurred during the warranty period and other long-term provisions and their relating expenses. Expenses are only recorded when an actual economic event takes place.

from financial results under the GFS and NA frameworks. Gains or losses from foreign currency exchange rate fluctuations do not impact financial results under the GFS and NA statistical frameworks because they impact revaluation accounts below the line, which is shown in Table 5, column number 3 in the asset section.

Financial accounting, through its established reporting framework, is primarily designed to support financial analysis, such as ratio analysis and vertical and horizontal assessments of a firm's performance. At the same time, financial reports can also serve as a basis for approximating selected macroeconomic indicators at the individual company level. Such indicators include estimates of Gross Fixed Capital Formation; Net Fixed Capital Formation; approximations of Net Output or Value Added comparable to GDP; potentially a firm's net export / import position and the company's total debt arising from loans and securities payable (principal plus accrued but unpaid interest), along with some other related aggregates.¹³

It is important to point out that major macroeconomic indicators such as GDP, GNI, Gross Fixed Capital Formation, savings rate, the government deficit or surplus, i.e. net lending/borrowing, balance of payments components, and others are all derived from the national accounts, balance of payment and government finance statistics framework. These indicators form the foundation for macroeconomic analysis, policy design, the calculation of the official government surplus or deficit, and forecasting at both national and international levels.

In this context, financial reporting standards, IFRS for the private sector and IPSAS¹⁴ for the public sector, should, as much as possible, be conceptually aligned with national accounts and government finance statistics methodologies, while still acknowledging the inherent methodological differences between these systems. At a deeper level, financial accounting and NA/GFS frameworks should operate as interconnected systems that support a more coherent, consistent and efficient economic analysis in the public interest.

As illustrated in Appendix, closer cooperation among these frameworks would facilitate more resilient macroeconomic and financial reporting. In practical terms, all these standards and statistical frameworks should circulate within the same orbit, allowing information to flow smoothly among them and enabling policymakers, analysts and stakeholders to obtain a more integrated and reliable picture of economic performance.

Financial accounting systems, whether using cash, hybrid,¹⁵ or accrual methods, are important not only at the national and international levels, where their value is well established, but also because they provide the main and most reliable data source for the System of National Accounts (SNA 2008/2025) and the European System of Accounts (ESA 2010/2025). These data are essential for calculating key macroeconomic aggregates. For this reason, it is crucial to understand the logic, scope and limitations of financial accounting and its reporting rules, as this knowledge directly supports

¹³ The aggregates like company net/import position and total amount of debt (principal + accrued but not paid interest) could be calculated only by applying the potential improvements of the new IFRS 18 standard on the national level.

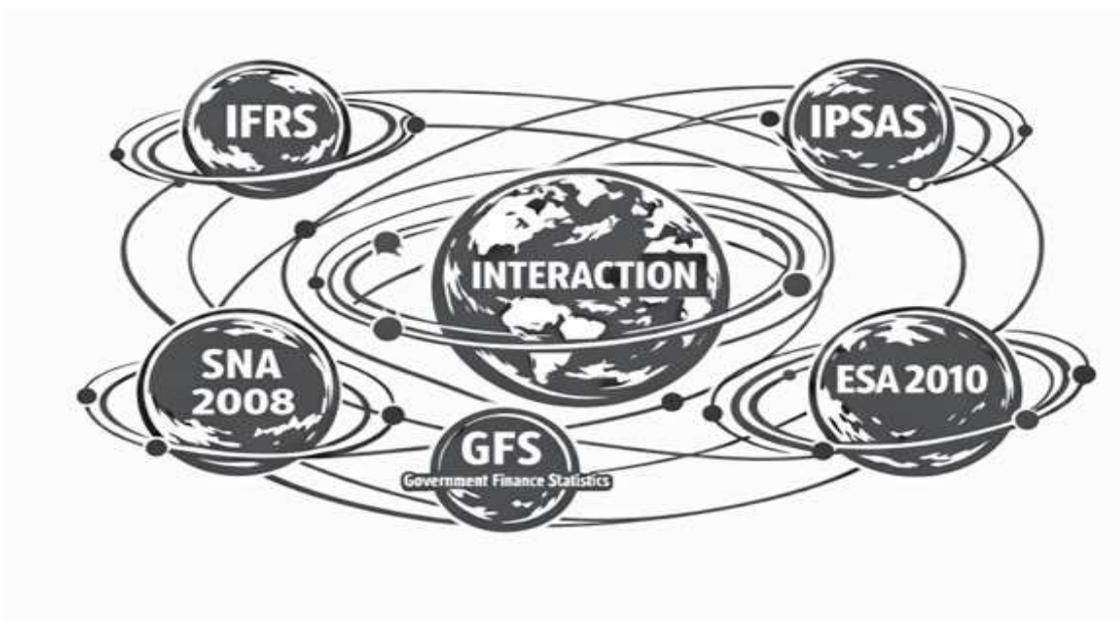
¹⁴ In Serbia, public non-financial corporations report their financial statements under the IFRS standards.

¹⁵ The hybrid method of financial accounting is a very interesting approach situated between the cash and accrual methods of financial accounting. Its key characteristic is that revenues and expenses are recognized when cash changes hands, while still maintaining full tracking of accounts payable and receivable, as well as accrued revenues and expenses, which can be calculated under a certain accounting procedure. It applies in Serbia to government entities and possibly in some other countries in Southeast Europe, but the author does not clarify this for other countries with certainty.

the production of high-quality, trustworthy data for compiling national accounts and government finance statistics and their indicators.

Appendix

The interactive framework FA and NA/GFS - picture



Box 1 - Journal entries with list of T accounts below (amounts are in EUR)

Debit	CASH		Credit	Debit	EQUIPMENT		Credit	Debit	A/RECEIVABLE		Credit	Debit	A/PAYABLE		Credit	Debit	EQUITY		Credit
1)	1000		100 2)	2)	100		20 11)	7)	50					100 8)				1000 1)	
4)	200		100 3)	8)	100														
5)	80		80 6)																
	1000				180				50					100				1000	
Debit	LOAN PAYABLE		Credit	Debit	LOAN RECEIVABLE		Credit	Debit	INVENTORY		Credit	Debit	COGS		Credit	Debit	DEPRECIATION EXPENSE		Credit
			200 4)	6)	80		5 10)	3)	100		50 5)	5)	50			11)	20		
			200				75		50		50		50				20		
Debit	SALES REVENUE		Credit	Debit	WAGES PAYABLE		Credit	Debit	WAGES EXPENSE		Credit	Debit	EXCH. GAIN/LOSS		Credit				
			80 5)				50 9)	9)	50			10)	5						
			50 7)				50		50				5						
			130				50		50				5						

- 1) Capital paid in 1000.
- 2) Purchase of equipment for 100 for cash.
- 3) Purchase of inventory for 100 for cash.
- 4) Take a loan payable for 200.
- 5) Sale of inventory for 80 and recognize the COGS for 50.
- 6) Provide loan receivable (FX currency denominated) for 80.
- 8) Purchase additional equipment for 100 on account.
- 9) Accrual of wages for 50.
- 10) Record the loss from foreign exchange for 5. It's related to loan receivable in foreign currency.
- 11) Recording of depreciation expense for 20.

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