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AN IMPACT OF INFLATION ON THE NEO-KEYNESIAN PHILLIPS CURVE - THE CASE OF THE REPUBLIC OF SERBIA*

ABSTRACT: The Phillips curve has evolved into a systematic instrument that elaborates on macroeconomic analysis, showing the relationship between unemployment and inflation, illustrating the trade-off between achieving full capacity engagement and maintaining price stability. The New Keynesian Phillips curve presumes that expectations of inflation are neither adaptive nor rational, as posited in Lucas's theory. Consequently, a New Keynesian Phillips curve has emerged, distinct from the curve modeled by Phelps and Friedman.

In 2023, inflation in the Republic of Serbia (Serbia) peaked at 16.2% in March, gradually declining to 10.2% by September, aided by reduced pressure from food prices. Projected inflation is expected to decelerate further by the end of 2023 and into the following year, influenced by effects and tighter financing conditions. While some increases in 2023 are evident,

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approximate yearly inflation is expected to be in single digits in 2024, returning within the central bank's target in two years. This paper will present the New Keynesian Phillips curve in the Republic of Serbia (Serbia), as well as macroeconomic predictions for the country.

Keywords: inflation, unemployment, model, Serbia

INTRODUCTION

What the curve created by Phillips offers is an adequate answer to the relationship between unemployment and inflation. Although it was designed in the 1960s, this curve has evolved into a systematic instrument that elaborates on macroeconomic analysis, illustrating the relationship between unemployment and inflation. It demonstrates the trade-off between achieving full capacity engagement and maintaining price stability.

Economists deal with the relationship between individual indicators and engage in comparative research of macroeconomic indicators. The influence of one macroeconomic aggregate is followed by the degradation of the other aggregate. Macro or microeconomically speaking, the two biggest problems of any economy are unemployment and inflation. Their relationship is obviously recognized by the Phillips curve. In 1958, the British economist Alban Phillips, a professor at the London School of Economics, published an article titled "The relationship between unemployment and the rate of change of money wages in the UK, from 1861 to 1957," in the journal *Economica* (Phillips, AW 1958).

The Keynesians of the 1970s couldn't explain stagflation, despite the growth of unemployment becoming a major problem. Based on the Phillips curve and the idea of the change in unemployment and wages, American economists Paul Samuelson and Robert Solow critiqued Keynesian theory and identified a negative trend between price inflation and unemployment through a case study of data from the United States. Modifying the Phillips curve to represent the correlation between price inflation and unemployment, they discovered the same phenomenon as Phillips: that price inflation and unemployment changed in a manner similar to the ratio of wage inflation and unemployment.

Following this case, the enhancement of these curves was continued by the schools of New Keynesians. What overcame the limitations of the previous New Keynesian model is the presumption of a new postulate in the analysis, enhancing the initiation of monopolistic competition, nominal and

real rigidities in prices and wages, as well as the approximation of real developments in the economy.

What the New Keynesian Phillips model presumes is rational, not adaptive, inflation expectations (as withheld in Lucas's theory).

Lucas and Rapping demonstrated through probaton that the Phillips curve was changeable over time. In 2001, Mankiw and Rice stressed that the relationship between output and inflation still remained puzzling for microeconomics, a conclusion echoed by Simionescu in 2017 (Simionescu, 2017).

In recent years, many economists have researched inflation expectations and price tuning. John Taylor, Rotemberg Julio, and Calvo Guillermo are three researchers whose work served as a foundation for the New Keynesian Phillips curve model. Rotemberg highlighted the macroeconomic framework in which the discussion was on the cost scaling down of price changes. Calvo created a model grounded in the price of the company, emphasizing that each firm kept a fixed price while general managers didn't receive the "random signal" of the price change. While forming the new price, the firm considered the fact that the prices of other firms had to change. Taking into account that the other companies' prices were set up in the past, the company conducted an analysis of the previous prices in forming the current price.

Firstly, probaton results which show the modeling of the Phillips curve were reached. However, Richard G. Lipsey was the first to test the Phillips curve empirically, forming the starting equation as a moderate adjustment of variations in the labor market (Palley, T., 2012):

$$w=f(u-u^*) \quad f(0)=0, \quad f'<0, \quad f''<0 \quad (1)$$

w represents nominal inflation wages, u represents the actual unemployment rate, and u^* represents the unemployment rate (friction and structural) that corresponds to full employment (natural rate). Lipsey's econometric model showed that an immoderate demand for labor caused wages inflation, and that a labor supply surplus caused deflation of wages.

The Phillips curve model has been widely used in recent research as it is convenient for the analysis of monetary policy theoretically. In 1995, John Roberts stressed one of the main adjustments to the New Keynesian Phillips curve, emphasizing the significant role of nominal rigidities in the model. Roberts conducted a comparative analysis of Phillips curves over time, concluding that New Keynesian models included expectations of future inflation, while the supply curve created by Lucas included up-to-date assumptions and up-to-date inflation. The New Keynesian model considers

the prediction of inflation related to when prices are “sticky” or rigid. Another model of the Phillips curve was formed on rational predictions of rigid prices and was presented in models by Calvo, Taylor, and other researchers. These models were the ones of the New Keynesian Phillips curve, including the forward-looking current inflation predictions, as Robert stressed:

$$\pi_t = \beta E_t \pi_{t+1} + \gamma x_t \quad (2)$$

Gali and Gertler (Gali, Gertler, 1999) described the inflation process using another approach to assess if the New Keynesian Phillips, specifically focused on the impact of delayed inflation, discussing the new type of the Phillips curve “New Keynesian Phillips curve,” that includes rational expectations. More than 20 years ago, in 2003, Woodford used the Calvo's model of price adjustment, representing that the set of linear optimal price adjustments of individual companies could show not only the current but also the expected future inflation and aggregate marginal cost as well (mc).

Hornstein introduced a component of marginal costs in the New Keynesian model (Hornstein, 2008):

$$\pi_t = \gamma f E_t \pi_{t+1} + \lambda m c_t + \zeta_t \quad (3)$$

This formula shows the structural model of the New Keynesian Phillips curve, in which λ and γf are structural parameters functions, encompassing the probability of price adjustment, while α , ζ_t is a random variable. Random variables are usually interpreted as an exogenous shock to the company. The New Keynesian Phillips curve model is pretty similar to the traditional model of the Phillips curve, but it introduces numerous questions for the optimal impact of monetary policy and the deflation of costs (Rudd, Whelan, 2005).

A hybrid model of the Phillips curve was interpreted by Gali and Gertler (1999):

$$\pi_t = \lambda s_t + \gamma f E_t \{ \pi_{t+1} \} + \gamma b \pi_t \quad (4)$$

According to their model, the New Keynesian Phillips curve could be a suitable instrument for the prediction of the dynamic indication.

Khan, Zhu, predictions of oppressive information of the Phillips curve in the USA were made by in 2006, following the optimal monetary and fiscal policy based on the sticky prices in the research of Schmitt-Grohe Uribe in 2004. This prediction was also made in the theory of real wage rigidity in the New Keynesian model. In 2015, using the 20 years period data from 1983 to 2013, Kumar and Orrenius presented the ratio of prices and wages was not

linear and convex. Furthermore, they concluded that this ratio diminished in the situation when the unemployment rate was below the approximate norm, but an increase in wages caused a change in unemployment more than the historical average. Additionally, they concluded that the short-term unemployment rate is strongly related to the average and median wage growth until the long-term unemployment rate appeared, affecting the median wage growth only. While there are papers analyzing European inflation and employment as well as differences in the non-accelerating inflation rate of unemployment (NAIRU) (Posta, 2015), other authors analyze the sectorial neo-Keynesian curve and the impact on changing of monetary policy (Norkute, 2015). Recent research is focused on the hybrid model and the relationship of inflation and unemployment that affects all business environments (Kliestik, Kocisova, Misankova, 2015; Simionescu, 2016).

The IMF report stresses that the recent past of the Phillips curve has been a mystery. In the last decade, a lot of studies have found out that the curve has flattened in advanced economies (see e.g. Blanchard, 2016; Del Negro et al., 2020), while others have noticed the muted reaction of inflation to large changes in unemployment not only during that period but after the Great Recession as well (Coibion and Gorodnichenko, 2015; Heise et al., 2022). A great number of details for this phenomenon have been proposed in scientific articles in the last three years:

1. the inflation targeting implementation may have increased the monetary policy capacity to neutralize demand shocks (what would move unemployment and inflation in adverse directions), leaving supply shocks (what would move them in the same direction, shifting the curve inwards/outwards) as the main source of aggregate inconstancy (Broadbent, 2020; Bergholt, and others, 2023).
2. larger sharing of inflation expectations may have diminished second-round impacts of relative price shocks (Borio and others, 2021).
3. the responsiveness of inflation to unemployment and domestic economic slack may have been reduced by globalization (Heise and others, 2022), as well as by labor market flexibility raising through redacting in power of labor bargaining (Lombardi and others, 2020).
4. market power that has increased may have enlarged the capacity of firms in absorbing cost-push shocks in their margins (Baqaei, Farhi, and Sangani, 2021). In the observed period, some of the structural trends may be reversed.

A scenario of delocalization may make the gap of domestic output more relevant and encourage some labor discussion power (Goodhart and Pradhan, 2020) regarding digitalization, COVID-19, and Post-COVID-19 practice of online retailing, where prices are usually much more flexible.

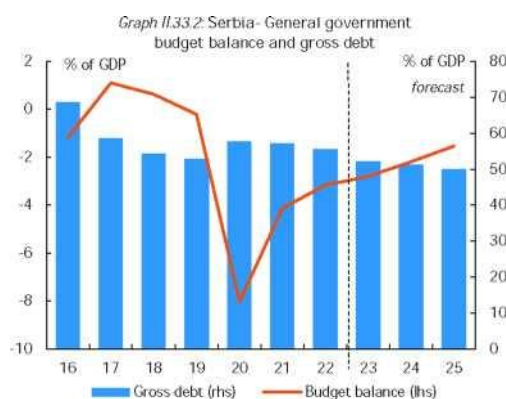
MACROECONOMIC GOALSb- OVERVIEW OF THE REPUBLIC OF SERBIA

The projection of Serbian economic growth remains controlled in 2023 and is expected to pick up in the next two years. This will be affected by lower inflation on real disposable income, set to support private consumption.

Both the debt ratios and the general government deficit are predicted to gradually fall over the next two years, supported by high nominal GDP growth and lower capital utilities for state-owned energy.

The Serbian economy expanded at a moderate pace of 1.3% in the first half of 2023, driven by both net exports and investments, after a substantial deceleration in 2022.

Graph 1.



Source: https://ec.europa.eu/economy_finance/forecasts/2023/autumn/autumn_forecast-2023_rs_en.pdf

In 2023, a growth of 2.2% was expected in Serbia. The projected decrease in inflation's impact on real disposable income fostered private consumption growth until the end of 2023. However, investments and stronger net exports will support moderate growth, although partially diminishing government consumption and investments. All production sectors are set to contribute positively to yearly growth, mostly from agriculture and the construction industry due to base effects from drought periods and lower construction activity in the previous year. Growth in the Serbian economy is expected to reach 3.1% next year and 3.7% in 2025, mostly supported by intensifying private consumption growth and backed up by lower inflation, as well as investment expansion. Since the basic positive effect in 2023, the net exports' contribution to growth is predicted to be neutral in the next two years, supported by increased export performance backed by foreign direct investment in the trade sector. The expansion in the economy is predicted to only gradually access the pre-pandemic rate of somewhat around 4%. As a

sharp decrease was noticed in 2023, mostly due to lower imports of energy, the deficit of the current account is set to be stable in the next two years.

The unemployment rate in Serbia is expected to remain mostly unchanged in 2023, and the estimation for the next two years is a slight decrease in this parameter in the economy due to the predicted economic recovery.

In March 2023, inflation in Serbia was 16.2%, followed by a gradual decrease to 10.2% in September (due to the effect of food prices decrease). It was predicted that inflation would decelerate until the end of 2023 and the next year, partly due to effects and tighter financing conditions. Predictions are that the inflation rate in Serbia will be in single digits in 2024 and returning within the central bank's target level in 2025.

Table 1: Main macroeconomics indicators - forecast for 2024 and 2025

	bn RSD Curr. prices	% GDP	04-19	2020	2021	2022	2023	2024	2025
GDP	7097.6	100.0	3.0	-0.9	7.7	2.5	2.2	3.1	3.7
Private Consumption	4845.8	68.3	25	-1.9	7.8	4.0	0.8	2.9	3.4
Public Consumption	1 148.7	16.2	1.2	2.8	4.1	0.4		-1.1	1.1
Gross fixed capital formation	1714.5	24.2	5.5	-1.9	15.7	1.9	3.5	4.7	4.9
Exports (goods and services)	4531.2	63.8	8.0	-4.2	20.5	16.6	3.3	6.9	7.3
Imports (goods and services)	5309.8	74.8	6.7	-3.6	18.3	16.1	1.1	6.2	6.4
GNI (GDP deflator)	6695.7	94.3	2.7	1.5	6.8	0.7	2.4	2.9	3.4
Contribution to GDP growth:	Domestic demand		3.3	-1.2	9.3	3.1	1.2	3.2	3.7
	Inventories		0.3	0.3	-1.1	0.4	-0.3	-0.1	0.0
	Net exports		0.8	0.0	-0.5	-1.0	1.3	0.0	0.1
Employment			-0.3	-0.2	2.6	2.3	0.3	0.5	0.6
Unemployment rate (a)			17.9	9.7	1 1.0	9.4	9.4	9.0	8.6
Compensation of employees / head									
Unit labour costs whole economy									
Saving rate of households (b)									
GDP deflator			6.2	2.4	5.8	10.4	13.5	5.4	3.9
Consumer price index			6.8	1.6	4.1	11.9	12.7	5.5	3.6
Terms of trade goods				1.0	0.1	-3.7	2.5	0.0	0.0
Trade balance (goods) (c)			-14.2	-11.1	-11.3	-15.5	-11.5	-11.7	-11.8
Current-account balance (c)			-7.2	-4.1	-4.3	-6.9	-3.3	-3.5	-3.3
General government balance (c)			-2.6	-8.0	-4.1	-3.2	-2.8	-2.2	-1.5
Structural budget balance (d)									
General government gross debt (c)			82.1	57.8	57.1	55.6	52.2	51.2	50.1

Source: https://ec.europa.eu/economy_finance/forecasts/2023/autumn/autumn_forecast-2023_rs_en.pdf

CONCLUSION

An adequate management of inflation is considered the primary goal not only of monetary but also of macroeconomic policy. There is an increasing interest in forecasting inflation, which is especially important given that Serbia is on the way to joining the EU, and thus it aims to keep inflation within the allowed limits. The paper presents various causes of changes in the Phillips curve. It is evident that there is no trade-off between unemployment and inflation in Serbia. Macroeconomic policy is aimed at targeting inflation. For decades, we have witnessed the fact that inflation cannot be neutralized but can be kept under control.

Although the New Keynesian Phillips curve links inflation to the output gap and the "cost-push" effect of expected inflation, the model has not proved to be a simple task for reconciling with the data.

REZIME

UTICAJ INFLACIJE NA NEOKEJNZIJANSKU FILIPSOVU KRIVU - SLUČAJ REPUBLIKE SRBIJE

Filipsova kriva je postala sistematski instrument koji razrađuje makroekonomsku analizu koja pokazuje odnose između nezaposlenosti i inflacije, ilustrujući kompromis između postizanja punog angažovanja kapaciteta i održavanja stabilnosti cena.

Nova kejnzijanska Filipsova kriva pretpostavlja da su inflaciona očekivanja racionalna, a ne prilagodljiva, što je zadržano od Lukasove teorije. Kao rezultat toga, postojala je nova kejnzijanska Filipsova kriva koja se razlikovala od Filipsove krive koju su razvili Fridman i Felps.

Dostigavši vrhunac od 16,2% u martu, inflacija je postepeno opala na 10,2% u septembru, a posebno je pomogla smanjenjem pritiska cena hrane. Predviđena inflacija će se dodatno usporavati do kraja 2023. i tokom 2024. godine, na osnovu efekata i strožih uslova finansiranja. Iako je evidentan blagi porast u 2023. godini, očekuje se da će prosečna godišnja inflacija biti jednocifrena u 2024. godini, a da će se 2025. vratiti unutar ciljanog opsega centralne banke.

U ovom radu biće predstavljena Nova kejnzijanska Filipsova kriva u Republici Srbiji, kao i makroekonomska predviđanja u zemlji.

Ključne reči: inflacija, nezaposlenost, model, Srbija

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