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The Limited Effects of Post-Pandemic U.S. Monetary Policy Tightening: Demand Composition and the Credit Channel

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Abstract

This paper investigates the reasons behind the resilience of the U.S. economy despite the rapid and significant monetary policy tightening since 2022, focusing on two perspectives: heterogeneity among GDP demand components, and the time-varying nature of the credit channel. Methodologically, we employ a Factor-Augmented VAR model to examine the heterogeneity in the effects of monetary policy across demand components. Subsequently, we estimate a smooth-transition Local Projection model with the excess bond premium as a transition variable to quantify the time-varying effects of monetary policy depending on financial market conditions. The analysis reveals that demand components with higher reliance on borrowing are dampened by rate hikes, while components with lower reliance exhibit muted responses. Furthermore, the results show that the effects of monetary policy intensify for demand components with higher borrowing dependence only when the credit channel is strongly operative. Conversely, components with lower borrowing dependence demonstrate weak reactions irrespective of the prevailing regime. These findings suggest that the limited downward impact of the monetary policy tightening since 2022 on the real economy can be explained by the heterogeneity in responses among demand components, the "composition effect" linked to the growing recent dominance of service consumption in the U.S. economy, and the "regime effect" characterized by the subdued amplification role of the credit channel during this period. This paper contributes to the literature by providing a unified framework to analyze both composition and regime effects.

JEL classification：E21, E22, E44, E52

Keywords：Monetary Policy, Credit Channel, FAVAR, Smooth-transition Local Projection

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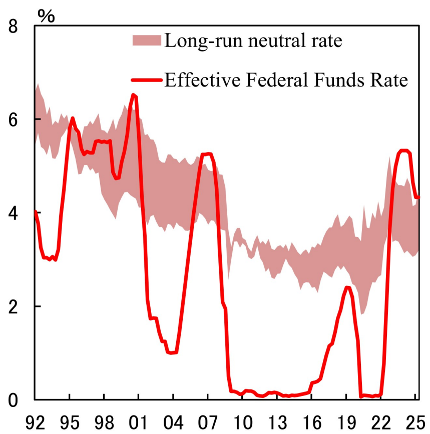
1 Introduction

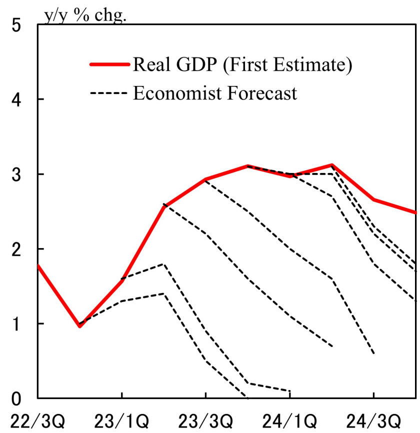
Since 2022, the Federal Reserve has implemented rapid and substantial monetary policy tightening. The policy interest rate has been raised cumulatively in a short period, reaching levels above the long-run neutral rate as estimated by various methodologies (Figure 1). Based on the standard transmission mechanisms of monetary policy, such interest rate hikes were expected to strongly depress demand, particularly housing investment and durable goods consumption, leading to a significant economic slowdown. However, in practice, the U.S. economy has remained resilient, contrary to the predictions of many economists, with the slowdown in aggregate demand being limited (Figure 2). This paper investigates the resilience of the real economy despite recent monetary policy tightening in the U.S.

Figure 1. Effective FF rate and Long-run neutral rate



Note: The latest observations are for the second quarter of 2025. The shaded area indicates the range of long-run neutral rates, from the minimum to the maximum, obtained by adding 10-year CPI inflation expectations in the Survey of Professional Forecasters to Kim et al. (2019), Holston et al. (2023), and Lubik and Matthes (2025), respectively.
Source: HAVER; Kim et al. (2019); Holston et al. (2023); Lubik and Matthes (2025)

Figure 2. Forecasts and Realizations of Real GDP



Note: The latest observations are for the fourth quarter of 2024. The year-on-year growth rate of actual real GDP is calculated based on the first preliminary estimate and the data available at that time for the same period of the previous year. The economist forecasts are the average of predictions compiled by Blue Chip.
Source: Wolters Kluwer; HAVER; Federal Reserve Bank of Philadelphia

The main objective of this paper is to investigate whether the effects of monetary policy have weakened or whether changes in economic structure and the financial market environment have led to a smaller observed effect of policy across the economy. Of particular interest is the credit channel, which is thought to amplify the effects of monetary policy. Many previous studies, such as Bernanke and Gertler (1995), have suggested that monetary policy tightening increases external funding premiums through the balance sheets and collateral values of borrowers, raising financing costs beyond the rise in policy rates and thereby restraining investment and consumption. This effect is expected to be stronger for demand components that are highly dependent on borrowing and where collateral is crucial.

On the other hand, in recent years, the U.S. economy has seen a significant rise in the share of service consumption and intangible asset investments (such as intellectual property production investments). These demand components are considered to have low collateral values and relatively low reliance on bank borrowing, which may weaken the traditional amplification effects of monetary policy through the credit channel (Döttling and Ratnovski (2023)). This suggests that the observed effects of monetary policy on the macroeconomy could appear lower due to the "composition effect."

Furthermore, the effectiveness of the credit channel is likely to depend not only on the borrowing structure of demand components but also on the financial market environment. Previous studies, such as Gilchrist and Zakrajšek (2012) and Gertler and Karadi (2015), have pointed out that the excess bond premium (EBP), which reflects investor risk tolerance and the intensity of financial frictions, can moderate the amplification of monetary policy effects when the EBP is low. In other words, the effects of monetary policy on the real economy may change over time through a "regime effect" involving a broad credit channel that includes both the borrowing structures of borrowers and the risk tolerance of lenders.

The aim of this paper is to empirically examine, using macro-level data, two key factors that underlie the changing effects of monetary policy: the "composition effect," which reflects the heterogeneity in responses among demand components and their weight changes, and the "regime effect," which captures cyclical variations driven by the time-varying nature of the credit channel. To this end, we conduct the following two analyses. First, we construct a Factor-Augmented VAR (FAVAR) model using a large dataset comprising approximately 100 time series, including GDP demand components. By estimating the impulse responses of individual demand components to monetary policy shocks, we identify the heterogeneity in the effects of monetary policy across these components and discuss the potential attenuation of monetary policy effects driven by the composition effect. While prior studies have traditionally focused on the overall aggregate demand or the effects on individual sectors, relatively limited research has integrated the analysis of how changes in demand composition impact the observed macroeconomic effects of monetary policy from the perspective of the composition effect. One contribution of this paper lies in demonstrating the heterogeneity in monetary policy effects across demand components using the FAVAR model, and examining the possibility that the increased share of service consumption and intangible asset investment attenuates the aggregate demand response to monetary policy. Second, we estimate a smooth-transition Local Projection (ST-LP) model utilizing the EBP from Favara et al. (2016) as a transition variable, quantitatively exploring the "regime effect," in which changes in financial market conditions influence the magnitude of policy effects. Regarding the regime effect, Rüth (2017) demonstrates, using an ST-LP model with EBP as the transition variable, that the functionality of the credit channel is heightened during periods of stronger financial frictions, amplifying the effects of monetary policy. However, the literature has not thoroughly examined whether the regime effect varies across different demand components. In particular, despite its theoretical significance, empirical evidence is scarce on how the differences in borrowing dependence across demand components influence their sensitivity to regimes. Another contribution of this paper is to estimate the regime effect at the level of individual demand components, shedding light on the interaction between the functionality of the credit channel and the structural composition of the real economy. Based on these analyses, this paper quantitatively evaluates changes in the effects of monetary policy through the dual lenses of composition and regime effects, offering new implications for the ongoing discussion on the evolving nature of monetary policy effectiveness in recent years.

The empirical results reveal the following. The FAVAR model estimation shows that durable goods consumption, housing investment, and non-residential tangible asset investments are substantially depressed by monetary policy tightening, while the responses of service consumption and intangible asset investments are limited. This suggests that the growing recent dominance of service consumption and intangible asset investments could explain why the overall effect of monetary policy on aggregate demand appears lower. Furthermore, the ST-LP model estimation confirms that demand components with higher borrowing dependencies show a larger response to monetary policy in the regime where the credit channel is more active, while the response of components with lower borrowing dependencies remains small regardless of the regime.

Based on these results, the limited downward pressure on the real economy during the period of monetary policy tightening since 2022 can be explained not only by the structural effect of the rising share of service consumption and intangible asset investments but also by a financial market environment with a higher risk tolerance, which has made it harder for the credit channel's amplification effects to manifest. This paper contributes by presenting a framework that integrates the "composition effect" and the "regime effect" to analyze how recent monetary policy tightening has influenced the U.S. economy. Nonetheless, the results of this paper do not negate the importance of other factors such as fiscal policy, the easing of supply constraints, and the marketization of financial intermediation. This paper provides an empirical basis for understanding how the effects of recent monetary policy can be perceived by combining the perspective of heterogeneity among demand components with that of financial market regimes.

The remainder of this paper is structured as follows. Section 2 describes the model and data. Section 3 presents the estimation results and examines the heterogeneity among demand components as well as the time variation induced by credit channel regimes. Section 4 concludes.

2 Model and Data

2.1 FAVAR Model

This section explains the FAVAR model used to examine the heterogeneity of responses to monetary policy shocks across demand components . This paper estimates the following Bayesian FAVAR model by extracting common factors from a large dataset of approximately 100 macroeconomic and financial indicators related to U.S. economic GDP demand components. Using a large dataset allows for capturing the broad effects of monetary policy shocks on the economy:[1]

$$\begin{pmatrix} MPS_t \\ F_t \end{pmatrix} = \begin{pmatrix} \mu^{MPS} \\ \mu^{F} \end{pmatrix} + \sum_{p=1}^{P} \phi^p \begin{pmatrix} MPS_{t-p} \\ F_{t-p} \end{pmatrix} + \Sigma \begin{pmatrix} \varepsilon_t^{MPS} \\ \varepsilon_t^{F} \end{pmatrix}, \tag{1}$$

where MPS represents orthogonalized monetary policy surprises explained in detail in Section 2.3, F is a vector of factors obtained from principal component analysis of macroeconomic and financial indicators, μ is a constant term, and ε_t is a structural shock. The matrix Σ represents the Cholesky decomposition of the variance-covariance matrix of the errors.[2] The number of factors is set to 9 (with a cumulative contribution ratio of approximately 80 %), and the lag length is set to 4 quarters, following other studies that analyze the impact of monetary

[1] The estimation uses the Empirical Macro Toolbox published by Canova and Ferroni (2021). A non-informative Jeffries prior distribution is applied for the estimation.

[2] MPS uses quarterly averages.

policy shocks on the real economy.[3]

The identification of monetary policy shocks uses the Internal Instrument Approach by Plagborg-Møller and Wolf (2021). This method incorporates monetary policy surprises, based on high-frequency data, as an instrumental variable in the VAR model and identifies structural shocks through a Cholesky decomposition. In this paper, the orthogonalized monetary policy surprise proposed by Bauer and Swanson (2023) is used as the instrument for monetary policy shocks, and it is placed before the common factors in the FAVAR model to impose the identification assumption that monetary policy shocks are uncorrelated with other macroeconomic shocks at the same point in time. An advantage of this identification approach is that it allows one to estimate impulse response functions that are asymptotically equivalent to those obtained using an external instrument within the LP framework.

In principal component analysis for dimensionality reduction, data standardization is common practice. However, for non-stationary time-series data, this procedure encounters the issue of divergence in the mean and variance as the sample size approaches infinity. To address this problem, existing studies employing the FAVAR model often achieve stationarity by differencing the data. Nevertheless, it is practically challenging to assess the stationarity and apply appropriate transformations to each variable in a large-scale dataset. To overcome this issue, this paper adopts the regression-based detrending approach proposed by Hamilton (2018) and Hamilton et al. (2024). Specifically, for each variable, the following linear projection is estimated using ordinary least squares (OLS) with its own lags, and the resulting residuals $\widetilde{y}_t$ are treated as cyclical components:

$$y_t = a + \beta_1 y_{t-k} + \beta_2 y_{t-k-1} + \ldots + \beta_q y_{t-k-q+1} + \widetilde{y}_t.$$

This allows consistent treatment of all series before performing principal component analysis.

[3] E.g., Bernanke and Gertler (1995), Stock and Watson (2001), Boivin and Giannoni (2006).

All economic and financial variables used in the analysis are expressed in natural logarithms, except for variables measured in percentages, such as interest rates. The forecast period and lag length are denoted as k and q, respectively. The literature recommends $k = 8$ and $q = 4$ for quarterly data, and this paper follows this approach for detrending.

2.2 Smooth-Transition LP Model

This section explains the details of the ST-LP model. To investigate the heterogeneity across demand components, the FAVAR model described in the previous section is used. However, since dimensionality reduction is performed using principal component analysis, many factors must be incorporated into the VAR model to recover the impulse response functions for each variable. Furthermore, to capture how the effects of monetary policy change with the degree of credit channel functioning, a sufficiently large sample size is required to estimate a complex large model. Since quarterly data is used, there are limitations on the time-series sample size for monetary policy shocks. Therefore, this paper constructs an LP model with GDP expenditure components as the dependent variable, incorporating an ST mechanism, replacing the FAVAR model.

This paper follows prior studies and uses the EBP by Favara et al. (2016) as the transition variable to investigate whether there are differences in the response of the real economy to monetary policy shocks across regimes with higher and lower investor risk tolerance.

In this analysis, following Tenreyro and Thwaites (2016), the following ST-LP model is estimated by OLS:

$$\widetilde{y}_{t+h} = (\alpha_h^T + \beta_h^T \varepsilon_t^{MPS} + \phi_h^T x_t)G(s_{t-1}) + (\alpha_h^A + \beta_h^A \varepsilon_t^{MPS} + \phi_h^A x_t)(1 - G(s_{t-1})) + u_{t+h}, \tag{2}$$

where, as explained below, T represents the regime where the credit channel is functioning strongly, while A represents a regime with a higher investor risk tolerance, i.e., weaker credit channel functionality. ε_t^{MPS} is the monetary policy shock, identified using the structural shocks from the FAVAR model (1). x_t is a vector of control variables, which includes the lagged variables of EBP, real GDP, stock prices, and the PCE deflator, as well as the lagged terms of the dependent variable.[4] Lag length is set to 4. u_{t+h} is the error term, and s_{t-1} is the transition variable, with $G(s_{t-1})$ representing the weight of regime T, which takes values between 0 and 1.

To analyze monotonic state transitions based on the degree of credit channel functioning, the transition variable is EBP, i.e. $s_{t-1} = EBP_{t-1}$, and the transition function $G(s_{t-1})$ follows the logistic function as specified by Granger et al. (1993).

$$G(s_{t-1}) = \frac{1}{1 + \exp\left(-\gamma \left(s_{t-1} - c\right)\right)}, \quad \gamma > 0, \tag{3}$$

where c defines the threshold at which the weight of regime T becomes higher than regime A, and γ determines the speed of transition from regime A to regime T. The smaller the value of s_{t-1}, the closer $G(s_{t-1})$ is to 0, and the greater the weight of regime A. Conversely, when s_{t-1} is larger, $G(s_{t-1})$ is closer to 1, and the weight of regime T increases. Therefore, regime T represents a state in which the s_{t-1} is high and the credit channel functions strongly. In contrast, regime A can be interpreted as a state where the s_{t-1} is low, investors' risk tolerance is high, and thus the functionality of the credit channel is weak. Furthermore, the strength or weakness of the functionality of the credit channel is determined by the parameter c. When the s_{t-1} is smaller than c, regime A dominates (i.e., its weight exceeds 0.5), whereas when the s_{t-1} is larger than c, the weight of regime T surpasses 0.5. Additionally, as the parameter γ increases, the transition from regime A to regime T becomes faster when the s_{t-1} exceeds c, resulting in a more abrupt change in the effects of monetary policy.

[4] For variables other than the structural shock used in the ST-LP model estimation, trend removal is applied using the method of Hamilton et al. (2024).

2.3 Data

The data used for the analysis in this paper consists of quarterly macroeconomic and financial indicators, encompassing approximately 100 series related to the U.S. economy, including demand components of GDP. Details of the data employed for estimating the FAVAR model and the ST-LP model are summarized in Appendix A. The analysis covers the period from the second quarter of 1985 to the fourth quarter of 2023. Below, we discuss the MPS and the EBP, which play a crucial role in these analyses.

2.3.1 Instrumental Variable

In this paper, as mentioned earlier, we conduct an analysis to identify monetary policy shocks using the FAVAR model, employing the monetary policy surprises proposed by Bauer and Swanson (2023) as instrumental variables. The instrumental variables, in accordance with the identification criteria of Stock and Watson (2018), are defined as external instruments that satisfy the following conditions when the structural shock of interest is denoted as $\varepsilon_{1,t}$ and other structural shocks are denoted as $\varepsilon_{2,t}$.

(i) $\mathbb{E}(\varepsilon_{1,t} z_t) \neq 0$

(ii) $\mathbb{E}(\varepsilon_{2,t} z_t) = 0$

(iii) $\mathbb{E}(\varepsilon_{t+j} z_t) = 0 \quad for \quad j \neq 0$

Bauer and Swanson (2023) point out that monetary policy surprises, calculated using the movements of interest rate futures within a 30-minute window around FOMC announcements, may still be correlated with real economic and financial variables. This potential correlation suggests that these surprises might not satisfy the requirements for valid instrumental variables. To address this issue, they propose regressing monetary policy surprises on variables such as nonfarm payrolls and financial indicators, and using the residuals from this regression referred to as orthogonalized monetary policy surprises (hereafter, orthogonalized MPS) as instrumental variables. When comparing the impulse responses to orthogonalized MPS with those generated by unprocessed monetary policy surprises, they find no significant differences in responses among financial variables. However, for real variables, the impulse responses to orthogonalized MPS are larger and statistically more significant. In this paper, we adopt orthogonalized MPS as instrumental variables in accordance with the aforementioned conditions that instrumental variables must satisfy. Figure 3 illustrates the time series of the orthogonalized MPS used in this study.

2.3.2 Transition Variable

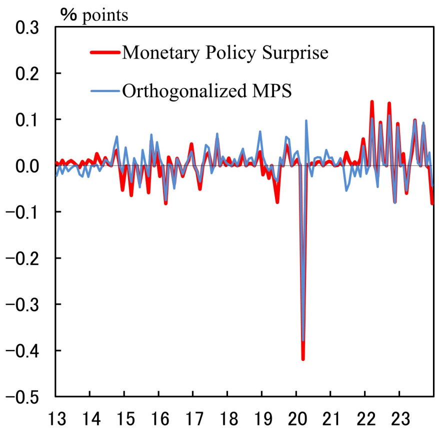
In the ST-LP model (2) employed in this paper, the EBP proposed by Favara et al. (2016) is used as the transition variable. The EBP is a measure derived by removing the default-risk component from corporate bond spreads and is interpreted as reflecting the degree of risk appetite in financial markets and the strength of financial frictions. Previous studies have widely utilized the EBP as a proxy variable to capture financial market conditions that either amplify or dampen the propagation of monetary policy shocks to the real economy.[5]

In this paper, the EBP is positioned not as a causal explanatory variable for monetary policy but as a state variable that characterizes financial market conditions. Specifically, as shown in equation (3), only the lagged values of the EBP are used in the transition function. This approach ensures that contemporaneous variations in the EBP at the time of monetary policy shocks do not directly influence the estimation of impulse responses. In this regard, the framework of this paper is not intended to interpret the level of the EBP itself as directly changing the demand components; instead, its purpose is to capture the type of financial

[5] For instance, Rüth (2017) references Gertler and Karadi (2015) to justify the use of EBP as a transition variable. By separating the component associated with default risk from spreads that are thought to reflect the effects of traditional interest rate channels, the EBP can serve as a proxy variable representing the financial accelerator effects through the credit channel in monetary policy.

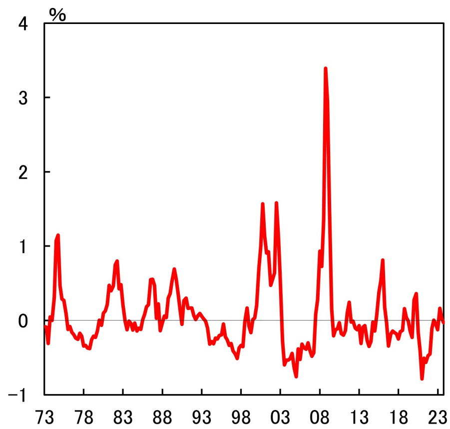
market conditions under which monetary policy is more effective. Figure 4 illustrates the time series of the EBP utilized in this study.

Figure 3. Monetary Policy Surprise



Note: The latest observations are for December 2023.
Source: Bauer and Swanson (2023)

Figure 4. EBP



Note: The latest observations are for the second quarter of 2025.
Source: Favara et al. (2016)

3 Estimation Results

This section uses the FAVAR model and ST-LP model described in Section 2 to examine the heterogeneity of responses to monetary policy shocks across demand components, as well as the time-varying responses depending on the degree of credit channel functioning. First, we confirm the average monetary policy effects by demand component using the FAVAR model, and then analyze the nonlinearity of monetary policy effects depending on the financial market environment using the ST-LP model.

3.1 Heterogeneity Across Demand Components: Analysis Using the FAVAR Model

Figures 5 and 6 show the impulse response functions of demand components of GDP to monetary policy shocks. These represent responses to a one standard deviation monetary policy shock, with shaded areas representing 68% credible sets.

Figure 5. FAVAR Estimates of Consumption Expenditures

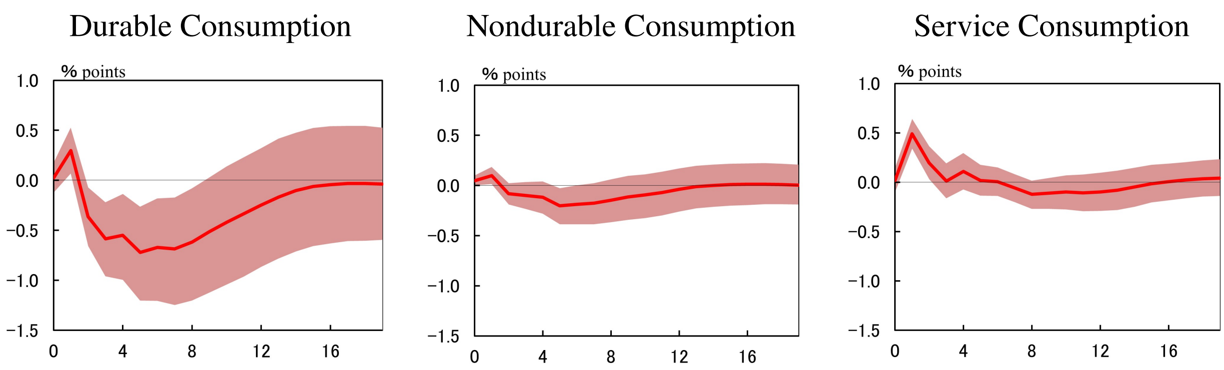
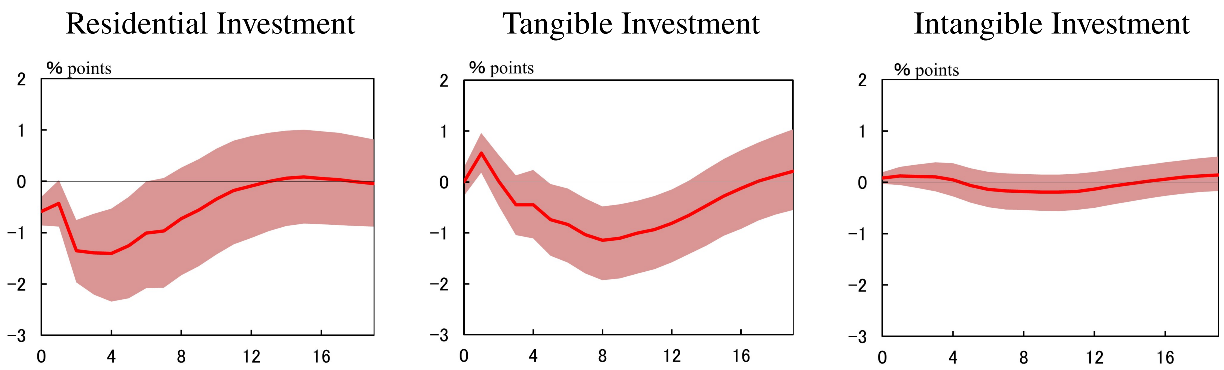


Figure 6. FAVAR Estimates of Fixed Investment



Note: The panels show the effects of a positive monetary policy shock of one standard deviation. Shaded areas show 68% credible sets. Tangible Investment is the sum of investment in nonresidential structures and equipment.

Household Consumption

For household consumption, durable goods consumption is persistently depressed by monetary policy tightening, while the responses of nondurable goods consumption and service consumption are small, and the credible sets encompass zero over a large portion of the sample period. Specifically, for nondurable goods and service consumption, the magnitude of the impulse response is economically limited, suggesting that the monetary policy effect is small.[6]

These results are consistent with findings from prior studies that report differences in the responses of household consumption components to monetary policy shocks, such as Baumeister et al. (2013), Andreolli et al. (2024) and Gareis and Minasian (2025). For example, Jappelli and Pistaferri (2017) argue that the fundamental difference between durable and nondurable goods lies in the fact that the former can serve as collateral. Moreover, Monacelli (2009) introduces borrowing constraints into a standard two-sector New-Keynesian model and shows that when durable goods function as collateral, the impulse response function better aligns with empirical results. Additionally, Yilmazkuday (2024) suggests that durable goods are often purchased with credit cards, making them more susceptible to the effects of borrowing constraints. Such a transmission mechanism of interest rates through borrowing constraints corresponds to the credit channel, implying a stronger effect of monetary policy on durable goods consumption compared to nondurable goods consumption and service consumption.

[6] The impulse response function for service consumption is positive in the short term, but this may be due to economic fluctuations caused by economic shutdowns during the COVID-19 pandemic. In fact, when the estimation period is adjusted to end by late 2019, the short-term response is found to be limited.

Fixed Investment

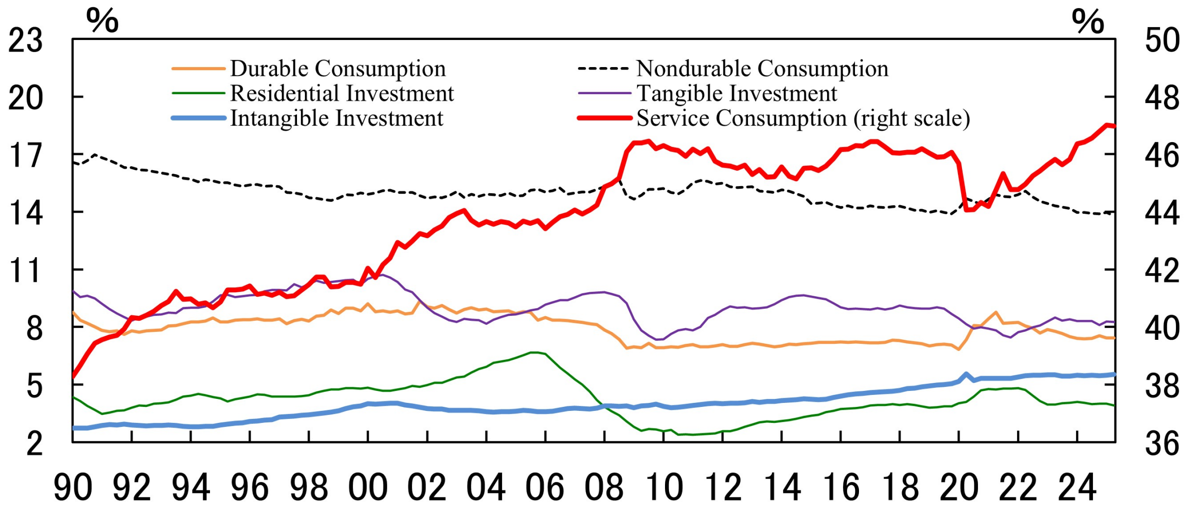
Investment spending is analyzed by decomposing it into three components: residential investment, nonresidential tangible investment, and intangible investment. As illustrated in Figure 6, residential investment and nonresidential tangible investment exhibit a negative response to monetary policy shocks, with residential investment displaying the largest and most immediate reaction. In contrast, the response of intangible investment (intellectual property investment) is relatively muted, with credible sets encompassing zero.

The pronounced decline in residential and tangible asset investments under monetary policy tightening is often attributed to their reliance on bank borrowing and their susceptibility to collateral value channels (Bernanke and Gertler (1995)). On the other hand, intangible investment characterized by lower collateral value and greater dependence on internal or market-based financing is reported to be less affected by credit channels, resulting in lower sensitivity to monetary policy compared to tangible investment (Caggese and Pérez-Orive (2022); Döttling and Ratnovski (2023); David and Gourio (2023)). The results presented in Figure 6 are consistent with these previous findings, suggesting that the FAVAR model employed in this study further supports the notion that the average transmission effects of monetary policy vary significantly depending on the collateral and borrowing structures of demand components.

Implications for Composition Effects

As shown in Figure 7, the share of services consumption and intangible asset investment in GDP has been rising in recent years in the U.S. Considering the heterogeneity of responses to monetary policy shocks across demand components and the compositional changes within these demand components, it is likely that the average response of the macroeconomy to monetary policy shocks is smaller compared to previous periods. However, since the results from the FAVAR model show average responses by demand component, changes over time depending on financial market conditions are further examined in the next section.

Figure 7. Nominal GDP weights

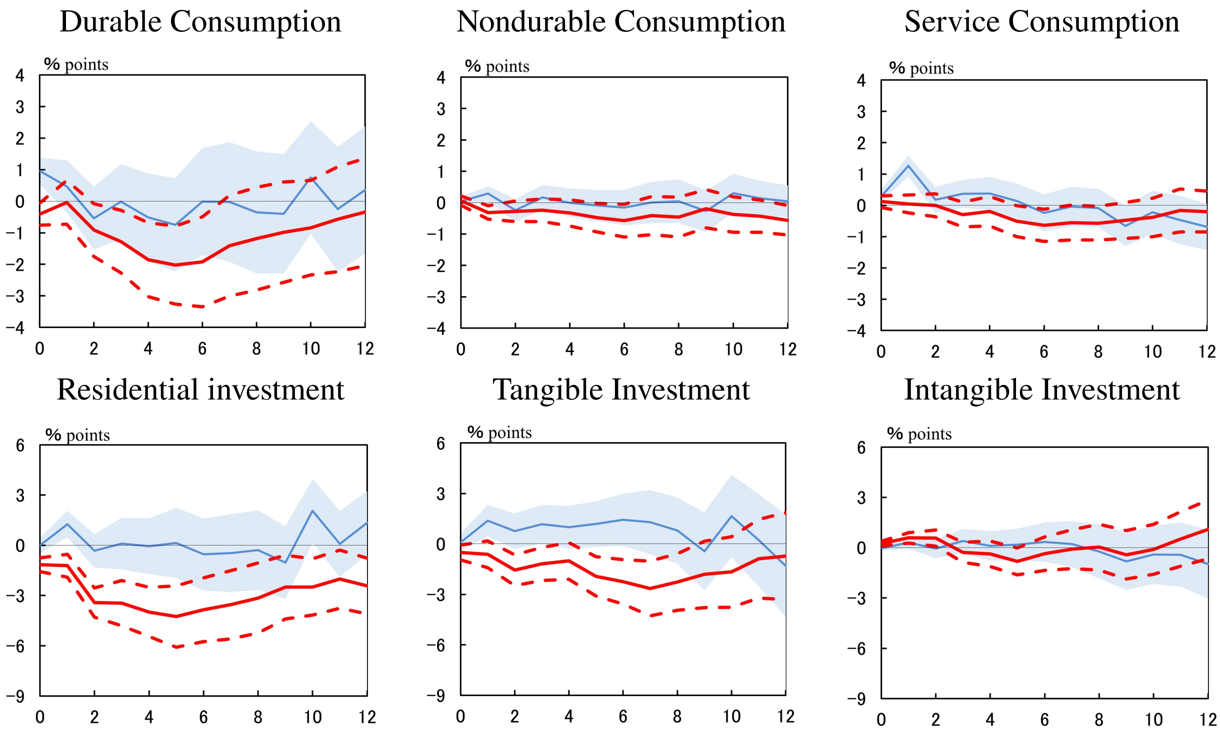


Note: The latest observations are for the second quarter of 2025.
Source: HAVER

3.2 Time-Varying Credit Channel Effects: Analysis Using the ST-LP Model

In the previous section, the FAVAR model revealed the heterogeneity of monetary policy effects across demand components. However, it does not capture the possibility that the transmission of monetary policy could change over time due to variations in the financial market environment. Therefore, in this section, we use the ST-LP model with EBP as the transition variable to analyze the nonlinear responses of the real economy to monetary policy shocks depending on the degree of credit channel functioning. Figure 8 shows the impulse responses of monetary policy shocks with 68% confidence interval (CI), divided into regimes where the credit channel is functioning relatively strongly and those where it is functioning weakly.

Figure 8. ST-LP Estimates



Note: The panels show the effects of a positive monetary policy shock of one standard deviation. The red line denotes impulse responses under the regime in which the credit channel is functioning, while the blue line denotes the regime where the credit channel is inactive. Shaded areas and the red dotted lines indicate 68% CI.

High Borrowing-Dependent Demand Components

For durable goods consumption, residential investment, and nonresidential tangible asset investment, there is a clear difference in responses to monetary policy shocks between the two regimes. Specifically, in the regime where the credit channel is functioning strongly, the downward effects of monetary policy tightening are large and appear early, whereas in the regime with weak credit channel functioning, the response is relatively small. This result suggests that for demand components with high borrowing dependence, in addition to the traditional interest rate channel, the amplification effects through changes in credit conditions may shape the effects of monetary policy. In other words, the existence of a "regime effect," where the amplification of policy effects changes depending on the financial market environment, is supported.

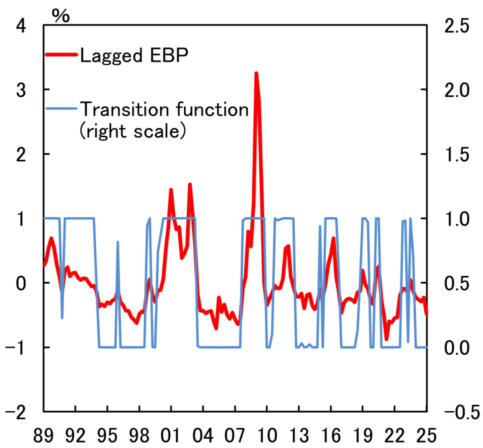
Low Borrowing-Dependent Demand Components

In contrast, for nondurable goods consumption, service consumption, and intangible asset investment, responses to monetary policy shocks are small regardless of the regime. These demand components are less dependent on bank borrowing and collateral value, suggesting that the amplification effect via the credit channel is limited, consistent with the interpretation that these demand components have a weaker response to monetary policy shocks.

Implications of Regime Effects

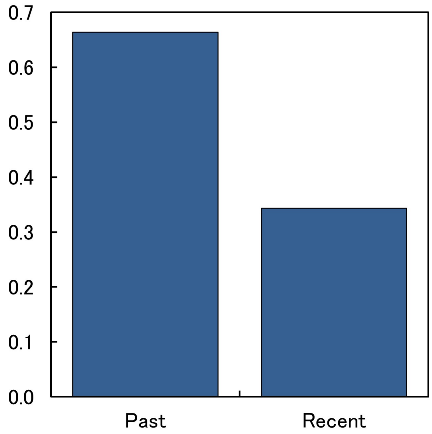
Figure 9 shows the time series of the lagged values of EBP, the transition variable, and the transition function that represents the weight of the regime T with strong credit channel functioning. Figure 10 compares the average value of the transition function during the period when interest rates were held at their peak in the three tightening cycles between 2000 and 2019, and that in the tightening cycle since 2022. In the monetary policy tightening episode after 2022, EBP is at a lower level compared to previous tightening episodes. This suggests that during this period, the financial market environment was relatively weak in terms of the amplification effects through the credit channel, which is consistent with the fact that the downward pressure on the real economy in the U.S. during the recent monetary policy tightening episode since 2022 was limited.

Figure 9. Transition Function



Note:The latest observations are for the first quarter of 2025. EBP is detrended using Hamilton et al. (2024)'s method.
Source: Favara et al. (2016)

Figure 10. Transition function during the plateau phase of the tightening cycle



Note: The averages for the past plateau phases of the tightening cycle are calculated over 2000 Q2 - 2000 Q4, 2006 Q3 - 2007 Q3, and 2019 Q1 - 2019 Q3. The average for the recent phase is calculated over 2023 Q3 - 2024 Q3.

The analysis in this section suggests that the response of the real economy to monetary policy shocks is determined by the interaction between the collateral and borrowing structure of demand components and the financial market environment. The analysis using the FAVAR model shows that demand components with a high dependence on borrowing, such as durable goods consumption and residential investment, exhibit higher average sensitivity to changes in policy interest rates, whereas the sensitivity of service consumption and intangible asset investment is lower. Furthermore, the analysis using the ST-LP model reveals that these differences are either amplified or attenuated depending on financial market conditions.

These findings provide empirical evidence to understand the limited downward impact on the real economy during recent monetary policy tightening phases in the U.S., from the perspective of changes in demand structure and the time-varying nature of the credit channel.

4 Conclusion

In this paper, we examined how the transmission of monetary policy in the U.S. economy has changed in recent years, focusing on two perspectives: the heterogeneity across demand components of GDP and the time-varying credit channel effects. Specifically, we sought to explain the fact that despite the rapid and significant monetary policy tightening since 2022, the downward pressure on the real economy has been limited, not by a decline in the effectiveness of monetary policy itself, but by changes in economic structure and the financial market environment.

First, our analysis using the FAVAR model confirmed that there is clear heterogeneity in the response to monetary policy shocks across different demand components. Durable goods consumption, residential investment, and nonresidential tangible asset investment were suppressed by monetary policy tightening, whereas service consumption and intangible asset investment showed only a limited response. The increasing weight of service consumption and intangible asset investment in the U.S. economy in recent years has acted as a "composition effect," reducing the sensitivity of the overall macroeconomy to monetary policy shocks. This result suggests that the credit channel may work differently across demand components, depending on differences in collateral and borrowing dependence.

Next, our analysis using the ST-LP model employing the EBP proposed by Favara et al. (2016) as the transition variable revealed that the effects of monetary policy vary depending on the functioning of the credit channel in the financial market environment. For demand components that are highly dependent on borrowing, the effect of monetary policy tightening was significantly stronger in regimes where the credit channel was functioning more effectively. Conversely, for components with low borrowing dependence, such as service consumption and intangible asset investment, responses to monetary policy shocks were small, regardless of the financial market regime.

These findings imply that the limited downward pressure on the real economy in the U.S. during the recent period of monetary policy tightening since 2022 may have been due to both the "composition effect" resulting from the rise in service consumption and intangible asset investment, and the "regime effect," where the amplification of monetary policy effects through the credit channel was limited in the financial market environment characterized by a higher risk tolerance as indicated by EBP.

However, this paper focuses on the composition of demand components and the financial market regimes and does not explicitly model other factors such as fiscal policy, easing of supply constraints, or long-term changes in the structure of financial intermediation. Therefore, the results of this paper provide one possible explanation for the observed effects of recent monetary policy tightening, without negating the importance of these other factors. By combining the perspectives of demand component heterogeneity and financial market regimes, this paper contributes empirical evidence to understanding why the U.S. economy has remained resilient despite the rapid and significant tightening of monetary policy since 2022.

References

Andreolli, Michele, Natalie Rickard, and Paolo Surico. (2024) "Non-Essential Business-Cycles." *CEPR Discussion Paper*, 19773.

Bauer, Michael D. and Eric T. Swanson. (2023) "A Reassessment of Monetary Policy Surprises and High-Frequency Identification." *NBER Macroeconomics Annual*, 37, 87–155.

Baumeister, Christiane, Philip Liu, and Haroon Mumtaz. (2013) "Changes in the Effects of Monetary Policy on Disaggregate Price dynamics." *Journal of Economic Dynamics and Control*, 37, 543–560.

Bernanke, Ben S and Mark Gertler. (1995) "Inside the Black Box: The Credit Channel of Monetary Policy Transmission." *Journal of Economic perspectives*, 9, 27–48.

Boivin, Jean and Marc P Giannoni. (2006) "Has Monetary Policy Become More Effective?" *The Review of Economics and Statistics*, 88, 445–462.

Caggese, Andrea and Ander Pérez-Orive. (2022) "How Stimulative Are Low Real Interest Rates for Intangible Capital?" *European Economic Review*, 142, 103987.

Canova, Fabio and Filippo Ferroni. (2021) "A Hitchhiker's Guide to Empirical Macro Models." *Chicago Fed Working Paper*, 2021-15.

David, Joel and François Gourio. (2023) "The Rise of Intangible Investment and the Transmission of Monetary Policy." *Chicago Fed Letter*, 482.

Döttling, Robin and Lev Ratnovski. (2023) "Monetary Policy and Intangible Investment." *Journal of Monetary Economics*, 134, 53–72.

Favara, Giovanni, Simon Gilchrist, Kurt F. Lewis, and Egon Zakrajšek. (2016) "Updating the Recession Risk and the Excess Bond Premium.” FEDS Notes. Washington: Board of Governors of the Federal Reserve System.

Gareis, Johannes and Ryan Minasian. (2025) “Durability, Essentiality, and the Transmission of Monetary Policy to Household Consumption.” *ECB Working Paper*, 3127.

Gertler, Mark and Peter Karadi. (2015) “Monetary Policy Surprises, Credit Costs, and Economic Activity.” *American Economic Journal: Macroeconomics*, 7, 44–76.

Gilchrist, Simon and Egon Zakrajšek. (2012) “Credit Spreads and Business Cycle Fluctuations.” *American economic review*, 102, 1692–1720.

Granger, Clive W, Timo Terasvirta, and Heather M Anderson. (1993) “Modeling Nonlinearity Over the Business Cycle.” *Business cycles, indicators, and forecasting*, edited by Stock, James H and Mark W Watson, 311–326: University of Chicago Press.

Hamilton, James D. (2018) “Why You Should Never Use the Hodrick-Prescott Filter.” *The Review of Economics and Statistics*, 100, 831–843.

Hamilton, James D., Xinwei Ma, and Jin Xi. (2024) “Principal Component Analysis for a Mix of Stationary and Nonstationary Variables.” NBER Working Paper 32068, National Bureau of Economic Research.

Holston, Kathryn, Thomas Laubach, and John C Williams. (2023) “Measuring the Natural Rate of Interest after COVID-19.” *Federal Reserve Bank of New York Staff Reports*, 1063.

Jappelli, Tullio and Luigi Pistaferri. (2017) *The Economics of Consumption: Theory and Evidence*: Oxford University Press.

Jarociński, Marek and Peter Karadi. (2020) “Deconstructing Monetary Policy Surprises—The Role of Information Shocks.” *American Economic Journal: Macroeconomics*, 12, 1–43.

Kim, Don, Cait Walsh, and Min Wei. (2019) "Tips from TIPS: Update and Discussions." FEDS Notes. Washington: Board of Governors of the Federal Reserve System.

Lubik, Thomas and Christian Matthes. (2025) "Natural Rate of Interest." Federal Reserve Bank of Richmond, Last updated September 15, 2025.

Monacelli, Tommaso. (2009) "New Keynesian Models, Durable Goods, and Collateral Constraints." *Journal of Monetary Economics*, 56, 242–254.

Plagborg-Møller, Mikkel and Christian K Wolf. (2021) "Local Projections and VARs Estimate the Same Impulse Responses." *Econometrica*, 89, 955–980.

Rüth, Sebastian K. (2017) "State-dependent Monetary Policy Transmission and Financial Market Tensions." *Economics Letters*, 157, 56–61.

Stock, James H. and Mark W. Watson. (2001) "Vector Autoregressions." *Journal of Economic Perspectives*, 15, 101–115.

Stock, James H and Mark W Watson. (2018) "Identification and Estimation of Dynamic Causal Effects in Macroeconomics Using External Instruments." *The Economic Journal*, 128, 917–948.

Tenreyro, Silvana and Gregory Thwaites. (2016) "Pushing on a String: US Monetary Policy Is Less Powerful in Recessions." *American Economic Journal: Macroeconomics*, 8, 43–74.

Yilmazkuday, Hakan. (2024) "Uneven Effects of Monetary Policy: Sectoral Disparities in Credit Card Spending." *Central Bank Review*, 24, 100181.

Appendix A　Data Description

The details of the data used for the estimation of the FAVAR model are summarized in the table below.

Table A.1. FAVAR model dataset

Variable	Source
Monetary Policy Surprise	Bauer and Swanson(2023)
Real Personal Consumption Expenditures: Durable goods	HAVER
Real Personal Consumption Expenditures: Nondurable goods	HAVER
Real Personal Consumption Expenditures: Services	HAVER
Real Private Fixed Investment: Tangible (Structures and Equipment)	HAVER
Real Private Fixed Investment: Intellectual Property Products	HAVER
Real Private Residential Investment	HAVER
Real Exports of Goods	HAVER
Real Exports of Services	HAVER
Real Imports of Goods	HAVER
Real Imports of Services	HAVER
Real Government Consumption Expenditures and Gross Investment	HAVER
All Employees: Mining and Logging	HAVER
All Employees: Construction	HAVER
All Employees: Nondurable Goods	HAVER
All Employees: Durable Goods	HAVER
All Employees: Wholesale Trade	HAVER
All Employees: Retail Trade	HAVER
All Employees: Transportation and Warehousing	HAVER
All Employees: Utilities	HAVER
All Employees: Information	HAVER
All Employees: Financial Activities	HAVER
All Employees: Professional and Business Services	HAVER
All Employees: Education and Health Services	HAVER
All Employees: Leisure and Hospitality	HAVER

Variable	Source
All Employees: Other Services	HAVER
All Employees: Government	HAVER
Unemployed: Less than 5 Weeks	HAVER
Unemployed: 5-14 Weeks	HAVER
Unemployed: 15 Weeks and Over	HAVER
Civilian Unemployment Rate: aged 16 and over	HAVER
Civilian Labor Force: aged 16 and over	HAVER
Average Hourly Earnings: Mining and Logging	HAVER
Average Hourly Earnings: Construction	HAVER
Average Hourly Earnings: Durable Goods	HAVER
Average Hourly Earnings: Nondurable Goods	HAVER
Average Hourly Earnings: Wholesale Trade	HAVER
Average Hourly Earnings: Retail Trade	HAVER
Average Hourly Earnings: Transportation and Warehousing	HAVER
Average Hourly Earnings: Utilities	HAVER
Average Hourly Earnings: Information Services	HAVER
Average Hourly Earnings: Financial Activities	HAVER
Average Hourly Earnings: Professional and Business Services	HAVER
Average Hourly Earnings: Private Education and Health Services	HAVER
Average Hourly Earnings: Leisure and Hospitality	HAVER
Average Hourly Earnings: Other Services	HAVER
Housing Starts	HAVER
S&P CoreLogic Case-Shiller Home Price Index: US National	HAVER
FHFA House Price Index, United States	HAVER
New Private Housing Units Authorized by Building Permit	HAVER

Table A.2. FAVAR model dataset

Variable	Source
New 1-Family Houses Sold: United States	HAVER
Industrial Prodution: Consumer Goods	HAVER
Industrial Prodution: Equipment	HAVER
Industrial Prodution: Construction Supplies	HAVER
Industrial Prodution: Business Supplies	HAVER
Industrial Prodution: Durable Materials	HAVER
Industrial Prodution: Nondurable Materials	HAVER
Industrial Prodution: Energy Materials	HAVER
Light Weight Vehicle Sales	HAVER
Retail Sales	HAVER
Merchant Wholesalers Sales	HAVER
PCE: Durable goods: Chain Price index	HAVER
PCE: Nondurable goods: Chain Price index	HAVER
PCE: Services: Chain Price index	HAVER
GDP deflator：Structures	HAVER
GDP deflator：Equipment	HAVER
GDP deflator：Intellectual Property Products	HAVER
GDP deflator：Residential Investment	HAVER
GDP deflator： Exports of Goods	HAVER
GDP deflator： Exports of Services	HAVER
GDP deflator： Imports of Goods	HAVER
GDP deflator： Imports of Services	HAVER
GDP deflator： Government Consumption Expenditures and Gross Investment	HAVER
Consumer Price Index	HAVER
PPI: Finished Goods Less Food and Energy	HAVER

Variable	Source
PPI: Intermediate Materials Less Food and Energy	HAVER
PPI: Crude Nonfood Materials Less Energy	HAVER
3 month Treasury Bill Yield	FRED
2-Year Treasury Note Yield	HAVER
5-Year Treasury Note Yield	HAVER
10-Year Treasury Note Yield	HAVER
30-Year Treasury Bond Yield	HAVER
Commercial Bank Interest Rates: 48-Month New Car Loans	HAVER
FHLMC: 30-Year Fixed-Rate Mortgages	HAVER
Stock Price Index: S&P500	HAVER
Stock Price Index: NASDAQ	HAVER
Stock Price Index: Dow	HAVER
Dividend Yield: S&P500	HAVER
PER: S&P500	HAVER
Nominal FRB Broad Trade-Weighted Dollar Index	HAVER
GZ Spread	Favara et al. (2016)
EBP	Favara et al. (2016)
CRB Spot Commodity Price Index	HAVER
Money Stock: M1	HAVER
Money Stock: M2	HAVER
C & I Loans in Bank Credit: All Commercial Banks	HAVER
Nonrevolving Consumer Credit Outstanding	HAVER
University of Michigan: Index of Consumer Expectations	HAVER
University of Michigan: Expected Inflation Rate, Next Year	HAVER
ISM: Manufacturing PMI	HAVER

The details of the data used for the estimation of the ST-LP model are summarized in the table below.

Table A.3. ST-LP model dataset

Variable	Source
Monetary Policy Surprise	Bauer and Swanson(2023)
Real Personal Consumption Expenditures: Durable goods	HAVER
Real Personal Consumption Expenditures: Nondurable goods	HAVER
Real Personal Consumption Expenditures: Services	HAVER
Real Private Fixed Investment: Tangible (Structures and equipment)	HAVER
Real Private Fixed Investment: Intellectual Property Products	HAVER
Real Private Residential Investment	HAVER
Real GDP	HAVER
PCE deflator	HAVER
Stock Price Index: S&P500	HAVER
EBP	Favara et al. (2016)

Appendix B Robustness Checks

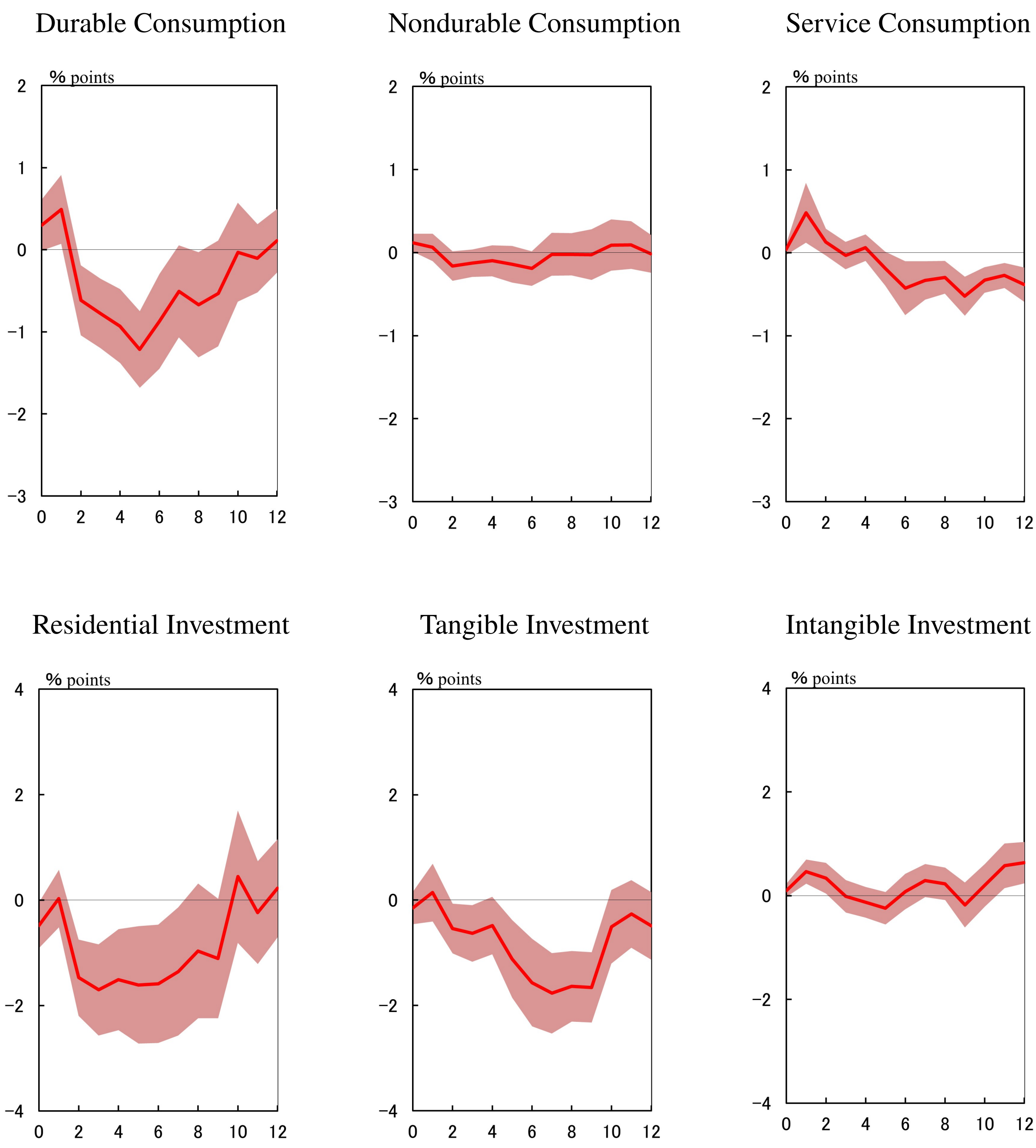
B.1 Baseline LP Model Estimation Results

As discussed earlier, the FAVAR model uses dimensionality reduction through principal component analysis, which may not fully preserve the information from the original variables when estimating impulse response functions. To address this, we estimate impulse response functions using the LP model, applying the monetary policy shocks estimated from the FAVAR model to the components of consumption and investment. Specifically, we estimate the following regression equation:

$$\widetilde{y}_{t+h} = \alpha_h + \beta_h \varepsilon_t^{MPS} + \phi_h x_t + u_{t+h}, \tag{B.1}$$

where ε_t^{MPS} represents the monetary policy shock, and x_t represents control variables, including real GDP, PCE deflator, stock prices, EBP lag variables, and the lagged values of the dependent variable itself. Lag length is set to 4. The control variables and the dependent variables, as in the FAVAR model and ST-LP model, are detrended using Hamilton et al. (2024)'s method. The error term is represented by u_{t+h}. The estimation results are shown in Figure B.1. Similar to the FAVAR model results, durable goods consumption, nonresidential tangible asset investment, and residential investment are significantly suppressed by monetary policy tightening, while the suppression for nondurable goods consumption, service consumption, and intangible asset investment is limited.

Figure B.1. Baseline LP model estimates

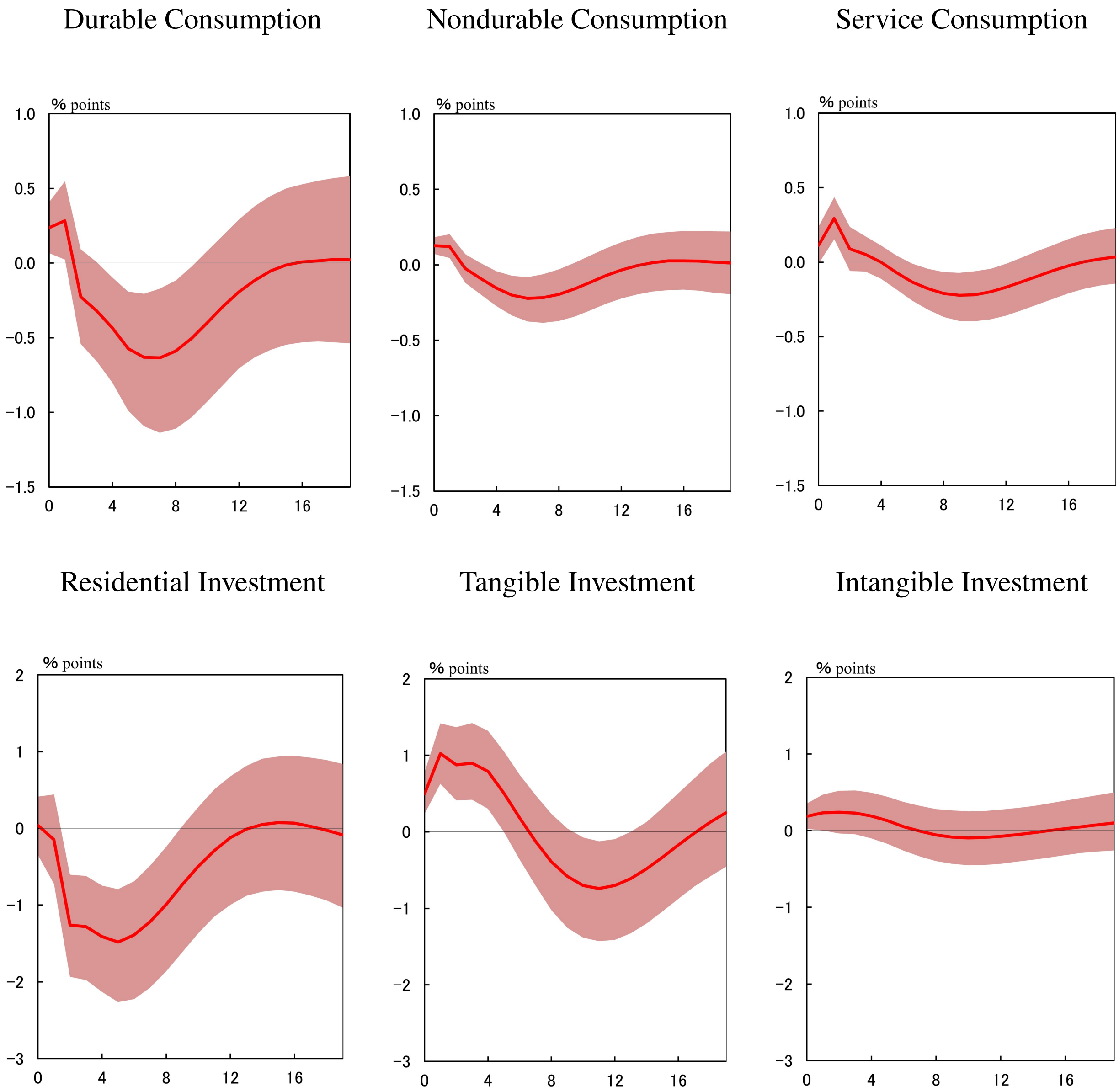


Note: The panels show the effects of a positive monetary policy shock of one standard deviation. Shaded areas indicate 68% CI.

B.2 Alternative MPS Estimation Results

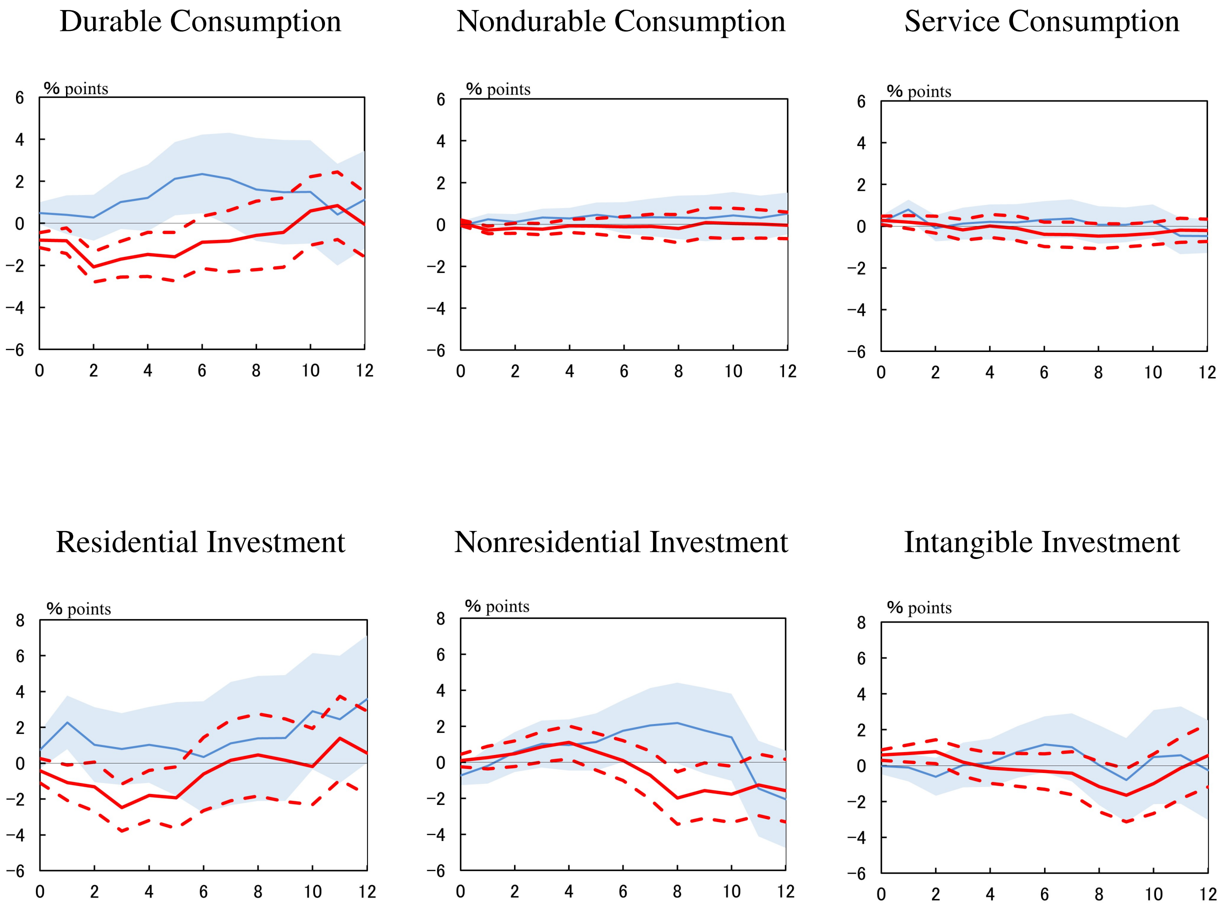
As a robustness check, we replace Bauer and Swanson (2023)'s monetary policy surprise with Jarociński and Karadi (2020)'s monetary policy surprise and estimate the FAVAR model and the ST-LP model. Since the sample size for the alternative monetary policy surprise is smaller than that for Bauer and Swanson (2023)'s MPS, we reduce the lag length to 2 and estimate both models. The results from the FAVAR model are shown in Figure B.2. Comparing the results, we observe similar trends as in the FAVAR model using Bauer and Swanson (2023)'s MPS, suggesting that the effects of monetary policy on durable goods consumption, nonresidential tangible asset investment, and residential investment are high, while the effects on nondurable goods consumption, service consumption, and intangible asset investment are low, regardless of the type of financial policy surprise used. Similarly, we estimate the ST-LP model using Jarociński and Karadi (2020)'s monetary policy surprise, and the results are shown in Figure B.3. The results are consistent with the estimation using Bauer and Swanson (2023)'s MPS, showing that for durable goods consumption, residential investment, and nonresidential tangible asset investment, responses to monetary policy shocks vary significantly depending on the financial market regime, while for nondurable goods consumption, service consumption, and intangible asset investment, the response is limited regardless of the regime.

Figure B.2. FAVAR Estimates



Note: The panels show the effects of a positive monetary policy shock of one standard deviation. Shaded areas show 68% credible sets. The estimation sample is 1990 Q1 - 2023 Q4.

Figure B.3. ST-LP Estimates



Note:The panels show the effects of a positive monetary policy shock of one standard deviation. The estimation sample is 1990 Q1 - 2023 Q4. The red line denotes impulse responses under the regime in which the credit channel is functioning, while the blue line denotes the regime where the credit channel is inactive. Shaded areas and red dotted lines indicate 68% CI.