Does Economic Policy Uncertainty Differ from Other Uncertainty Measures?

Replication of Baker, Bloom, and Davis (2016)*

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Abstract

This paper revisits Baker et al. (2016)'s main finding that shows the significant negative impacts of shocks to the Economic Policy Uncertainty index on the U.S. aggregate economic activity. We focus on sub-sample analyses with sample periods extended to December 2022. We find that shocks to the index do not significantly affect the economy during the period from September 2008 to December 2019, in contrast to significant negative impacts found in the sample ending earlier. Interestingly, this feature is specific to the Economic Policy Uncertainty index, while other popular uncertainty measures retain downward pressures on the economy across all of the sub-sample periods under examination. Economic Policy Uncertainty again deters economic activity once the Covid-19 period is included in the sample, implying that the size of shocks and/or the state of the economy may play an additional role for its transmission.

JEL classification: E30, E32

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1 Introduction

Since the seminal work by Bloom (2009), a large number of studies delved into empirically examining the effects of uncertainty.[1] A critical issue with these empirical analysis is that uncertainty is not observable. Therefore, many papers introduced different measures of economic uncertainty, drawing on information from various sources (e.g., Jurado et al. (2015), Ludvigson et al. (2021), and Jo and Sekkel (2019)). One of the most widely-used measures of uncertainty is the Economic Policy Uncertainty (henceforth EPU) index introduced by Baker et al. (2016), which is constructed to capture uncertainty surrounding economic policy or policy decisions of a country (or around the world).[2] Baker et al. (2016) claim that the EPU index captures uncertainty about "*who* will make economic policy decisions, *what* economic policy actions will be undertaken and *when*, and the economic *effects* of policy actions (or inaction)" (pp. 1598). Similar to the case of other uncertainty measures, the authors find that an unexpected hike in the uncertainty surrounding economic policy induces negative impacts on the real economic activity (Figure VIII, pp. 1629).

This paper aims to investigate whether the main findings of Baker et al. (2016) hold for sub-sample analyses using an updated data. We start by replicating one of the main analyses in Baker et al. (2016); the authors employ the EPU index along with other macroeconomic indicators in a time-series model, and find that policy uncertainty shocks lead to significant declines in investment, output, and employment in the U.S.[3] We use the monthly U.S. data spanning from January 1985 to December 2019, which extends the sample period of Baker et al. (2016) from January 1985 to October 2014. We then choose September 2008 as a structural breakpoint based on a statistical breakpoint test result on the EPU index. To keep the comparability, we closely follow the empirical specification of Baker et al. (2016) and estimate a vector autoregressive (VAR) model, where an exogenous shock to the EPU index is identified by a Choleski decomposition.

Key findings can be summarized as follows. First, using the sample extended through the end of 2019, we find that the significantly negative impacts of EPU shocks on the industrial production and employment still show up, similar to Baker et al. (2016). Second, once the sample is split into two sub-

[1] See Bachmann et al. (2013); Caggiano et al. (2014); Leduc and Liu (2016); and Bloom et al. (2018), for example. In particular, Bloom (2014) provides a nice summary of the literature.

[2] As of 02/19/2024, number of citations for this paper is about 11,000 according to Google Scholar.

[3] To examine whether the policy uncertainty matters for economic activity, Baker et al. (2016) conduct empirical exercises at the firm- and aggregate-level. The firm-level replication results, which are in line with our main findings at the aggregate-level, are provided in Appendix B.

periods , i.e., January 1985 - August 2008 and September 2008 - December 2019, the negative effects of the EPU shocks do not appear any longer for the latter period.[4] Third, the loss of statistical significance in responses is specific to the EPU index only. With other widely-used uncertainty measures, we still see that the industrial production and employment continue to decline in the period after the Global Financial Crisis, when a positive uncertainty shock occurs. Forecast error variance decomposition results add to this finding, showing that the contribution of the EPU shocks in explaining variability in the real economic activity decreases sharply after September 2008, while that of other uncertainty indexes changes little. Our findings imply that the muted effects of the EPU shocks on real variables for the recent period are a unique feature of the EPU index. Finally, once we extend our sample further to include the Covid-19 period, we see that the EPU shocks again result in a significant decline in industrial production and employment.[5] This implies that other factors such as the size of EPU shocks as well as the state of the economy may play an additional role for the transmission of EPU.

Time-dependent and/or non-linear impacts of uncertainty shocks, and more generally, of all economic shocks are attributable to a number of structural factors (see Caggiano et al. (2021) and references therein, for uncertainty shocks). For instance, a large exogenous shock such as the Global Financial Crisis or the Covid-19 pandemic may affect the responsiveness of an economy. Other factors, such as new regulation implementation and changes in preference, can also bring such time-dependence in responses. While identifying potential factors is beyond the scope of this paper, our findings support possible state-dependence in the transmission mechanism of EPU shocks, in line with Caggiano et al. (2014) and Caggiano et al. (2021). Nonetheless, finding a fundamental source of such state-dependence that appears to exist only in the case of EPU remains for future study.

Our paper is related to existing studies showing state- or time-dependent impacts of uncertainty. For instance, Caggiano et al. (2014) show that uncertainty shocks measured as unexpected increases in VIX decreases real activity only during economic recessions. While our empirical model does not explicitly consider economic regimes, our results imply that EPU shocks may induce significantly negative impacts when sample periods include critical economic events. Choi (2013) is the closest work to ours in that it tests the robustness of the findings of Bloom (2009), where an uncertainty shock, again measured as

[4]The muted effect of the EPU shocks on the real sector itself has been also found in Choi and Shim (2019). They show that the EPU shocks do not have negative effects on the real sector in several emerging economies such as South Korea, Russia, Chile, and Brazil.

[5]Related, Altig et al. (2020) show that economic uncertainty measures exhibit huge jumps during the COVID-19 pandemic and cause large negative impacts on the real sector.

VIX, shows statistically negative impacts on various economic indicators in a VAR framework. Choi (2013) shows that when the original sample from 1962 to 2008 of Bloom (2009) is divided into two sub-periods, the negative impacts disappear in the latter period starting from 1983. We focus on the time-dependent effects of the EPU index, and compare our main results with responses to a number of alternative uncertainty indexes. As such, our analysis considers heterogeneity across various uncertainty measures in terms of capturing different aspects of economic uncertainty.

The rest of the paper is organized as follows. Section 2 describes the data and introduces the empirical models. Section 3 presents our main findings. Section 4 concludes.

2 Data and Methodology

Our setup follows Section IV.D. of Baker et al. (2016) as closely as possible in terms of modeling and data selection. Baker et al. (2016) use monthly U.S. data and draw a causal inference regarding the impacts of EPU shocks in a VAR model. Following their specification, we use three lags in our VAR model and employ the Cholesky decomposition for the identification of uncertainty shocks. Variables are included in our model in the following order: EPU, the log of S&P 500 index (monthly averages of daily closing prices), the federal funds rate (monthly averages of daily values), log employment, and log industrial production. It is worthwhile to note that we use the version of the EPU index that is a normalized index of the volume of news articles discussing economic policy uncertainty, to make our replication exercise as close as possible to the published version of Baker et al. (2016).[6]

Our baseline VAR model can be summarized as:

$$Ay_t = c + \sum_{k=1}^{3} B_k y_{t-k} + u_t, \tag{2.1}$$

where y_t is a 5-dimensional vector of the endogenous variables mentioned above; c a 5-dimensional vector of constant terms; B_k 5×5 matrices of regression coefficients; and u_t a 5-dimensional vector of orthogonalized shocks.

[6] An earlier, working-paper version of Baker et al. (2016) introduced an EPU index that combines three components: i) a normalized index of the volume of news articles discussing economic policy uncertainty, ii) the number of federal tax code provisions set to expire from the Congressional Budget Office, and iii) disagreement among economic forecasters from the Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters. As noted in footnote 6 of Baker et al. (2016), the authors switched to the version based solely on i) in order to extend the construction of the EPU series for many other countries as well as sub-policy categories. The EPU website provides both versions of EPU indices extended to recent periods. Some results using the three component-based EPU index are presented in Appendix A.

For estimation purposes, we can express Equation (2.1) in a reduced form as follows:

$$y_t = A^{-1}c + \sum_{k=1}^{3} F_k y_{t-k} + A^{-1}\Sigma\epsilon_t, \qquad \epsilon_t \sim N(0, I_5). \tag{2.2}$$

Here, $F_k = A^{-1}B_k$ for $k = 1, 2, 3$,

$$A = \begin{pmatrix} 1 & 0 & ... & 0 \\ a_{21} & 1 & ... & 0 \\ ... & ... & ... & 0 \\ a_{51} & ... & a_{54} & 1 \end{pmatrix},$$

and

$$\Sigma = \begin{pmatrix} \sigma_1 & 0 & ... & 0 \\ 0 & \sigma_2 & ... & 0 \\ ... & ... & ... & 0 \\ 0 & ... & 0 & \sigma_5 \end{pmatrix},$$

where σ_i is the standard deviation of each of the orthogonal shocks identified with a Cholesky decomposition. That is, we identify an uncertainty shock as an unanticipated exogenous change to the EPU index which is ordered first, implying that this type of a shock can have impacts on other variables included in the VAR in the impact month. This identification strategy, in turn, assumes that other exogenous shocks would not influence EPU in the same month. Despite the fact that this strategy has been widely employed in the existing literature including Baker et al. (2016) and Jo and Sekkel (2019), a natural choice of the ordering of the uncertainty index and real variables is not clear. The exogeneity of the uncertainty shocks implied in this scheme has been questioned in a number of studies (see Plante et al. (2018) and Ludvigson et al. (2021), for example). Related, some papers use alternative strategies to disentangle exogenous variations in uncertainty by using stochastic volatility-in-mean type models (for instance, Jo (2014) and Carriero et al. (2018)).

Our focus is to investigate whether the responses of real variables to uncertainty shocks elicit any notable distinction across different time periods. That is, we estimate our VAR model using monthly U.S. data mainly for three periods, which are i) January 1985 - December 2019, ii) January 1985 - August 2008, and iii) September 2008 - December 2019. We divide the second and third sample periods as such based on the supremum Wald test (Andrews (1993)) for an ordinary least-squares (OLS) regression of the EPU index on a constant term to find a structural break in the average level of the EPU index over the period from 1985 to 2019.[7] Figure 1 displays the time series of the U.S. EPU index from 1985 to 2019 and its breakpoint noted as a dashed vertical line.

In addition, we use other popular measures of economic and financial uncertainty such as CBOE Volatility Index (VIX, monthly averages of daily data), the macro uncertainty index from Jurado et al. (2015) (JLN macro), and the real and financial uncertainty index developed by Ludvigson et al. (2021) (LMN real and LMN financial). Figure 2 displays time series of these uncertainty indexes used in our analysis and Table 1 shows their correlation coefficients. In particular, Panels A, B, and C of Table 1 present the correlation coefficients from January 1985 to December 2019, January 1985 to August 2008, and September 2008 to December 2019, respectively. The EPU index appears to be correlated with other uncertainty indexes to a moderate degree. For instance, the correlation coefficients between the EPU index and LMN real is about 0.32 for the entire period (Panel A), while it falls below 0.20 for the sub-samples (Panels B and C). Interestingly, the correlation coefficients of JLN macro and LMN real with financial uncertainty indexes (VIX and LMN financial) increase greatly after September 2008 from as low as 0.22 – 0.39 (January 1985-August 2008) to 0.72 – 0.84 (September 2008-December 2019). This is in stark contrast to the case of the EPU index; its correlation coefficients with these financial uncertainty indexes decrease after September 2008 from 0.42 and 0.58 to 0.30 and 0.29. All in all, the diverging patterns in the correlation coefficient show the first indication that uncertainty surrounding economic policy reflected in the EPU index may differ from what other uncertainty measures capture, especially after the Great Financial Crisis.

3 Empirical findings

3.1 Replication of Baker et al. (2016) and sub-sample analysis: Jan. 1985 to Oct. 2014

We begin our analysis by replicating impulse responses presented in Figure VIII of Baker et al. (2016) for the period from January 1985 to October 2014.[8] In this replication, we use two sets of data; first, we

[7] We use a trimming parameter of 0.15.

[8] The sample period used in the replication files ends in October 2014, which is slightly earlier than the one noted in the paper, i.e., December 2014. Hence, we set the replication period to finish in October 2014, in line with the replication file.

use the replication data provided by the authors of Baker et al. (2016)[9] and second, we download each variable of the most recent vintage. We find that two out of five variables used in the VAR model of Baker et al. (2016) are revised over time, i.e., the EPU index and industrial production. While the size of the revision conducted in the industrial production series is negligible, the EPU index, in fact, shows some material variations from the one provided in the replication file, as shown in Figure 1. Hence, we estimate the same model with the most recent vintage data and compare the resulting responses.

The replicated impulse responses of industrial production and employment to a shock to EPU are presented in Figure 3. The sizes of the EPU shock is set to be 97 points for the original data set and 88 points for the recent-vintage data set. These are equivalent to the difference between the average level of the EPU index in 2011 and in 2005–06, in line with the shock size in Baker et al. (2016).[10] As shown in Panel A, when the data from the replication file is employed, both industrial production and employment significantly drop following the EPU shocks and the magnitude of the impulse responses are identical to Figure VIII of Baker et al. (2016), confirming that one of the main findings in Baker et al. (2016) is well replicated. Panel B shows that little difference is found in the responses when the recent updated data are used.

We further divide the original sample period into two sub-periods, using the breakpoint of September 2008 that we find in Section 2: (1) January 1985 to August 2008 and (2) September 2008 to October 2014. Starting from this exercise and onward, we use the data set of the most recent vintage. The size of the shocks is set to be 88 points for both sub-periods, to keep results comparable across different periods. Figure 4 shows the resulting impulse responses for each sub-periods. In Panel A, we see that industrial production and employment decrease significantly following EPU shocks between January 1985 and August 2008, as before. Interestingly, magnitudes of the responses are almost identical to those reported in Figure 3, implying that the finding of Baker et al. (2016) is likely driven by the earlier episode. However, the effects of the EPU shocks on those variables are no longer significant between September 2008 and October 2014, as shown in Panel B. Throughout most of the impulse response horizon, the responses remain statistically insignificant for both industrial production and

[9]The replication code and data are available using the link in the Economic Policy Uncertainty website: https://www.policyuncertainty.com/research.html.

[10]Baker et al. (2016) note that the size of the shock is determined to be "equal in size to the EPU change from its average value in 2005–2006 (before the financial crisis and recession) to its average value in 2011–2012 (a period with major fiscal policy battles and high EPU levels)". The replication code used the average value in 2011 instead of that of 2011-2012, and we hence follow the calculation from the code.

employment.[11] This estimation result provides the first indication that the effect of the EPU shocks on the aggregate economy has become less relevant to the real economic activity after the financial crisis, and thus, the impacts of policy uncertainty increases may vary over time. One concern with this exercise is that the sample size of the second sub-sample period is relatively small, i.e., about 70 months. Thus, we further extend the sample period and conduct similar exercises to verify our findings.

3.2 Extension of the sample period

This section extends the sample period further to include recent observations and re-estimate the same VAR model as in the previous section. The extension is done for two end points: December 2019 and December 2022. The former leaves out the periods affected by the Covid-19 pandemic, and the latter includes all available samples. This exercise alleviates potential concerns that the muted effects of economic policy shocks on the real economic activity for the period from September 2008 to October 2014 (Panel B in Figure 4) suffer from a small-sample problem and hence exhibit a wide error bands.

Period ending in December 2019 We first examine the sample ending prior to the arrival of the Covid-19 pandemic. Panels A and B of Figure 5 represent the resulting impulse responses of industrial production and employment to an 88-point upward shock to EPU for January 1985 - December 2019 and September 2008 - December 2019, respectively.[12] In panel A, industrial production is significantly negatively hit by the EPU shock, similar to the replication results presented in Figure 3, while the negative impacts on employment are mostly insignificant. This finding shows that the original results of Baker et al. (2016) are weakened when the sample period is extended. More importantly, when we use the sample from September 2008 ending in 2019 as shown in Panel B, we again find that the responses are no longer statistically significant, in line with the responses plotted in Panel B of Figure 4. That is, negative responses observed in panel A are mainly driven by the relationship between the EPU index and real variables in the past, but not by the recent one since September 2008 (panel B).[13]

A natural follow-up question would be if the aforementioned unresponsiveness of real variables to EPU shocks is a general feature that can be found in other uncertainty measures. To answer this question, we re-estimate the same VAR model by replacing the EPU index with other widely-used

[11] Impulse responses obtained using the original replication data are very similar to those presented in Figure 4 and available upon request.

[12] The supremum Wald tests performed for 1985 - 2014 and 1985 - 2019 suggest the same breakpoint of September 2008.

[13] We also investigate the dynamics of two categorical policy uncertainty indices and their impacts in Appendix C. In short, these categorical sub-indices we examine did not lead to any significant responses.

uncertainty indexes. Figures 6 and 7 represent responses of industrial production and employment, respectively, following the one-standard deviation shocks to uncertainty quantified by VIX, JLN macro, LMN real, and LMN financial. Here, we set the size of each shock to be one standard deviation in the corresponding sample period, to keep the shocks comparable across the various measures across different periods. For these uncertainty measures, industrial production and employment significantly decrease in response to the uncertainty shocks in both past and recent sample periods, in contrast to the case of EPU.[14] Hence, we conclude that the muted responses of real variables for the recent period of September 2009 - December 2019 are unique to the case of the EPU index. This, in turn, implies that what is captured by the EPU index is likely different from economic uncertainty reflected in the other indexes.

We also calculate the share of forecast error variance of industrial production and employment explained by uncertainty shocks in the benchmark VAR model for three different time periods, as reported in Table 2. Panels A, B, and C describe the estimated share for January 1985 - December 2019, January 1985 - August 2008, and September 2008 - December 2019, respectively. The error variance decompositions in the latter two sub-periods in Panels B and C show a stark contrast. For January 1985 - August 2008, as much as 20% of the forecast error variance of industrial production is explained by EPU shocks after a year. However, this share drops to only 2% for September 2008 - December 2019. Similarly, while the EPU shocks explain about 10% of the variance of employment after 1 to 3 years for January 1985 - August 2008, they contribute to its variability only marginally (3-4%) for September 2008 - December 2019. On the other hand, when measured by other uncertainty indexes, the contributions of uncertainty shocks remain little changed across the two sub-sample periods. If anything, the shares tend to increase slightly after September 2008. In sum, consistent with our previous finding, the role of the EPU index in explaining the variability in industrial production and employment becomes much less important since September 2008 than before, and this is specific to the EPU, unlike other measures of economic uncertainty.

One possible reason for such differences between the EPU and other uncertainty indices is that the former appears to be much more volatile during the period from September 2008 to December 2019, compared to the rest, as shown in Figure 2. Facing frequent and erratic fluctuations in the policy

[14] Impulse responses for the entire sample, i.e., January 1985 to December 2019, are not reported to save space. However, the negative responses of industrial production and employment are easily inferred from the observation that these variables decline in both sub-samples. Results are available upon request.

uncertainty, economic agents may not respond to its increases any longer, especially when they are soon followed by decreases in the policy uncertainty.[15] During this time, there were 14 months where the policy uncertainty increased more than its one standard deviation calculated for the entire period. In contrast, increases of the same size were observed for four months only in the case of VIX and zero for all three other uncertainty measures.

Period ending in December 2022 The Covid-19 pandemic required various policy interventions to an extreme extent, in order to limit the pathological and economic impacts of the disease. However, because of the unprecedented nature of the pandemic, there was a huge uncertainty surrounding the timing and the magnitude of policy measures. This is also reflected in the EPU indicator, which spiked up to the maximum level around the time the pandemic hit the U.S (Figure 2). As such, we extend our sample further to include observations obtained during the Covid-19 period. We acknowledge that the Covid-19 period can be viewed as outliers, especially from the statistical point of view (see Diebold (2020); Carriero et al. (2022), for example) and it may not be completely suitable to apply the same linear VAR model for a sample including this period. However, examining this period provides us a unique opportunity to gauge the impacts of an extremely salient and large policy uncertainty shock.

We add observations from January 2020 to December 2022 to our sample and re-estimate the benchmark VAR model. The size of the shock is once again set at 88 points, in order to facilitate the comparison across different sample periods. The estimated impulse response functions are reported in Figure 8. Unlike the previous sub-sample analysis in Figure 5, the inclusion of the pandemic period in our VAR model renders the responses of industrial production and employment to significantly drop following an EPU shock, even during the period starting in September 2008.

While identifying precise causes of the above change in responses would be beyond the scope of this paper, we present two possibilities, drawing on our reading of the related literature. First, for policy uncertainty, the size of a shock and its impact may be nonlinear, and large shocks might be the ones that really matter. It is worthwhile to note that the first sub-sample period (January 1985 to August 2008) includes critical episodes such as the Global Financial Crisis which raised the EPU to

[15] This discussion bases on the findings from the oil-macroeconomy literature. For instance, Lee et al. (1995) show that oil price increases in an environment where oil prices have been stable would have a much greater impact on the real economy, than in an environment where they have been frequent and volatile. Hamilton (1996, 2008) also show that price increases of a size that is larger than what have been recently observed incur significantly negative economic responses. Consistent with this idea, EPU resumes to affect IP and employment significantly negatively once we include the Covid-19 period during which the EPU skyrockets, as will be shown below.

peak. Related, Born and Pfeifer (2014) show, using a DSGE model incorporating a policy risk, that is comparable to the EPU index that a shock to policy risk does not play an important role at the business cycle frequency. They argue that this is because the risk shock is too small when the model is estimated using the U.S. data and thus, not sufficiently amplified. In our sample period, the EPU index skyrocketed in the beginning of 2020 as can be seen in Figure 2. Second, for policy uncertainty, the state of the economy may have a crucial impact on its propagation channel, consistent with the findings of Caggiano et al. (2014). In other words, when the economy is in an economic recession, a shock in policy uncertainty can have material negative impacts on real economic activities, while its impact is marginal in normal times.

Finally, we repeat the same exercise replacing the EPU index with other uncertainty measures in our benchmark VAR model. Impulse responses for the latter sub-sample period, i.e., September 2008 to December 2022, are presented in Figure 9. Notably, the responses are not too different from the ones based on the sample ending in December 2019 (Panel B in Figures 6 and 7). This corroborates our conclusion earlier that uncertainty captured in the EPU index is different from what is reflected in other economic and financial uncertainty measures.

3.3 Robustness checks

We further examine the robustness of our findings by performing a battery of additional analyses, using samples from January 1985 to December 2019.

Index-specific breakpoints As September 2008 is the breakpoint identified for the EPU index, we re-run the supremum Wald test for all other uncertainty indexes and find breakpoints for each index. Then, we re-estimate our benchmark VAR model with the other indexes by dividing the sample periods according to the index-specific breakpoints. The breakpoints obtained as results of the supremum Wald test are August 2012 for VIX, December 1999 for JLN macro, November 2004 for LMN real, and February 2012 for LMN financial, respectively. Figure 10 and 11 show that shocks in uncertainty other than EPU have robust negative effects on real variables; the only exception is employment responses to a VIX shock after the breakpoint (see the first chart in Panel B in Figure 11), which loses statistical significance. Nonetheless, the point estimates of the responses and its dynamics are quite different from what we saw in the case of EPU in Panel B of Figure 5; the former still falls and remains in the negative range throughout the impulse response horizons, while the latter increases and stay in the positive range.

Other specifications First, we consider the VAR model using the shadow rate constructed by Wu and Xia (2016) instead of the federal funds rate since our sample period includes the period at which monetary policy was constrained by the zero lower bound. Figure 12 and 13 indicate that the results change little with the use of the shadow rate. Second, we alter the number of lags: When we use six lags instead of three lags in the VAR, the impulse responses of industrial production and employment now increase significantly, instead of begin insignificant, following the shocks to the EPU index after September 2008, as shown in Figures 14 and 15. In contrast, the responses to other uncertainty shocks still show significant negative impacts, despite slight changes in the timing of the peak and persistence. Hence, including more lags in the VAR further strengthens our benchmark findings.

4 Concluding Remark

We replicate one of the most influential papers in studies of uncertainty shocks, i.e, Baker et al. (2016) with extended samples. Our focus is on examining any changes in the responses of real economic indicators to EPU shocks in comparison to those in Baker et al. (2016) when we vary sample periods. We show that shocks to EPU index do not have significant impacts on the real economic activity in the U.S. after the Global Financial Crisis ending prior to the start of the Covid-19, while they lead to significantly negative impacts during the earlier period (January 1985 - August 2008). We further find that other uncertainty measures that are commonly used in the literature consistently put downward pressures on economic activity throughout different sample periods, which is in a stark contrast to the case of the EPU. Once the Covid-19 period is included in the sample, the EPU shocks regain its importance even in the sample starting after 2008.

Our findings should be taken with caution; we do not argue that the EPU shocks are not important at the business cycle frequency. Rather, our finding indicates that the EPU index might capture different aspects of uncertainty surrounding the aggregate economy than other indices, especially between 2008 and 2019. The finding that the impacts of the EPU shocks on the real activity revive when the sample period is extended to 2022 supports this argument. It also points to the importance of considering the size of the EPU shock as well as the state of the economy for better understanding the transmission of policy uncertainty.

Table 1: Correlation Coefficients of Different Uncertainty Indexes

A) 1985M01 - 2019M12

	EPU	VIX	JLN macro	LMN real
VIX	0.37			
JLN macro	0.22	0.62		
LMN real	0.32	0.49	0.87	
LMN financial	0.35	0.81	0.63	0.57

B) 1985M01 - 2008M08

	EPU	VIX	JLN macro	LMN real
VIX	0.58			
JLN macro	0.25	0.31		
LMN real	0.19	0.22	0.84	
LMN financial	0.42	0.83	0.45	0.39

C) 2008M09 - 2019M12

	EPU	VIX	JLN macro	LMN real
VIX	0.29			
JLN macro	0.16	0.82		
LMN real	0.16	0.72	0.94	
LMN financial	0.30	0.83	0.84	0.83

Note: Panels A, B, and C show correlation coefficients of different uncertainty indexes from January 1985 to December 2019, from January 1985 to August 2008, and from September 2008 to December 2019, respectively.

Table 2: Forecast Error Variance Decomposition

A) 1985M01 - 2019M12

	Industrial Production					Employment				
Horizon	EPU	VIX	JLN mcr	LMN rl	LMN fnncl	EPU	VIX	JLN mcr	LMN rl	LMN fnncl
1	0.00	0.02	0.03	0.04	0.01	0.00	0.01	0.00	0.00	0.00
6	0.06	0.06	0.25	0.18	0.06	0.01	0.13	0.02	0.04	0.04
12	0.07	0.11	0.47	0.33	0.20	0.03	0.28	0.22	0.23	0.24
24	0.05	0.14	0.60	0.41	0.34	0.02	0.36	0.52	0.43	0.52
36	0.04	0.13	0.58	0.38	0.37	0.02	0.38	0.60	0.45	0.63

B) 1985M01 - 2008M08

	Industrial Production					Employment				
Horizon	EPU	VIX	JLN mcr	LMN rl	LMN fnncl	EPU	VIX	JLN mcr	LMN rl	LMN fnncl
1	0.00	0.02	0.03	0.05	0.01	0.00	0.02	0.00	0.00	0.00
6	0.14	0.05	0.23	0.15	0.04	0.06	0.06	0.02	0.03	0.02
12	0.17	0.13	0.45	0.28	0.19	0.12	0.15	0.16	0.11	0.14
24	0.13	0.15	0.67	0.36	0.41	0.13	0.19	0.49	0.23	0.41
36	0.10	0.14	0.72	0.34	0.48	0.11	0.17	0.64	0.28	0.52

C) 2008M09 - 2019M12

	Industrial Production					Employment				
Horizon	EPU	VIX	JLN mcr	LMN rl	LMN fnncl	EPU	VIX	JLN mcr	LMN rl	LMN fnncl
1	0.00	0.02	0.03	0.08	0.03	0.00	0.00	0.00	0.01	0.00
6	0.01	0.19	0.37	0.29	0.31	0.02	0.10	0.02	0.06	0.13
12	0.02	0.29	0.76	0.53	0.57	0.03	0.24	0.20	0.30	0.33
24	0.02	0.33	0.80	0.52	0.56	0.04	0.34	0.36	0.39	0.37
36	0.02	0.32	0.74	0.46	0.51	0.04	0.35	0.32	0.31	0.34

Note: This table shows the share of forecast error variance of industrial production and employment explained by shocks to uncertainty quantified by EPU, VIX, JLN macro, LMN real, and LMN financial.

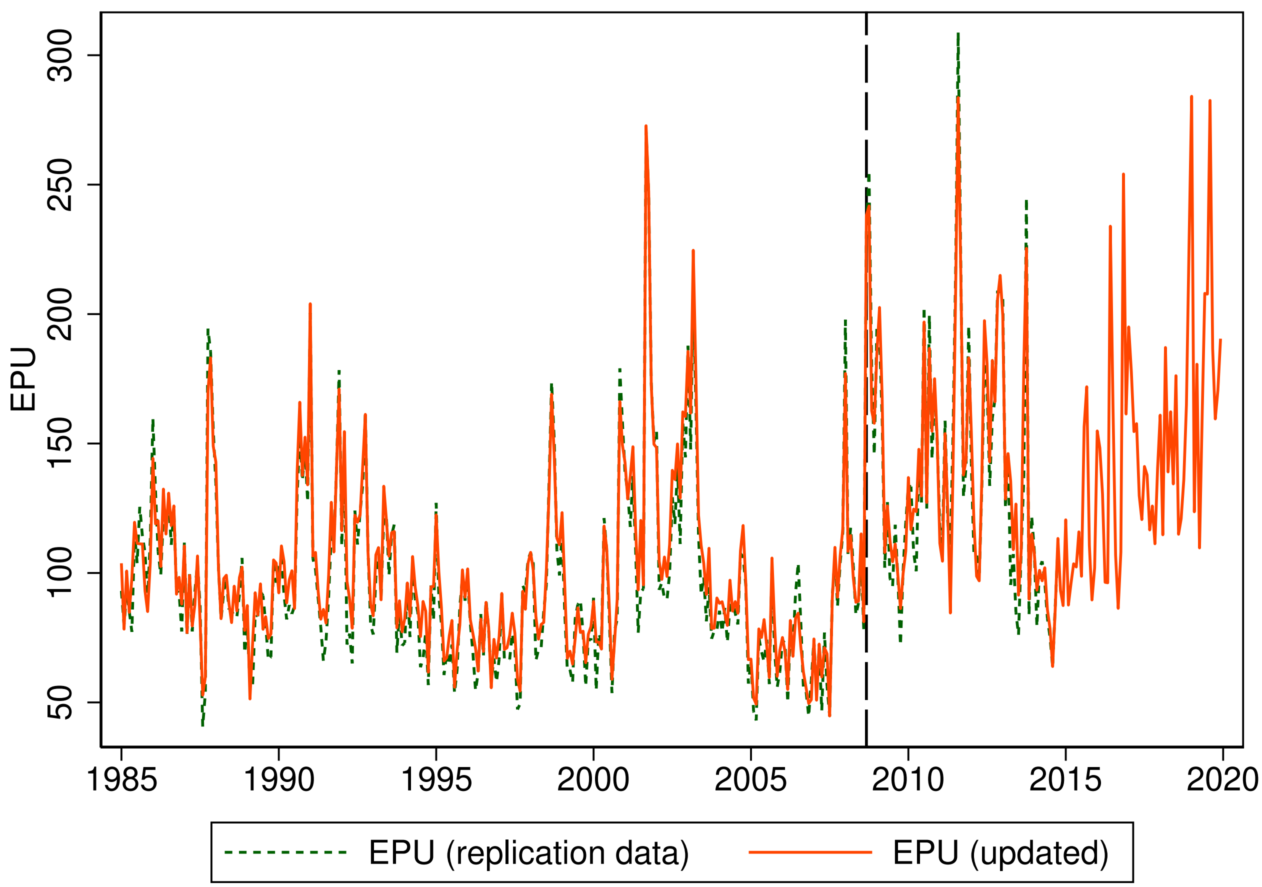

Figure 1: U.S. Economic Policy Uncertainty Index

Note: The green short-dashed line indicates the EPU index provided in the replication file from January 1985 to October 2014. The orange solid line represents the EPU index of the recent vintage from January 1985 to December 2019. The black long-dashed line indicates September 2008, the breakpoint estimated by supremum Wald test for an OLS regression of each of the two versions of the EPU index on the constant term.

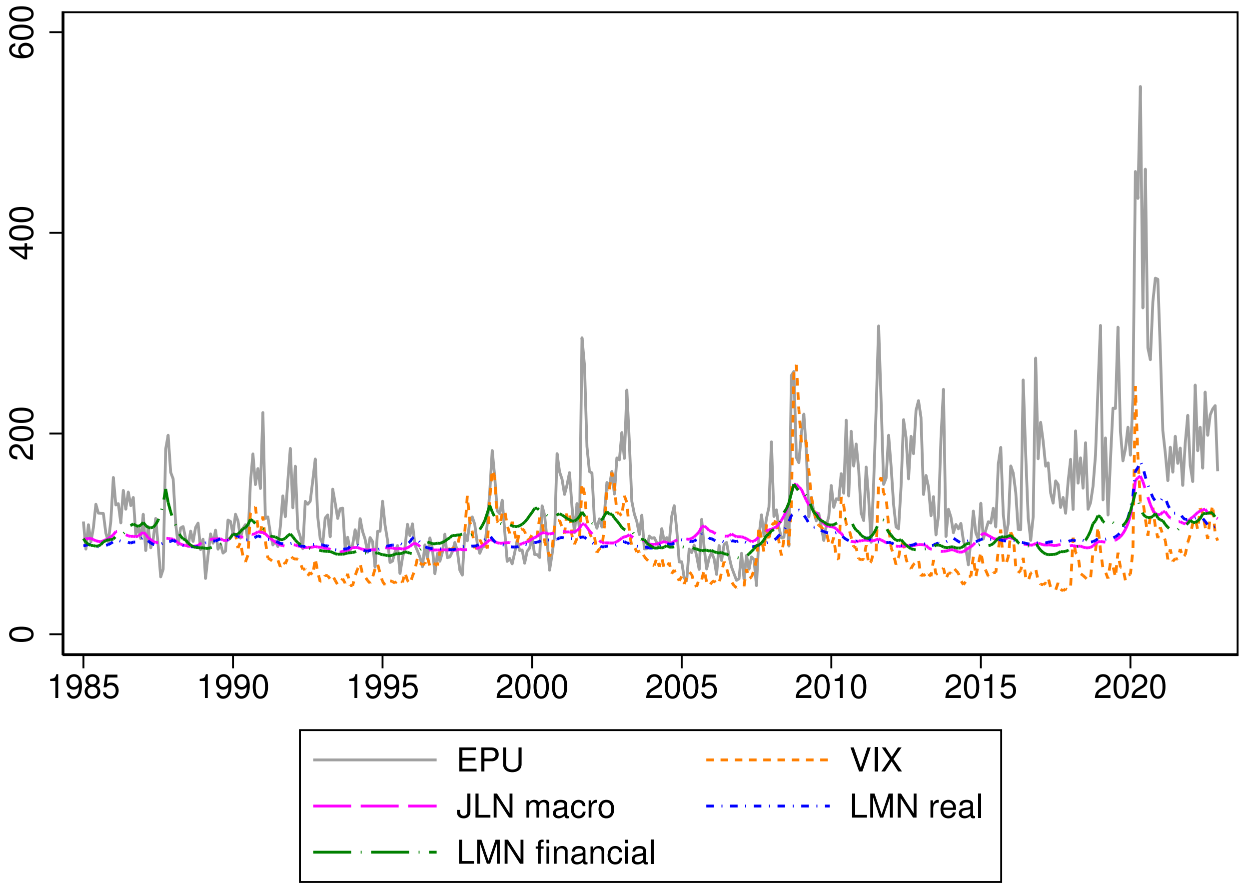

Figure 2: Various Uncertainty Indexes (1990M01 = 100)

Note: The series are scaled to index each value of January 1990 to 100 for the purpose of comparing the dynamics together. The gray solid line indicates the time series of the EPU index; the orange short-dashed line, VIX; the magenta long-dashed line, JLN macro; the blue short-dash-dotted line, LMN real; and the green long-dash-dotted line, LMN financial. VIX is from January 1990 to December 2022. The others are from January 1985 to December 2022.

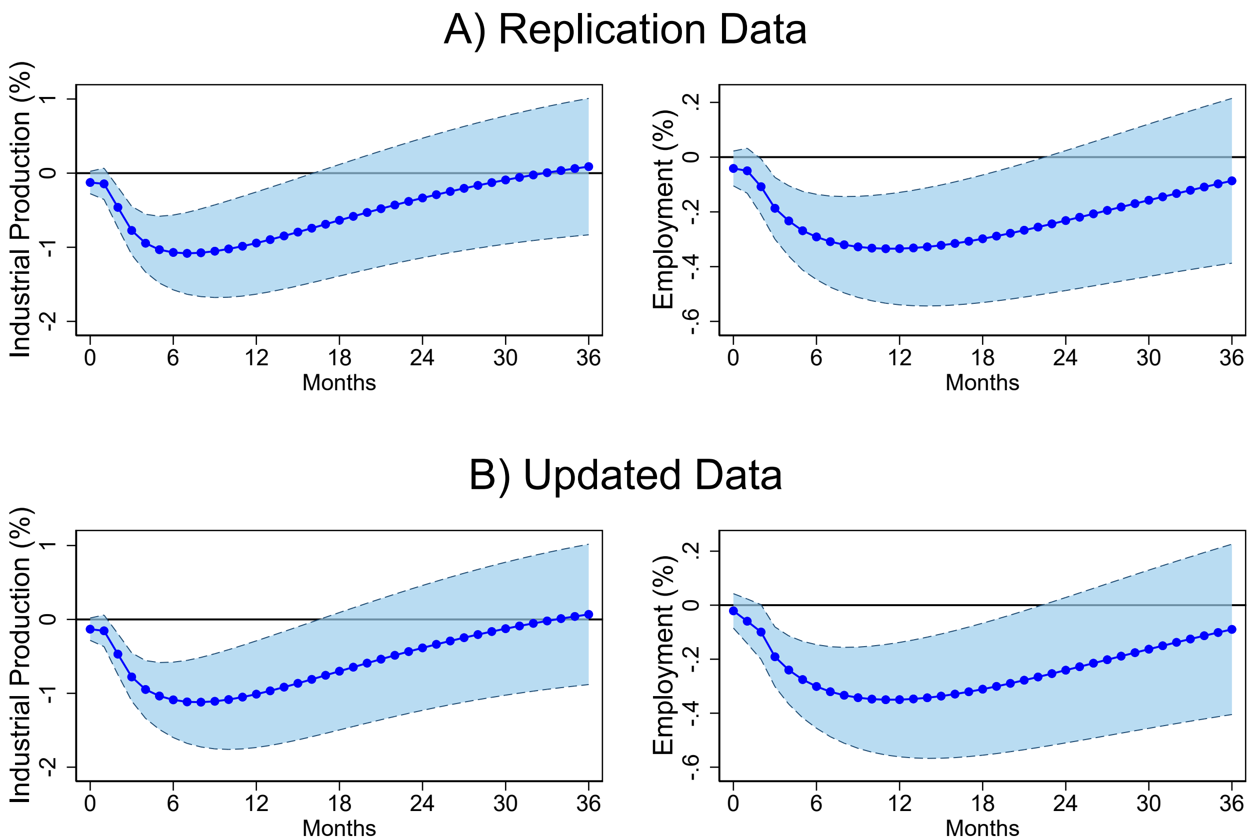

Figure 3: Responses of Industrial Production and Employment to EPU Shocks (1985M01 - 2014M10)

Note: Each panel shows the responses of industrial production (left panels) and employment (right panels) to the EPU shocks equal to the change in the average value of the EPU index from 2005/06 to 2011 (97 points for panel A and 88 points for panel B). Panels A and B are obtained using replication data provided by Baker et al. (2016) and updated version of the same data, respectively. Shaded areas represent 90-percent confidence intervals.

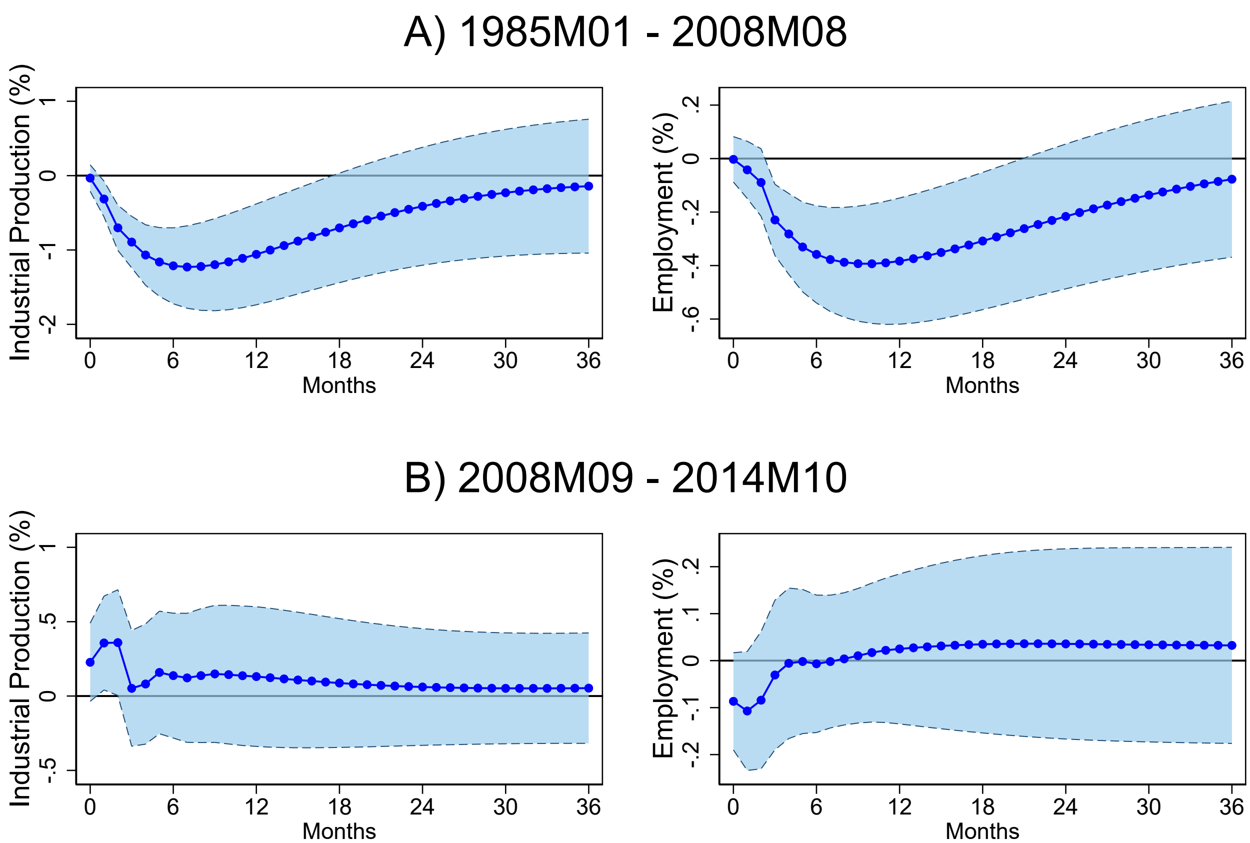

Figure 4: Responses of Industrial Production and Employment: Sub-sample Analysis

Note: Each panel shows the responses of industrial production (left panels) and employment (right panels) to the EPU shocks equal to the change in the average value of the EPU index from 2005/06 to 2011 (88 points). Panels A and B are obtained using updated version of replication data from January 1985 to August 2008 and from September 2008 to October 2014, respectively. Shaded areas represent 90-percent confidence intervals.

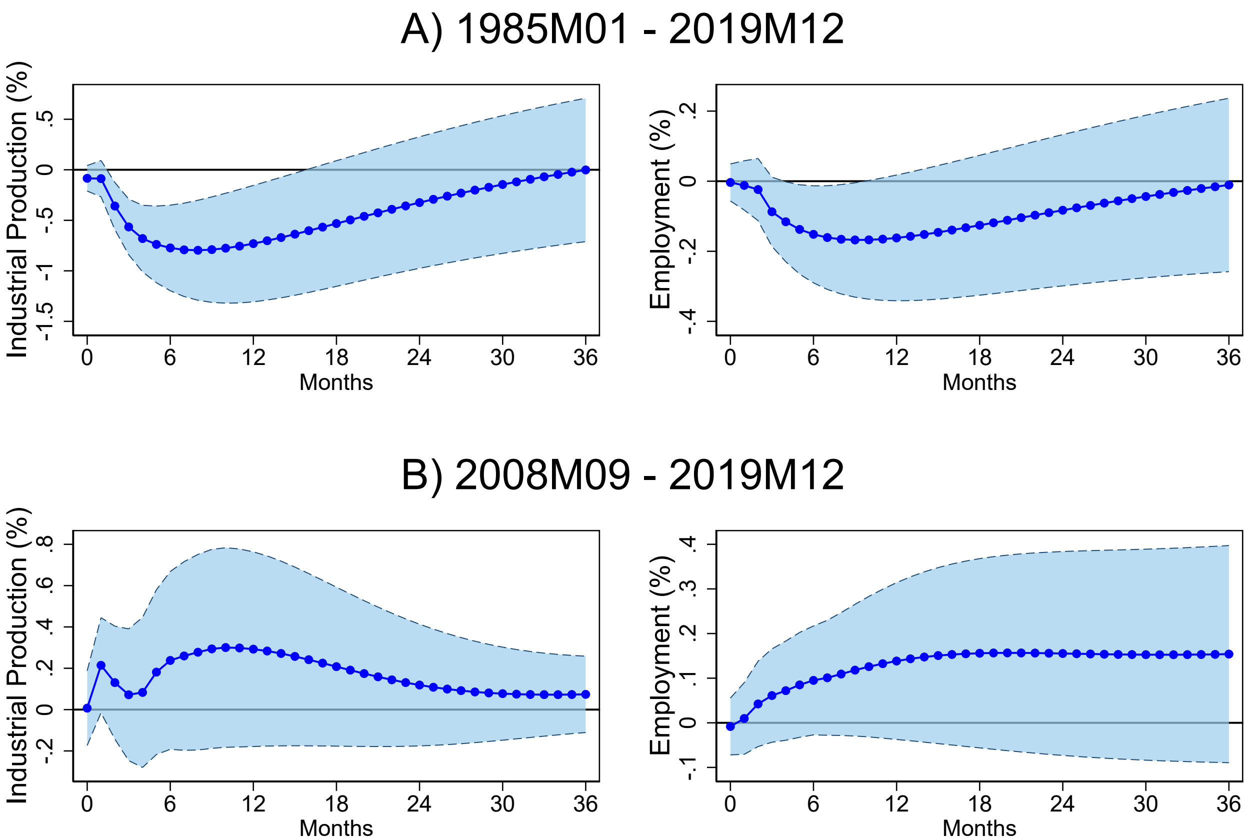

Figure 5: Responses of Industrial Production and Employment: the EPU Index

Note: Each panel shows the responses of industrial production (left panels) and employment (right panels) to the EPU shocks equal to the change in the average value of the EPU index from 2005/06 to 2011 (88 points). Panels A and B are obtained using data from January 1985 to December 2019 and from September 2008 to December 2019, respectively. Shaded areas represent 90-percent confidence intervals.

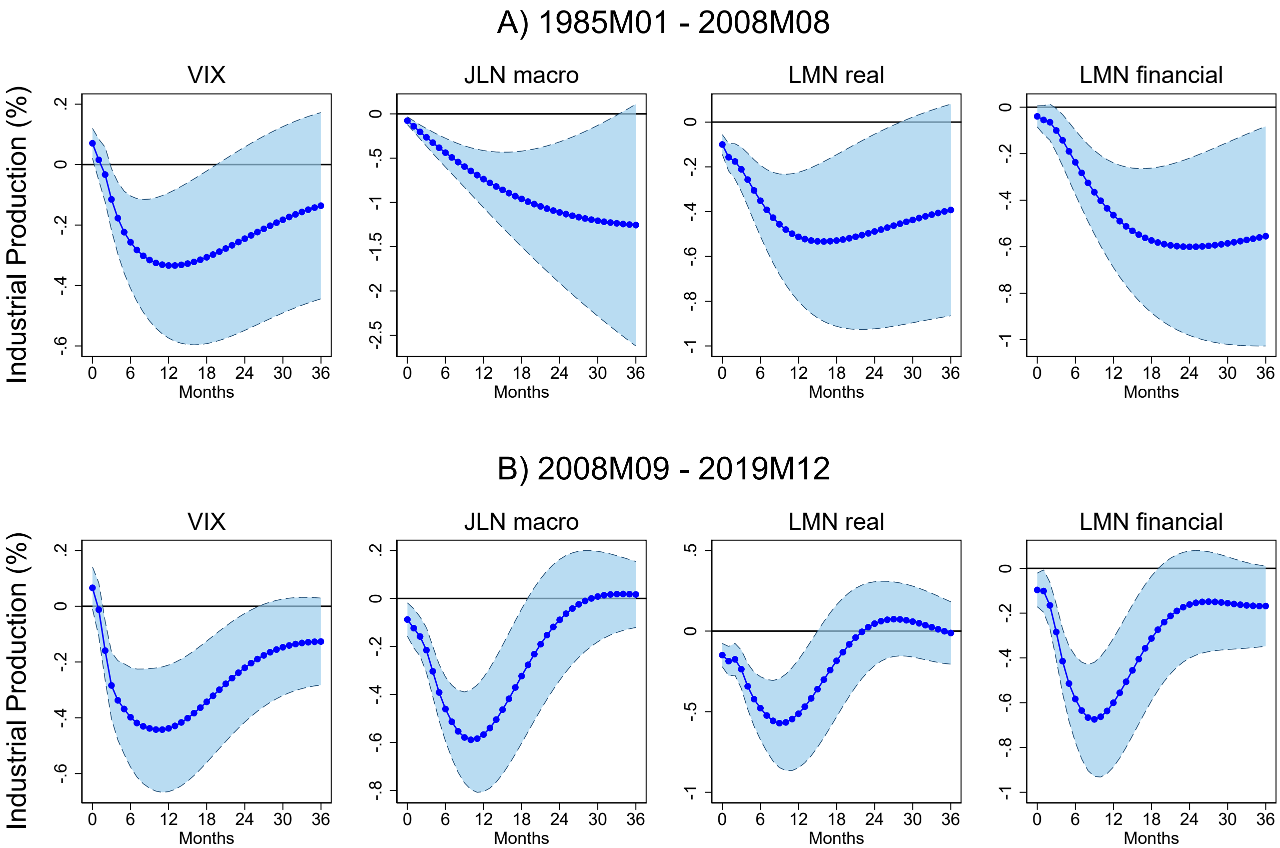

Figure 6: Responses of Industrial Production: Other Uncertainty Indexes

Note: Each panel shows the response of industrial production to the one-standard deviation shocks to uncertainty quantified by VIX (first column), JLN macro (second column), LMN real (third column), and LMN financial (last column). Panels A and B are obtained using data from January 1985 to August 2008 and from September 2008 to December 2019, respectively. Shaded areas represent 90-percent confidence intervals.

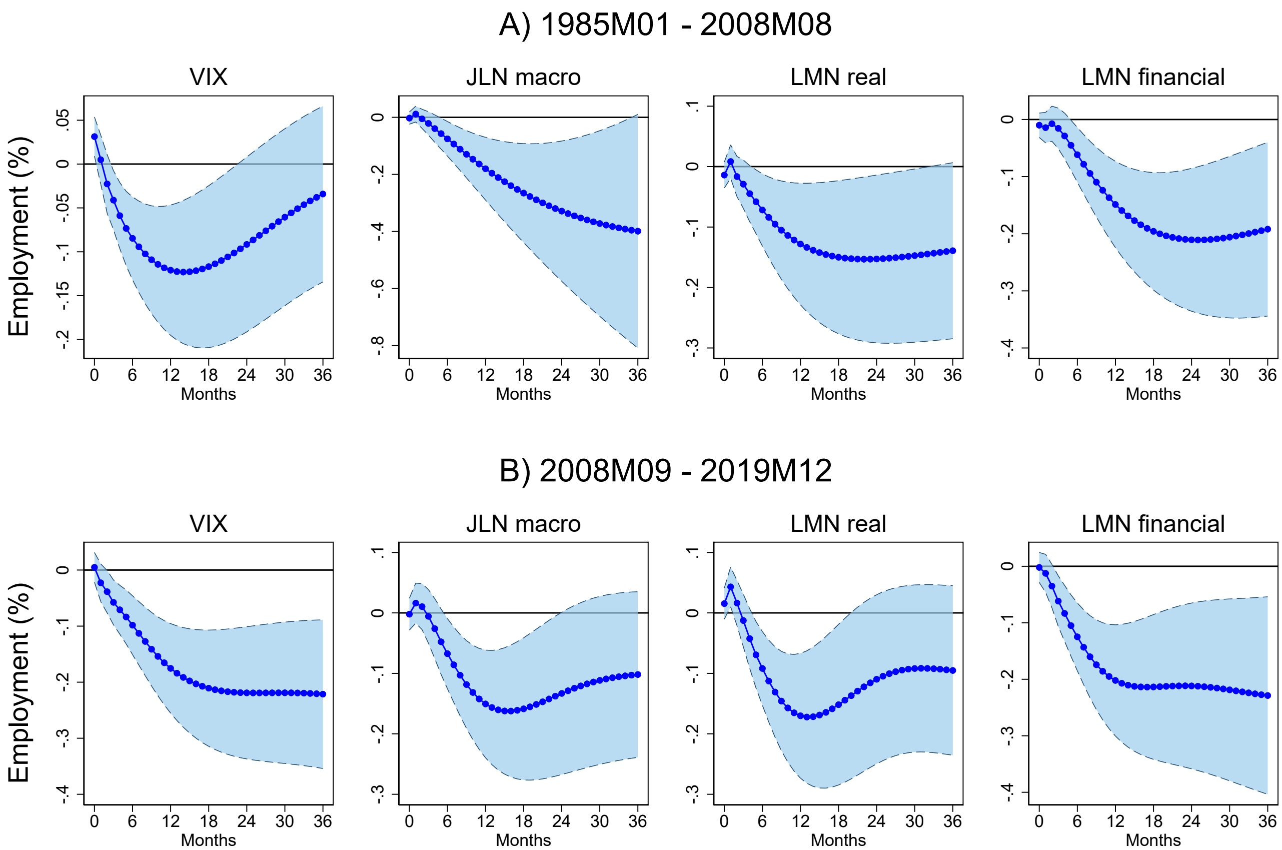

Figure 7: Responses of Employment: Other Uncertainty Indexes

Note: Each panel shows the response of employment to the one-standard deviation shocks to uncertainty quantified by VIX (first column), JLN macro (second column), LMN real (third column), and LMN financial (last column). Panels A and B are obtained using data from January 1985 to August 2008 and from September 2008 to December 2019, respectively. Shaded areas represent 90-percent confidence intervals.

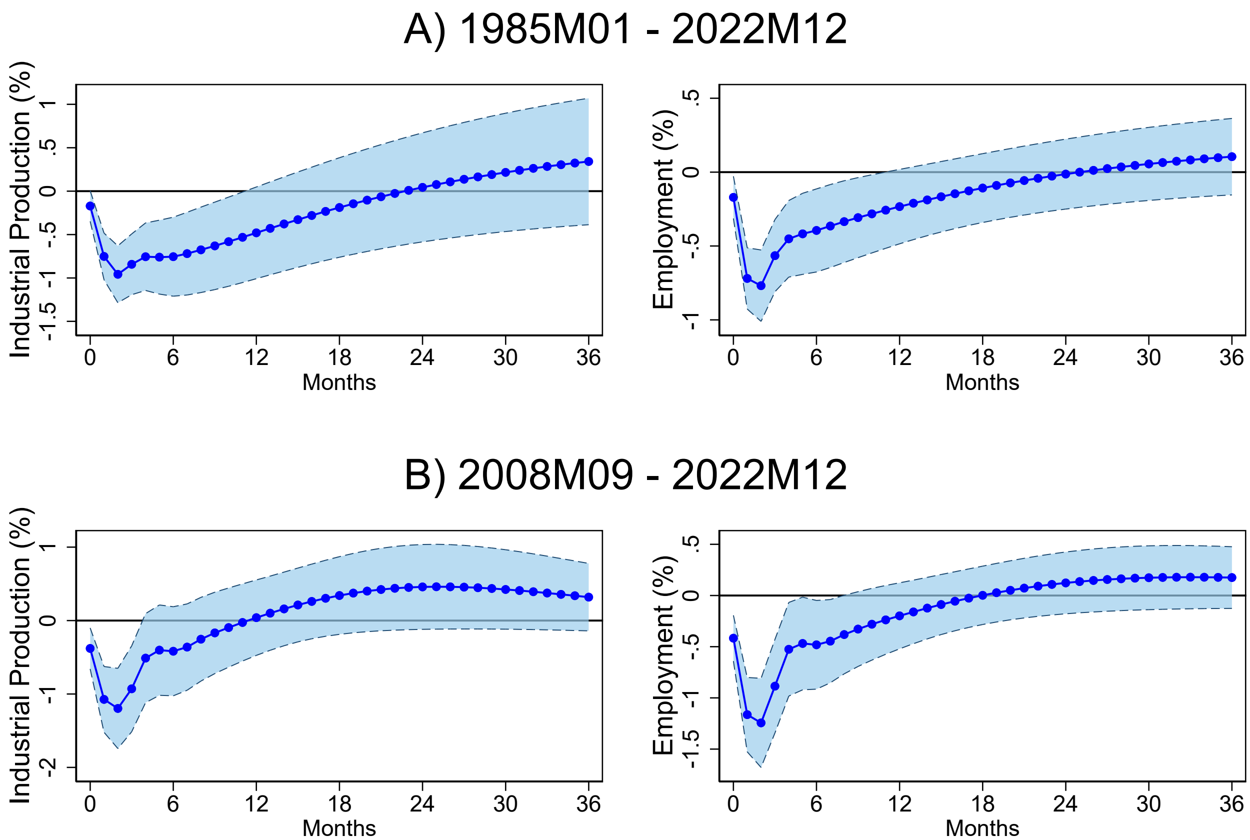

Figure 8: Responses of Industrial Production and Employment to EPU shocks: 2008 - 2022

Note: Each panel shows the responses of industrial production (left panel) and employment (right panel) to the EPU shocks equal to the change in the average value of the EPU index from 2005/06 to 2011 (88 points). Panels A and B are obtained using data from January 1985 to December 2022 and from September 2008 to December 2022. Shaded areas represent 90-percent confidence intervals.

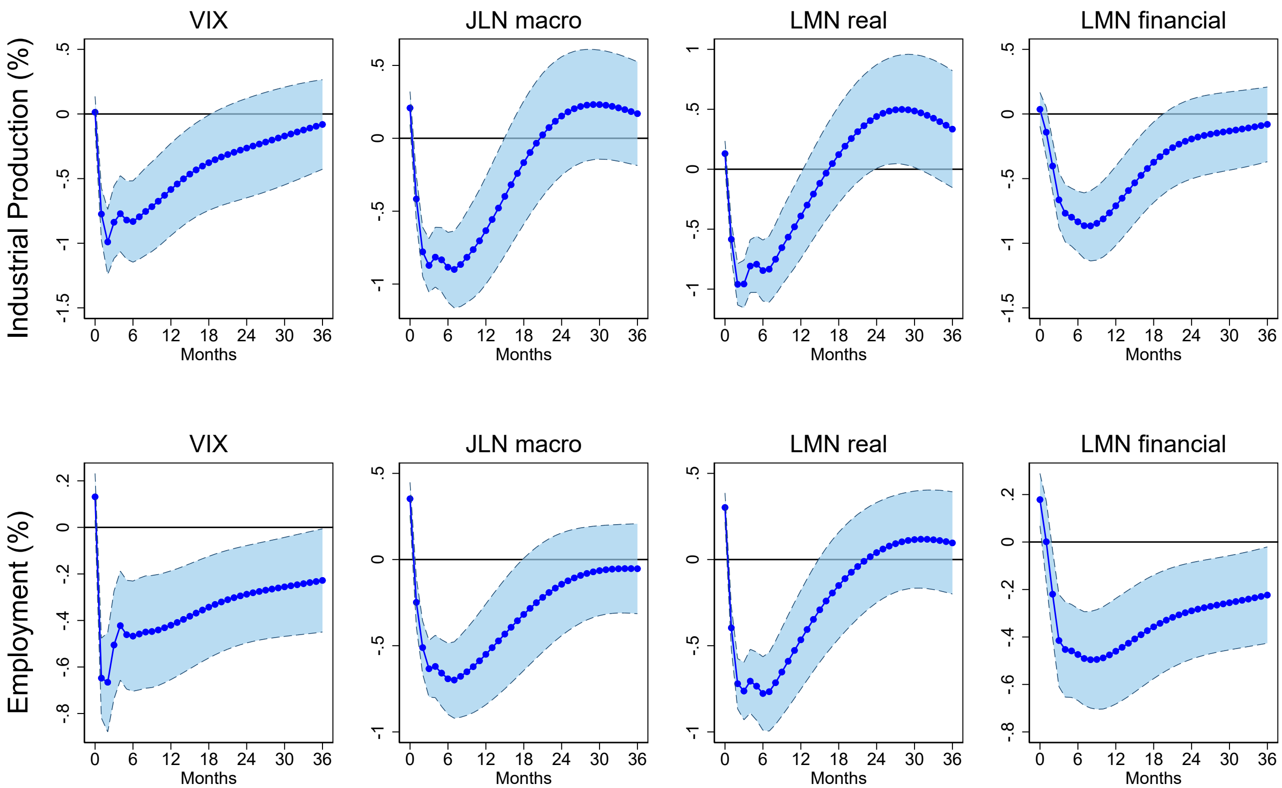

Figure 9: Responses of Industrial Production and Employment: 2008 - 2022

Note: Each panel shows the responses of industrial production (first row) and employment (second row) to the one-standard deviation shocks to uncertainty quantified by VIX (first column), JLN macro (second column), LMN real (third column), and LMN financial (last column). Panels are obtained using data from September 2008 to December 2022. Shaded areas represent 90-percent confidence intervals.

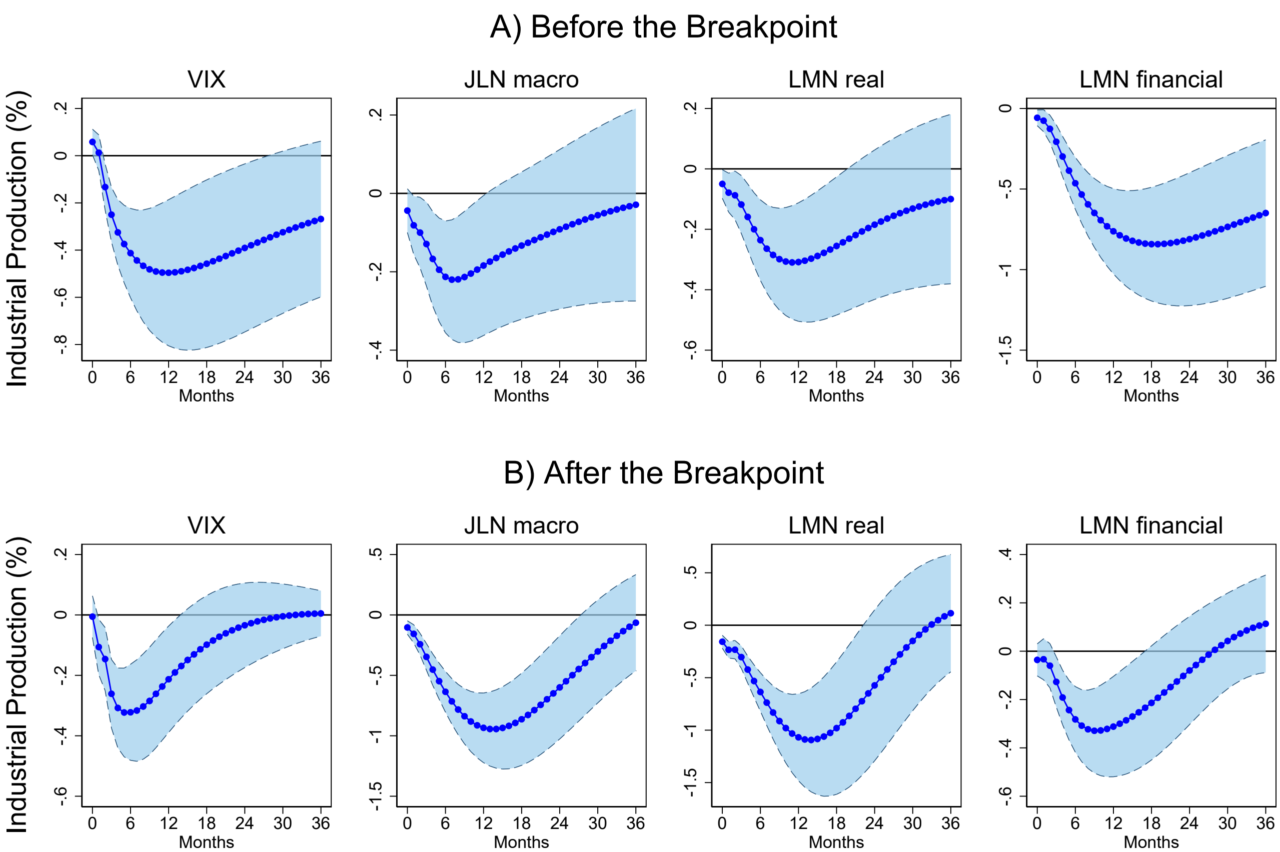

Figure 10: Responses of Industrial Production: Index-specific Breakpoints

Note: Each panel shows the response of industrial production to the one-standard deviation shocks to uncertainty quantified by VIX (first column), JLN macro (second column), LMN real (third column), and LMN financial (last column). Panels A and B are obtained using data before and after the breakpoint, respectively. The breakpoints are August 2012 for VIX, December 1999 for JLN macro, November 2004 for LMN real, and February 2012 for LMN financial. Shaded areas represent 90-percent confidence intervals.

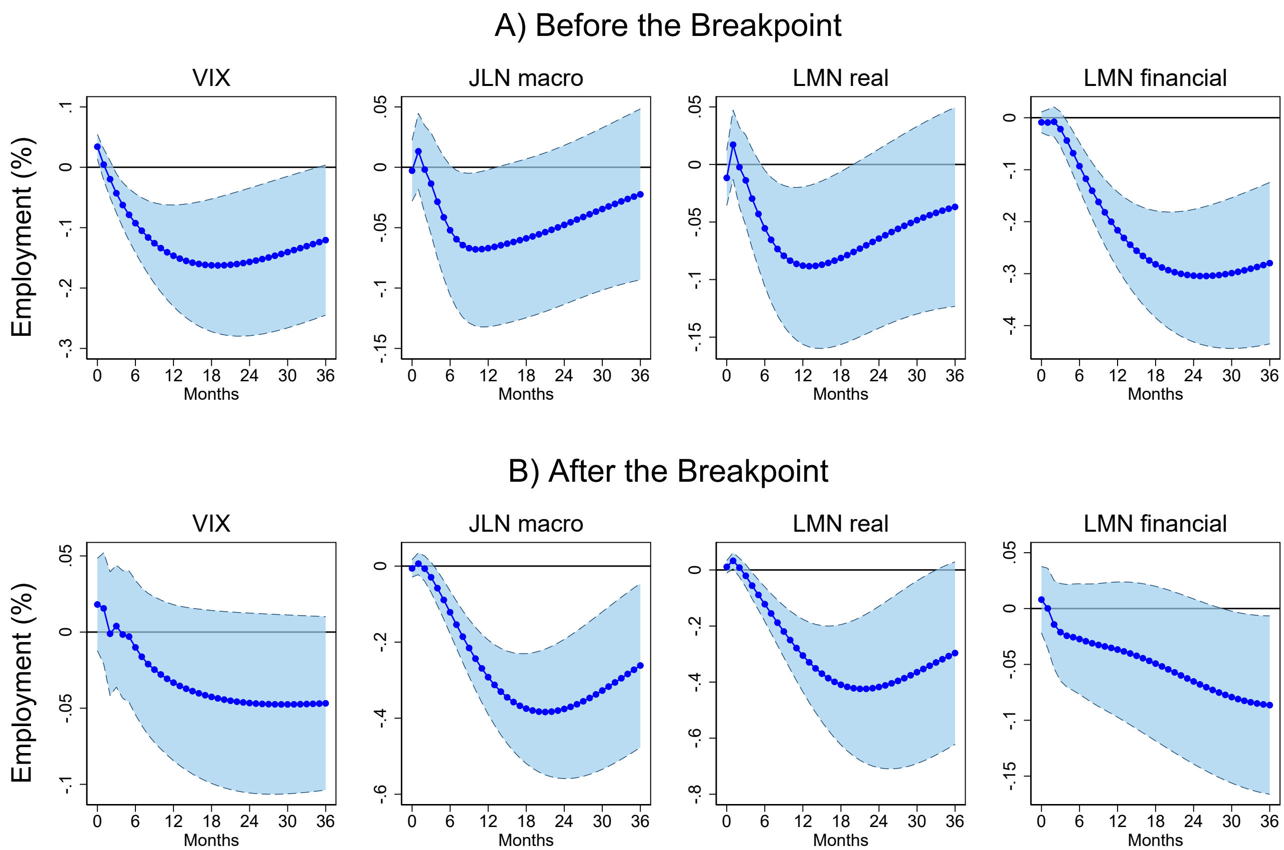

Figure 11: Responses of Employment: Index-specific Breakpoints

Note: Each panel shows the response of employment to the one-standard deviation shocks to uncertainty quantified by VIX (first column), JLN macro (second column), LMN real (third column), and LMN financial (last column). Panels A and B are obtained using data before and after the breakpoint, respectively. The breakpoints are August 2012 for VIX, December 1999 for JLN macro, November 2004 for LMN real, and February 2012 for LMN financial. Shaded areas represent 90-percent confidence intervals.

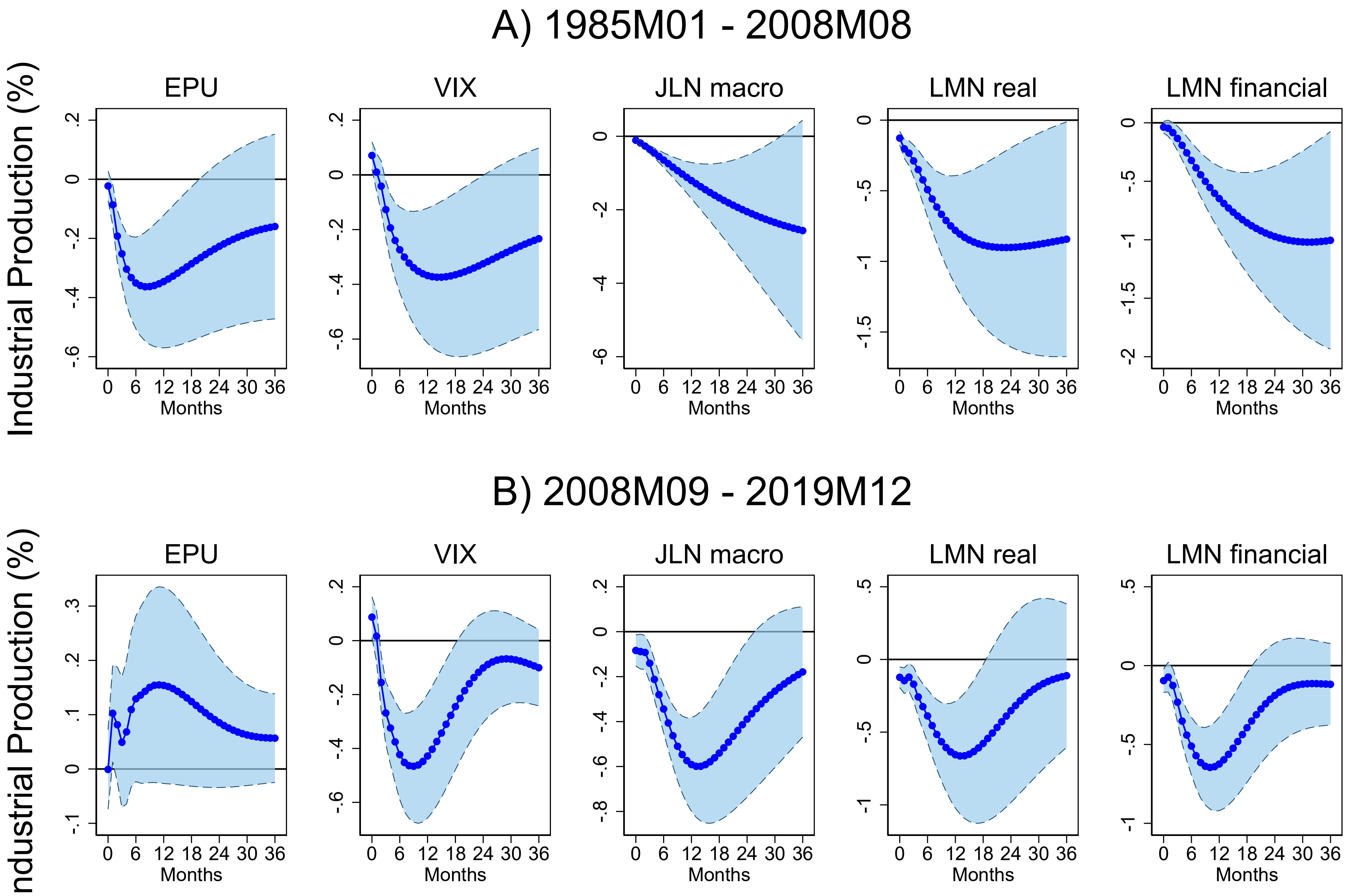

Figure 12: Responses of Industrial Production: Using Shadow Rate

Note: Each panel shows the response of industrial production to the one-standard deviation shocks to uncertainty quantified by EPU (first column), VIX (second column), JLN macro (third column), LMN real (fourth column), and LMN financial (last column), respectively, in the baseline VAR with the shadow rate constructed by Wu and Xia (2016) instead of the federal funds rate. Panels A and B are obtained using data from January 1985 to August 2008 and from September 2008 to December 2019, respectively. Shaded areas represent 90-percent confidence intervals.

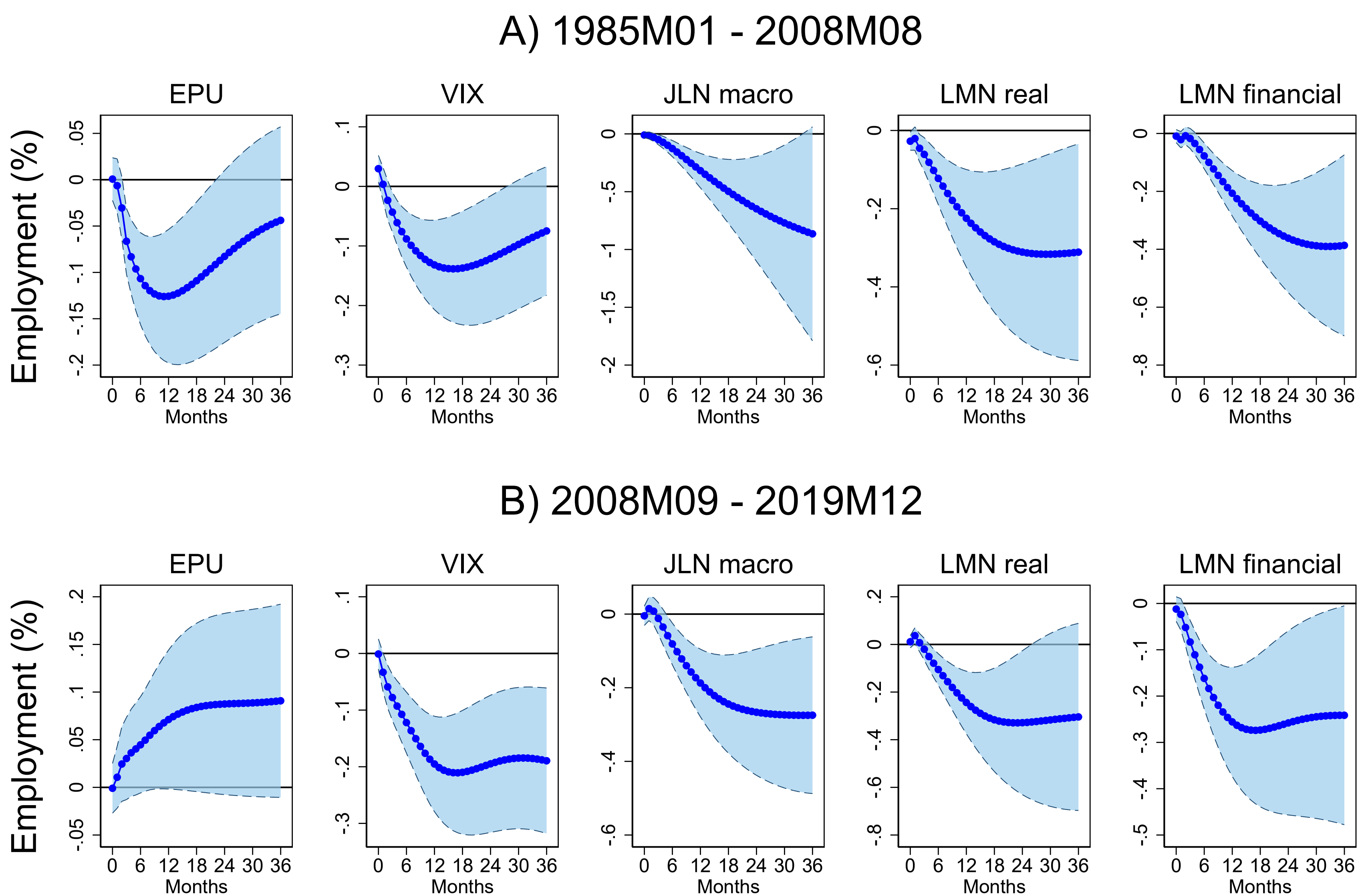

Figure 13: Responses of Employment: Using Shadow Rate

Note: Each panel shows the response of employment to the one-standard deviation shocks to uncertainty quantified by EPU (first column), VIX (second column), JLN macro (third column), LMN real (fourth column), and LMN financial (last column), respectively, in the baseline VAR with the shadow rate constructed by Wu and Xia (2016) instead of the federal funds rate. Panels A and B are obtained using data from January 1985 to August 2008 and from September 2008 to December 2019, respectively. Shaded areas represent 90-percent confidence intervals.

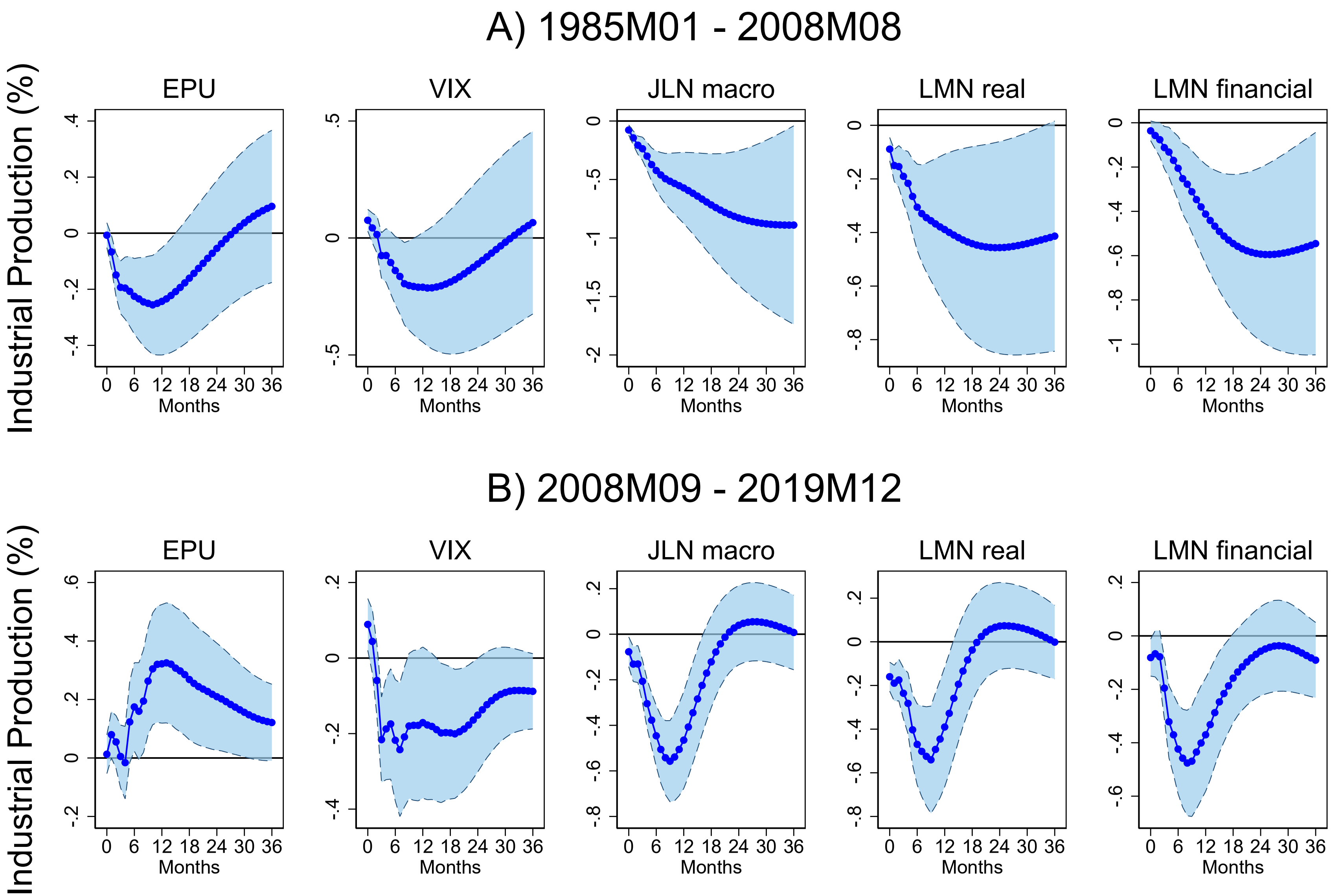

Figure 14: Responses of Industrial Production: Using Six Lags

Note: Each panel shows the response of industrial production to the one-standard deviation shocks to uncertainty quantified by EPU (first column), VIX (second column), JLN macro (third column), LMN real (fourth column), and LMN financial (last column), respectively, in the baseline VAR with six lags instead of three lags. Panels A and B are obtained using data from January 1985 to August 2008 and from September 2008 to December 2019, respectively. Shaded areas represent 90-percent confidence intervals.

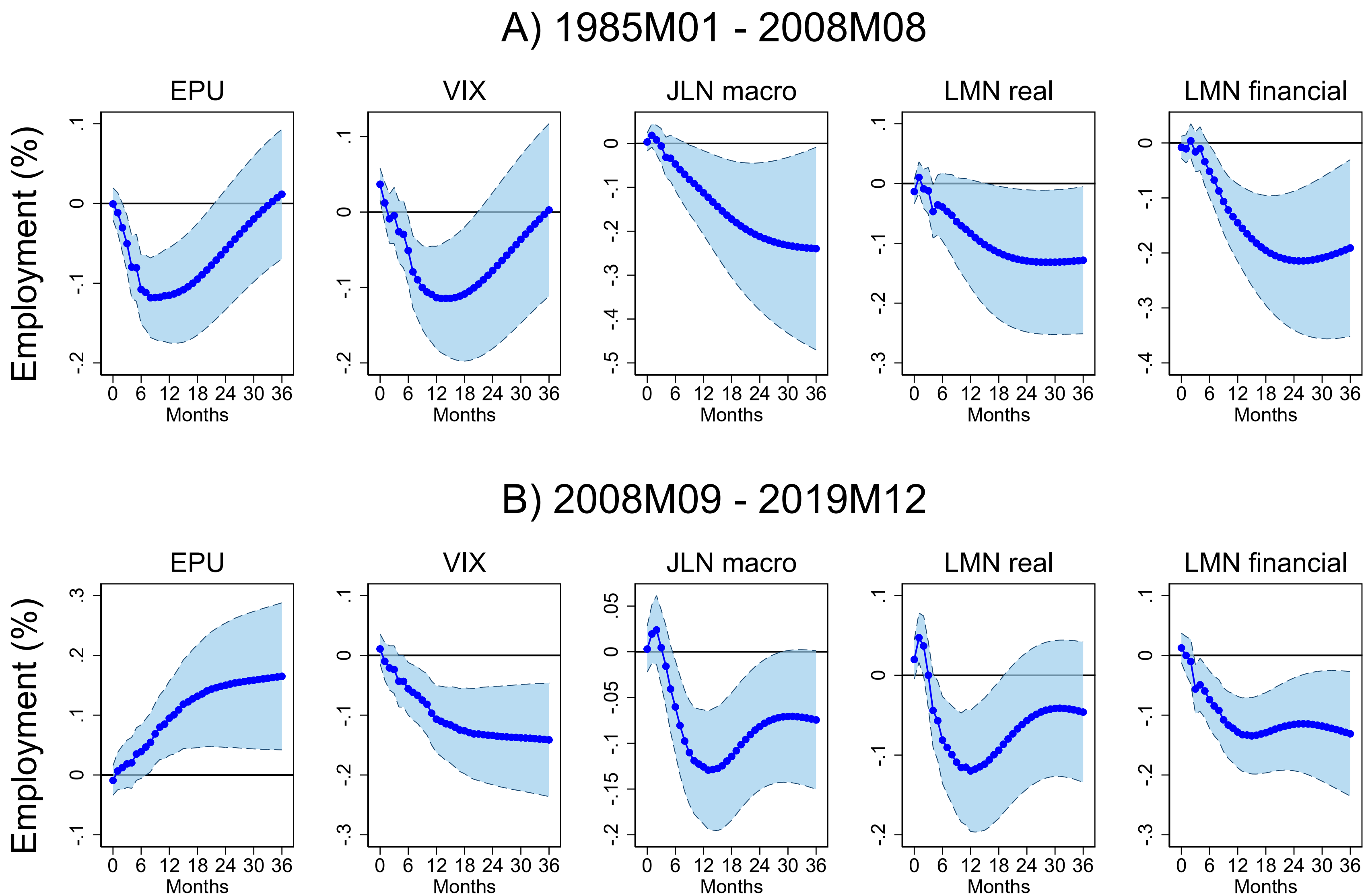

Figure 15: Responses of Employment: Using Six Lags

Note: Each panel shows the response of employment to the one-standard deviation shocks to uncertainty quantified by EPU (first column), VIX (second column), JLN macro (third column), LMN real (fourth column), and LMN financial (last column), respectively, in the baseline VAR with six lags instead of three lags. Panels A and B are obtained using data from January 1985 to August 2008 and from September 2008 to December 2019, respectively. Shaded areas represent 90-percent confidence intervals.

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Appendix

A EPU Series Based on Three Components

As discussed briefly before, two versions of EPU indices are available from the EPU website. The first one is based solely on the newspaper article counts that contain specific terms reflecting reports on economic policy uncertainty. The second one combines two other components to the newspaper article counts, which are i) the number of federal tax code provisions set to expire from the Congressional Budget Office, and ii) disagreement among economic forecasters from the Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters. The latter was introduced in the working paper version of Baker et al. (2016), whereas the former was used in the published version, likely due to the ease of extension to other countries and to sub-policy categories. The correlation between two versions is very high (0.93).

While all of the analysis in our main text was conducted using the EPU index capturing article counts only, we also use the broad-based EPU index and re-do some of the analysis from before, to examine how much of our results change. As expected from the high correlation coefficient between the two EPU versions, most of the impulse responses remains little changed.

B Replication of the Firm-Level Analysis in Baker et al. (2016)

While our analysis so far has dealt with the aggregate-level analysis of Baker et al. (2016) that is presented in Section IV.D., here we shift our focus to the firm-level analysis from Section IV.C.[16] In Section IV.C., the authors examine the relation between policy uncertainty and firm-level investment changes and employment growth using data from 1985 to 2012. More specifically, we replicate and extend results presented in Table IV of Baker et al. (2016).

We first show the firm-level analysis results using the data provided in the replication package[17], for the period from 1985Q1 to 2012Q4. Table A1 confirms that we are able to replicate results in Table IV in Baker et al. (2016) (pp. 1625); the coefficient estimates presented in this table are precisely the same. We next divide the sample into two sub-periods using 2008Q3 as the structural break, similar in spirit to our main analysis.[18] Tables A2 and A3 report sub-sample estimation results for the respective periods, i.e., 1985Q3–2008Q3 and 2008Q4–2012Q4. Interestingly, we find that our baseline results using the aggregate level data survive at the micro-level analysis. In other words, most of the coefficient estimates of uncertainty remain significantly negative for the earlier sample period, as shown in Table A2; however, the estimation results from the latter period presented in Table A3 show a stark contrast. To be more specific, almost all of the uncertainty coefficients in Table A3 are statistically insignificant, or when significant, it is positive (column (3)), pointing to a very different impact of policy uncertainty increases. In sum, our sub-sample analysis at the firm level based on the replication package confirms our main finding that the negative effects of uncertainty disappears in the sample after 2008Q3.

[16] We thank an anonymous referee for the suggestion.

[17] We download the package from https://www.dropbox.com/s/qzvugui9g08i6v0/Replication_Files.zip?e=1&dl=0.

[18] Recall that in our main analysis at the aggregate level, the first sub-sample period ended in August 2008.

Next, we obtain the firm-level data on our own from the COMPUSTAT database, in order to extend the sample period to a more recent period.[19] Before moving into estimation, Table A4 reports and compares the summary statistics of the firm-level variables from the updated data set and those from the replication package. For the overlapping period of 1985Q1–2012Q4, we are able to match the means and standard deviations of most firm-level variables except those of capital expenditure, while the number of observations in the updated data is slightly smaller for most of the variables. Even when observations to 2023Q2 are added, the means and standard deviations change little.

As before, Tables A5-A7 reports firm-level estimation results for the entire extended sample and subsamples using 2008Q3 as a break point. What we find can be summarized as follows. First, we no longer see the negative effects of EPU in the full sample; none of the coefficient estimates of the EPU in Table A5 are statistically significant. Second, when the sample is split, the negative coefficient estimates of the EPU regain statistical significance in the first part of the sample (1985Q3–2008Q3), while this is not at all the case for the second sub-sample period (2008Q4–2023Q2). In the latter period, we rather find that the changes in EPU is significantly positively correlated with the firm-level investment. These findings are again in line with the aggregate-level analysis results.

Therefore, we find that the firm-level analysis also provides support to our earlier finding that the negative effects of EPU on the economic activity is mainly driven by the effects of EPU until August 2008.

[19]This exercise requires the balance sheet data of the U.S. firms. The two main dependent variables used in Baker et al. (2016) include changes in employment as well as investment to capital ratio at the firm level at the quarterly frequency. However, it is worthwhile to note here that we focus on results using the firm-level investment only. Baker et al. (2016) document that the firm-level data are weighted by the size of firm sales; nonetheless, we find that the estimation code included in the replication package notes that both variables are weighted by the number of employment. Indeed, our replication results are close to theirs when we used the employment as the weights. This, in turn, makes it difficult for us to analyze the firm-level employment using the data we download from COMPUSTAT. Based on this observation, we focus on the investment analysis. We refer readers to Section IV.A. of Baker et al. (2016) for more details of the firm-level data construction.

Table A1: Replication Data: 1985Q3 - 2012Q4 (1985 - 2012)

VARIABLES	(1) I/K	(2) I/K	(3) I/K	(4) I/K	(5) ΔEmp	(6) ΔEmp	(7) ΔEmp	(8) ΔEmp	(9) ΔRev
Δ Log(EPU) × intensity	-0.032***	-0.032***	-0.024**	-0.029***	-0.213**	-0.227***	-0.220*	-0.220**	-0.128
	(0.010)	(0.010)	(0.011)	(0.010)	(0.084)	(0.085)	(0.118)	(0.094)	(0.096)
$\Delta \frac{\text{Federal purchases}}{\text{GDP}} \times$ intensity	8.203***	8.044***	12.121***	8.853***	10.791	15.603*	3.192	10.993	20.391**
	(2.860)	(2.865)	(3.181)	(2.873)	(7.409)	(8.036)	(12.558)	(7.885)	(9.427)
$\Delta \frac{\text{Forecasted Federal purchases}}{\text{Forecasted GDP}} \times$ intensity		1.005				-4.650			
		(0.828)				(2.893)			
Δ Log(defense EPU) × defense firm				0.002				0.018	
				(0.004)				(0.017)	
Δ Log(health care EPU) × health firm				-0.012***				-0.005	
				(0.002)				(0.025)	
Δ Log(fin. reg. EPU) × finance firm				-0.002***				0.003	
				(0.001)				(0.005)	
Periodicity	Quarterly	Quarterly	Quarterly	Quarterly	Yearly	Yearly	Yearly	Yearly	Yearly
3 yrs Fed purchase leads	No	No	Yes	No	No	No	Yes	No	No
Observations	708398	708398	411205	708398	162006	162006	107205	162006	151473
Number of firms	21636	21636	13563	21636	17151	17151	11505	17151	15749

Note: This table is estimated using replication data provided by Baker et al. (2016) for the sample period which is from 1985Q3 to 2012Q4 for quarterly data and from 1985 to 2012 for yearly data. Following the definition of variables in Baker et al. (2016), I/K is the investment rate, ΔEmp is the employment growth rate, and ΔRev is the revenue growth rate. See Baker et al. (2016) for further variable definitions. Firm- and time-fixed effects are included in all specifications. The standard errors are estimated by clustering at the firm level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table A2: Replication Data: 1985Q3 - 2008Q3 (1985 - 2008)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	I/K	I/K	I/K	I/K	ΔEmp	ΔEmp	ΔEmp	ΔEmp	ΔRev
Δ Log(EPU) × intensity	-0.037***	-0.037***	-0.037***	-0.032***	-0.192**	-0.197**	-0.195	-0.211*	-0.072
	(0.011)	(0.011)	(0.013)	(0.011)	(0.093)	(0.094)	(0.146)	(0.108)	(0.104)
$\Delta \frac{\text{Federal purchases}}{\text{GDP}} \times$ intensity	10.321***	10.299***	9.675***	10.229***	13.038	16.310	14.746	12.166	21.755*
	(3.267)	(3.267)	(3.675)	(3.284)	(10.281)	(10.281)	(19.012)	(10.594)	(12.345)
$\Delta \frac{\text{Forecasted Federal purchases}}{\text{Forecasted GDP}} \times$ intensity		1.392				-5.325*			
		(1.046)				(3.173)			
Δ Log(defense EPU) × defense firm				0.005				0.024	
				(0.004)				(0.019)	
Δ Log(health care EPU) × health firm				-0.013***				0.003	
				(0.003)				(0.027)	
Δ Log(fin. reg. EPU) × finance firm				-0.004***				0.014**	
				(0.001)				(0.006)	
Periodicity	Quarterly	Quarterly	Quarterly	Quarterly	Yearly	Yearly	Yearly	Yearly	Yearly
3 yrs Fed purchase leads	No	No	Yes	No	No	No	Yes	No	No
Observations	570699	570699	309802	570699	132438	132438	82731	132438	126339
Number of firms	19287	19287	11925	19287	15546	15546	9607	15546	14447

Note: This table is estimated using replication data provided by Baker et al. (2016) for the first sub-sample period which is from 1985Q3 to 2008Q3 for quarterly data and from 1985 to 2008 for yearly data. Following the definition of variables in Baker et al. (2016), I/K is the investment rate, ΔEmp is the employment growth rate, and ΔRev is the revenue growth rate. See Baker et al. (2016) for further variable definitions. Firm- and time-fixed effects are included in all specifications. The standard errors are estimated by clustering at the firm level. *** p<0.01, ** p<0.05, * p<0.1

Table A3: Replication Data: 2008Q4 - 2012Q4 (2009 - 2012)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	I/K	I/K	I/K	I/K	ΔEmp	ΔEmp	ΔEmp	ΔEmp	ΔRev
Δ Log(EPU) × intensity	-0.010	-0.010	3.377**	-0.009	-0.304	-0.253	1.809	-0.225	-0.996***
	(0.017)	(0.017)	(1.537)	(0.017)	(0.207)	(0.219)	(5.775)	(0.202)	(0.256)
$\Delta \frac{\text{Federal purchases}}{\text{GDP}} \times$ intensity	2.607	2.936	1,672.467**	4.178	8.092	1.243	351.783	17.351	19.866*
	(4.814)	(4.765)	(756.323)	(5.153)	(9.990)	(21.031)	(599.805)	(13.306)	(11.782)
$\Delta \frac{\text{Forecasted Federal purchases}}{\text{Forecasted GDP}} \times$ intensity		-0.681				3.768			
		(1.126)				(10.297)			
Δ Log(defense EPU) × defense firm				-0.009				-0.042	
				(0.010)				(0.043)	
Δ Log(health care EPU) × health firm				-0.002				-0.096	
				(0.004)				(0.079)	
Δ Log(fin. reg. EPU) × finance firm				0.008***				-0.046***	
				(0.001)				(0.012)	
Periodicity	Quarterly	Quarterly	Quarterly	Quarterly	Yearly	Yearly	Yearly	Yearly	Yearly
3 yrs Fed purchase leads	No	No	Yes	No	No	No	Yes	No	No
Observations	137132	137132	43781	137132	28656	28656	9372	28656	24334
Number of firms	8809	8809	5051	8809	6515	6515	4235	6515	5516

Note: This table is estimated using replication data provided by Baker et al. (2016) for the second sub-sample period which is from 2008Q4 to 2012Q4 for quarterly data and from 2009 to 2012 for yearly data. Following the definition of variables in Baker et al. (2016), I/K is the investment rate, ΔEmp is the employment growth rate, and ΔRev is the revenue growth rate. See Baker et al. (2016) for further variable definitions. Firm- and time-fixed effects are included in all specifications. The standard errors are estimated by clustering at the firm level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table A4: Summary Statistics

	1985Q1 - 2012Q4						1985Q1 - 2023Q2		
	Replication data			Updated data			Updated data		
VARIABLES	Obs	Mean	SD	Obs	Mean	SD	Obs	Mean	SD
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Capital expenditure	709,110	26.02	201.52	617,368	69.72	483.25	844,515	84.37	566.27
Net plant property and equipment	707,851	649.78	3,534.74	621,963	674.79	3,694.93	841,610	918.39	5,182.64
Employment (yearly)	162,006	6.48	31.17	140,795	6.67	32.58	190,481	7.31	36.87
Revenue (yearly)	162,006	1,508.76	8,084.51	140,816	1,632.05	8,657.07	190,233	2,098.88	11,048.46
Intensity	709,110	0.01	0.05	615,118	0.01	0.05	844,515	0.01	0.05
Intensity (yearly)	162,006	0.01	0.05	140,994	0.01	0.05	190,481	0.01	0.05
EPU	709,110	102.95	40.05	623,845	107.99	35.08	844,515	117.96	47.32
defense EPU	709,110	1.53	14.94	709,110	1.47	14.83	844,515	1.52	14.75
health care EPU	709,110	2.20	20.48	709,110	1.68	16.53	844,515	1.93	18.66
financial regulation EPU	709,110	13.83	59.25	709,110	11.10	48.47	844,515	13.08	49.27
$\frac{\text{Federal purchases}}{\text{GDP}}$	708,718	0.06	0.01	623,845	0.08	0.01	844,311	0.08	0.01
$\frac{\text{Forecasted Federal purchases}}{\text{Forecasted GDP}}$	708,718	0.06	0.01	623,845	0.07	0.01	844,515	0.07	0.01

Note: This table shows the number of observations, mean, and standard deviation of each variable. Columns (1), (2), and (3) describe summary statistics of replication data. Columns (4), (5), and (6) document summary statistics of updated data from 1985Q1 to 2012Q4. Columns (7), (8), and (9) report summary statistics of updated data from 1985Q1 to 2023Q2.

Table A5: Updated Data: 1985Q3 - 2023Q2

VARIABLES	(1) I/K	(2) I/K	(3) I/K	(4) I/K
Δ Log(EPU) $\times$ intensity	-0.005	-0.015	-0.004	-0.004
	(0.040)	(0.037)	(0.027)	(0.039)
$\Delta\frac{\text{Federal purchases}}{\text{GDP}} \times$ intensity	9.644**	5.810	7.795	10.082**
	(4.810)	(3.849)	(8.247)	(4.930)
$\Delta\frac{\text{Forecasted Federal purchases}}{\text{Forecasted GDP}} \times$ intensity		11.629*		
		(6.251)		
Δ Log(defense EPU) $\times$ defense firm				0.023*
				(0.013)
Δ Log(health care EPU) $\times$ health firm				-0.003
				(0.008)
Δ Log(fin. reg. EPU) $\times$ finance firm				0.003
				(0.007)
Periodicity	Quarterly	Quarterly	Quarterly	Quarterly
3 yrs Fed purchase leads	No	No	Yes	No
Observations	844,225	844,225	561,951	844,225
Number of firms	20,911	20,911	14,915	20,911

Note: This table is estimated using updated data for the extended sample period from 1985Q3 to 2023Q2 by weighting by the firm's average employment. Following the definition of variables in Baker et al. (2016), I/K is the investment rate. See Baker et al. (2016) for further variable definitions. Firm- and time-fixed effects are included in all specifications. The standard errors are estimated by clustering at the firm level. *** p<0.01, ** p<0.05, * p<0.1

Table A6: Updated Data: 1985Q3 - 2008Q3

VARIABLES	(1) I/K	(2) I/K	(3) I/K	(4) I/K
Δ Log(EPU) × intensity	-0.103**	-0.103**	-0.088***	-0.096*
	(0.050)	(0.050)	(0.030)	(0.050)
$\Delta \frac{\text{Federal purchases}}{\text{GDP}} \times$ intensity	14.204**	14.118**	11.007	14.498**
	(6.491)	(6.441)	(8.525)	(6.489)
$\Delta \frac{\text{Forecasted Federal purchases}}{\text{Forecasted GDP}} \times$ intensity		0.331		
		(5.240)		
Δ Log(defense EPU) × defense firm				0.020
				(0.015)
Δ Log(health care EPU) × health firm				-0.014*
				(0.008)
Δ Log(fin. reg. EPU) × finance firm				0.003
				(0.008)
Periodicity	Quarterly	Quarterly	Quarterly	Quarterly
3 yrs Fed purchase leads	No	No	Yes	No
Observations	570,448	570,448	330,738	570,448
Number of firms	18,405	18,405	12,256	18,405

Note: This table is estimated using updated data for the first sub-sample period from 1985Q3 to 2008Q3 by weighting by the firm's average employment. Following the definition of variables in Baker et al. (2016), I/K is the investment rate. See Baker et al. (2016) for further variable definitions. Firm- and time-fixed effects are included in all specifications. The standard errors are estimated by clustering at the firm level. *** p<0.01, ** p<0.05, * p<0.1

Table A7: Updated Data: 2008Q4 - 2023Q2

VARIABLES	(1) I/K	(2) I/K	(3) I/K	(4) I/K
Δ Log(EPU) $\times$ intensity	0.119*	0.088*	0.079	0.116*
	(0.066)	(0.052)	(0.077)	(0.064)
$\Delta \frac{\text{Federal purchases}}{\text{GDP}} \times$ intensity	5.590	-3.619	10.516	6.499
	(5.921)	(4.309)	(30.474)	(6.315)
$\Delta \frac{\text{Forecasted Federal purchases}}{\text{Forecasted GDP}} \times$ intensity		25.800*		
		(13.999)		
Δ Log(defense EPU) $\times$ defense firm				0.027
				(0.023)
Δ Log(health care EPU) $\times$ health firm				0.023
				(0.016)
Δ Log(fin. reg. EPU) $\times$ finance firm				0.007
				(0.013)
Periodicity	Quarterly	Quarterly	Quarterly	Quarterly
3 yrs Fed purchase leads	No	No	Yes	No
Observations	273,586	273,586	176,211	273,586
Number of firms	8,452	8,452	6,111	8,452

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: This table is estimated using updated data for the extended second sub-sample period from 2008Q4 to 2023Q2 by weighting by the firm's average employment. Following the definition of variables in Baker et al. (2016), I/K is the investment rate. See Baker et al. (2016) for further variable definitions. Firm- and time-fixed effects are included in all specifications. The standard errors are estimated by clustering at the firm level. *** p<0.01, ** p<0.05, * p<0.1

C Categorical Policy Uncertainty

To better understand what drives insignificant responses to EPU shocks during the period after the Global Financial Crises, we turn to categorical EPU data, introduced in Baker et al. (2016). These are 10 sub-indices to the aggregate EPU index and constructed based on newspaper article counts.[20] The EPU website notes that "Each sub-index requires our economic, uncertainty, and policy terms as well as a set of categorical policy terms." Among these categorical EPU indices, we select two that show most notable dynamics during this period: i) sovereign debt & currency crisis uncertainty and ii) trade policy uncertainty. Figure A1 plots these two categorical EPU indices along with other uncertainty measures under study. The dynamics of the two categorical uncertainty are particularly notable during the periods after the Global Financial Crisis in the case of the former and since the inauguration of the Trump administration in the case of the latter. To be more specific, these align with the European debt crisis in 2010 and with elevated trade tensions between the U.S. and China since 2016. A relatively higher level as well as large spikes of the aggregate EPU index in the later part of the sample have likely been driven by these two categories.

We replace the EPU index with the above two categorical indices in equation (2.1) and compute the impulse responses of IP and employment for the period from January 1985 to December 2019, as shown in Figure A2. Interestingly, these two uncertainty sub-indices fail to generate significant negative impacts on both real economic variables, similar to the case of the aggregate EPU index. If any, trade policy uncertainty shocks drive IP and employment slightly upward temporarily. Their impact on the real-side of the economy might have been limited, as the episodes in 2010 and 2016 did not materialize to substantial changes in the U.S. policies, despite the elevated level of policy uncertainty. In other words, while sovereign debt/currency crisis and trade policy are important sources of economic policy uncertainty, their impacts may not be the same as shocks in macroeconomic or financial uncertainty during this period.

[20] They capture uncertainty about monetary policy, overall fiscal policy, taxes, government spending, health care, national security, entitlement program, regulation, financial regulation, trade policy, and sovereign debt and currency crises.

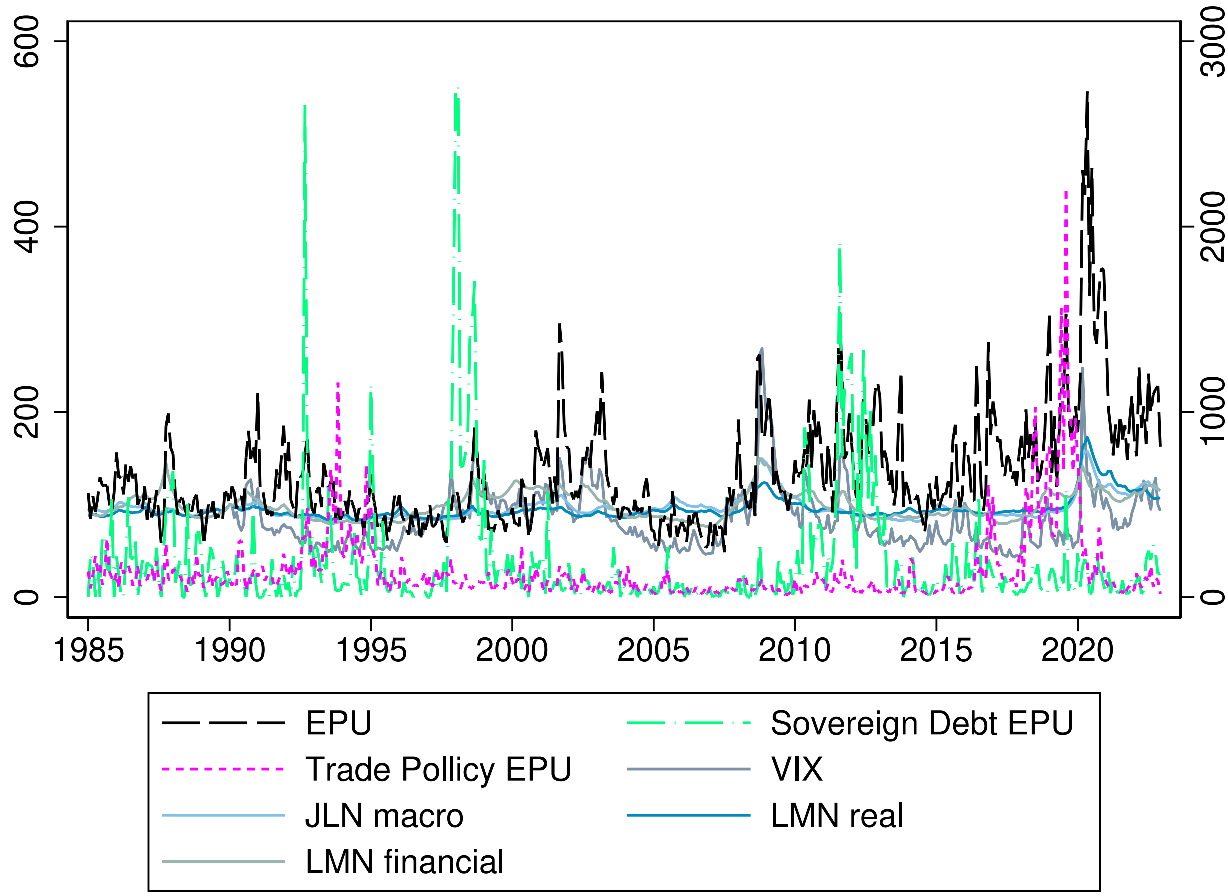

Figure A1: Various Uncertainty Indexes and Categorical EPU Indexes (1990M01 = 100)

Note: The black long-dashed line represents the time series of the EPU index; the mint dash-dotted line, sovereign debt and currency crises EPU index; the magenta short-dashed line, trade policy EPU index; the emidblue solid line, vix; the eltblue solid line, JLN macro; the ebblue solid line, LMN real; the eltgreen solid line, LMN financial. The series are scaled to index each value of January 1990 to 100 for the purpose of comparing dynamics together. EPU, VIX, JLN macro, LMN real, and LMN financial are associated with the left y-axis. The others are assigned to the right y-axis.

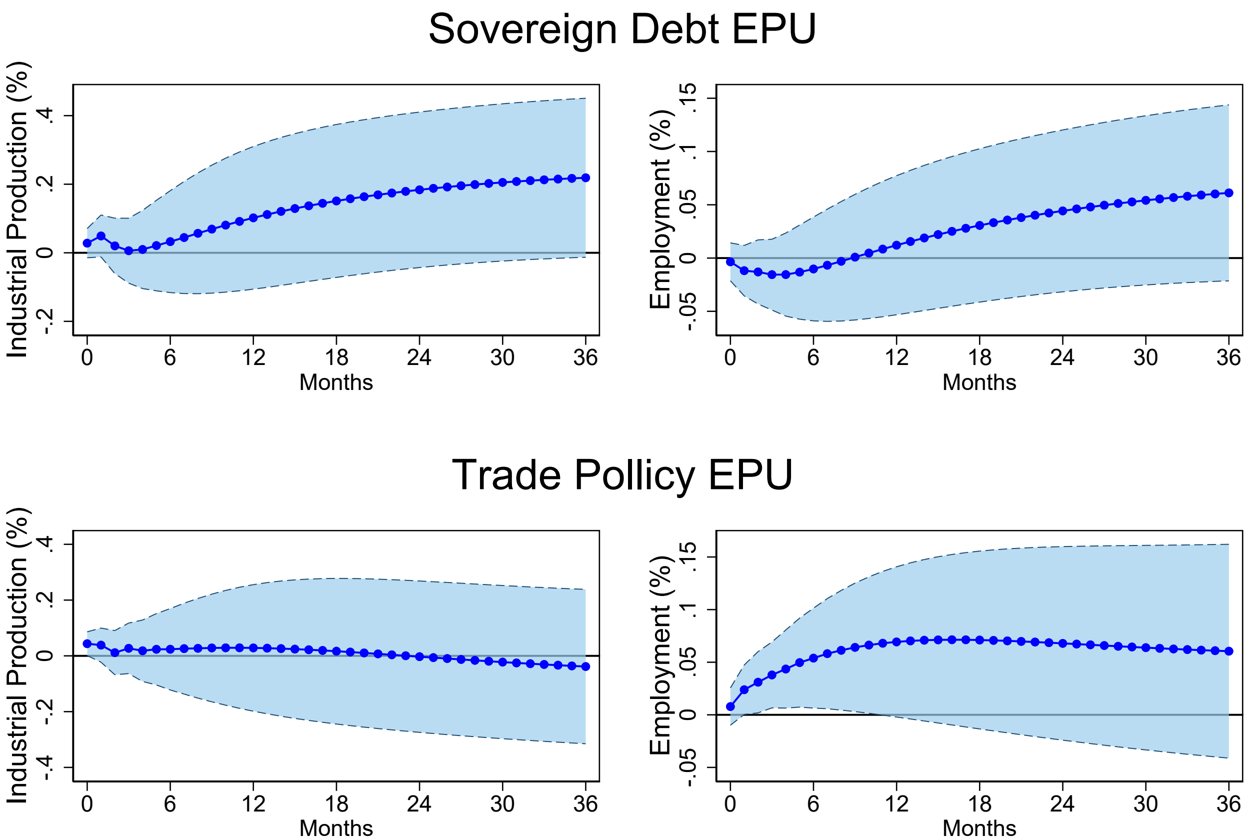

Figure A2: Responses to Categorical EPU Shocks (1985M01 - 2019M12)

Note: Each panel shows the responses of industrial production (left panels) and employment (right panels) to the categorical EPU shocks, which are sovereign debt and currency crises EPU shock (upper panels) and trade policy EPU shock (lower panels). Panels are obtained using data from January 1985 to December 2019, respectively. Shaded areas represent 90-percent confidence intervals.

D Alternative Break Points

We select a break point for the baseline analysis based on results of the supremum Wald test (Andrews (1993)) that is conducted by regressing the EPU index on a constant. The break point for the main analysis chosen divided our sample a couple of months after the Great Financial Crisis (GFC), i.e., September 2008. In order to check whether the inclusion of the GFC in the earlier subsample drives our main findings, this section re-estimates our benchmark VAR model using different points in time as break points. More specifically, we first use January 2006 and January 2007 as alternative break points (i.e., the starting month of the latter subsample period). In addition, we remove the GFC out of our analysis by defining sample periods as the following: January 1985 – December 2007 and January 2011 – December 2019. We also re-estimate the same VAR model replacing the EPU with other four uncertainty measures that have been analyzed in the main text.

Figures A3 - A8 plot the resulting IRFs of IP and employment when the economic and financial uncertainty is measured in various ways. In the first two cases where we use January 2006 (Figures A3 - A4) and January 2007 (Figures A5 - A6) as alternative break points, our main findings hold surprisingly well. That is, an unanticipated increase in EPU does not significantly affect both IP and employment in the second subsample. This is despite the fact that the GFC is now included in the latter sub-sample, unlike our benchmark split where it is part of the first sample. Moreover, the other uncertainty indices maintain their significant negative influences to the two real economic indicators in both subsample periods, similar to our main results. This again supports our idea that the uncertainty reflected by the EPU index is different from what is captured in other economic and financial uncertainty indices.

However, when we completely remove the GFC from the analysis and re-estimate our model using samples of January 1985 – December 2007 and January 2011 – December 2019, we see slightly different results for IP and employment. In the case of IP as shown in Figure A7, we see that results remain largely the same as before; an increase in EPU does not lead to a significant drop in the latter part of our sample, while other uncertainty indices still affect IP significantly negatively. It is notable, however, that the persistence of the IRFs to the other uncertainty measures declines overall. In contrast, employment no longer respond significantly to all of the uncertainty indices we examine in the latter subsample period, as shown in Figure A8.

In sum, while we find some differences in the case of employment, we interpret these new results still supporting our main findings. In most of our analysis using alternative subsample selections, we find that the impact of EPU remain significantly negative in the periods ending around the timing of GFC, which disappears in a more recent period. This feature is again uniquely found in the case of the EPU, unlike other popular economic and financial uncertainty measures.

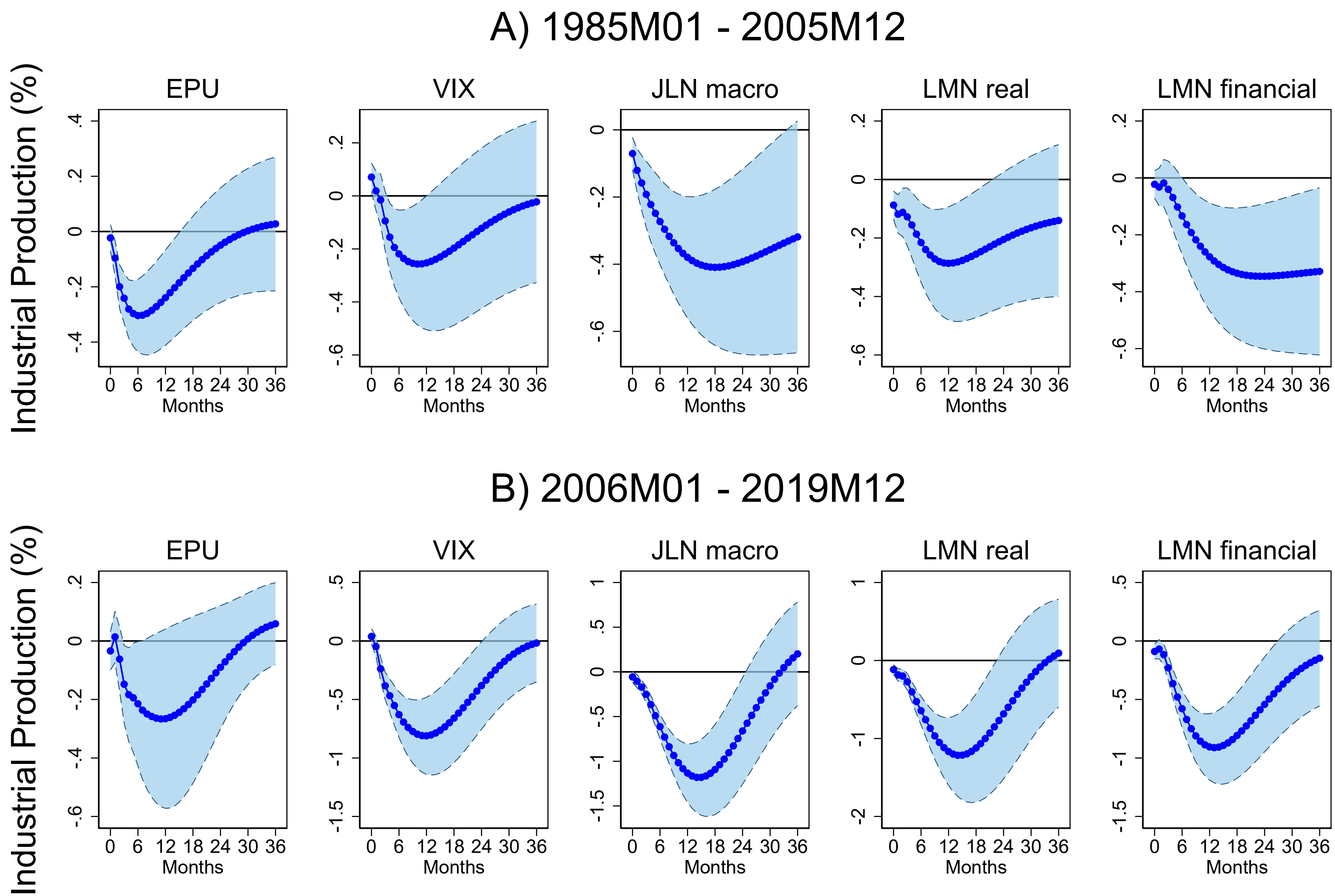

Figure A3: Responses of Industrial Production: breakpoint at 2006M01

Note: Each panel shows the response of industrial production to the one-standard deviation shocks to uncertainty quantified by EPU (first column), VIX (second column), JLN macro (third column), LMN real (fourth column), and LMN financial (last column), respectively. Panels A and B are obtained using data from January 1985 to December 2005 and from January 2006 to December 2019, respectively. Shaded areas represent 90-percent confidence intervals.

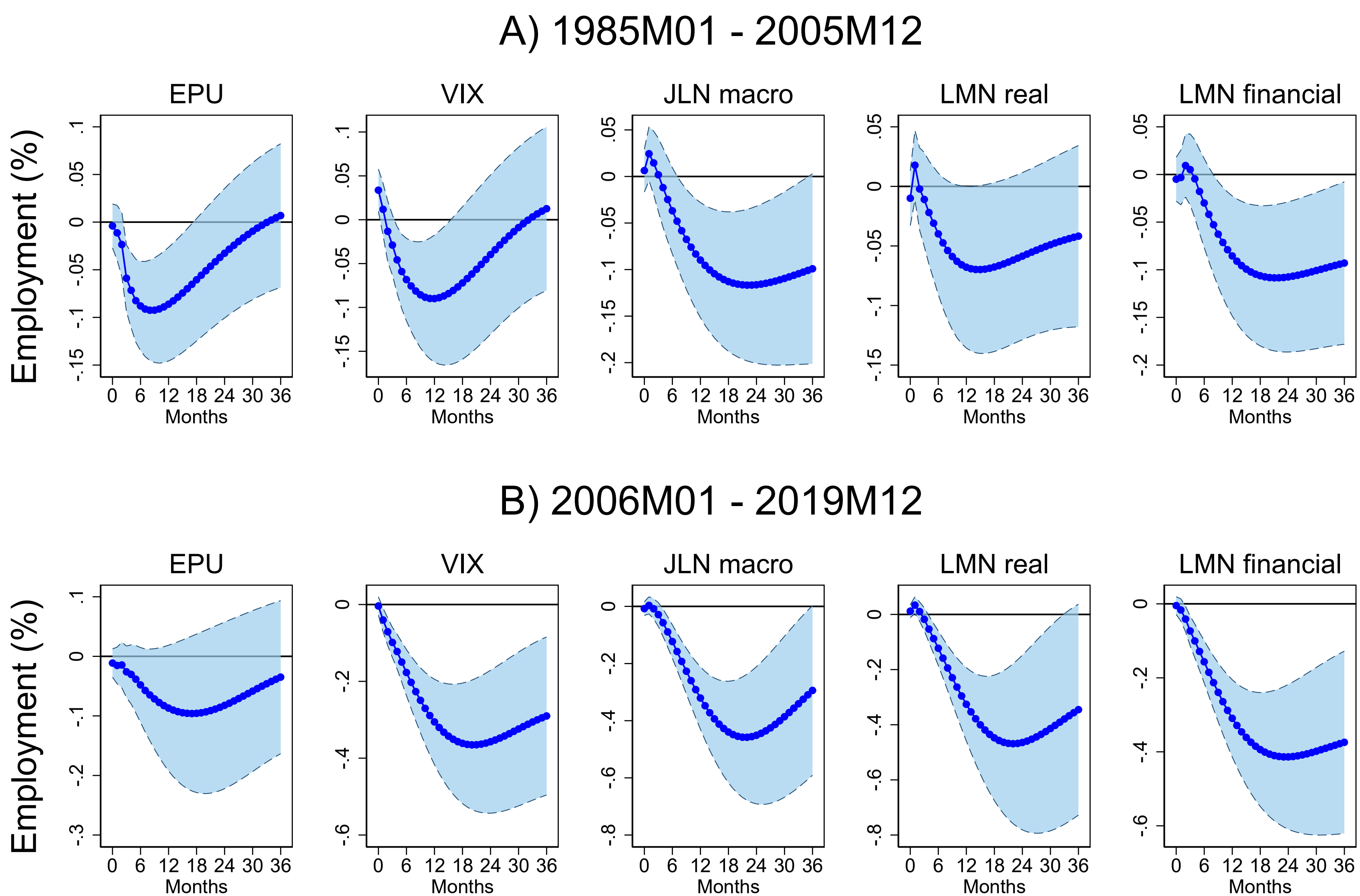

Figure A4: Response of Employment: breakpoint at 2006M01

Note: Each panel shows the response of employment to the one-standard deviation shocks to uncertainty quantified by EPU (first column), VIX (second column), JLN macro (third column), LMN real (fourth column), and LMN financial (last column), respectively. Panels A and B are obtained using data from January 1985 to December 2005 and from January 2006 to December 2019, respectively. Shaded areas represent 90-percent confidence intervals.

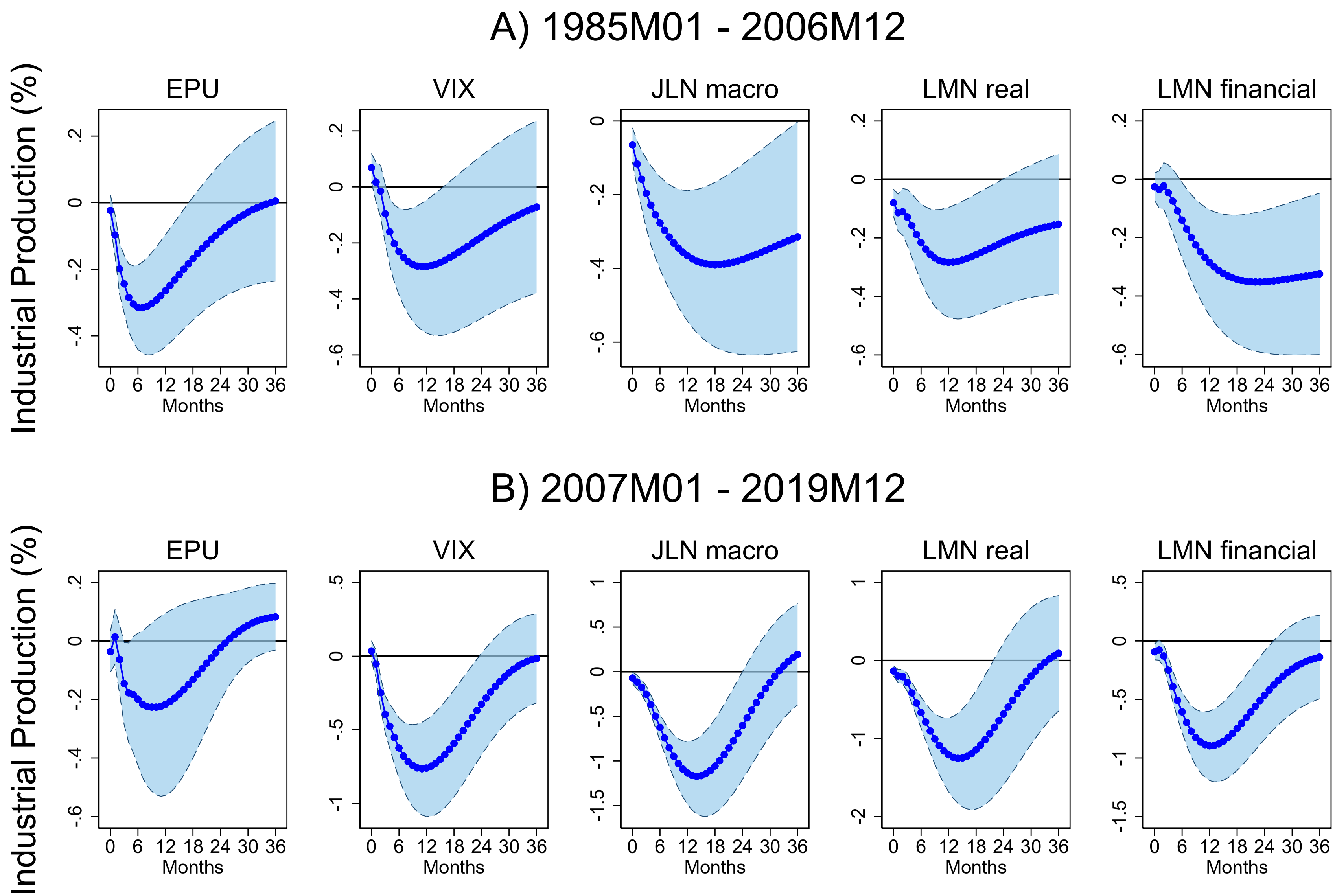

Figure A5: Responses of Industrial Production: breakpoint at 2007M01

Note: Each panel shows the response of industrial production to the one-standard deviation shocks to uncertainty quantified by EPU (first column), VIX (second column), JLN macro (third column), LMN real (fourth column), and LMN financial (last column), respectively. Panels A and B are obtained using data from January 1985 to December 2006 and from January 2007 to December 2019, respectively. Shaded areas represent 90-percent confidence intervals.

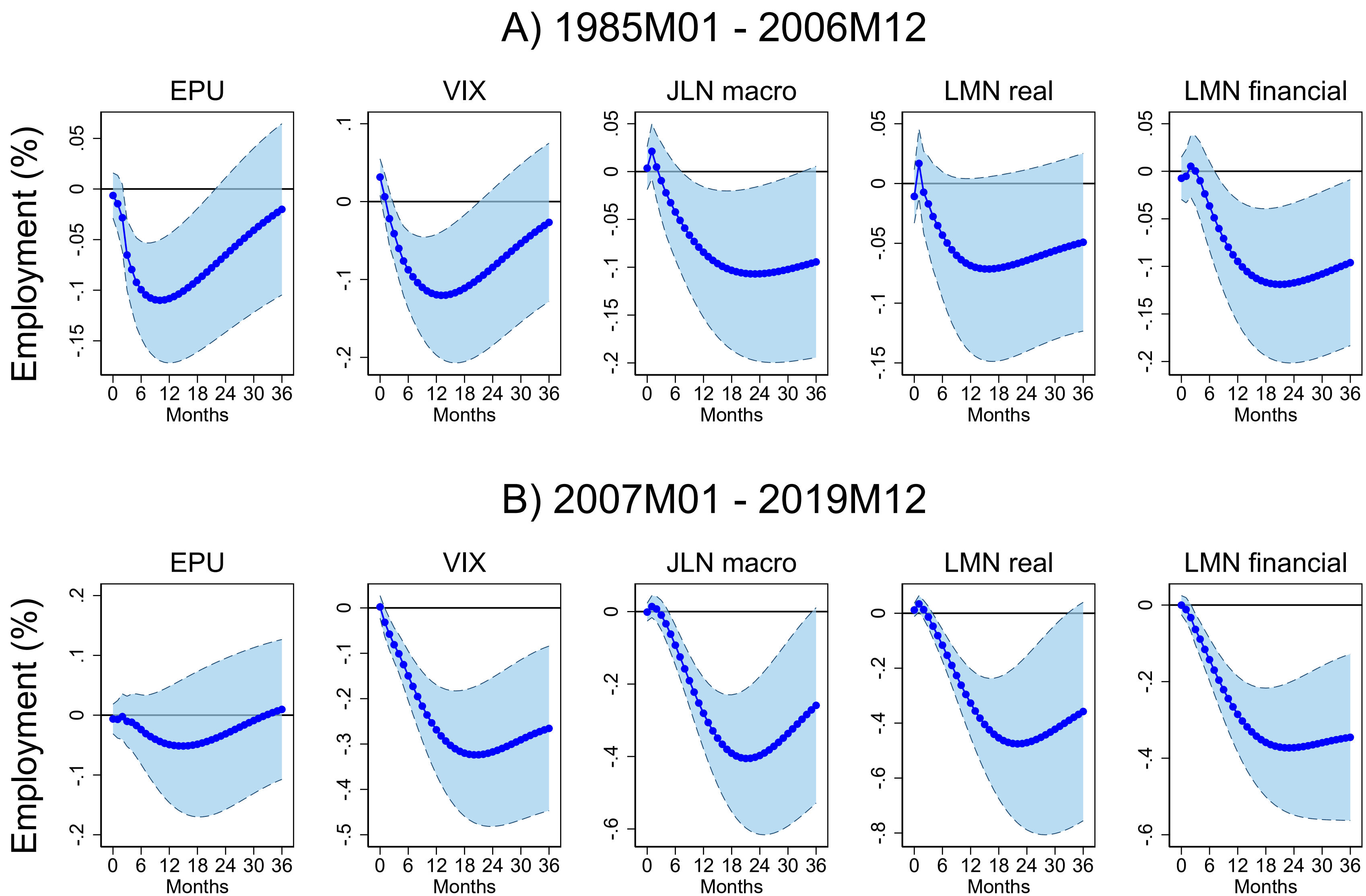

Figure A6: Response of Employment: breakpoint at 2007M01

Note: Each panel shows the response of employment to the one-standard deviation shocks to uncertainty quantified by EPU (first column), VIX (second column), JLN macro (third column), LMN real (fourth column), and LMN financial (last column), respectively. Panels A and B are obtained using data from January 1985 to December 2006 and from January 2007 to December 2019, respectively. Shaded areas represent 90-percent confidence intervals.

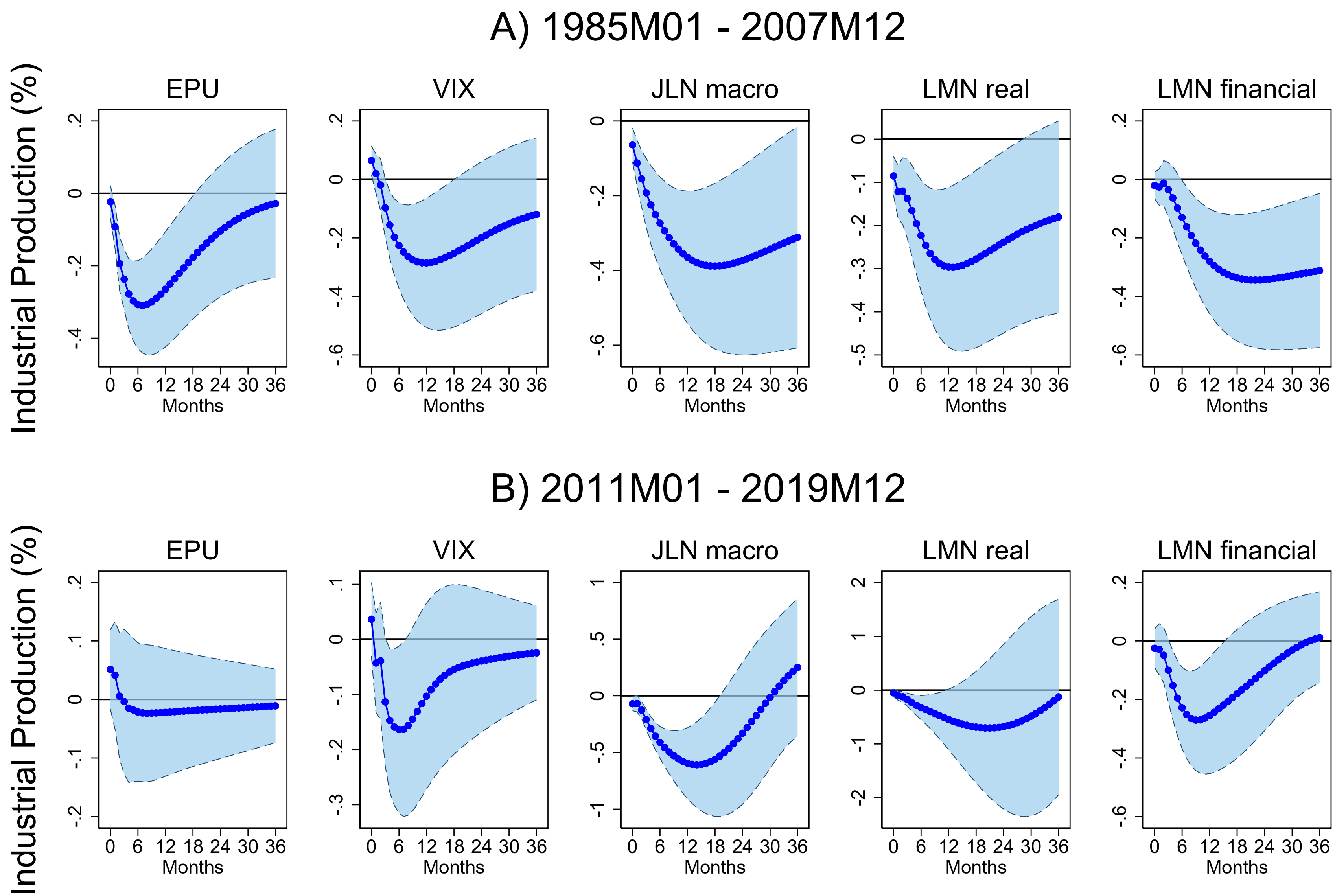

Figure A7: Responses of Industrial Production: exclusion of the GFC period

Note: Each panel shows the response of industrial production to the one-standard deviation shocks to uncertainty quantified by EPU (first column), VIX (second column), JLN macro (third column), LMN real (fourth column), and LMN financial (last column), respectively. Panels A and B are obtained using data from January 1985 to December 2007 and from January 2011 to December 2019, respectively. Shaded areas represent 90-percent confidence intervals.

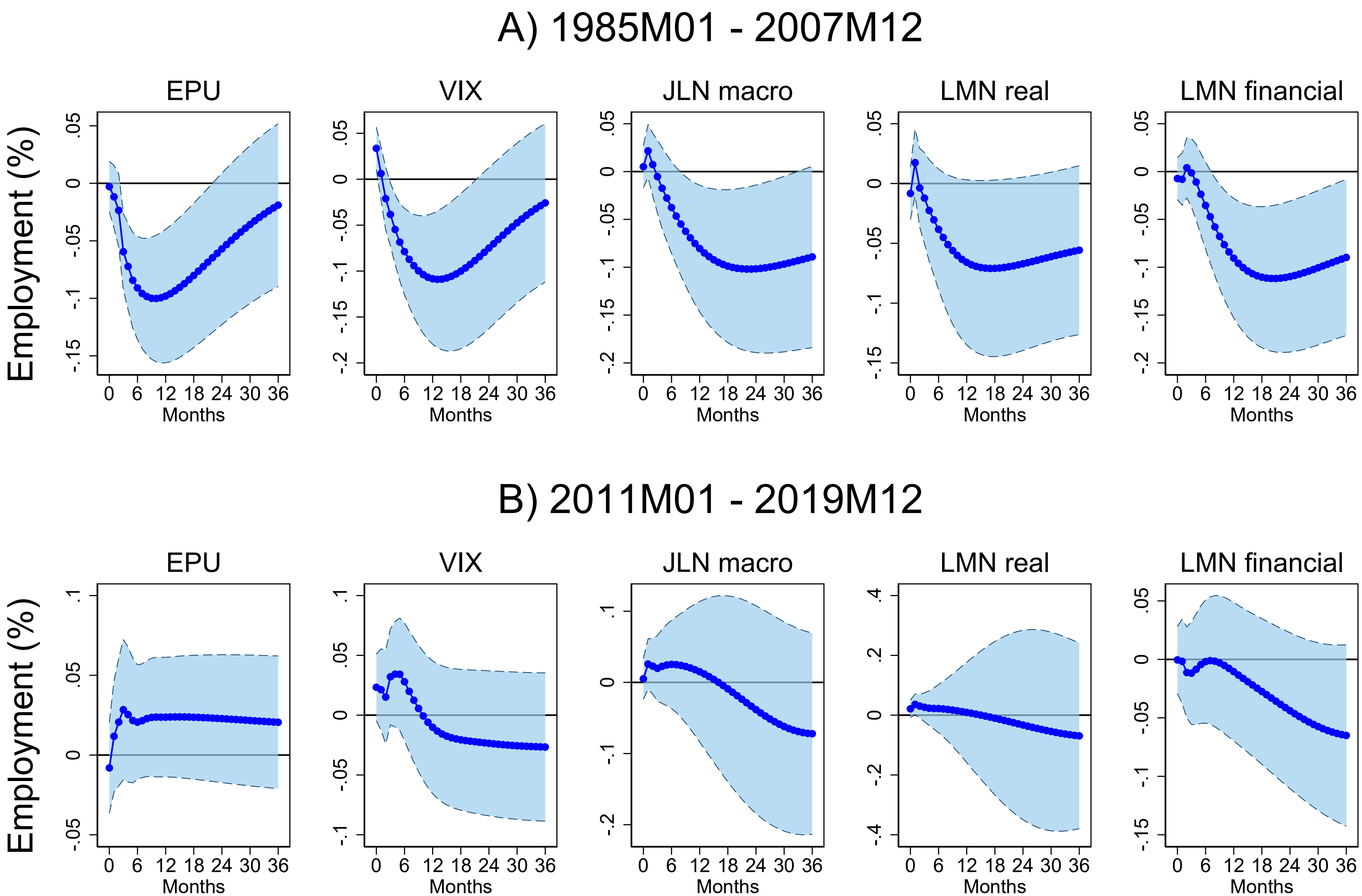

Figure A8: Response of Employment: exclusion of the GFC period

Note: Each panel shows the response of employment to the one-standard deviation shocks to uncertainty quantified by EPU (first column), VIX (second column), JLN macro (third column), LMN real (fourth column), and LMN financial (last column), respectively. Panels A and B are obtained using data from January 1985 to December 2007 and from January 2011 to December 2019, respectively. Shaded areas represent 90-percent confidence intervals.