Propagation of Monetary Policy Shocks Across Sectors: The Case of Slovenia*

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Abstract

This paper constructs a monthly firm-level dataset from Slovenia to examine how monetary policy transmission differs across the manufacturing and services sectors and to evaluate whether disaggregated marginal-cost-based Phillips curves enhance our understanding of inflation dynamics. Using panel local projections, the findings indicate sluggish responses of labour-related costs and stronger reactions of non-labour-related costs to contractionary monetary policy shocks, with services firms responding more than their manufacturing counterparts. The paper highlights the importance of micro-level data for understanding monetary policy transmission and provides evidence of variable transmission lags. It shows that the short- to medium-term aggregate inflation response is predominantly shaped by the manufacturing sector, whereas long-term inflation persistence is largely driven by the services sector. A comparison of the aggregate inflation impulse response from the full sample with that from the pre-pandemic period suggests that the Phillips curve has steepened in Slovenia during the post-pandemic era.

JEL codes: E31, E52, E58, C23, C5
Keywords: Inflation, Manufacturing and Services, Monetary Policy Transmission Lags

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1 Introduction

The 2022-2024 surge in inflation highlighted the need to better understand how monetary policy transmits across different sectors. Exogenous changes in monetary policy can affect sectors differently, leading to delays and a less-than-one-to-one pass-through to specific firm components, which, in turn, affects aggregate inflation. Yet, this topic remains largely unexplored, primarily due to the lack of granular firm-level data available at frequencies shorter than annual.

This paper bridges micro-level foundations with macroeconomic policy relevance by investigating the differences in monetary policy transmission between the manufacturing and services sectors, the firm characteristics that shape these sectoral variations, and the role of disaggregated Phillips curves in enhancing our understanding of inflation dynamics. To explore these questions, this paper analyzes the effects of monetary policy shocks on a small open economy (SOE) under the European Central Bank's (ECB) monetary policy framework, utilizing a novel monthly firm-level dataset that reveals significant sectoral heterogeneity often obscured by aggregation.

The findings of this study are threefold. First, after a contractionary monetary policy shock, labour-related costs respond more sluggishly than non-labour costs, with varying effects between manufacturing and services. Firms in the services sector exhibit a stronger reaction than their manufacturing counterparts, which I attribute to the role of external financing, while controlling for firm size, exports, and position in the production network. Second, reduced-form Phillips curves that incorporate labour and non-labour costs as empirical measures of marginal costs and hours worked, measured as deviations from trend, indicate that the Phillips correlation is stronger in manufacturing than in the services sector. Third, I provide evidence of variable transmission lags of monetary policy. In the short to medium term, the aggregate inflation response is primarily driven by manufacturing, while in the long term, inflation persistence is mainly determined by services. Additionally, a comparison of the aggregate inflation impulse response from the full sample with that from the pre-pandemic sample suggests that the Phillips correlation has strengthened in Slovenia during the post-pandemic period. Slovenia's case can offer valuable lessons for other small open economies within the Euro area. The policy implications of this paper are that central banks should focus on the distinct dynamics within the manufacturing and services sectors to better understand the inflationary landscape and the varying impacts of monetary policy across these sectors.

Micro-level data are essential for documenting the heterogeneous transmission of monetary policy. Yet much of the existing literature encounters a "frequency mismatch".[1] Most firm-level datasets are available only at annual frequency, while monetary policy shocks typically transmit to the real economy at higher frequencies. This paper addresses this gap by constructing a novel dataset for Slovenia that combines several sources of firm-level information provided by the Statistical Office of the Republic of Slovenia (SORS). The dataset integrates detailed balance-sheet information with granular labour and non-labour cost components, recorded monthly from 2008 to 2023. The

[1] As noted by Mavroeidis et al. (2014), the literature has reached its limits in explaining the New Keynesian Phillips curve solely through aggregate macroeconomic time series.

resulting dataset covers nearly the entire universe of active firms over this period. The richness and monthly frequency of the data allow for a flexible decomposition of firm-specific components that help understand how monetary policy shocks transmit through the economy. Unlike studies that treat ECB member states as a homogeneous block, this dataset highlights the unique structural characteristics of a country within the currency union.

To understand the sources of firm-level heterogeneity, I construct several firm-level measures. This paper focuses on the financing channel of monetary policy, using total financial liabilities and the short-term debt ratio as key indicators of firms' exposure to monetary policy. Descriptive statistics and firm-level regressions show that firms in services rely more heavily on external financing. The seminal literature on the credit channel of monetary policy (Bernanke and Gertler (1995), Bernanke et al. (1999)) argues that sectors more dependent on external financing should respond more strongly to monetary policy shocks, and empirical evidence confirms that such sectors are indeed more sensitive to monetary tightening. As argued by Dedola and Lippi (2005), sector-level data are particularly informative for studying monetary transmission because the factors shaping sensitivity to monetary policy vary more across industries within a country than across countries. These sectoral asymmetries are particularly relevant in an SOE operating under a common monetary policy framework. At the same time, the dataset's granularity allows me to control for additional firm-level characteristics, including firm size, export orientation, and upstreamness in the production network at the NACE-5 level. I construct these measures and examine how these patterns differ between manufacturing and services.

I utilize panel local projections à la Jordà (2005) to estimate impulse response functions for the growth of labour-related and non-labour-related costs, as well as hours worked by firms in the manufacturing and services sectors. This analysis focuses on contractionary monetary policy shock series identified by Jarociński and Karadi (2020) to examine plausibly exogenous changes in interest rates. The results highlight important sectoral differences, underscoring the need to distinguish between them when studying the effects of monetary policy shocks. A contractionary monetary policy shock reduces labour-related costs in both the services sector and the economy as a whole. Conversely, manufacturing shows a delayed and slightly positive response that is statistically insignificant. Regardless of whether we look at aggregate or sectoral dynamics, all responses display a delay to monetary policy shocks. This finding reinforces the well-established notion that labour costs adjust sluggishly. In particular, wage agreements limit firms' ability to quickly modify labour expenses in response to changing economic conditions. This underscores the greater rigidity of labour-related costs compared to non-labour inputs. The impulse responses for non-labour-related costs are negative across both sectors and the aggregate, with services showing a stronger and more persistent decline than manufacturing.

This sectoral asymmetry is consistent with broader evidence on inflation dynamics. In particular, the literature suggests that service inflation tends to be stickier, a pattern also observed in Slovenian data. To explore this further, I employ a bottom-up estimation of the reduced-form Phillips

curve, drawing on the approach in Gagliardone et al. (2025). The specification relies on labour and non-labour costs, the two key components of a firm's marginal costs, together with hours worked. This approach allows me to estimate dynamic pass-through regressions relating inflation to these costs, with hours worked measured as deviations from trend, providing an alternative to the activity-based output gap. I estimate three versions of the reduced-form Phillips curve: one for manufacturing, one for services, and one for the full panel. The estimates reveal how inflation responds to economic conditions and pressures from labour and non-labour costs across sectors. Labour-related costs consistently play a larger role in shaping inflation dynamics than non-labour costs. The results indicate that the reduced-form Phillips curve is steeper in manufacturing, suggesting that manufacturing inflation is more responsive to changes in economic conditions than services inflation.

Using the coefficients and the impulse responses for costs and hours worked, I recursively construct inflation impulse responses for manufacturing, services, and the aggregate economy, following the approach in McGregor and Toscani (2022). This allows me to compare the direct aggregate inflation response with the indirect response constructed from the sectoral impulse responses. Additionally, I re-estimate the aggregate inflation response using the pre-pandemic sample, incorporating the correction proposed by Lenza and Primiceri (2022). These comparisons highlight differences between manufacturing and services, enabling assessment of the compositional effects of ECB monetary policy on inflation in Slovenia. Consistent with Buda et al. (2023), I find evidence of variable transmission lags of monetary policy. Following a contractionary monetary policy shock, all responses—sectoral, aggregate, direct, and indirect—decline on impact. Manufacturing inflation moves closely with aggregate inflation, while services inflation adjusts more slowly and shows greater persistence. This suggests that manufacturing drives the short- to medium-term response of aggregate inflation, whereas services dominate the medium-to long-term dynamics and account for most of the observed persistence.

Overall, the results indicate that aggregation can mask significant sectoral differences. Even so, the aggregate pass-through does not appear to be significantly distorted by jointly estimating manufacturing and services, which is reassuring from a policymaker's perspective. Comparing the aggregate inflation impulse response from the full sample with that from the sample ending in 2019 suggests that the Phillips correlation has strengthened in the post-pandemic period. The restricted sample shows a much weaker response of aggregate inflation to ECB tightening. This comparison indicates that the post-pandemic inflation surge provides important insights into inflation dynamics. Including these years uncovers important economic disturbances and helps clarify the differing responses of manufacturing and services to ECB monetary policy. Restricting the sample to 2019 obscures these dynamics. The heightened uncertainty of the post-pandemic period, compounded by geopolitical tensions, underscores the importance of accounting for major economic disturbances when evaluating the effectiveness of policy interventions.

2 Literature

The first strand of literature this paper contributes to is the literature on sectoral monetary policy pass-through, focusing on the individual member economies of the Euro area. As emphasized by Marcellino and Tornese (2025), research shows that tighter monetary policy lowers inflation and output at the Euro area level, yet evidence on how these shocks affect individual countries remains limited. The multi-country literature on ECB monetary policy consistently finds substantial cross-country heterogeneity in sensitivity to monetary shocks (see, e.g., Auerbach and Gorodnichenko (2013), Jordà et al. (2015), and Mandler et al. (2022), Blanchard and Bernanke (2024), Datsenko and Fleck (2024)). The availability of granular, long-span monthly data makes it possible to examine shock transmission at a higher frequency. This positions Slovenia not only as a case study but also as a representative example of the Euro area's heterogeneous fringe. Moreover, because the dataset spans both the COVID-19 period and the post-pandemic inflation surge, it allows for an analysis of manufacturing and services dynamics across all major episodes of economic disruption, including the Global Financial Crisis (GFC) and the Euro area sovereign-debt crisis.

By examining the differences between manufacturing and services, I provide evidence on how sector-specific characteristics shape the aggregate response to ECB policy. In the post-pandemic period, research on sectoral pass-through has largely focused on households (e.g., Aruoba and Drechsel (2024), Battistini and Gareis (2024), and Allayioti et al. (2025)). This literature finds that prices of manufacturing-related goods adjust more quickly to monetary policy than those of services, which respond later and more gradually. This paper shifts the focus to firms and uncovers a different pattern: service-sector firms contract more strongly in response to a monetary policy tightening than manufacturing firms.

The literature that studies firm-level data documents substantial heterogeneity in monetary policy transmission across sectors. Labour intensity, financial frictions, supply constraints, and production networks shape how quickly and effectively interest-rate changes pass through to firms (e.g., Dedola and Lippi (2005), Peersman and Smets (2005), and more recent work from Ghassibe (2021), Balleer and Noeller (2023), Choi et al. (2024), Steininger and Matzner (2025), Unsal and Franco (2025)). This paper is closely related to the literature on financial constraints, which shows that differences in financing conditions influence firms' sensitivity to monetary policy. Foundational work by Bernanke and Gertler (1986) and Bernanke et al. (1999) shows that financially constrained firms react more strongly to policy changes. More recent studies, such as Nylund et al. (2020) and Durante et al. (2022), document systematic sectoral differences in the reliance on internal versus external financing in Europe. In addition, Akarsu et al. (2025) show that responses vary with firm size, leverage, export orientation, and sectoral characteristics, with highly leveraged firms reacting more strongly to monetary tightening. The findings of this literature align with the results of this paper: service-sector firms face tighter financial constraints and contract more after a monetary policy shock. This pattern indicates that the credit channel operates differently across sectors, with firms more dependent on external financing experiencing sharper declines following a rate increase.

Finally, this paper contributes to the literature on monetary-policy pass-through to inflation and on heterogeneous inflation dynamics. Using firm-level survey and administrative data enables focusing on the role of micro-level heterogeneity in shaping macroeconomic outcomes. In particular, it allows me to capture how differences in cost structures between manufacturing and services translate into distinct sector-specific inflation responses (see, e.g., Boneva et al. (2020) for the UK, Gaiotti (2008) for Italy, and Frohm (2020) for Sweden). The methodology builds on work that shifts the Phillips curve's focus from aggregate output gaps to micro-level marginal costs. The study most closely related to this paper is Gagliardone et al. (2025), who use quarterly firm-level data for Belgian manufacturing firms to estimate cost-based Phillips curves. I adopt a similar bottom-up approach to estimating the reduced-form Phillips curve slope, but this paper differs in several important ways. I use monthly data covering nearly the entire population of firms, spanning both manufacturing and services, and the sample extends into the post-COVID period. I rely on hours worked, measured as deviations from trend, as an alternative to the activity-based output gap (as in Galí (2015) or Coibion and Gorodnichenko (2015)), and estimate a reduced-form Phillips curve in which both labour and non-labour costs serve as empirical measures of marginal costs. The recursive construction of inflation impulse responses is conceptually related to McGregor and Toscani (2022) and Gagliardone and Gertler (2023). In contrast, this paper applies the approach to examine the implications of ECB monetary policy for inflation dynamics in a Euro area member country.

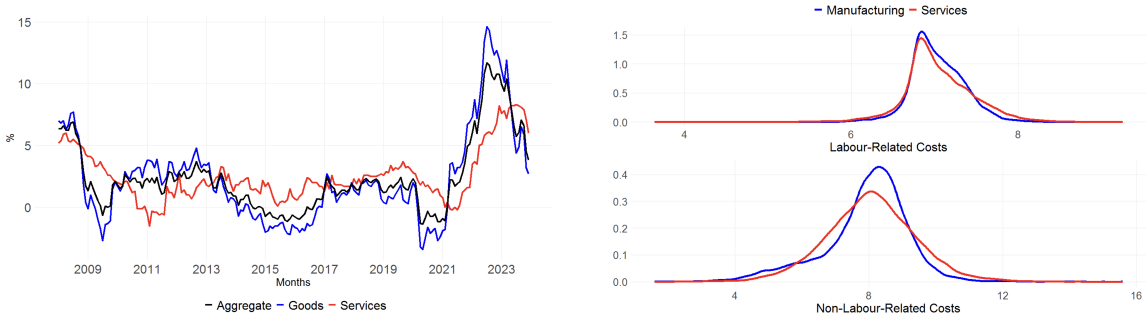
3 Environment: SOE in a Currency Union

Slovenia offers a compelling case for studying macroeconomic dynamics in a small open economy within a currency union. Between 2008 and 2023, the Slovenian economy experienced a sequence of structural adjustments. The GFC triggered one of the sharpest contractions in economic activity in the Euro area, exposing vulnerabilities in the domestic financial system and paving the way for a banking crisis that unfolded between 2012 and 2013. The accumulation of non-performing loans ultimately required large-scale state intervention to recapitalize banks. This period was followed by the Euro area sovereign debt crisis, the launch of the ECB's quantitative easing programme in 2015, the COVID-19 pandemic, and the post-pandemic monetary tightening cycle after nearly a decade at the zero lower bound. As a member of the Euro area since 2007, Slovenia shares a common monetary policy but retains national fiscal autonomy. This combination of high exposure to ECB monetary policy shocks and limited monetary independence makes it a particularly informative case for studying how monetary policy propagates in economies with constrained policy tools and diverse domestic structures, especially where comparable firm-level data are scarce.

Figure 1a shows year-over-year changes in the harmonised consumer price index (HICP) for Slovenian goods and services, alongside aggregate inflation from 2008 to 2023. Goods inflation moves closely with the aggregate series, while services inflation follows a distinctly different pattern.

Services prices adjust more slowly and persistently, reflecting stickier pricing and stronger wage-cost pressures, while goods prices react more quickly to global supply conditions and energy costs. These divergent patterns naturally raise the question of how inflation and its underlying drivers evolve across sectors, and which firm-level mechanisms might explain these differences. Examining firms' cost structures provides a useful foundation, since heterogeneity in input costs and cost volatility shape how quickly and how strongly prices adjust to shocks.

Figure 1: Inflation Dynamics and Firm-Level Cost Distributions in Slovenia



(a) HICP Inflation

(b) Distribution of Firm-Level Costs

Source: Author's calculations based on firm-level data from SORS.
Note: The left panel shows the evolution of HICP inflation in Slovenia for the aggregate (black), goods (blue), and services (red). The right panel compares the distributions of labour- and non-labour-related costs in manufacturing (blue) and services (red).

Figure 1b presents the distributions of firm-level labour costs (upper panel) and non-labour-related costs (lower panel), based on the firm-level dataset constructed in this paper. Labour-cost distributions are notably similar across manufacturing and services, with substantial overlap. In contrast, non-labour costs show more pronounced sectoral differences, highlighting how sector characteristics shape firm-level cost structures. Both sectors show a heavier left tail in labour-cost distributions, indicating that cost compression or wage moderation is widespread. Although they share similar downside dynamics, services display greater upside variability, likely reflecting more heterogeneous wage adjustments, stronger demand pressures, or exposure to idiosyncratic labour market shocks. In contrast, the distribution of non-labour costs in manufacturing exhibits higher kurtosis, consistent with the sector's greater reliance on material inputs and its vulnerability to supply chain disruptions.

4 Data

This paper leverages a unique and comprehensive dataset that combines several sources of firm-level information provided by the Statistical Office of the Republic of Slovenia (SORS). These include monthly data on labour-related costs and hours worked from the labour expenditure survey of

legal entities, as well as non-labour-related cost data drawn from value-added tax (VAT) declarations, annual balance sheets, income statements data, and input-output tables.

4.1 Dataset Construction

The richness and frequency of the dataset enable a flexible decomposition of multiple firm-specific components relevant for exploring the transmission of monetary policy shocks. The empirical analysis focuses on Slovenian firms across different sectors over the period 2008 to 2023, covering approximately the universe of active firms during this time.

4.1.1 Data on Labour Expenditures by Legal Entities

The data on labour-related costs and hours worked are sourced from a monthly survey on labour expenditures by legal entities, which records detailed information on gross earnings. These include regular wages, overtime compensation, and additional payments such as 13th-month salaries or Christmas bonuses. The survey also provides data on the number of employees receiving regular and overtime earnings, as well as the number of paid hours for both categories. The dataset spans the period from January 2002 to December 2023. For the purposes of this paper, the sample is restricted to firms with at least one employee.[2] To isolate labour cost dynamics associated with regular employment, earnings from overtime work, and additional payments are excluded to focus on regular gross earnings.

4.1.2 VAT Declarations Data

Data on non-labour-related costs are obtained from value-added tax (VAT) declarations. For the purposes of this study, the focus is on purchases of goods and services, which serve as proxies for firm-level non-labour-related costs.[3] The dataset further distinguishes between domestic and cross-border transactions, recording purchases from Slovenia as well as from other EU member states. This distinction allows for separating purchases associated with domestic and foreign markets. In this paper, all firm-level purchases are considered regardless of their final destination. The data cover the period from January 2003 to December 2023.

4.1.3 Final Firm-Level Dataset

The final dataset is constructed by merging the aforementioned sources and spans the period from January 2008 to December 2023. Slovenia adopted the euro in 2007, and data prior to and including that year are denominated in Slovenian tolars (SIT). In addition, a substantial revision of variable definitions in the VAT declarations occurred in 2007. To ensure consistency and avoid discrepancies

[2] Firms with zero recorded employees in specific periods are excluded from the sample due to concerns regarding data reliability.

[3] This assumption is also adopted by SORS.

arising from definitional changes and exchange rate conversions, the dataset is restricted to the post-2007 period. The resulting dataset is an unbalanced panel, with irregularities removed and seasonality-adjusted variables. Furthermore, the variables are deflated using the Slovenian HICP to obtain real values and normalized per worker, ensuring that the resulting firm-level measures are comparable across firms.

On average, a firm is observed in the dataset for approximately eight years. The full sample comprises 84,176 firms, representing approximately 600 distinct sectors according to the 5-digit NACE Rev. 2 industry classification. Approximately 10% of firms change their primary 5-digit NACE Rev. 2 sector during the sample period, with some changing more than once. Such changes are treated as natural adjustments in response to business cycle dynamics or firm-level restructuring. For these firms, the last reported 5-digit NACE sector is used throughout the analysis. The dataset is filtered to include only firms with at least three years of available data. This selection yields an unbalanced panel consisting of 40,319 firms. Of the firms included in the sample, approximately 15 percent operate in the manufacturing sector, 72 percent in the services sector, and the remaining firms belong to other sectors.[4] In cases where missing values appear within a firm's time series, i.e., not at the beginning or end of its observed spell, imputation methods are applied.[5]

4.2 Firm-Level Exposure Measures

To exploit different sources of heterogeneity, I build several firm-level exposure measures which offer a nuanced view of firm composition in the Slovenian economy. Specifically, I use data on firms' borrowing to construct measures of external financing, export orientation, size, and a sectoral measure of upstreamness. With the exception of upstreamness, all measures are calculated over a 5-year period (2019-2023), ensuring they are representative of economic developments in Slovenia rather than driven by particular events or outliers. The upstreamness measure, in contrast, is constructed from the input-output tables. The constructed exposure measures serve a dual purpose. They shed light on the structural composition of the Slovenian economy and allow an assessment of whether firms cluster into similar groups across multiple dimensions.

4.2.1 Descriptive Statistics

To capture the role of external financing, I construct a measure of total financial liabilities that encompasses both short- and long-term debt, expressed as a share of total assets. To account for

[4] Sectoral classification follows the standard NACE Rev. 2 convention. Specifically, firms are identified as manufacturing if the first two digits of their NACE-5 code fall within the range 10–33, and as services if the code begins with a number between 45 and 96. A detailed overview of the sectoral classification is provided in Table 4 in Appendix **??**.

[5] These imputations are based on the assumption that the firm remained active during the missing period, as it appears in the dataset both before and after the gap, and was therefore only temporarily absent from reporting. A smooth evolution of employment, labour-related costs, and other firm-level expenditures is thus considered reasonable. For labour-related costs, missing values are replaced with the last available observation. For other cost variables, the next available data point is distributed evenly across the preceding months with missing observations.

debt composition, I calculate a short-term debt ratio that indicates the proportion of liabilities due in the near term, allowing me to distinguish between firms based on their reliance on short-term versus long-term borrowing. On average, firms have a total liabilities-to-assets ratio of 20 percent and a short-term debt ratio of 37 percent (see Table 1).

Table 1: Summary Statistics of Firm-Level Exposure Measures

	(log) Size	External Financing Share	Short-Term Debt Ratio	Export Share
Mean	1.27	0.20	0.37	0.13
SD	1.14	0.22	0.35	0.23

Source: Author's calculations based on firm-level data from SORS.
Note: The table reports summary statistics for four key exposure measures: firm size (log of number of employees), external financing share (total liabilities over total assets), short-term debt ratio, and export share. All variables are calculated as five-year averages over 2019-2023.

Given that Slovenia is a highly open economy, I construct a measure of export orientation defined as the share of sales to foreign markets relative to total sales (domestic and foreign combined). On average, firms in Slovenia have an export share of 13 percent. Firm size is proxied by the number of employees reported at the firm level. To mitigate potential bias arising from an unbalanced panel, I use each firm's average number of employees over the full period for which data are available.[6]

Lastly, to construct the measure of firms' upstreamness, I use input-output tables for Slovenia from the year 2020.[7] The dataset covers 64 sectors classified at the 2-digit NACE Rev. 2 level. The upstreamness measure is derived from the Leontief inverse, which captures intersectoral linkages by accounting for both direct and indirect effects of final demand.[8] Higher values indicate that a sector lies further upstream in the supply chain, meaning its output is used more intensively as an input in other sectors before reaching final demand. To link this sector-level measure to firm-level data, I map each 2-digit NACE Rev. 2 sectors to the firms operating within it.

Several notable patterns emerge from the data. Financial structure varies substantially across the size distribution. Among the smallest firms, 24.7 percent rely least on external financing, while 18.7 percent rely most heavily on it, underscoring significant heterogeneity in credit access even among firms of similar scale. Additionally, 24.9 percent of the smallest firms fall into the top quintile of short-term debt ratio, suggesting that limited access to long-term financing may force them to refinance more frequently, heightening their exposure to interest-rate volatility. Debt maturity also shapes firms' sensitivity to monetary policy. Among the most indebted firms, 27.9 percent are also in the top quintile for short-term debt, reinforcing the idea that debt-heavy firms are particularly

[6] This paper does not focus on firm entry, exit, or growth dynamics, but rather on cross-sectional firm characteristics.
[7] Specifically, the symmetric input–output table at basic prices, sourced from SORS.
[8] The Leontief inverse is calculated as $(I - \Gamma)^{-1}$, where Γ is the matrix of direct intermediate inputs divided by total output in each sector.

vulnerable to changes in borrowing costs.

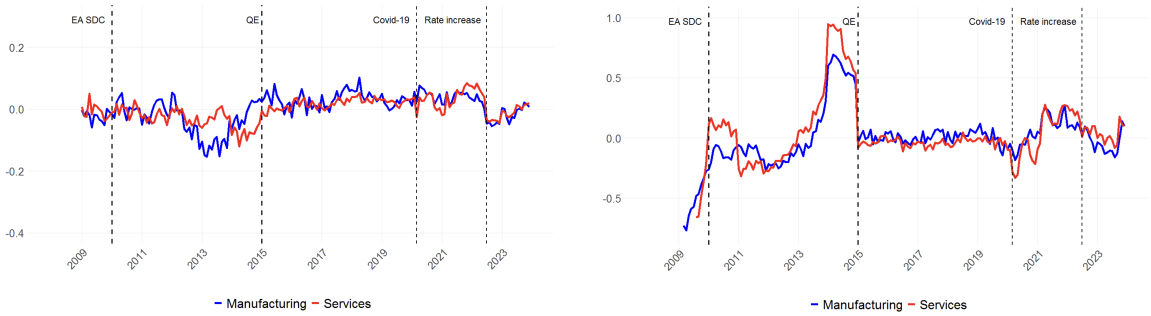
A similar degree of heterogeneity appears in firms' export activity. Among the largest firms (those in the top size quintile), 72.9 percent fall into the lowest quintile of export intensity, indicating a weak relationship between firm size and international market integration in Slovenia. This pattern likely reflects the prominence of large firms in domestically oriented sectors such as construction and retail, where scale does not necessarily translate into export activity. In contrast, 41.6 percent of the smallest firms rank among the most export-active, suggesting that smaller firms may be more agile and engaged in specialized or high-value-added niches abroad.

4.2.2 Firm-Level Characteristics Across Manufacturing and Services

This section examines the distributional characteristics of key firm-level indicators in the manufacturing and services sectors, based on firms' NACE-5 classifications. Figures 2a and 2b show the evolution of labour- and non-labour-related cost growth in Slovenia from 2009 to the end of 2023 for manufacturing (blue) and services (red).

Labour-related costs (Figure 2a) display relatively moderate variability. During the COVID-19 pandemic, labour costs fell more sharply in services, consistent with the sector's greater exposure to lockdowns and temporary layoffs, while manufacturing recovered more quickly. In 2022, services experienced stronger wage momentum amid reopening dynamics and labour shortages, before the growth rates in both sectors converged toward the end of the year. In contrast, non-labour-related costs (Figure 2b) exhibit substantially greater variability, reflecting their sensitivity to non-labour input prices, such as energy, raw materials, and imported inputs, as well as global supply-chain disruptions.

Figure 2: Labour-Related and Non-Labour-Related Costs Growth by Sector



(a) Labour-Related Costs Growth

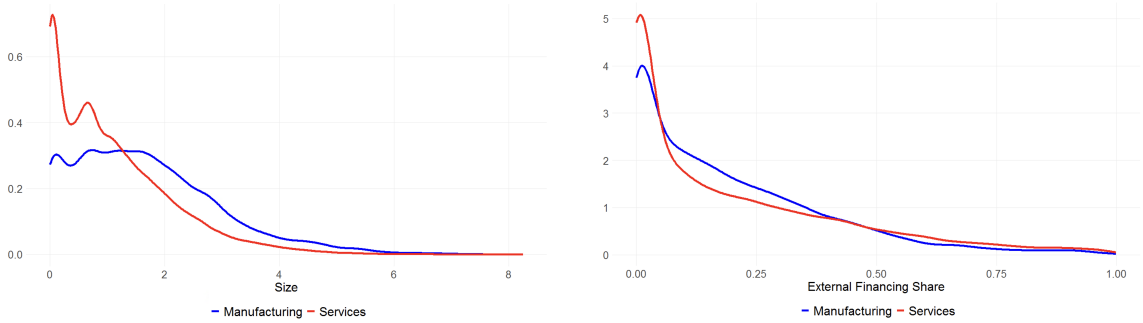
(b) Non-Labour-Related Costs Growth

Source: Author's calculations based on firm-level data from SORS.
Note: The figure compares labour- and non-labour-related costs growth across manufacturing (blue) and services (red) sectors.

A notable feature of the series is the sharp decline in non-labour-related costs in 2015 across

both sectors. Several developments in the Slovenian economy may help explain this pattern. First, 2015 was a period of extensive corporate restructuring and deleveraging, particularly among state-owned and formerly distressed firms. These efforts often involved cost-cutting measures and the renegotiation of supplier contracts, which lowered intermediate input costs. Second, ongoing privatisation processes and changes in corporate governance in several large firms increased pressure to streamline operations and reduce non-labour expenditures. After moving more closely together in the subsequent years, the series diverged again during the COVID-19 shock, when services experienced a steeper decline due to the collapse in demand and activity restrictions. From early 2022 onward, services faced stronger increases in non-labour costs, driven by the surge in energy prices, supply-chain bottlenecks, and the rapid rebound in service-sector demand, a divergence that persisted through 2023.

Figure 3: Distribution of Firm Size and External Financing Share by Sector



(a) Firm Size (log of employees)

(b) External Financing Share

Source: Author's calculations based on firm-level data from SORS.
Note: The figure compares the distributions of firm size and external financing share across manufacturing (blue) and services (red) sectors. Firm size is measured as the log of the number of employees, while external financing is defined as total liabilities divided by total assets.

Figures 3a and 3b illustrate the distributions of firm size and external financing share. The size distribution for service firms has a sharper peak and a longer right tail than that of manufacturing firms, indicating that most service firms are relatively small, with a few large firms skewing the average upward. This pattern reflects the nature of many service activities, which typically require less upfront investment and allow firms to operate efficiently at a smaller scale.[9] Manufacturing firms, by contrast, tend to be larger on average and have broader market reach, which together result in a more dispersed size distribution.

Turning to financial structure, Figure 3b shows that although the overall distributions of external financing appear similar across sectors, they mask important differences. External-financing shares are strongly right-skewed. The higher kurtosis in the services sector points to greater dispersion.

[9]Many service firms operate locally, require less capital investment, and can remain small.

Some service firms rely extensively on debt, whereas many use little or none. Manufacturing firms, in contrast, tend to rely more consistently on debt financing, likely because of their capital-intensive production processes, longer production cycles, and greater working-capital needs.

4.2.3 Sectoral Differences in Reliance on External Finance

The reported patterns highlight the importance of accounting for firm-level heterogeneity when analysing how monetary policy shocks are transmitted and how they affect the real economy. Differences in financing structures, in particular, may shape firms' sensitivity to changes in interest rates or credit conditions, thereby influencing aggregate outcomes. To examine whether services and manufacturing firms systematically differ in their reliance on external financing, I estimate the following regression:

$$y_{i,t} = \alpha + \delta_t + \beta D_{i,t} + \mathbf{x}_{i,t}\gamma + u_{i,t} \tag{1}$$

where $y_{i,t}$ denotes the log of the firm's external-financing share. The indicator variable $D_{i,t}$ equals one if firm i operates in the services sector and zero if it operates in manufacturing. To control for macroeconomic conditions and trends that may affect all firms in a given year, I include time fixed effects δ_t. The coefficient $\hat{\beta}$ captures the average difference in external financing intensity between services and manufacturing firms, conditional on the vector of controls $\mathbf{x}$, which includes export share, sectoral upstreamness, and firm size. Importantly, $\hat{\beta}$ is not interpreted causally. Rather, the specification is used to document systematic sectoral differences in financing structures.

Table 2: Regression Analysis of External Financing Intensity by Sector

Variable	Estimate	Standard Error
Intercept	−3.417	(0.014)***
$D = 1$	0.077	(0.003)***
Size	0.213	(0.001)***
Upstreamness	0.461	(0.004)***
Export Share	-0.193	(0.004)***
Fixed Effects	Yes	
Observations	40,319	
R^2	0.026	

Source: Author's calculations based on firm-level data from SORS.
Note: Standard errors are reported in parentheses. Statistical significance at the 1% level is denoted by ***.

The results show that, on average, service-sector firms have an external-financing share roughly 8 percent higher than manufacturing firms, conditional on firm size (Table 2). The positive, statistically significant estimate of $\hat{\gamma}$ further indicates that larger firms rely more on external financing than smaller firms. Together, these findings have important implications for monetary policy transmission. The literature on the credit channel of monetary policy emphasizes that firms more dependent on external finance are typically more exposed to monetary tightening, as higher interest rates raise

financing costs and tighten borrowing constraints. From this perspective, service firms, given their higher external-financing shares, are expected to respond more strongly to monetary policy shocks. Manufacturing firms, by contrast, rely less on external financing, suggesting that their balance sheets may be less sensitive to shifts in credit conditions, potentially dampening their response to tighter policy. These sectoral differences in financing structures, therefore, offer a plausible mechanism through which monetary policy may propagate unevenly across the economy.

5 Empirical Framework

To analyse the transmission of monetary policy shocks to firm-specific cost components at the sectoral level, I employ the panel local projection method introduced by Jordà (2005). Local projections allow the direct estimation of impulse response functions (IRF) and easily incorporate interaction terms, enabling identification of how sector-level characteristics shape heterogeneity in the transmission of monetary policy shocks. The underlying data and obtained impulse responses support a bottom-up estimation of the Phillips curve, in which labour and non-labour costs serve as empirical measures of marginal costs, and hours worked, measured as deviations from trend, provide an alternative to the activity-based output gap. This framework ultimately enables a recursive construction of inflation impulse responses for manufacturing, services, and the aggregate economy.

5.1 Panel Local Projections

I estimate separate sets of local projections for labour- and non-labour-related cost growth, as well as for hours-worked growth, across granular NACE-5 sectors in manufacturing and services.[10] To assess whether these cost components respond differently across sector groups, I define a dummy variable $D^s_{i,t-1}$ that selects the relevant NACE-5 sectors and estimate specification (2) for each group. Formally, for units $i = 1, \dots, n$ observed over periods $t = 1, \dots, T$, the sequence of local projections across horizons $h = 0, 1, \dots, H$ is given by:

$$\begin{aligned} y_{i,t+h} - y_{i,t-1} = \alpha_{i,h} + \mu_i + \delta_t + \beta_h^{(0)} \cdot \varepsilon_t + \beta_h^{(1)} \zeta_i \varepsilon_t + \sum_{k=1}^{K} \delta_h^{(l)} \cdot \Delta y_{i,t-k+1} + \\ + \sum_{l=1}^{L} \phi_h^{(l)} \cdot \varepsilon_{i,t-l} + \mathbf{x}_{i,t-1} \cdot \gamma_h + u_{i,t+h} \end{aligned} \tag{2}$$

The dependent variable $y_{i,t+h} - y_{i,t-1}$ denotes the growth rate of the variable of interest for sector i, where i corresponds to either manufacturing or services. The coefficients β_h trace the impulse response at horizon h. Sector fixed effects (μ_i) control for time-invariant heterogeneity, while time fixed effects (δ_t) capture aggregate fluctuations common across sectors. The specification includes

[10] Because firm-level panels often suffer from non-random attrition, I follow Wooldridge (2010) and aggregate the underlying firm-level data to the sectoral level to mitigate potential attrition bias.

lags of the monetary policy shock ($L = 3$) and lags of the dependent variable ($K = 3$) to account for serial correlation, following Montiel Olea and Plagborg-Møller (2021).

I examine how monetary policy shocks in month t affect the outcome variable over subsequent horizons h. To capture unexpected changes in the euro-area policy stance, I use the shock series constructed by Jarociński and Karadi (2020), which isolates a single shock at each policy announcement. These movements in EONIA swap rates can reasonably be viewed as exogenous for a small open economy such as Slovenia. This feature allows shocks to serve as valid instruments for identifying the effects of monetary policy on firms' labour- and non-labour-cost dynamics within a local projection setting. Although ϵ_t is considered exogenous and controls are not strictly necessary for identification of $\beta_h^{(0)}$ and $\beta_h^{(1)}$, the choice of controls can affect the precision of the estimates, particularly when working with highly granular data, as shown by Plagborg-Møller and Wolf (2021). To improve estimation accuracy, I include the control vector $\mathbf{x}$, which contains a measure of sectoral upstreamness to capture both direct and indirect channels of monetary policy transmission, as well as a measure of sectoral export orientation. To analyse how financing conditions shape the transmission of monetary policy, I include interaction terms. The variable ζ_i captures NACE-5 sector characteristics and allows the specification to separate the average effect of the shock, $\beta_h^{(0)}$, from heterogeneous responses across sectors, captured by $\beta_h^{(1)}\zeta_i$.

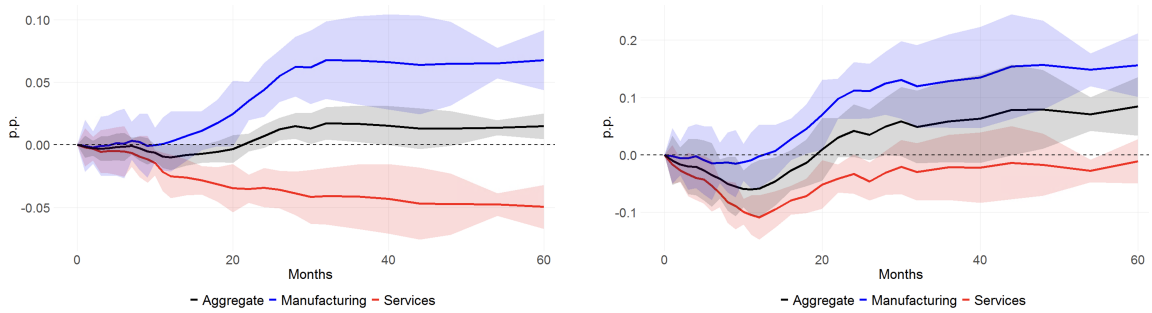
5.1.1 Results

The resulting panel local projections trace the cumulative percentage change in each outcome variable following a one-standard-deviation monetary policy shock. The impulse responses correspond to labour-related costs ($\text{IRF}^s_{\Delta\omega}$), non-labour-related costs ($\text{IRF}^s_{\Delta\zeta}$), and hours worked deviations from trend ($\text{IRF}^s_{\Delta\text{slack}}$).

Figure 4a shows the responses of labour-related costs for the aggregate economy (black), manufacturing (blue), and services (red). A contractionary monetary policy shock reduces labour-related costs in services and in the aggregate. Manufacturing, however, shows a delayed, positive response. The effect is negligible on impact, becomes positive after about one year, and remains elevated for about two years. This pattern suggests that labour costs in manufacturing adjust more slowly, possibly due to longer production cycles or contractual arrangements that limit short-term wage flexibility. Services, by contrast, exhibit an immediate and persistent decline, consistent with their greater exposure to demand fluctuations and heavier reliance on external financing.

Figure 4b presents the corresponding responses of non-labour-related costs. Here again, services react more strongly and more negatively than manufacturing. In services, non-labour costs fall sharply, reaching a peak decline of about 0.15 percentage points, before gradually returning to baseline after roughly two years. This adjustment is less persistent than that of labour-related costs. Manufacturing shows a small and insignificant decline on impact, which turns positive after about 18 months and peaks after roughly three years, remaining elevated thereafter. This persistence likely reflects the sector's dependence on material inputs, imported components, and energy.

Figure 4: Impulse Responses to a Monetary Policy Shock by Sector



(a) Labour-Related Costs

(b) Non-Labour-Related Costs

Source: Author's calculations based on firm-level data from SORS.
Note: The figures display the impulse responses of real labour and non-labour-related costs to a one standard deviation monetary policy shock for manufacturing (blue), services (red), and the aggregate economy (black), together with 90 percent confidence intervals.

Two insights emerge from comparing labour- and non-labour-cost dynamics. First, the weak and insignificant contemporaneous response of labour-related costs, and their tendency to build only after about a year, reinforce the well-established view that labour costs adjust sluggishly. Wage agreements, in particular, limit firms' ability to modify labour expenses quickly in response to changing economic conditions. This highlights the greater rigidity of labour-related costs relative to non-labour inputs. Second, these dynamics are visible only because the data are available at a monthly frequency. With annual data, such patterns would be obscured.

The differences between manufacturing and services can be interpreted through the credit and cost channels of monetary policy transmission (Bernanke and Gertler (1995), Bernanke et al. (1999), Barth III and Ramey (2001), Christiano et al. (2005)). Manufacturing firms' reliance on external financing allows them to maintain existing labour contracts in the short run. However, because they must pay for both labour and non-labour inputs before receiving sales revenues, higher interest rates raise production costs and operate as an adverse cost-push shock. Services, on the other hand, display a more conventional negative response to monetary tightening, consistent with the credit channel of monetary policy.

5.2 Sector-Specific Reduced-Form Phillips Curves

I adopt a bottom-up estimation of the reduced-form Phillips curve following the approach in Gagliardone et al. (2025). The sector-specific specifications use labour and non-labour costs as empirical measures of marginal costs, and hours worked, measured as deviations from trend, as an alternative to the activity-based output gap (as in Galí (2015) or Coibion and Gorodnichenko (2015)). Hours worked capture both extensive and intensive margins of labour utilisation and exhibit

cyclical variation, making them a suitable proxy for economic slack. I estimate three versions of the reduced-form Phillips curve: one for manufacturing, one for services, and one for the full panel. The specification is:

$$\pi_t^s = \beta_1^s \text{slack}_t^s + \beta_2^s \pi_{t-1}^s + \beta_3^s \Delta\omega_t^s + \beta_4^s \Delta\zeta_t^s + \varepsilon_t^s \tag{3}$$

where ω_t and ζ_t denote the growth rates of labour-related and non-labour-related costs and therefore capture sectoral or aggregate marginal-cost dynamics. Expected inflation is proxied by lagged inflation, π_{t-1}, consistent with the adaptive-expectations view in which agents form expectations based on past inflation, commonly used in reduced-form Phillips curve estimations (see, e.g., Mavroeidis et al. (2014)). The term ε_t denotes the residual.

Table 3: Estimates of the Reduced-Form Phillips Curve Parameters

Sector	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\beta}_3$	$\hat{\beta}_4$
Manufacturing	2.410	0.969	0.987	0.528
	(1.961)	(0.033)***	(1.446)	(0.523)
Services	0.642	0.974	0.652	0.172
	(1.285)	(0.026)***	(1.005)	(0.114)
Aggregate	2.148	0.974	1.671	0.397
	(1.197)	(0.030)***	(1.445)	(0.275)

Source: Author's calculations based on firm-level data from SORS.
Note: Standard errors are reported in parentheses. Statistical significance at the 1% level is denoted by ***.

Equation (3) provides a linear mapping from sectoral or aggregate slack, lagged inflation, and marginal-cost components to inflation. Estimating this equation yields the reduced-form Phillips curve coefficients $\hat{\beta}_1$, $\hat{\beta}_2$, $\hat{\beta}_3$, and $\hat{\beta}_4$ for manufacturing, services and the aggregate economy (Table 3). These estimates shed light on how inflation responds to economic conditions and to labour- and non-labour-cost pressures across sectors. The first notable result is a strong, statistically significant effect of lagged inflation, indicating substantial inflation persistence. A second clear pattern appears in the cost coefficients. The estimate on labour-related costs ($\hat{\beta}_3$) is consistently larger than the estimate on non-labour-related costs ($\hat{\beta}_4$), across all three specifications. This indicates that labour costs exert a stronger influence on inflation dynamics than other input costs. In other words, changes in wages and broader labour-related expenses tend to pass through to prices more strongly than changes in non-labour inputs.

The relative magnitude of these coefficients is also informative. The ratio of $\hat{\beta}_3$ to $\hat{\beta}_4$ is highest in services, reflecting the fact that labour accounts for a large share of input costs in this sector. As a result, labour-related costs play a particularly important role in firms' pricing decisions. The lower manufacturing ratio is consistent with its more diversified cost structure, in which material and energy inputs account for a larger share of total costs.

The results also suggest that the slope of the reduced-form Phillips curve is steeper in manufacturing than in services. This implies that manufacturing inflation responds more strongly to changes

in economic conditions. By contrast, the flatter slope in services points to weaker sensitivity to slack. This may reflect greater pricing rigidities, institutional features of wage-setting, or a more cautious approach to passing cost changes on to consumers. As a result, economic conditions have a less pronounced effect on inflation in services than in manufacturing.

These estimates allow the sectoral and aggregate impulse responses of labour- and non-labour-related costs, $\text{IRF}^s_{\Delta\omega}(h)$ and $\text{IRF}^s_{\Delta\zeta}(h)$, to be translated into the corresponding impulse responses of inflation. As the system is linear, I construct inflation responses recursively, following an approach conceptually related to those in McGregor and Toscani (2022) and Gagliardone and Gertler (2023). For $h = 0, 1, \ldots, H$:

$$\text{IRF}^s_\pi(h) = \hat{\beta}^s_1 \text{IRF}^s_{\Delta\text{slack}} + \hat{\beta}^s_2 \pi^s_{t-1} + \hat{\beta}^s_3 \text{IRF}^s_{\Delta\omega}(h) + \hat{\beta}^s_4 \text{IRF}^s_{\Delta\zeta}(h) \tag{4}$$

with impulse-response terms at negative horizons set to zero. I construct both the direct aggregate inflation response and the indirect response constructed from the sectoral impulse responses.

First, using the full sample, I combine the impulse responses of labour- and non-labour-related costs and hours worked to obtain the directly estimated aggregate inflation response, $\text{IRF}^{\text{Agg,Direct}}_\pi$. I then estimate sectoral inflation responses for manufacturing and services, $\text{IRF}^{\text{Mfg}}_\pi$ and $\text{IRF}^{\text{Srvcs}}_\pi$. To derive the aggregate inflation response implied by sectoral dynamics, I combine the sector-specific responses using the 2023 HICP weights for manufacturing and services, $\omega^M_{\text{HICP}} = 0.67$ and $\omega^S_{\text{HICP}} = 0.33$.[11] The sectoral-implied aggregate response is then constructed as:

$$\text{IRF}^{\text{Agg,indirect}}_\pi = \omega^M_{\text{HICP}} \cdot \text{IRF}^{\text{Mfg}}_\pi + \omega^S_{\text{HICP}} \cdot \text{IRF}^{\text{Srvcs}}_\pi \tag{5}$$

Finally, I estimate the aggregate inflation response using only the pre-pandemic sample to account for the correction proposed by Lenza and Primiceri (2022). This enables a comparison of the reduced-form Phillips-curve slopes obtained from the full sample (through 2023) with those estimated from the shorter, pre-pandemic sample.

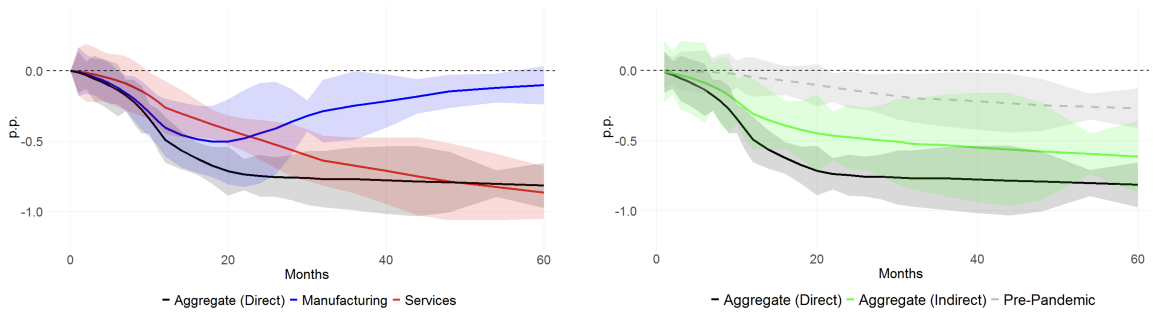
Following a contractionary monetary policy shock, all responses—sectoral and aggregate, direct and indirect, and across both sector lengths ($\text{IRF}^{\text{Mfg}}_\pi$, $\text{IRF}^{\text{Srvcs}}_\pi$, $\text{IRF}^{\text{Agg, Direct}}_\pi$, $\text{IRF}^{\text{Agg, Indirect}}_\pi$, and $\text{IRF}^{\text{Agg 2019, Direct}}_\pi$)—decline on impact (Figure 5a and 5b). The aggregate inflation response (black line) reaches its trough slightly before two years after the shock, falling by around 0.75 percentage points, and remains at that level for the rest of the horizon. Manufacturing inflation (blue line) responds with similar strength, reaching its lowest point after roughly a year and a half before gradually returning toward the mean. In contrast, services inflation (red line) adjusts more slowly and with a lag, but its response is more persistent.[12] These patterns suggest that manufacturing

[11] The ECOICOP weights are sourced from SORS and closely match the relative composition of firms in the sample.

[12] Firms facing supply constraints, which are common in manufacturing, may delay price adjustments when monetary policy tightens if they are still working through backlogs, as shown in Balleer and Noeller (2023). Another explanation relates to price-setting behaviour. Firm-level surveys suggest that service-sector firms adjust prices less frequently than manufacturing firms (Unsal and Franco (2025)).

drives the short- to medium-term response of aggregate inflation, while services dominate the medium- to long-term dynamics and largely account for the persistence observed in the aggregate response.

Figure 5: Reduced-form Phillips Curve-Implied Impulse Responses of Inflation



(a) Sectoral and Aggregate Inflation IRFs

(b) Pre-Pandemic, Direct, and Indirect IRFs

Source: Author's calculations.
Note: The figures show recursively estimated impulse responses for aggregate (black), manufacturing (blue), and services (red) inflation, along with aggregate inflation based on sectoral data (green), and aggregate inflation estimated on the pre-pandemic sample (dashed black), each shown with 90 percent confidence intervals.

Overall, the results show that aggregation masks important sectoral heterogeneity. Even so, the aggregate pass-through does not appear to be substantially distorted by jointly estimating manufacturing and services, which is reassuring from a policy perspective. When comparing the direct (black line) and indirect (green line) aggregate impulse responses in Figure 5b, the sector-implied indirect response is somewhat weaker. This can reflect several factors. One is the broader mix of sectors included in the aggregate measure beyond manufacturing and services, which, although dominant, do not capture the full range of economic activity. Another is the averaging effect of aggregation, since the aggregate response represents a weighted combination of sectoral dynamics, and sectors with weaker inflation responses may dampen the overall indirect effect. Recognising these nuances is important for policymakers because it highlights the value of accounting for sectoral heterogeneity when assessing inflation dynamics and designing effective policy responses.

Finally, comparing the aggregate inflation impulse response estimated on the full sample (black line) with the one based on the sample ending in 2019 (dashed black line) in Figure 5b suggests that the Phillips correlation strengthened in the post-pandemic period. The restricted sample produces a much weaker response of aggregate inflation to ECB tightening than the full-sample response. The comparison illustrates that the pandemic and post-pandemic inflation surge contain crucial information for understanding inflation dynamics, despite the additional volatility they introduce. Including these years reveals important economic disturbances that help explain inflation behaviour in the post-pandemic period and the different responses of manufacturing and services

to ECB monetary policy, dynamics that are concealed when the sample is restricted to 2019. The heightened uncertainty of the post-pandemic period, amplified by geopolitical tensions, underscores the importance of incorporating major economic disturbances when assessing the effectiveness of policy interventions.

6 Conclusion

The findings of this paper emphasize the critical need to understand the differences in the impacts of monetary policy across sectors, particularly in light of the 2022-2024 inflation surge. The paper highlights that external financing plays a significant role in cost responsiveness, with service firms exhibiting greater sensitivity than manufacturing firms. By employing a novel monthly firm-level dataset, this paper uncovers sectoral heterogeneities that traditional aggregate analyses often overlook. Furthermore, the evidence of a steeper Phillips curve in manufacturing suggests that the short- to medium-term aggregate inflation response is primarily driven by the manufacturing sector, while the long-term persistence of inflation is largely attributed to the services sector.

These findings illuminate the unique characteristics of a small open economy like Slovenia and offer valuable insights for other countries operating under the common ECB monetary policy framework. As central banks navigate the complexities of monetary policy transmission, it is imperative to consider these sector-specific dynamics to enhance policy effectiveness. The lessons drawn from Slovenia's experience can guide other small economies in their approach to tackling inflation, particularly in a post-pandemic context characterized by heightened economic uncertainty and geopolitical challenges.

References

Akarsu, O., Çolak, M. S., Karahan, H., and Torun, H. (2025). The heterogeneous impact of monetary policy announcements on firms' financial outcomes. *Empirical Economics*, 69(6):3045–3087.

Allayioti, A., Fagandini, B., Górnicka, L., and Martínez Hernández, C. (2025). Monetary policy pass-through to goods and services inflation: a granular perspective. *Economic Bulletin Boxes*, 8.

Aruoba, S. B. and Drechsel, T. (2024). The long and variable lags of monetary policy: Evidence from disaggregated price indices. *Journal of Monetary Economics*, 148:103635.

Auerbach, A. J. and Gorodnichenko, Y. (2013). Output spillovers from fiscal policy. *American Economic Review*, 103(3):141–146.

Balleer, A. and Noeller, M. (2023). *Monetary policy in the presence of supply constraints: Evidence from German firm-level data*. Number 1060. Ruhr Economic Papers.

Barth III, M. J. and Ramey, V. A. (2001). The cost channel of monetary transmission. *NBER macroeconomics annual*, 16:199–240.

Battistini, N. and Gareis, J. (2024). Monetary policy and the recent slowdown in manufacturing and services. *Economic Bulletin Boxes*, 8.

Bernanke, B. S. and Gertler, M. (1986). Agency costs, collateral, and business fluctuations.

Bernanke, B. S. and Gertler, M. (1995). Inside the black box: the credit channel of monetary policy transmission. *Journal of Economic perspectives*, 9(4):27–48.

Bernanke, B. S., Gertler, M., and Gilchrist, S. (1999). The financial accelerator in a quantitative business cycle framework. *Handbook of macroeconomics*, 1:1341–1393.

Blanchard, O. J. and Bernanke, B. S. (2024). An analysis of pandemic-era inflation in 11 economies. Technical report, National Bureau of Economic Research.

Boneva, L., Cloyne, J., Weale, M., and Wieladek, T. (2020). Firms' price, cost and activity expectations: Evidence from micro data. *The economic journal*, 130(627):555–586.

Buda, G., Carvalho, V. M., Corsetti, G., Duarte, J. B., Hansen, S., Ortiz, A., Rodrigo, T., and Rodríguez Mora, J. V. (2023). Short and variable lags. *Robert Schuman Centre for Advanced Studies Research Paper*, (22).

Choi, S., Willems, T., and Yoo, S. Y. (2024). Revisiting the monetary transmission mechanism through an industry-level differential approach. *Journal of Monetary Economics*, 145:103556.

Christiano, L. J., Eichenbaum, M., and Evans, C. L. (2005). Nominal rigidities and the dynamic effects of a shock to monetary policy. *Journal of political Economy*, 113(1):1–45.

Coibion, O. and Gorodnichenko, Y. (2015). Is the phillips curve alive and well after all? inflation expectations and the missing disinflation. *American Economic Journal: Macroeconomics*, 7(1):197–232.

Datsenko, R. and Fleck, J. (2024). Country-specific effects of euro-area monetary policy: The role of sectoral differences.

Dedola, L. and Lippi, F. (2005). The monetary transmission mechanism: evidence from the industries of five oecd countries. *European Economic Review*, 49(6):1543–1569.

Durante, E., Ferrando, A., and Vermeulen, P. (2022). Monetary policy, investment and firm heterogeneity. *European Economic Review*, 148:104251.

Frohm, E. (2020). Price-setting and economic slack: Evidence from firm-level survey data. *Journal of Macroeconomics*, 65:103235.

Gagliardone, L. and Gertler, M. (2023). Oil prices, monetary policy and inflation surges.

Gagliardone, L., Gertler, M., Lenzu, S., and Tielens, J. (2025). Anatomy of the phillips curve: micro evidence and macro implications. *American Economic Review*, 115(11):3941–3974.

Gaiotti, E. (2008). Has globalisation changed the phillips curve? firm-level evidence on the effect of activity on prices. *Firm-Level Evidence on the Effect of Activity on Prices (July 11, 2008). Bank of Italy Temi di Discussione (Working Paper) No*, 676.

Galí, J. (2015). *Monetary policy, inflation, and the business cycle: an introduction to the new Keynesian framework and its applications*. Princeton University Press.

Ghassibe, M. (2021). Monetary policy and production networks: an empirical investigation. *Journal of Monetary Economics*, 119:21–39.

Jarociński, M. and Karadi, P. (2020). Deconstructing monetary policy surprises—the role of information shocks. *American Economic Journal: Macroeconomics*, 12(2):1–43.

Jordà, Ò. (2005). Estimation and inference of impulse responses by local projections. *American economic review*, 95(1):161–182.

Jordà, Ò., Schularick, M., and Taylor, A. M. (2015). Betting the house. *Journal of international economics*, 96:S2–S18.

Lenza, M. and Primiceri, G. E. (2022). How to estimate a vector autoregression after march 2020. *Journal of Applied Econometrics*, 37(4):688–699.

Mandler, M., Scharnagl, M., and Volz, U. (2022). Heterogeneity in euro area monetary policy transmission: Results from a large multicountry bvar model. *Journal of Money, Credit and Banking*, 54(2-3):627–649.

Marcellino, M. and Tornese, T. (2025). An empirical investigation of the effects of monetary policy shocks on the italian economy. *Economics Letters*, page 112686.

Mavroeidis, S., Plagborg-Møller, M., and Stock, J. H. (2014). Empirical evidence on inflation expectations in the new keynesian phillips curve. *American Economic Journal: Journal of Economic Literature*, 52(1):124–188.

McGregor, T. and Toscani, F. (2022). A bottom-up reduced form phillips curve for the euro area.

Montiel Olea, J. L. and Plagborg-Møller, M. (2021). Local projection inference is simpler and more robust than you think. *Econometrica*, 89(4):1789–1823.

Nylund, P. A., Arimany-Serrat, N., Ferras-Hernandez, X., Viardot, E., Boateng, H., and Brem, A. (2020). Internal and external financing of innovation: Sectoral differences in a longitudinal study of european firms. *European Journal of Innovation Management*, 23(2):200–213.

Peersman, G. and Smets, F. (2005). The industry effects of monetary policy in the euro area. *The Economic Journal*, 115(503):319–342.

Plagborg-Møller, M. and Wolf, C. K. (2021). Local projections and vars estimate the same impulse responses. *Econometrica*, 89(2):955–980.

Steininger, L. and Matzner, A. (2025). Monetary policy and the firm-level labor share: a story about capital.

Unsal, F. and Franco, G. (2025). Monetary policy and productivity: Unpacking multifaceted links. Technical report, OECD Publishing.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. MIT press.

7 Appendix

Dataset Construction

Table 4: Summary of Sectoral Coverage

NACE Group	**Group Name**
All NACE 5-digit sectors	-
Manufacturing	C (CA(10)-CM(33))
Services	G(45)-S(96)
Agriculture, forestry and fishing	A
Mining and quarrying	B
Electricity, gas, steam and air conditioning supply	D
Water supply & sewerage	E
Construction	F
Activities of households as employers - for own use	T
Activities of extraterritorial organisations and bodies	U

Source: SORS.