# Monetary Policy Transmission and Sticky Prices: Microdata Evidence from an Emerging Economy[§]

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**Abstract**

This paper examines heterogeneous price stickiness in the Philippines and its implications to overall inflation dynamics. Using micro-level data from the consumer price index (CPI) and producer price index (PPI), we estimate price stickiness across sectors by calculating the frequency of price changes, implied duration of price spells, and hazard functions. We also assess how heterogeneous price stickiness influences aggregate inflation dynamics and its response to macroeconomic shocks. The research aims to highlight the value of using diverse price stickiness compared to uniform price stickiness in economic models. This research provides a foundation for understanding inflation dynamics and monetary policy transmission in emerging markets like the Philippines, with potential implications for managing external shocks and stabilizing inflation.

*Keywords:* price rigidity, monetary policy, emerging markets

## 1. Introduction and motivation

How does heterogeneity in price stickiness across commodity groups in emerging market economies affect the dynamics and persistence of aggregate inflation, particularly in the context of various macroeconomic shocks? Understanding these dynamics has become increasingly important in light of the recent post-pandemic global economy, where persistent inflation pressures have been driven by both demand and supply shocks. These episodes pose significant challenges to central banks that maintain price stability. Differences in price rigidities between commodities play a key role in shaping how quickly prices respond to monetary policy interventions. Thus, price stickiness is crucial for unraveling inflation dynamics and assessing the effectiveness of monetary policy.

Despite its importance, empirical evidence on price stickiness in emerging market economies remains limited, particularly using different price indices (i.e., consumer price index (CPI) and producer price index (PPI)) and across different heterogeneous characteristics. This proposal presents an in-depth analysis of heterogeneous price stickiness in an emerging market economy. Using the case of the Philippines, this study presents the **first**

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**estimates of CPI-based and PPI-based price stickiness measures for the Philippines**, revealing that, nationally, the median duration of price spells for the Philippines is 3 to 5 months. The study highlights significant heterogeneity in price rigidity across different commodities and regions, with commodity groups like food and non-alcoholic beverages exhibiting considerably less rigidity at 3 to 4 compared to services (3 to 6 months).

We aim to examine the heterogeneous patterns of price stickiness within the Philippine context. By leveraging detailed micro-level price data for both consumer and producer prices, we seek to understand how these variations translate into aggregate inflation dynamics. The research is expected to make several significant contributions. First, by providing the first comprehensive price stickiness measures for the Philippines, we fill a critical empirical gap in the literature on emerging market economies. Second, by focusing on the Philippines, we will add to the limited empirical evidence on price-setting behavior within a dynamic emerging market context. We also offer insights into how global drivers interact with local dynamics in open and fragmented economies. Third, the integration of the Nakamura and Zerom (2010) framework for PPI-to-CPI pass-through within a broader study of heterogeneous price stickiness, coupled with an investigation of monetary policy asymmetries, provides a comprehensive analytical lens for understanding price formation throughout the supply chain and policy transmission in an emerging market economy.

## 2. Literature Review: Theoretical Frameworks and Empirical Evidence

The study of price stickiness is rooted in several theoretical frameworks. Each of these offer distinct explanations for why prices do not adjust instantaneously to changes in economic conditions. Pioneered by Mankiw (1985), the menu cost theory posits that firms face small real costs (e.g., printing new menus, updating systems, informing customers) associated with changing prices, leading them to adjust prices only when the benefits outweigh these costs. This implies that small shocks may not trigger price adjustments. The models of Taylor (1980) and Calvo (1983) suggest that firms set prices for a fixed period or with a certain probability, leading to overlapping price contracts. This staggering creates inertia in the aggregate price level as not all prices adjust simultaneously to new information or shocks.

Theories on information frictions (Sims, 2003; Maćkowiak and Wiederholt, 2009) propose that firms face costs or limitations in acquiring and processing information about the aggregate state of the economy or the prices of their competitors,leading to infrequent or delayed price adjustments. Meanwhile, the new monetarist models, which often feature search frictions and limited participation, can generate price stickiness through various channels, including the costs of adjusting money holdings or establishing new trading relationships. Finally, as suggested in Ball and Romer (1990), if firms perceive that their competitors' prices are sticky, they may find it optimal to keep their own prices sticky as well, creating a feedback loop that enhances aggregate price rigidity. Ball and Romer (1990) find that a firm will adjust its prices based on the decision of other sellers to adjust their prices. Wang and Werning (2022) provide a recent perspective on dynamic oligopoly and price stickiness.

Empirical evidence on price stickiness often relies on micro-level price data from consumer price indices (CPI) and producer price indices (PPI). Studies in developed economies have consistently shown that prices are indeed sticky, although the degree varies significantly across commodity groups, countries, and time periods. For instance, Bils and Klenow (2004) find that the median duration of consumer prices in the U.S. is about 4.3 months with sales. Excluding sales, Nakamura and Steinsson (2008) estimate a median

duration of 8 to 11 months. Similarly, Gautier et al. (2024) estimate a duration of about 7 to 8 months for the Euro area. Emerging markets, however, present a unique context due to factors such as higher and more volatile inflation, different market structures, and potentially less developed financial systems, which can influence price-setting behavior. Our findings for the Philippines provide crucial empirical anchors for this proposal, not only representing the first such estimates for the country but, more importantly, demonstrating observable heterogeneity within an emerging market economy context.

## 3. Conceptual Framework

Our conceptual framework is built on the understanding that price stickiness is not uniform across an economy but rather exhibits significant heterogeneity. This heterogeneity stems from various microfoundations of price adjustment, which are likely to vary in their importance between different commodity groups and regions. At the micro-level, firms face decisions on when and by how much to adjust their prices. These decisions are influenced by cost- and demand-side factors, information acquisition and processing due to rational inattention (Sims, 2003), and other firm-specific characteristics such as firm size, technology, and pricing policies.

The aggregation of these heterogeneous price-setting behaviors at the micro-level determines the overall degree of price stickiness at the aggregate national level. Our framework posits key factors at play.

First, commodity-specific factors (e.g., perishability, supply chain complexity, consumer habits, market structure within each commodity group) will lead to observable differences in price stickiness across commodity groups. Second, regional factors (e.g., differences in local market competition, transportation infrastructure, distribution networks, income levels) will contribute to regional disparities in price stickiness, even for the same commodity group. Geographic fragmentation affects heterogeneity of inflation dynamics. Third, these varying degrees of price stickiness directly influence the transmission of macroeconomic shocks. A shock will propagate through the economy differently depending on which prices adjust quickly and which remain rigid.

Consequently, the effectiveness of monetary policy in stabilizing inflation and output will be contingent on heterogeneous price stickiness. If key commodity groups are very sticky, monetary policy could face delays in influencing overall prices. Furthermore, the presence of asymmetries in price adjustments could imply that monetary policy's effectiveness differs depending on the direction of intervention or the prevailing economic state.

## 4. Empirical Motivation and Stylized Facts

The motivation for this research stems from the theoretical importance of price stickiness in macroeconomics and the pressing need for empirical evidence from emerging market economies like the Philippines. Understanding the dynamics of price adjustment at a granular level is crucial for effective monetary policy formulation, particularly in an environment of evolving global and domestic economic conditions.

Our estimates of price stickiness provide the empirical backbone for this proposal by establishing several key stylized facts about price stickiness in the Philippines.

Nationally, the median duration of price spells is from 3 to 5 months. Price rigidity also varies significantly across different commodity groups. For instance, food items exhibit considerably less rigidity compared to services: 3 to 4 months vs. 3 to 6 months, respectively. Food commodities, which exhibit lower price rigidity, contribute more significantly

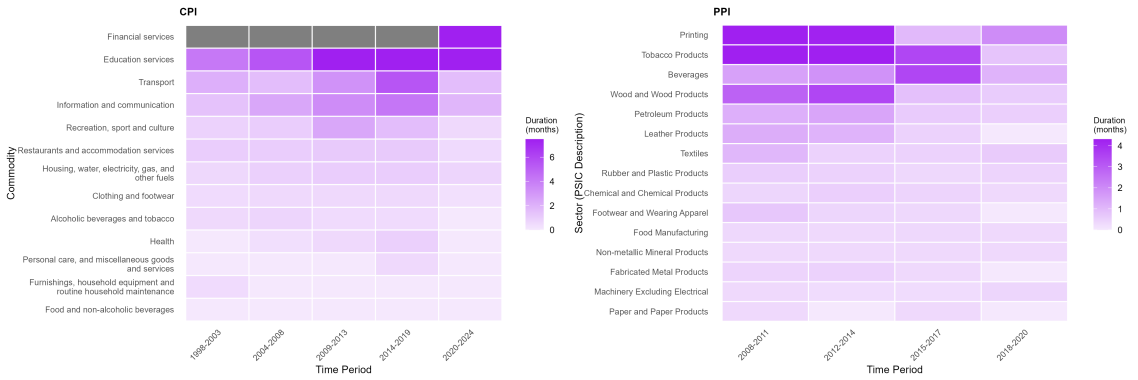



Figure 1: Heatmap of CPI and PPI Price Stickiness

to the short-term volatility and responsiveness of aggregate inflation to supply-side shocks compared to more rigid commodity groups. Figure 1 further shows that (1) producer prices tend to display less rigidity, and (2) prices tend to be less rigid in recent years.

These stylized facts highlight that treating price stickiness as a uniform phenomenon in the Philippines would be a significant oversimplification. The observed heterogeneity by commodity group and region has profound implications for how economic shocks propagate through the economy and how monetary policy affects inflation and real activity. This empirical richness strongly motivates the in-depth analysis we propose. We move beyond aggregate measures to understand the nuanced micro-dynamics of price adjustment.

## 5. Data and Measurement

This research extensively utilizes monthly micro-level price data from various price indices in the Philippines for the period from 1994 to 2025. This rich dataset includes Consumer Price Index (CPI), and Producer Price Index (PPI) microdata collected and maintained by the Philippine Statistics Authority (PSA) (Philippine Statistics Authority, 2025). From these microdata, we calculate several key measures of price stickiness. The frequency of regular price changes, $f$, is given by the ratio of a regular price change ($C$) to the total number of observations ($N$) over time: $f = \frac{C}{N}$. We define a regular price change as an absolute change in the price index that exceeds one standard deviation of price changes for each commodity. This threshold offers price rigidity statistics that lie between the case when a price change is defined as $p_t \neq p_{t-1}$ and when it is defined as a change that is greater than 0.2% following Dixon et al. (2023).

Following Nakamura and Steinsson (2008), we then estimate the implied duration of price spells ($d$) as,

$$d = -\frac{1}{ln(1-f)}. \tag{1}$$

Alternatively, Kaufmann (2009) calculates median duration:

$$d = \frac{ln(0.5)}{ln(1-f)}. \tag{2}$$

where implied duration $d$ corresponds to the duration no regular price change occurs.

We also calculate the probability of a price change at time $t$, conditional on the price remaining unchanged until that point, using a *hazard function*:

$$h(\tau) = \frac{f(\tau)}{1 - F(\tau)} \tag{3}$$

where $f(\tau)$ is the probability density function and $F(\tau)$ is the cumulative distribution function of price spell durations. For a price spell of duration $\tau$, the hazard rate $h(\tau)$ represents the conditional probability that a price will change at time $\tau$, given that it has remained unchanged up to $\tau - 1$.

This measure provides a more nuanced understanding of the timing of price adjustments and how such probabilities vary across product categories and regions. To empirically estimate the hazard rate and its determinants, we adopt a *probit* or *logit* specification, where the dependent variable is an indicator of whether a price changes at time $t$, and the explanatory variables include the duration, commodity-level characteristics (e.g., type, perishability),and regional identifiers.

The focus will be on disaggregating these measures by commodity groups, regions, and aggregate national level. We provide estimates of overall degree of price stickiness in the Philippine economy based on CPI and PPI microdata. To provide greater granularity and illustrate heterogeneity, we use detailed commodity classification to identify commodity groups with different underlying cost structures, market characteristics, and demand elasticities. We also analyze price stickiness across major administrative regions of the Philippines to capture local market dynamics, including variations in competition, transportation costs, and local demand conditions.

## 6. Empirical Strategy

The empirical strategy will combine robust econometric techniques to analyze both the measurement of price stickiness and its macroeconomic implications.

### *6.1. Baseline Approach: Vector Autoregressions (VAR) and Local Projections (LP)*

To analyze how heterogeneous price stickiness influences aggregate inflation dynamics and its response to macroeconomic shocks, we will primarily employ vector autoregression (VAR) models and local projection (LP) methods.

A VAR framework allows for the identification of structural shocks (e.g., demand shocks, supply shocks, monetary policy shocks) and the estimation of impulse response functions (IRFs) that show how aggregate inflation responds to these shocks over time.

Meanwhile, we follow Jordà (2005) and Li et al. (2022), to implement a LP to serve as an alternative to VAR for estimating IRFs. Furthermore, LP can be particularly useful for examining how the impact of a specific shock on aggregate inflation varies depending on the initial conditions of commodity group price stickiness.

### *6.2. Asymmetries in Monetary Policy Transmission*

Given the focus on the effectiveness of monetary policy in the presence of heterogeneous price stickiness, an important extension to our empirical strategy will involve investigating potential **asymmetries in the transmission of monetary policy**. This means analyzing whether the impact of monetary policy shocks (e.g., interest rate changes) on inflation and output differs depending on the direction of the shock, the state-dependence of monetary policy, and the level of price stickiness. To incorporate asymmetries, we will

extend the VAR and LP frameworks by employing threshold VAR (TVAR) or smooth transition VAR (STVAR) models, as well as state-dependent local projections.

LP can be made state-dependent by interacting the shock variable with a dummy or continuous variable that captures the state of the economy or the direction/size of the monetary policy change. This approach is flexible and can directly show how the dynamic effects of policy vary across different conditions, providing insights into the non-linear relationship between policy, price stickiness, and inflation.

Understanding these asymmetries is crucial for the BSP, as it can inform whether monetary policy needs to be adjusted differently depending on the prevailing economic conditions and the specific challenges posed by heterogeneos price stickiness.

### *6.3. Incorporating Pass-Through Delays: PPI to CPI Dynamics*

We also incorporate a methodology inspired by Nakamura and Zerom (2010) on pass-through delays from producer prices (PPI) to consumer prices (CPI). This analysis will complement the study of price stickiness by commodities and regions by providing insights into the transmission of cost shocks.

The core of this analysis will involve estimating a regression of the form:

$$\Delta \log p_{j,t}^{cpi} = \alpha + \sum_{k=0}^{n} \beta_k^{cpi} \Delta \log p_{j,t-k}^{ppi} + \sum_{k=0}^{m} \rho_k^{c} \Delta \log c_{t-k} + \cdots + \epsilon_{j,t} \tag{4}$$

where the log CPI price change of commodity $j$ at time $t$ is determined by the log PPI price change of commodity, and other controls. The coefficient $\beta_k^{cpi}$ will be interpreted as the percentage change in CPI prices associated with a given percentage change in PPI costs $k$ periods ago. The sum of these coefficients ($\sum \beta_k^{cpi}$) will indicate the total pass-through, while the individual coefficients will show the speed and pattern of pass-through.

This methodology will allow us to (i) quantify delays in the pass-through; (ii) assess the heterogeneity in the pass-through; and (iii) inform policy. We hope to identify the extent to which changes in producer prices or commodity costs are transmitted to consumer prices with a lag, and how long these lags persist. We, likewise, examine if the speed and completeness of pass-through vary across different commodity groups. This is directly related to the concept of heterogeneous price stickiness by commodities.

## 7. Conclusion

This research proposal outlines a comprehensive study into the heterogeneous nature of price stickiness in the Philippines, disaggregated by commodity group and region, and its implications for aggregate inflation dynamics and monetary policy transmission. By leveraging rich micro-level CPI and PPI data and employing advanced econometric techniques including VAR, Local Projections, detailed analysis of PPI-to-CPI pass-through, and an investigation into monetary policy asymmetries, we aim to provide a robust understanding of price-setting behavior in this emerging economy. The expected contributions are substantial, offering critical insights for both academic research and practical monetary policymaking in the Philippines, ultimately fostering greater price stability and economic welfare.

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