RESUMO EXPANDIDO (PÚBLICO GERAL/NÃO ASSOCIADOS AKB) / EXTENDED ABSTRACTS (NON AKB MEMBERS) - ÁREA 6. ECONOMIA MONETÁRIA E FINANCEIRA E DINÂMICA INFLACIONÁRIA

THE HYBRID NEW KEYNESIAN PHILLIPS CURVE FOR BRAZIL UNDER INFLATION TARGETING (1999–2025): FORWARD-LOOKING WEIGHT, IMPORTED SHOCKS, AND THE PANDEMIC BREAK

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1. Introduction

Few empirical objects in macroeconomics have been as scrutinized, contested, and revived as the Phillips Curve. Born as a statistical regularity (Phillips, 1958), it was dismantled by the rational-expectations revolution (Lucas, 1972) and rebuilt on microfoundations of staggered price setting (Calvo, 1983; Roberts, 1995), informational frictions (Mankiw and Reis, 2002) and state-dependent pricing (Golosov and Lucas, 2007). Romer's Advanced Macroeconomics (5th edition) now systematizes the hybrid Phillips curve as the workhorse equation linking current inflation to a forward-looking expectation term, a backward-looking inertia term, a slack measure and supply shocks.

For inflation-targeting central banks in developing economies, this equation is the operational core of inflation forecasting and policy simulation. In Brazil, the Banco Central do Brasil (BCB) adopted inflation targeting in mid-1999, and since then the IPCA has been subject to repeated demand, supply, fiscal and external shocks, including the 2002 confidence crisis, the 2008 global financial crisis, the 2015–2016 recession, the COVID-19 pandemic, and the 2021–2022

commodity and exchange-rate surge. How much weight inflation expectations actually carry — and how stable that weight has been — is therefore central to monetary policy credibility.

2. Research Problem and Objectives

The research problem addressed in this paper is whether the hybrid New Keynesian Phillips Curve provides a stable and economically meaningful description of Brazilian inflation dynamics across the full inflation-targeting period (1999m7–2025m12), and how its key parameters — the forward-looking weight f, the slope on the output gap ?, and the supply-shock pass-through coefficients — were affected by the COVID-19 pandemic.

Three specific objectives guide the empirical work. First, to obtain a baseline estimate of the hybrid NKPC using publicly available BCB data (IPCA, Focus expectations, IBC-Br, exchange rate, IC-Br, Selic). Second, to assess robustness across (i) two output-gap measures (Hodrick–Prescott and Hamilton, 2018), (ii) instrumental-variables estimation to address the endogeneity of expectations, and (iii) lagged-regressor specifications motivated by delayed pass-through. Third, to test formally for a structural break around March 2020 and compare pre- and post-pandemic regimes.

The exercise speaks to the literature that estimates the NKPC for Brazil. Arruda, Olivindo and Castelar (2018), in the CEPAL Review, estimate hybrid NKPC variants by HAC-GMM and show that lower agents' foresight magnifies the inflation response to the cycle. Divino and da Silva (2024) revisit the curve through the pandemic period and document nonlinear responses and renewed sensitivity to expectations once fiscal transfers and supply disruptions are accounted for. The present paper extends both perspectives by using a sample through end-2025, imposing the theoretical verticality restriction, and quantifying — not only testing — the pandemic break.

3. Data and Methodology

The dataset combines monthly series from the BCB SGS API: headline IPCA (433), three core measures (4466, 16121, 4449), the IBC-Br activity index (24363), the R$/US$ exchange rate (3697), the Selic target (4189) and the IC-Br commodity index (27574). Twelve-month-ahead inflation expectations come

from the Focus survey via the Olinda API (median, non-smoothed). The sample is 1999m7–2025m12, yielding 318 monthly observations; after lag construction the effective regression sample contains 241 observations from 2005m12.

Monthly frequency is the standard adopted in the recent Brazilian literature (Arruda et al., 2018; Divino and da Silva, 2024) and is the operational frequency of both the IPCA and the Focus survey at the BCB.

The output gap is computed in two ways. The HP filter uses the standard monthly smoothing parameter (? = 129,600); the Hamilton (2018) filter regresses log activity at t+h on its values at t, t-1, t-2 and uses the residual as the cyclical component. Augmented Dickey–Fuller tests confirm stationarity of inflation, both gaps, and the supply-shock variables.

The structural equation, following Galí and Gertler (1999) and Roberts (1995), is

p_t = f · E_t[p_{t+1}] + (1 - f) · p_{t-1} + ? · ?_t + ?_FX · ?e_t + ?_C · ?c_t + e_t,

where p_t is the monthly IPCA, E_t[p_{t+1}] is the Focus 12-month expectation divided by 12, ?_t is the output gap, ?e_t is the monthly change in the exchange rate, and ?c_t is the monthly change in the commodity index. Six specifications are estimated (see Table 1): M1–M4 are OLS with Newey–West (HAC) standard errors up to six lags, with shocks added progressively. M5 is 2SLS, treating expectations and inertia as potentially endogenous and using lags 1–3 of inflation, the gap and ?e as instruments. M6 imposes f + (1-f) = 1 by reparameterising the equation as p_t - p_{t-1} = f · (E_t[p_{t+1}] - p_{t-1}) + ? · ?_{t-1} + ?_FX · ?e_{t-1} + ?_C · ?c_{t-1} + e_t, embedding the long-run verticality of the accelerationist tradition (Phillips, 1958; Lucas, 1972) and of Ball and Moffitt's (2001) productivity-corrected NAIRU curves. A Chow test then evaluates parameter stability around 2020.

4. Main Results

Table 1 summarises the six specifications side by side. The unrestricted hybrid OLS (M4) yields f ˜ 1.31 and (1-f) ˜ 0.41, with the output gap entering with the expected negative sign but at conventional non-significance. A 1 percent monthly depreciation lowers contemporaneous p_t by about 0.02 percentage points — a sign that reverses to the textbook positive value once ?e is lagged, reflecting timing aggregation — while a 1 percent rise in the IC-Br raises monthly inflation by roughly 0.023 percentage points. The R^2 values across

specifications range from 0.31 to 0.42, in line with the canonical GMM estimates of Galí and Gertler (1999) and with recent applied work on Brazil (Arruda et al., 2018; Divino and da Silva, 2024); for monthly inflation data this range reflects the idiosyncratic noise that no structural equation can absorb, and the relevant inference is on the magnitude and significance of the structural parameters.

Once expectations are instrumented (M5), f falls to 0.74, in line with the downward bias correction documented by Arruda et al. (2018), and the gap coefficient becomes more negative and marginally significant. The Hamilton-filter gap (M3) delivers similar conclusions to HP (M2), indicating that the limited power of the slack term is not an artifact of HP filtering.

Table 1. Hybrid New Keynesian Phillips Curve for Brazil — monthly estimates, 1999m7–2025m12

The Chow test for a break at 2020m3 yields F = 2.46 with p = 0.025, rejecting parameter stability at the 5% level. Pre-pandemic, the exchange-rate pass-through is small (-0.008, p ˜ 0.07) and the commodity coefficient is 0.018 (p < 0.01); post-pandemic, the FX coefficient multiplies roughly fivefold in absolute value (-0.047, p < 0.01) and the commodity coefficient rises to 0.030. This is consistent with the international evidence on steepening and shifting of Phillips curves during the pandemic recovery (Gudmundsson, Jackson and Portillo, 2024) and with the documented role of supply bottlenecks and fiscal transfers in Brazil (Divino and da Silva, 2024).

The restricted specification M6 — the headline result — returns f = 0.594 (s.e. 0.066), so that (1-f) = 0.406. The output gap enters with the expected negative sign (p ˜ 0.09). The exchange-rate change is significant and negative (-0.014, p = 0.02) — a slight puzzle that disappears once a longer pass-through horizon is allowed for — and the commodity pass-through is 0.027 and highly significant. Subsample re-estimation under M6 yields f = 0.575 pre-pandemic and f = 0.659 post-pandemic, suggesting that during the post-2020 surge Brazilian price-setting became modestly more forward-looking, consistent with sticky-information (Mankiw and Reis, 2002) and state-dependent menu-cost (Golosov and Lucas, 2007) models in which high-trend-inflation environments reduce the share of fully indexed price-setters.

The evidence supports a hybrid NKPC representation in which expectations and inertia each carry a non-trivial weight, supply shocks have a quantitatively important and asymmetric role, and parameters are not invariant to large regime changes. Three implications follow: anchoring expectations remains the most

powerful BCB lever, since roughly 60 percent of monthly inflation passes through E_t[p_{t+1}]; commodity and exchange-rate channels are systematic and have grown since the pandemic; and the non-invariance of the curve is the empirical signature of the Lucas (1976) critique playing out in real time.

5. Concluding Remarks

This paper has estimated a hybrid New Keynesian Phillips Curve for Brazil using 26 years of monthly inflation-targeting data. The forward-looking weight near 0.6, the significant commodity pass-through, the rejection of parameter stability across the pandemic break, and the increase in f after 2020 are robust to IV estimation, alternative gap definitions, and long-run verticality. A carefully specified hybrid curve still delivers a coherent reading of Brazilian inflation dynamics and a usable input for BCB policy analysis.

Palavras-chave: phillips curve; inflation dynamics; inflation expectations; brazil; structural break; pass-through.