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Monetary Shocks and Labor Markets: Evidence from Online Job Vacancy Postings

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Abstract

Central banks conduct monetary policy to achieve price stability, but decisions also have effects on labor-market outcomes. In this paper, we identify exogenous monetary shocks with the 'interest rate surprise' approach based on high-frequency changes in forward-looking interest rates and use daily data on online job vacancy postings to investigate the impact of monetary policy on labor markets in three European countries (Estonia, Latvia and Lithuania) during the period 2018–2024. Our results indicate that monetary policy exerts significant and durable effects on labor-market conditions as measured by online job vacancy postings in our sample of countries. First, a contractionary (expansionary) monetary policy shock leads to a persistent decline (increase) in online job vacancy postings. Across all countries, the average effect amounts to about 2 percent in 15 days after a contractionary monetary policy shock (i.e., an unanticipated increase of 1 percentage point in short-term interest rates). Second, there is significant heterogeneity in the magnitude and persistence of how monetary policy affects the labor market across three countries in our sample, varying from 0.5 percent in Latvia to 2 percent in Estonia and 3.2 percent in Lithuania. Taken together, these results are both of direct concern for policymakers and important for the transmission of monetary policy.
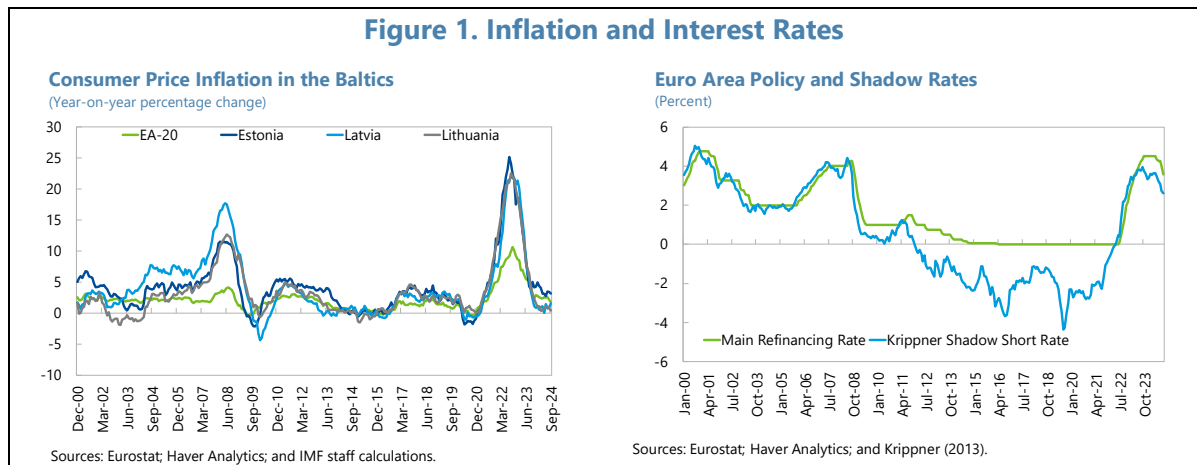
I. INTRODUCTION

A barrage of unprecedented shocks hit the global economy in recent years, causing havoc in economic activity and inflation dynamics.[2] Consumer price inflation in the euro area peaked at 10.6 percent in 2022, with significant heterogeneity across countries—5.9 percent in France *versus* as high as 25.2 percent in the Baltics (Figure 1). To bring inflation under control, the European Central Bank (ECB) increased short-term interest rates from a historical low of 0 percent in 2022 to 4.5 percent by the end of 2023.[3] With inflation moving toward the target, the ECB has eased the monetary policy stance by 115 basis points to 3.15 percent as of December 2024. In light of these developments, the identification of monetary policy shocks and their effects on output and inflation remain fundamental issues in macroeconomics. There is also growing interest in understanding the impact of monetary policy on labor-market outcomes (Zens, Böck, and Zörner, 2020; Cantore, Ferroni, and Léon-Ledesma, 2021; Singh, Suda, and Zervou, 2022; Evgenidis and Fasianos, 2023; Madeira and Salazar, 2023; Gulyas, Meier, and Ryzhenkov, 2024). In this study, we use a high-frequency dataset on online job vacancy postings to examine how monetary policy shocks affect labor-market developments in three eurozone countries (Estonia, Latvia and Lithuania) during the period 2018–2024.

In Figure 2, we present the number of online job vacancy postings on a daily basis and the relationship with labor market developments in the Baltics. The critical questions we aim to answer with this study are (i) how monetary policy shocks affect employment and (ii) whether the magnitude and persistence of this effect vary across countries. Because monetary policy simultaneously affects and responds to economic conditions, identifying exogenous monetary
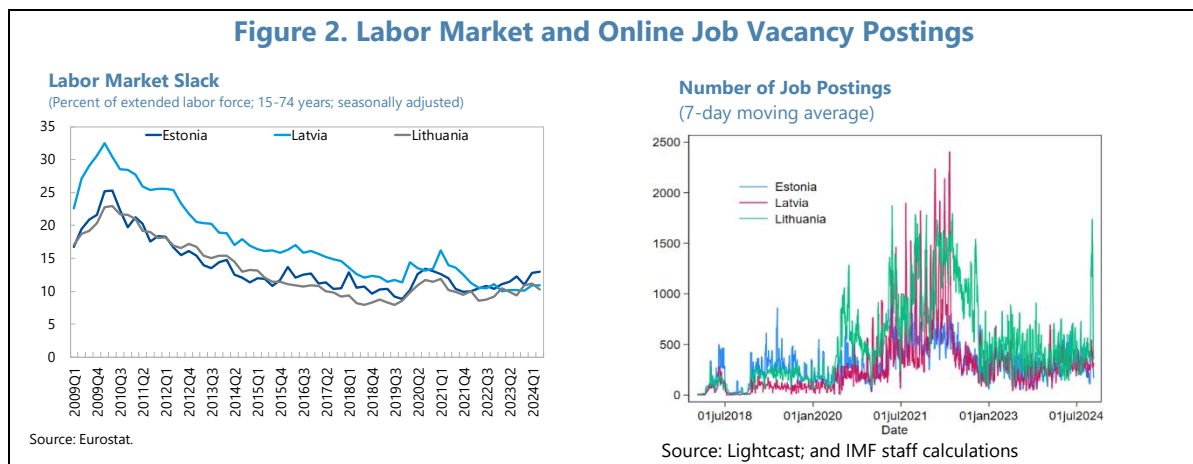

Figure 1. Inflation and Interest Rates

Consumer Price Inflation in the Baltics
(Year-on-year percentage change)

Sources: Eurostat; Haver Analytics; and IMF staff calculations.

Euro Area Policy and Shadow Rates
(Percent)

Sources: Eurostat; Haver Analytics; and Krippner (2013).

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[2] For an overview and analysis of post-pandemic inflation developments, please Binici *et al.* (2024) and Celasun *et al.* (2022). Inflation has been more volatile in the Baltics, compared to the rest of the eurozone (Cevik, 2023a, 2023b; Cevik, Fan, and Naik, 2024).

[3] The ECB sets three key interest rates for the euro area: (i) the rate on the deposit facility, which banks may use to make overnight deposits with the ECB at a pre-set interest rate; (ii) the interest rate on the main refinancing operations, through which banks can borrow funds from the ECB against broad collateral on a weekly basis at a pre-determined interest rate; and (iii) the rate on the marginal lending facility, which offers overnight credit to banks against broad collateral at a pre-set interest rate. The policy rate mentioned in this paper refers to the main refinancing operations rate, which is set above the deposit rate and below the marginal lending facility rate.

instruments is an empirical challenge. Such an instrument must control for all available information at the time of a monetary policy decision and assess the degree to which the decision was a surprise. To this end, we identify exogenous variation in the monetary policy stance in the euro area using the 'interest rate surprise' approach based on high-frequency changes in forward-looking Overnight Index Swap (OIS) rates in a narrow window around monetary policy announcements by the ECB and apply the local projection (LP) methodology that allows us to estimate the dynamic impact of monetary shocks on the labor market as measured by online job vacancy postings over the period before, during and after the COVID-19 pandemic.

Our results provide novel evidence that monetary policy has significant effects on labor-market conditions as measured by online job vacancy postings in three Baltic countries during the period 2018–2024. First, a contractionary (expansionary) monetary policy shock causes a persistent decline (increase) in online job vacancy postings. Across all countries, the average effect amounts to about 2 percent in 15 days after a contractionary monetary policy shock (i.e., an unanticipated increase of 1 percentage points in short-term interest rates). Conversely, an unexpected monetary easing leads to an increase of similar magnitude in online job vacancy postings. Second, there is significant heterogeneity in the magnitude and persistence of how monetary policy affects the labor market across three countries in our sample, with the rate of contraction in online job vacancy positing varying from 0.5 percent in Latvia to 2 percent in Estonia and 3.2 percent in Lithuania. While this negative effect on online job vacancy postings appears to be highly persistent in Lithuania, it tends to disappear over the course of a month in Estonia and Latvia. Overall, these statistically and economically significant findings indicate that monetary policy exerts substantial and persistent effects on labor markets as measured by online job vacancy postings. Hence, the empirical findings of this paper are of direct relevance to policymakers, especially in terms of the transmission of monetary policy.
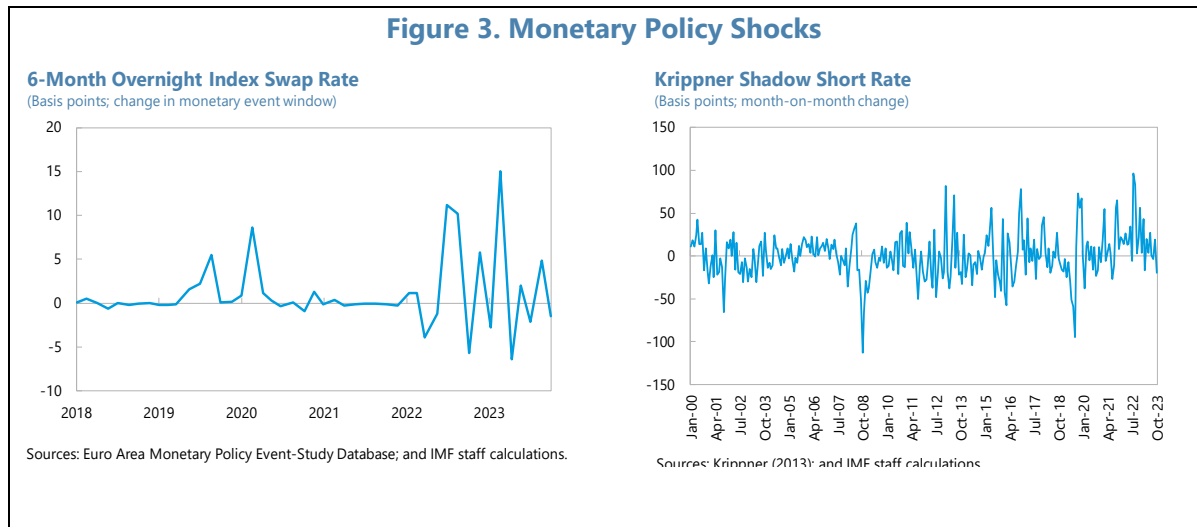
The remainder of the paper is structured as follows. Section II provides an overview of the data used in the empirical analysis. Section III describes the econometric methodology and presents the findings. Finally, Section IV summarizes and provides concluding remarks.

Figure 2. Labor Market and Online Job Vacancy Postings

Labor Market Slack
(Percent of extended labor force; 15-74 years; seasonally adjusted)

Source: Eurostat.

Number of Job Postings
(7-day moving average)

Source: Lightcast; and IMF staff calculations

II. DATA OVERVIEW

The empirical analysis presented in this paper is based on a dataset of daily observations covering Estonia, Latvia and Lithuania over the period 2018–2024. As our dependent variable, we measure the state of labor markets with online job vacancy postings in each country, which are obtained from Lightcast (previously Burning Glass Technologies). Lightcast is an analytics company that collects job postings from thousands of online sources and job portals. It uses text mining to extract and code information from each job description such as job title, employer, job location, occupation, industry, experience, skills, education requirements, and earnings. After deduplicating online job vacancy postings, Lightcast assigns jobs to standardized industry and occupation codes and provides an extensive coverage of job vacancies. This dataset has been shown to accurately track employment demand at the granular level in different countries across the world (Hershbein and Kahn, 2018; Deming and Noray 2020; Goldfarb, Taska, and Teodoridis, 2020; Cammeerat and Squicciarini, 2021; Acemoglu *et al.*, 2022; Braxton and Taska; 2023).

For baseline estimations, we follow the 'interest rate surprise' approach developed by Kuttner (2001), Cochrane and Piazzesi (2002), Gürkaynak, Sack, and Swanson (2005; 2007), Altavilla *et al.* (2019), Cesa-Bianchi, Thwaites, and Vicondoa (2020) and Jarocinski and Karadi (2020) and use daily changes in the OIS rates around the ECB's monetary policy announcements to identify unexpected changes in interest rates as monetary policy shocks. The OIS is a swap contract exchange fixed interest rate for the floating Euro Overnight Index Average (Eonia) on the European interbank market. We exclusively consider scheduled meetings, which mitigates the problem that monetary policy surprises may convey provide non-public central bank information about the state of the economy. This exogenous measure of monetary policy shocks—based on high-frequency changes in the 6-months ahead OIS rates—is drawn from the Euro Area Monetary Policy Event-Study Database (EA-MPD).[4] The EA-MPD distinguishes three event

Figure 3. Monetary Policy Shocks

6-Month Overnight Index Swap Rate
(Basis points; change in monetary event window)

Krippner Shadow Short Rate
(Basis points; month-on-month change)

Sources: Euro Area Monetary Policy Event-Study Database; and IMF staff calculations.

Sources: Krippner (2013); and IMF staff calculations.

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[4] For robustness, we also estimate the model using the 1-year and 2-year ahead OIS rates and the shadow interest rate calculated by Krippner (2013), which captures the nominal interest rate that would prevail in the absence of the zero lower bound. Hence, when the zero lower bound is not binding, the shadow rate equals the short-term interest rate.

windows around the announcement of ECB monetary policy decisions: (i) the press release window; (ii) the press conference window; and (iii) the monetary event window that combines the press release and press conference windows. In this paper, we use the monetary event window and compute the change in the OIS rates as the difference between the median quote during the interval 13:25-13:35 before the press release to the median quote for the interval 15:40-15:50 after the press conference.[5] The identification assumption is that economic agents (employees in this context) anticipate endogenous monetary policy decisions depending on economic conditions and therefore reacts only to unexpected monetary policy shocks. Accordingly, we have a high-frequency series of monetary policy surprises, varying in intensity and sign, that can be merged with the online job vacancy postings data on a daily basis.

For robustness, we consider common policy responses governments introduced during the COVID-19 pandemic as control variables. These series—drawn from the Oxford Covid-19 Government Response Tracker (OxCGRT) database—aggregates government actions into a suite of composite policy indices (Hale *et al.*, 2021). In this paper, we focus (i) stringency index and (ii) economic support index, which report a number between 0 to 100 that reflects the level of the government's response to the COVID-19 pandemic along certain dimensions.[6]

III. EMPIRICAL STRATEGY AND RESULTS

Our empirical objective is to investigate the impact of monetary policy shocks on the state of labor markets as measured by online job vacancy postings at daily frequency in three eurozone member countries (Estonia, Latvia and Lithuania) over the period 2018–2024.[7] To this end, we employ the LP method developed by Jordà (2005), which is less sensitive to misspecification compared to conventional vector autoregressive (VAR) models (Auerbach and Gorodnichenko, 2013; Jordà and Taylor, 2016; Ramey and Zubairy, 2018; Romer and Romer, 2019). Taking advantage of high-frequency data, we estimate impulse response functions (IRFs) from local projections as follows:

$$\Delta_h ojv_{c,t+h} = log(ojv_{c,t+h}) - \log(ojv_{c,t-1}) = \gamma_c^h + \mu_t^h + \beta_h shock_{t-1}^{ECB} + \sum_{l=1}^{L} \vartheta_{h,l} X_{c,t} + \varepsilon_{c,t+h} \qquad (1)$$

where $\Delta_h ojv_{c,t+h}$ is the cumulative change in online job vacancy postings in country *c,* and *h* periods after the monetary policy shock in time *t*. The $\gamma_c^h{}_c$ and μ_t^h coefficients denote the time-invariant country-specific effects and shocks that are common across countries in a given period, respectively.[8] $shock_{t-1}^{ECB}$ denotes the exogenous monetary policy shock as measured by daily changes in the 6-months ahead OIS rate during a narrow window around monetary policy announcements by the ECB. The daily dataset used in this analysis improves identification, allows

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[5] We assume that the value of monetary policy shocks is zero in a given day if there is no announcement.

[6] While an OxCGRT index is a measure of how many of the relevant indicators a government acted upon, and to what degree, it cannot say whether a government's policy was implemented effectively.

[7] We use the 7-day moving average to smooth out the volatility of online job vacancy postings on a daily basis.

[8] The time fixed effects also control for structural breaks due to events such as the COVID-19 pandemic, which we also include in the model as a robustness check.

for an accurate characterization of the lags in monetary transmission, and thereby reveals differences in the transmission strength and speed of monetary policy shocks across countries in the sample.

The vector $X_{c,t}$ contains 30-day lags of the dependent variable and monetary policy shocks, as well as composite measures of policy responses introduced during the COVID-19 pandemic as an additional robustness check. $\vartheta_{h,l}$ is a vector of coefficients associated with the lags of $X_{c,t}$. Specifically, we set $L =30$ and include 30 days of lagged values of $X_{c,t}$. β_h is the main coefficient of interest, denoting the cumulative response of the variable of interest (online job vacancy postings) h days after the monetary policy shock. Thus, IRFs are obtained by plotting the estimated β_h for $h= 0, .., 30$ in days with 95 percent confidence bands computed using the standard deviations associated with the estimated β_h coefficients at each horizon. One particular complication associated with the LP method is the serial correlation in the error terms induced by the successive leading of the dependent variable, which we address by using the Newey-West (1987) correction for the standard errors.

Do monetary policy shocks affect labor markets? We answer this question using a sequence of local projections at daily frequency, from which we are able to trace out the impulse responses of the dependent variable (online job vacancy postings) to monetary policy shocks. Figure 4 presents the estimated impulse response functions of online job vacancy postings to an unanticipated monetary tightening of 1 percentage point. The horizontal axis denotes the number of days following the shock, with the solid line displaying the average estimated impulse response surrounded by the 95 percent confidence intervals constructed with robust standard errors. These panels display the cumulative change in online job vacancy postings in each country after an 'interest rate surprise' as measured by the 6-months ahead OIS rate during a narrow window around monetary policy announcements by the ECB.

We find that that labor markets in respond slowly but persistently to a monetary policy shock. In line with theoretical predictions, a monetary policy tightening depresses the number of online job vacancy postings in an economically and statistically significant manner in our sample of countries. An unanticipated monetary tightening of a 1 percentage point by the ECB appears to have a marginal effect on online job vacancy postings within the first 10 days, but the cumulative impact becomes economically significant over time and peaks after 15 days from the monetary policy shock. Across all countries, the average effect is estimated to amount to about 2 percent in 15 days after a contractionary monetary policy shock. Conversely, an unexpected monetary easing leads to an increase of similar magnitude in online job vacancy postings. These effects, however, weaken slowly over time and, depending on the country, disappears over the course of a month.

We also find considerable heterogeneity in the magnitude and persistence of how monetary policy affects the labor market across three countries in our sample, with the rate of contraction in online job vacancy postings varying from 0.5 percent in Latvia to 2 percent in Estonia and 3.2 percent in Lithuania. While this negative effect on online job vacancy postings appears to be highly persistent in Lithuania, it tends to disappear over the course of a month in

Figure 4. Impact of Monetary Policy Shocks on Online Job Vacancy Postings

Estonia

Latvia

Lithuania
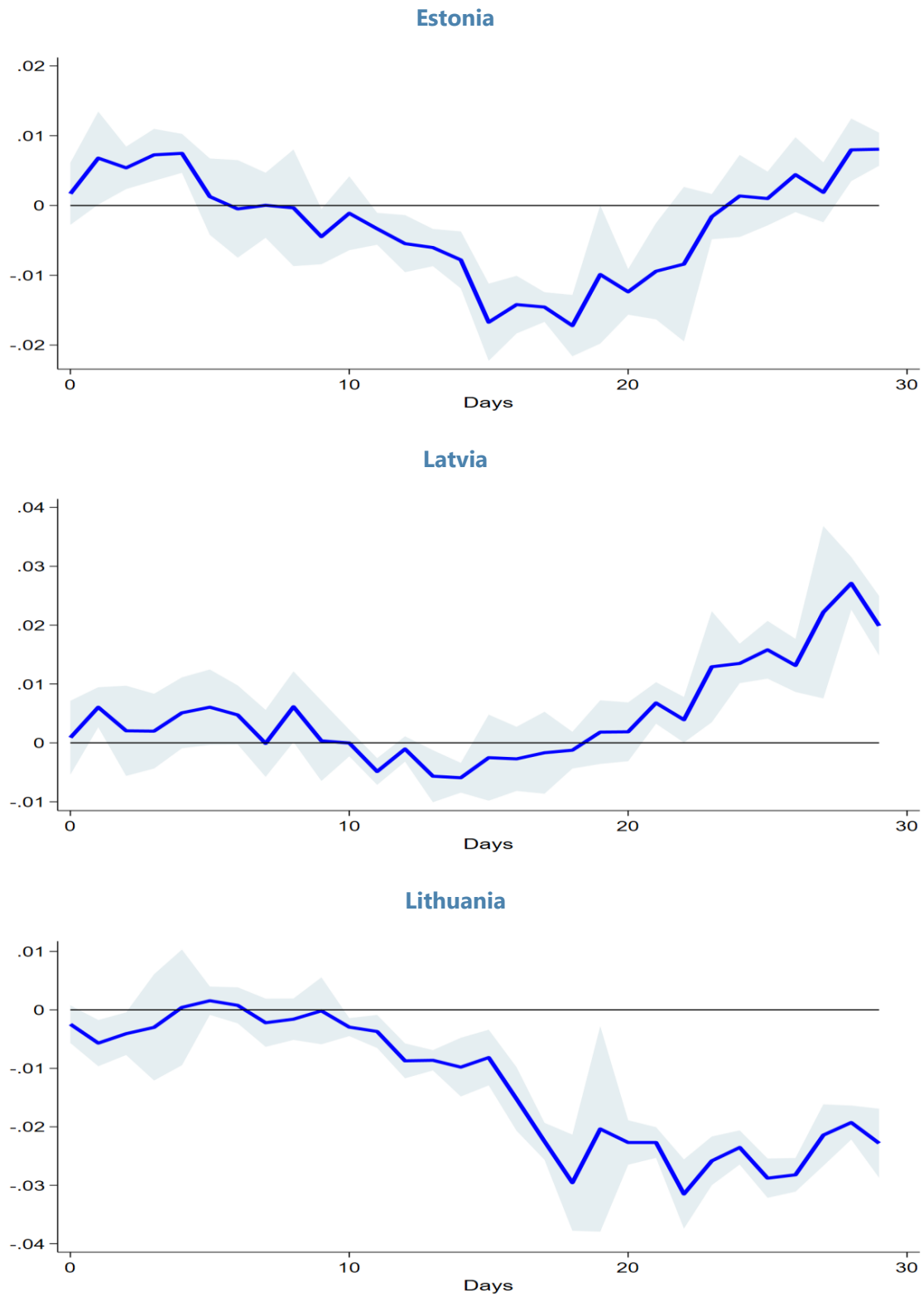
Source: Authors' estimations.

Estonia and Latvia. Although these countries had similar level of labor market flexibility prior to the COVID-19 pandemic (Krasnopjorovs, 2019), the differential effects of monetary policy shocks on online job vacancy postings during the pandemic may reflect, to some extent, the differences in government policy interventions to mitigate the consequences of the pandemic (Cevik, 2023c, 2023d).

We recognize the potential endogeneity of interest rates, but the monetary policy stance set by the ECB can be taken as fairly exogenous since Baltic countries only account for an extremely small share of GDP relative to the rest of the euro area and domestic shocks in the Baltics cannot be the major component behind the ECB's policy decisions. In addition, announcement effects may be a concern as a source of "contamination" of the monetary policy effect since economic agents could react to the announcement of policy changes. In our view, the announcement effect might not be as strong in the Baltics as it would be in larger eurozone countries such as France or Germany , since Baltic countries tend to have desynchronized economic cycles.

We subject our empirical analysis to several robustness checks. First, we use the shadow rate constructed by Krippner (2013) instead of the 6-month OIS rate to measure monetary shocks. Second, we introduce additional control variables (policy measures, such as the COVID-19 stringency and economic support indices, introduced during the pandemic) in the model. These results, presented in Appendix Figure A1 and A2, are again qualitatively and quantitively similar, although with few differences compared to the baseline findings.

IV. CONCLUSION

Central banks conduct monetary policy to achieve price stability, but decisions also have side effects on labor-market outcomes. What is the impact of monetary shocks on labor markets? In this paper, we aim to answer this crucial question for policymaking with the 'interest rate surprise' approach to identify exogenous monetary policy shocks and a novel dataset of online job vacancy postings at daily frequency to measure the state of labor markets in three eurozone countries (Estonia, Latvia and Lithuania) over the period 2018–2024.

First, by implementing local projections, we find evidence that a contractionary monetary policy shock causes a persistent decline in online job vacancy postings—in line with theoretical predictions. Across all countries, the average effect amounts to about 2 percent in 15 days after a contractionary monetary policy shock (i.e., an unanticipated increase of 1 percentage points in short-term interest rates). Equally, an unexpected monetary easing leads to an increase of similar magnitude in online job vacancy postings. Second, we observe considerable variation in the magnitude and persistence of how monetary shocks influence labor market developments across three countries in our sample, with the rate of contraction in online job vacancy postings varying from 0.5 percent in Latvia to 2 percent in Estonia and 3.2 percent in Lithuania. While this negative effect on online job vacancy postings appears to be highly persistent in Lithuania, it tends to disappear over the course of a month in Estonia and Latvia.

Overall, these statistically and economically significant findings indicate that monetary policy exerts substantial and persistent effects on labor markets as measured by online job vacancy postings. Hence, our empirical evidence is of direct relevance to policymakers, especially in terms of the transmission of monetary policy.

Appendix Figure A1. Impact of Monetary Policy Shocks on Online Job Vacancy Postings (with the Krippner shadow rate)
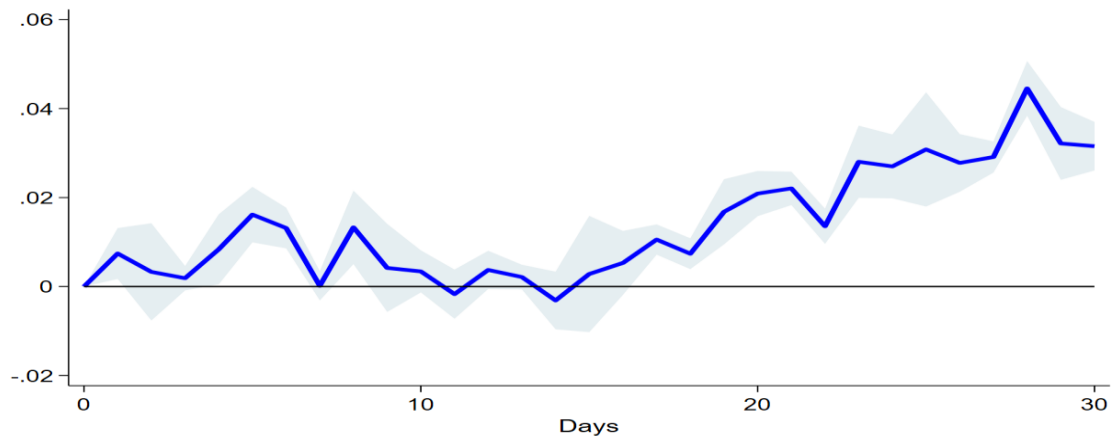
Estonia
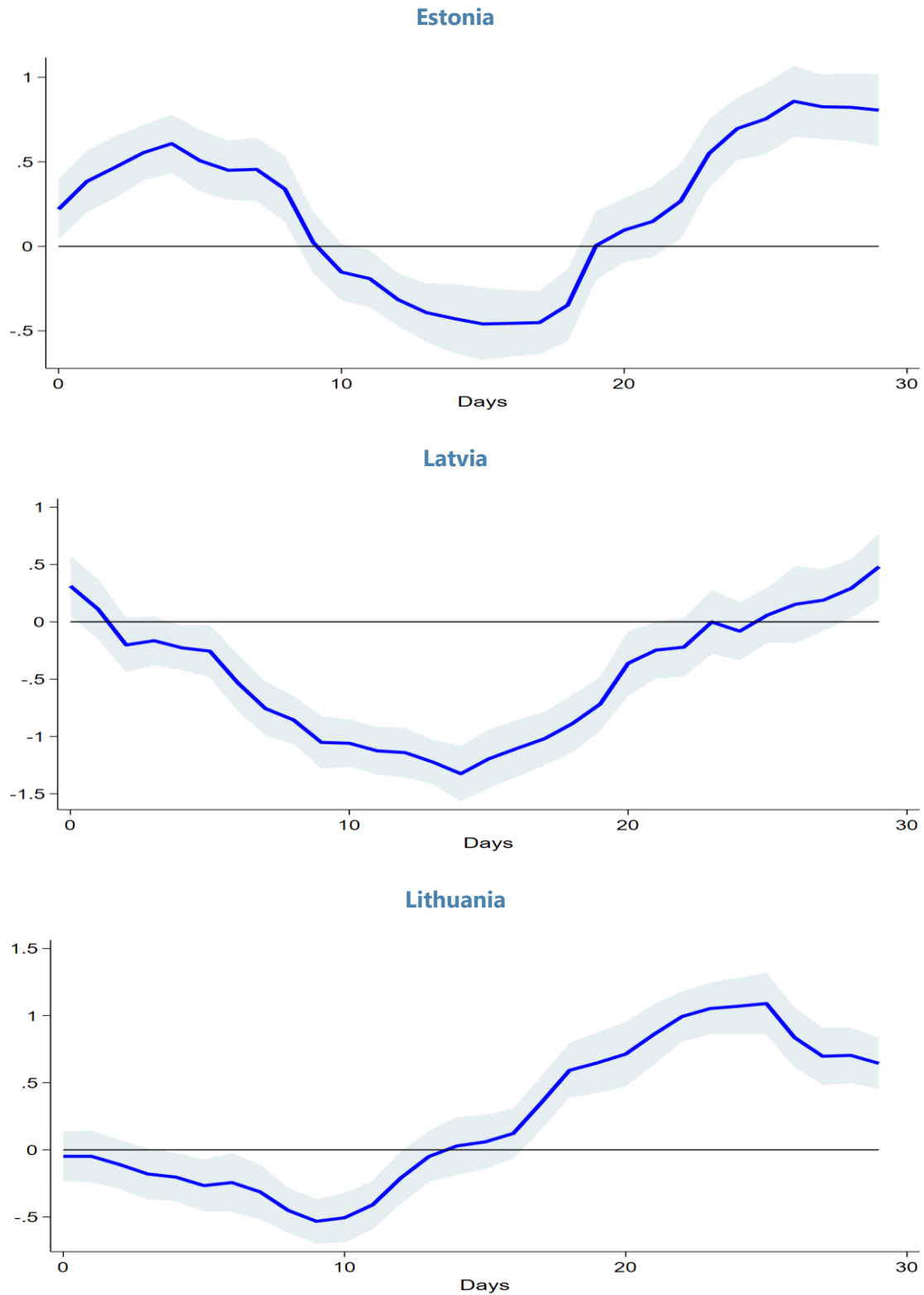
Latvia

Lithuania
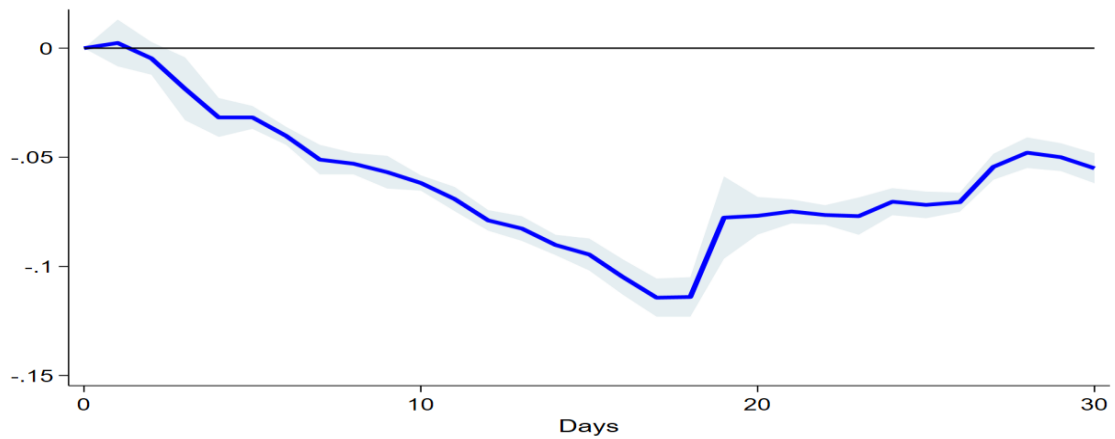

Source: Authors' estimations.

Appendix Figure A2. Impact of Monetary Policy Shocks on Online Job Vacancy Postings (with additional control variables)

Estonia
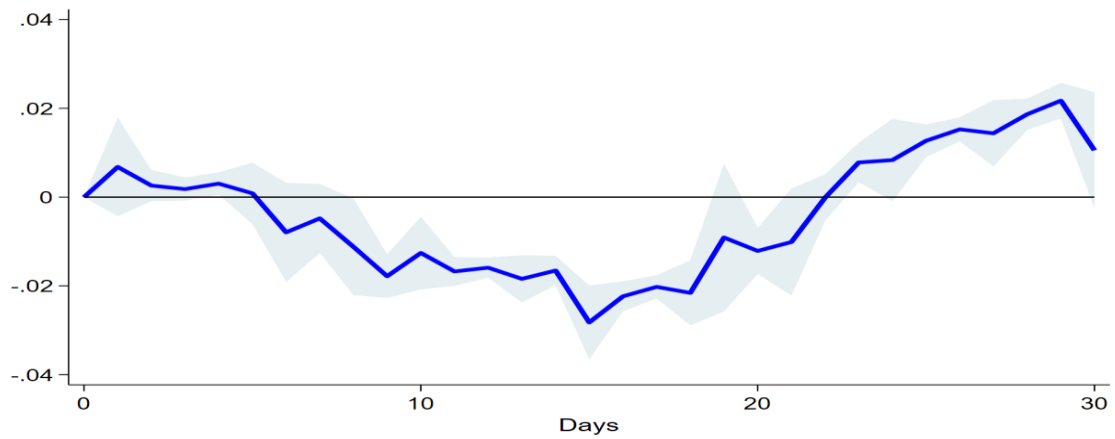
Latvia

Lithuania

Source: Authors' estimations.

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