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Does Uncertainty Matter for Trade Flows of Emerging Economies?

CAMA Working Paper 84/2021
September 2021

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Abstract

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Keywords

International trade, trade policy, uncertainty, emerging economies, panel VAR.

JEL Classification

F13, F41, F62

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ISSN 2206-0332

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September 24, 2021

[1]This paper has benefitted from comments by seminar participants at the University of Adelaide, and we would like to thank Arpita Chatterjee and Qazi Haque for helpful comments and suggestions. Heid gratefully acknowledges financial support from the Australian Research Council (DP190103524). Sewak is grateful for scholarship assistance under the University of Adelaide's Adelaide Scholarship International. The funding source had no involvement in the writing of this paper nor the decision to submit it for publication. Declarations of interest: none.

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Abstract

Uncertainty shocks have been shown to affect the real economy, but uncertainty remains about their trade effects and whether effects are similar across different types of uncertainty. We investigate how global economic, financial, and trade policy uncertainty affect the trade flows of the seven largest emerging economies (EM-7) using a panel structural vector autoregressive model. We find that: (1) Global economic and trade policy uncertainty shocks induce a protracted decline of about 4 to 5% in EM-7's imports and exports. (2) Global economic and trade policy uncertainty act as trade barriers, reducing the EM-7's degree of openness and their trade balance to GDP ratio. (3) Financial uncertainty only has a short-term impact on EM-7's trade flows. (4) Trade policy uncertainty is the most important type of uncertainty affecting trade flows, explaining 11% of the variation in trade flows.

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1 Introduction

Heightened uncertainty about the future affects decisions by firms, workers, and consumers. Trade flows are particularly vulnerable to uncertainty shocks, as illustrated by supply chain disruptions in the wake of Covid-19 lockdowns and border closures or the recent Suez Canal obstruction. Apart from pointing out highly prominent events, systematically measuring uncertainty shocks is difficult, as uncertainty is a latent variable. Creating different uncertainty indices has recently developed into a very active research area, with authors mostly studying the macroeconomic impact of their uncertainty measure in isolation, mostly abstracting from its trade effects, and mostly focusing on advanced economies (see Castelnuovo, 2019 for a review of the literature).

In this paper, we provide the first comparison of the effects on emerging economies' trade of three main facets of uncertainty: global economic, financial, and trade policy related uncertainty. Exporting involves sunk costs; hence we expect trade flows to be particularly sensitive to uncertainty shocks. Understanding the impact of uncertainty shocks is particularly important for emerging economies as they are especially exposed to uncertainty: Their output growth is more volatile compared to developed economies, and their financial markets are less developed or too remote from financial centers to hedge against these fluctuations, see the evidence presented in Koren and Tenreyro (2007) and Rose and Spiegel (2009). Emerging economies are also particularly exposed to uncertainty shocks as they often adopt export-led growth strategies and tend to "hyper-specialize" in producing and exporting only a small subset of goods, see Hanson (2012), making them potentially more vulnerable to external shocks.

Identifying which type of uncertainty is most detrimental to emerging economies' trade flows is crucial, as Ludvigson et al. (2020) document that different types of uncertainty have different macroeconomic effects. For example, whereas financial uncertainty leads to contractions in output, macroeconomic uncertainty has an expansionary effect. Cascaldi-Garcia et al. (2020) review the plethora of uncertainty measures used in the literature. Besides measuring different types of uncertainty, different measures are based on different methodologies, from news and survey-based measures, to asset market-based volatility measures, to indicators of Knightian uncertainty. Importantly, Liu and Sheng (2019) document the low correlation between these different uncertainty measures. To credibly guide trade policy decisions, a better understanding of whether different types of uncertainty have different trade effects, and whether trade policy uncertainty is particularly damaging to emerging economies' trade flows, is needed.

To quantify the trade effects of different types of uncertainty, we consider three alternative measures of uncertainty: Baker et al. (2016)'s global economic policy uncertainty index is used to proxy for the overall level of global economic uncertainty (GEU). Ludvigson et al. (2020) use diffusion indices on a large financial dataset to derive an exogenous financial uncertainty index (GFU) based on the forecast errors of the common component of time-varying volatilities. Finally, given our interest in trade flows, we also consider

Caldara et al. (2020)'s trade policy uncertainty index (TPU).

To estimate the impact of the three different types of uncertainty shocks on trade flows in emerging economies, we use a monthly panel data set from January 1997 to September 2019. We estimate a panel structural Vector Auto Regression (VAR) model for the seven largest emerging economies, the EM-7: Brazil, China, India, Indonesia, Mexico, Russia, and Turkey. Panel VAR models have several advantages for our purposes: Contrary to standard VARs, panel VARs allow us to disentangle the effects of uncertainty shocks on trade flows, while controlling for country-specific unobserved heterogeneity. This is particularly important in our case, as the literature has documented cross-country differences in the relationship between trade openness and uncertainty. di Giovanni and Levchenko (2009) show that greater trade openness contributes to output volatility, with a more negative impact for developing economies compared to advanced economies. Similarly, Martin and Rey (2006) document that emerging economies with higher trade openness are less prone to experience financial crashes, which are correlated with higher uncertainty. Our panel VAR approach controls for these cross-country differences in the level of openness and specialization via the inclusion of country-specific fixed effects. Our empirical approach is flexible and complements more structural studies that rely on particular functional form assumptions for consumer or firm behaviour concerning the relationship between trade and uncertainty such as Handley and Limão (2017).

We find that global economic and trade policy uncertainty shocks reduce the degree of openness of EM-7 economies, whereas financial uncertainty has a relatively negligible impact on their trade flows. These results are robust to using alternative measures of uncertainty and across a battery of different specifications. In our baseline results, imports and exports drop on impact following a GEU and TPU shock, reaching a trough after a few months. GEU shocks trigger a 3–4% decline in imports and exports, while a deeper deterioration is noted following the TPU shock, which causes imports to drop by 4.0% and exports by 4.8%. Our results suggest a persistent effect from the global economic and trade policy uncertainty shocks, as the impulse responses remain significant for over two years after the uncertainty shocks. On the flip side, a financial uncertainty shock triggers a contemporaneous decline of around 2% in imports and exports, with the impulse responses turning statistically insignificant shortly after. We also find that global economic and trade policy uncertainty shocks trigger a mild deterioration of the trade balance to GDP ratio in emerging economies. The forecast error variance decomposition exercise exposes the extent to which uncertainty shocks matter for EM-7 trade flows at the three-year forecast horizon. About 7 to 8% of the movement in imports and exports is explained by the global economic uncertainty shocks, and a higher proportion, 11–12% pertain to trade policy uncertainty shocks. Meanwhile, GFU shocks account for less than 2% of the variation in imports and exports, indicating that emerging economies are insulated from global financial uncertainty disturbances. This seems consistent with the decoupling phenomenon between EM-7 and advanced economies' business cycles, see Kose et al. (2003, 2012).

Our results have important policy implications. Lower openness implies lower gains from trade, as demonstrated by Arkolakis et al. (2012). Our finding that global economic and trade policy uncertainty shocks lead emerging economies' openness to shrink may reflect that trade liberalization efforts lately have encountered more resistance in an environment of higher uncertainty. Avoiding a downward spiral between higher uncertainty and demands for trade restrictiveness which in turn leads to higher trade policy uncertainty has clear economic benefits. Our results highlight the benefits of a calmer, more predictable economic environment, particularly with respect to trade policy discussions.

We are not the first to study the relationship between trade and uncertainty. The theoretical literature has established a clear link between trade flows and uncertainty. If firms have to invest into sunk costs to enter an export market, uncertainty leads to an option value of waiting for the firm, reducing entry into export markets, see Albornoz et al. (2012) and Nguyen (2012).[1] Handley (2014) shows that uncertainty due to a lack of credibility of trade policy causes firms to delay investment, reducing trade creation. Relatedly, Handley and Limão (2015) and Handley and Limão (2017) show that reduced uncertainty due to WTO membership and trade agreements increases firm entry into export markets and hence trade flows. Baley et al. (2020) demonstrate in a two goods, two country general equilibrium model that higher uncertainty leads to less trade, unless the elasticity of substitution between domestic and foreign goods is low.[2]

On the empirical side, Novy and Taylor (2020) use a structural VAR to compare the impacts of uncertainty shocks on trade and domestic activity in the US, using the uncertainty measure by Baker et al. (2016). In contrast, we shed light on the EM-7's dynamic response of trade flows to different types of uncertainty shocks. In addition, we quantify the different impact of uncertainty on imports, exports, and the trade balance, a key macroeconomic indicator for policy-makers.[3]

More generally, we contribute to the literature which studies the macroeconomic effects of uncertainty shocks. This literature has focused primarily on advanced economies, see Castelnuovo (2019) for an overview. Carrière-Swallow and Céspedes (2013) is a notable exception. Using standard VARs estimated country by country, they show that the repercussions of an uncertainty shock are more severe for emerging economies than developed economies; in comparison, our panel VAR approach allows us to control for unobserved time-invariant country-specific determinants of trade. Bhattarai et al. (2020) documents the heterogeneous impact of US uncertainty on emerging economies, attributing the differential impacts to the differences in the monetary policy responses. These papers focus

[1] Defever et al. (2015) present empirical evidence for this mechanism using Chinese firm-level data.

[2] Fernández-Villaverde and Guerrón-Quintana (2020) provide a review of the macroeconomic theoretical literature which links uncertainty to the real economy, but they abstract from its trade effects.

[3] The empirical literature has tended to focus exclusively on imports or exports in isolation, see Novy and Taylor (2020) on imports, and Handley (2014), Lewis (2014), Handley and Limão (2015), Feng et al. (2017), and De Sousa et al. (2020) on exports.

on the impact of uncertainty on aggregate consumption and investment, but abstract from the effects of uncertainty on international trade, which are our primary concern. Bonciani and Ricci (2020) study the impact of financial uncertainty on a large set of countries and document that its effects differ for emerging economies. Biljanovska et al. (2021) study the impact of economic policy uncertainty in a panel of developed and emerging economies using quarterly data, not monthly, as we do, and again abstract from its trade effects. A common feature of these studies is that they consider the impact of a single uncertainty measure, whereas our focus lies on a comparison of different uncertainty measures. Similarly, a strand of the literature considers the effect of uncertainty shocks for emerging markets in country-specific case studies using simple VARs, e.g., Cerda et al. (2018) for Chile, but abstracting from trade effects, and Apaitan et al. (2021) for Thailand. Choi and Shim (2019) compare the effects of financial uncertainty, as measured by the VIX index, versus economic policy uncertainty on six emerging economies estimating country by country VAR models, while again abstracting from the trade effects of uncertainty.

The remainder of the paper is structured into four sections. Section 2 presents descriptive evidence on the relationship between different uncertainty measures and trade. Section 3 presents our empirical strategy. Section 4 illustrates the dynamics of EM-7's trade flows in response to the selected measures of uncertainty shocks via impulse responses. Section 4 also investigates how much of the variation in trade flows can be explained by uncertainty shocks using forecast error variance decompositions. Section 5 concludes.

2 Descriptive Evidence

Simple correlations between trade flows and different uncertainty measures used in the literature already give some indication about the importance of uncertainty shocks for international trade. Table 1 presents contemporaneous and lagged cross-correlations between trade flows and three widely-used uncertainty indices which respectively measure global economic uncertainty (GEU), global financial uncertainty (GFU), and trade policy uncertainty (TPU). Both exports and imports are negatively correlated with uncertainty, no matter which uncertainty measure is used. Yet, the table also indicates that correlations differ, depending on the type of uncertainty measure. Judging by these simple correlations, trade policy uncertainty seems to have the greatest negative impact on trade flows.

Figure 1 corroborates the differences in the relationship between trade flows and the different uncertainty measures. It simultaneously plots the year on year growth rate of total trade (the sum of exports and imports) for the seven largest emerging economies as well as the three uncertainty measures. Clearly, spikes of the different types of uncertainty do not necessarily coincide. A synchronised spike in GEU and GFU signals the inherent global economic and financial uncertainty prevalent during the 2007/8 Global Financial Crisis (GFC). GFU has since stabilised. On the other hand, GEU which encompasses

Table 1: Contemporaneous and Lagged Cross-Correlation between Uncertainty and Trade

Uncertainty Measures	Exports	Imports	Total Trade
GEU_t	-0.377***	-0.402***	-0.391***
GEU_{t-1}	-0.392***	-0.413***	-0.406***
GFU_t	-0.175***	-0.157***	-0.163***
GFU_{t-1}	-0.194***	-0.174***	-0.181***
TPU_t	-0.623***	-0.613***	-0.622***
TPU_{t-1}	-0.612***	-0.602***	-0.610***

Notes: Exports and imports are calculated as the first principal component of the exports and imports, respectively, of the seven countries included in the sample. Total trade calculated as the sum of exports and imports, is also derived as the first principal component of the total trade in the selected countries. Trade variables for each country, are deseasonalised and detrended using a log linear trend, prior to extracting the principal component. *** significant at 1%. Data source: Trade flows, IMF Direction of Trade Statistics; GEU: Global Economic Uncertainty, Baker et al. (2016); GFU: Global Financial Uncertainty, Ludvigson et al. (2020); TPU: Trade Policy Uncertainty, Caldara et al. (2020).

wider-ranging sources of uncertainty, has remained elevated, exacerbated by Brexit, the impositions of sanctions on Iran as well as trade tensions between the US and China. Concomitantly, the TPU index which had been fairly tame over the sample period, witnessed a noticeable rise as from 2017, reflecting heightened trade policy uncertainty in the Trump presidency era.

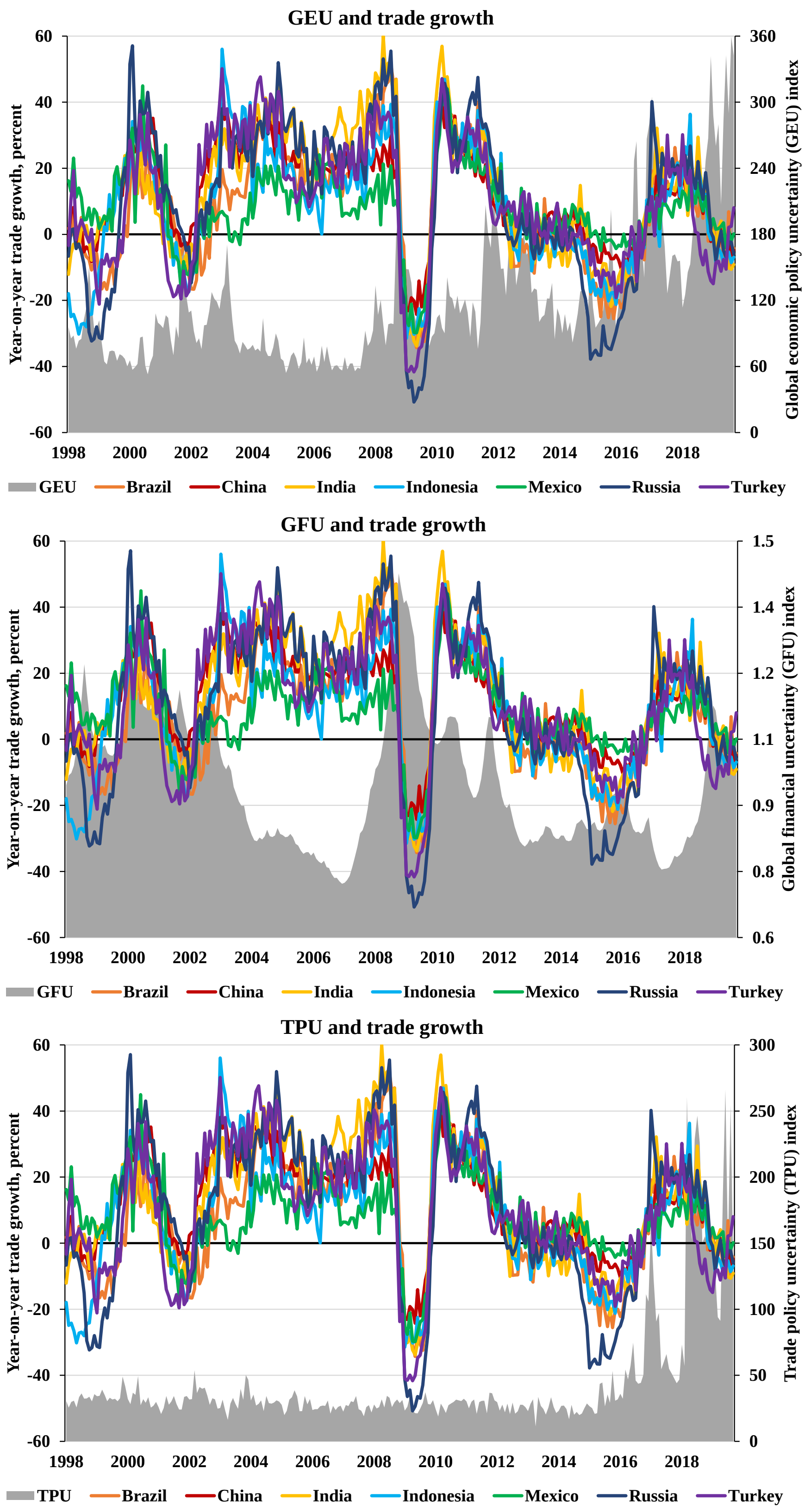
The graphs also indicate the negative relationship between uncertainty and trade growth. In particular, amidst the rising global economic and financial uncertainty spurred during the GFC, there was a steep contraction of emerging economies' trade flows. Meanwhile, the dip in trade flows in 2018/9 coincides with the heightened trade policy uncertainty, but is less pronounced than the GFC-induced drop.

While the descriptive evidence may be suggestive, unobserved differences across countries in the relationship between uncertainty and trade flows may lead to biased conclusions. We therefore estimate the trade effects of uncertainty in a rigorous way while controlling for unobserved country-specific time-invariant heterogeneity in the next section.

3 Empirical Strategy

The aim of our empirical analysis is to measure the impacts of different types of global uncertainty shocks on trade flows of emerging economies. We estimate a structural panel VAR using monthly data from seven large emerging economies.

Figure 1: Uncertainty and Trade Growth in Emerging Economies



Notes: Trade flows are computed as the sum of imports and exports. Data source: Trade flows, IMF Direction of Trade Statistics; *GEU*: Global Economic Uncertainty, Baker et al. (2016); *GFU*: Global Financial Uncertainty, Ludvigson et al. (2020); *TPU*: Trade Policy Uncertainty, Caldara et al. (2020).

3.1 Data

Sample selection: Our sample comprises the seven largest emerging economies of the world, namely, Brazil, China, India, Indonesia, Mexico, Russia and Turkey, dubbed as the EM-7 by the World Bank (Huidrom et al., 2017). Our focus on the EM-7 economies is motivated by the economic importance of these countries: The EM-7 are likened to the G-7, with each of them making up about 80% of aggregate outputs of emerging economies and advanced economies, respectively. In addition, EM-7 economies are important trading partners of emerging and developing economies, accounting for more than half of their total exports. Our monthly data run from January 1997 (the first year GEU is available) to September 2019 (purely due to data availability).

Global economic uncertainty (GEU): We use the global economic policy uncertainty index developed by Baker et al. (2016). The news-based index is constructed using a three-pronged approach. The same methodology is applied to compute a national economic policy index for each country. First, cases of economic policy uncertainty are identified by scanning articles from major local newspapers, normalised by the total number of articles in the sample of newspapers. Secondly, domestic economic policies that are set to extinguish over the next ten years are taken into consideration. Finally, dispersion among different forecasters predictions about the future levels of key macroeconomic variables is considered. Once the national economic policy indices are computed, the Global Economic Policy Uncertainty Index is constructed, based on the GDP weights of each country.

Global financial uncertainty (GFU): We use Ludvigson et al. (2020)'s financial uncertainty measure as a representative of global financial uncertainty, which builds on the approach by Jurado et al. (2015). Jurado et al. (2015) argue that movements in stock-based measures of uncertainty such as the Chicago Board Options Exchange's Volatility Index, the VIX, may be misleadingly interpreted as uncertainty, when the underlying cause could be unrelated, for example a change in investors' risk appetite. Building on the premise that uncertainty reflects greater unpredictability of the state of the economy, Ludvigson et al. (2020) use a time-varying volatility model and calculate uncertainty as being the common component of the three month ahead forecast errors. They use diffusion indices on 147 financial variables to compute the conditional forecasts. Our relevant GFU measure is the quarter-ahead forecast error.

Trade policy uncertainty (TPU): We use Caldara et al. (2020)'s news-based trade policy uncertainty. The TPU index is computed by scouring over seven major US newspapers for articles containing both uncertainty and trade related keywords. The resulting index reflects the share of articles discussing trade policy uncertainty.

Indicators for high uncertainty episodes: Firms may adjust their behavior if uncertainty increases beyond a certain level, irrespective of the specific value of the uncertainty indices we are using. In addition, such spikes in uncertainty are arguably more exogenous than more gradual changes of the underlying uncertainty indices. We therefore create indicators for high uncertainty episodes following Bloom (2009). We identify high uncertainty episodes as periods where the uncertainty index exceeds its mean by more than 1.28 standard deviations, based on the 10% level of significance for an upper-tailed test.[4]

We illustrate these high uncertainty episodes associated with each uncertainty index in Figure 2 as shaded areas. The identified episodes highlight the heterogeneity amongst the uncertainty indices. GEU shocks tend to be more frequent and encompass uncertainty linked to the 2007/8 Global Financial Crisis (GFC), the Eurozone debt crisis, the Brexit referendum, Trump's election as US president and the trade tensions between US and China. Heightened TPU uncertainty is only a recent phenomenon: The 2017 episode captures the threat of a trade war between the US and China, and the 2019 episode its actual materialization. In contrast, GFU shocks were more frequent in the earlier part of the sample, including the Russian Financial Crisis, the dot-com bubble, the 9/11 terrorist attack and the GFC, having tamed down since. Compared to the GEU, the GFU shock during the GFC is of a longer duration.

Trade data and other variables: Imports and exports are obtained from the IMF Direction of Trade Statistics Database. The financial market variable is the local stock price index sourced from the OECD. Domestic activity is proxied by local Industrial Production (IP) whereas global demand is captured by global IP, both from Bloomberg.[5] To control for changes in trade flows due to changes in relative prices, we control for the real exchange rate ($REER$), calculated by using nominal bilateral exchange rates against the US Dollar, adjusting for the consumer price indices in the US and each emerging economy. Table 2 summarizes the data used and their respective sources.

Seasonality and data transformations: As monthly data are affected by pronounced seasonality, we deseasonalize the series, separately for each country (except global IP, as it is already available deseasonalized from Bloomberg). We then take logs and detrend using a linear trend. All the series in the panel data set, except the uncertainty indices, are deseasonalized and detrended. We do not detrend the uncertainty indices as there is no a priori reason to expect a secular trend in uncertainty.[6] We also compute the trade balance to GDP ratio, using seasonally adjusted GDP in local currency units for each EM-7 country from the St Louis Federal Reserve Economic Data. We convert to US Dollars using the quarterly exchange rate extracted from the same source. As GDP data are only available at quarterly frequency, we convert to monthly frequency by linear interpolation. We follow Schmitt-Grohé and Uribe (2018)'s approach to scale the trade balance by the secular component of GDP and detrend the resulting trade balance to GDP ratio.

[4] Bloom (2009) identifies high uncertainty episodes as periods based on the 5% level of significance for an upper-tailed test, in a sample ending in 2009. We check the robustness of our results to this alternative threshold in Section 4.2.

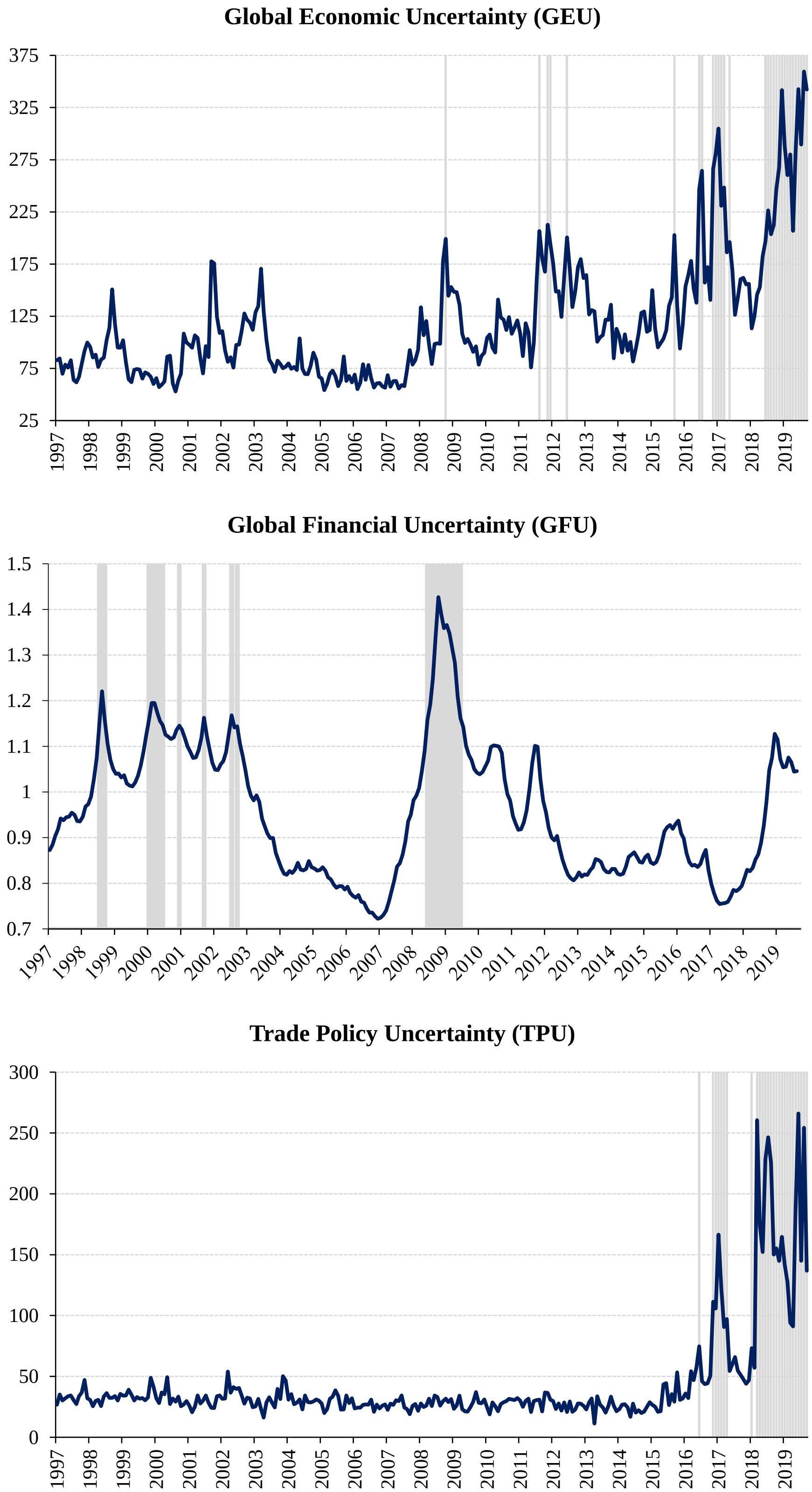
[5] Local IP has been rebased to a single base period (January 2005) for all countries, first to ensure comparability across countries, and second, owing to the fact that some countries' data were in levels whereas others' were only available as percentage changes.

[6] We check the robustness to this in Section 4.2.

Table 2: Data and Data Sources

Variable	**Unit of measurement**	**Source**
GEU_t: Global Economic Policy Uncertainty	Index	Baker et al. (2016)
GFU_t: Financial Uncertainty	Index	Ludvigson et al. (2020)
TPU_t: Trade Policy Uncertainty	Index	Caldara et al. (2020)
Glo_t: Global IP	Index	Bloomberg
$X_{i,t}$: Exports	\$ million	IMF Direction of Trade Statistics
$M_{i,t}$: Imports	\$ million	IMF Direction of Trade Statistics
$Stk_{i,t}$: Stock Market Index	Share Price Index (Base Year=2010)	OECD Database
$Dom_{i,t}$: Local IP	Index (Jan 2005=100)	Bloomberg
Nominal bilateral exchange rate	Price of 1 US Dollar in local currency units	Federal Reserve Bank of St. Louis
Consumer Price Index (CPI)	Index	OECD Database
$REER_{i,t}$: Real exchange rate	Price of 1 US Dollar in local currency units, adjusted for differences in CPIs	Constructed by the authors

Figure 2: High Uncertainty Episodes



Notes: Shaded areas highlight high uncertainty episodes which we define as periods wherein the underlying uncertainty index exceeds its mean by 1.28 standard deviations. Data source: GEU: Baker et al. (2016); GFU: Ludvigson et al. (2020); TPU: Caldara et al. (2020).

3.2 The Empirical Model

The aim of the empirical model is to identify the different uncertainty shocks, and to evaluate their respective impacts on trade flows of EM-7 economies. The empirical model is the following first-order panel VAR system:

$$A \begin{bmatrix} U_t \\ Glo_t \\ Stk_{i,t} \\ Dom_{i,t} \\ M_{i,t} \\ X_{i,t} \\ REER_{i,t} \end{bmatrix} = \eta_i + B \begin{bmatrix} U_{t-1} \\ Glo_{t-1} \\ Stk_{i,t-1} \\ Dom_{i,t-1} \\ M_{i,t-1} \\ X_{i,t-1} \\ REER_{i,t-1} \end{bmatrix} + \begin{bmatrix} \epsilon_t^U \\ \epsilon_t^{Glo} \\ \epsilon_{i,t}^{Stk} \\ \epsilon_{i,t}^{Dom} \\ \epsilon_{i,t}^{M} \\ \epsilon_{i,t}^{X} \\ \epsilon_{i,t}^{REER} \end{bmatrix}, \tag{1}$$

where U_t represents any of the three indicators for high uncertainty episodes.[7] We estimate three separate VARs: A first one where U_t represents the indicator for GEU; in the second U_t represents the indicator for GFU, and in the final VAR, U_t is the indicator for TPU. All other variables are defined as given in Table 2.

Our specification broadly follows standard specifications used in the uncertainty literature, adjusted to our purposes in terms of data availability for EM-7 countries. We use $Dom_{i,t}$, Glo_t and $Stk_{i,t}$ to proxy for domestic activity, external demand conditions and domestic financial conditions, respectively.[8] Our panel VAR includes a (7×1) vector of country-specific fixed effects, η_i, following a wealth of studies using panels of emerging economies, e.g., Uribe and Yue (2006), Akıncı (2013), Pasricha et al. (2018), Caballero et al. (2019), and Bhattarai et al. (2020).

Structural identification of the empirical model is obtained by imposing restrictions that turn matrix A in Equation (1) into a lower triangular matrix with unit diagonal elements. We recover structural shocks from the VAR innovations by using a Cholesky decomposition identification strategy. Our ordering of variables is standard and follows Baker et al. (2016) and Caggiano et al. (2014). Importantly, as we are interested in the impact of uncertainty shocks, we put the uncertainty measure at the top; the order of the remaining variables does not affect our results. Hence, we group the variables into a global block containing the uncertainty index and the global IP at the top, followed by a domestic block. This implies that EM-7 economies react contemporaneously to global shocks, while changes in EM-7 economies only affect global indicators with a lag. The economic

[7] To choose the optimal lag length, we use the model selection procedures suitable for dynamic panel models with unobserved individual effects developed by Andrews and Lu (2001). These model selection criteria are similar to likelihood-based information criteria and model the trade-off between the value of the J-statistic and the number of parameters and moments included. We report model selection criteria in Table A.1 in the Appendix. Irrespective of the uncertainty measure, they unanimously favour one lag.

[8] Novy and Taylor (2020) use monthly employment as their measure for domestic activity, but monthly employment data are not available for EM-7 countries.

interpretation of our structural identification strategy is that we treat each individual EM-7 economy as a small open economy in the short-run, i.e., contemporaneously, and as a large open economy in the long-run, i.e., we allow for each EM-7 economy to impact the global block, albeit with a lag. This is akin to modelling large open economy or general equilibrium effects as "second round" effects. Our ordering therefore goes from the uncertainty index, global IP, the domestic stock market, local IP, imports, exports, and finally, the real exchange rate.

Panel VARs are an example of dynamic panel models, i.e., panel models with lagged variables. In such models, the presence of fixed effects renders OLS parameter estimates biased, see Nickell (1981). We therefore estimate parameters using a generalized method of moments estimator by Holtz-Eakin et al. (1988) using forward-orthogonalized variables as suggested by Arellano and Bover (1995).[9] We instrument transformed variables by the first lag of their respective untransformed counterparts in levels.[10]

We present impulse response functions of our estimated models which describe the reaction of all the variables in the model following a one standard deviation shock to each uncertainty variable GEU, GFU and TPU, for up to 36 months after the shock. The impulse response confidence intervals are based on 500 Monte Carlo simulations. The 68% and 95% confidence intervals are derived from the resulting distributions.

4 Results

4.1 Uncertainty Shocks and Trade Flows

Exports and imports. Using Equation (1), we estimate three panel VARs, each featuring a different uncertainty indicator and including both exports and imports as separate variables. We present impulse response functions following a standard deviation shock to each of the uncertainty variable in Figure 3. Results are to be read row-wise. The first row shows the impulse responses in a model where Baker et al. (2016)'s global economic uncertainty index (GEU) is used. Similarly, the second row depicts the impulse responses to a standard deviation uncertainty shock in the model where uncertainty is captured by Ludvigson et al. (2020)'s financial uncertainty index (GFU). Finally, the third row's set of impulse responses reflect the dynamics following a shock to Caldara et al. (2020)'s trade policy uncertainty index (TPU).

The results accentuate how different uncertainty measures impact imports and exports in emerging economies heterogeneously. In particular, GEU and TPU shocks lead to a

[9]Monte Carlo simulations by Hayakawa (2009) suggest the superiority of forward-orthogonal deviations over first-differencing. The forward-orthogonal transformation consists of subtracting the mean of future observations at each period t from each variable to eliminate the country fixed effects.

[10]We use STATA 16 and the package `pvar` by Abrigo and Love (2016).

protracted decline in trade flows, while financial uncertainty shocks, captured by GFU, have a short-lived impact on trade.

Uncertainty acts as a barrier to trade. However, the extent and duration of the decline in trade flows depend on the nature of the shock. Global economic uncertainty and trade policy uncertainty shocks lead to a persistent decline in trade. GEU and TPU shocks occasion a contemporaneous drop in trade flows, but this deteriorates further after a quarter. Following a GEU shock, imports contract by 1.7% on impact, and drop further by 3.2% after two months. Similarly, exports fall by 1.7% contemporaneously and by 3.8% thereafter. A similar dynamic is noted for TPU shocks, whereby imports and exports drop by 1.3% on impact, and by 4.0% and 4.8%, respectively by the sixth month. Our results complement existing evidence on the trade-reducing impact of uncertainty covering developed economies, see Handley (2014), Handley and Limão (2015), Handley and Limão (2017), De Sousa et al. (2020), and Novy and Taylor (2020).

In contrast to the enduring decline in trade flows triggered by global economic uncertainty and trade policy uncertainty shocks, financial uncertainty shocks only have a transitory impact on trade flows. Admittedly, the contemporaneous impact of GFU shocks to the tune of 1.7% for imports and 2.2% for exports exceed the contemporaneous impacts observed for GEU and TPU shocks. However, in the case of GFU shocks, trade flows return to positive trajectory by the third month. In contrast, impulse responses of imports and exports remain negative and statistically significant for 2.5 years in the case of GEU and TPU shocks. Bonciani and Ricci (2020) also document a short term impact of global financial uncertainty shocks on trade flows in emerging economies, contrasting the longer-lasting contraction in advanced economies. Similarly, Novy and Taylor (2020) find larger negative effects of financial uncertainty on U.S. imports. Our results therefore lend support to the evidence on the decoupling between emerging economies and advanced economies' business cycles, see Kose et al. (2003, 2012).

Turning to the other variables, we find that across the three models, uncertainty shocks trigger a depreciation of EM-7 currencies as well as a deterioration of stock market performance, reflecting 'flight-to-safety' adjustments of international investors. This resonates with evidence of perceived riskiness of emerging economies in times of uncertainty, see Uribe and Yue (2006) and Akıncı (2013). Global economic uncertainty and trade policy uncertainty engender long-lasting depreciation of EM-7 currencies, as indicated by impulse responses that persist in the positive region over the forecast horizon. Meanwhile, a different picture prevails for external financial uncertainty shocks. GFU shocks have the largest impact on global IP among all the uncertainty measures we consider. In contrast, except for the contemporaneous drop, their impact on EM-7's real activity is rather short-lived. This is again in line with the decoupling literature, highlighting how the business cycles of emerging economies have diverged from advanced economies'. Following a GFU shock, EM-7's stock market prices plunge by nearly 10%, followed by an immediate recovery. In contrast, following a GEU or a TPU shock, stock market prices drop by around 4.0% initially and remain rather lethargic afterwards, failing to recover within three years.

Overall, the results also draw a clear demarcation line between how uncertainty affects financial markets versus real activity, with stock markets reacting more aggressively to uncertainty shocks than local IP.

Our results highlight the sensitiveness of emerging economies' trade flows to different types of external uncertainty shocks. Trade flows react even stronger to uncertainty shocks than domestic activity. In other words, the damages caused by uncertainty shocks are most visible in the impulse responses of trade flows. Heightened trade policy uncertainty is the most detrimental source of uncertainty.

The impulse response functions indicate that exports undergo a marginally deeper contraction than imports, following uncertainty shocks. This corresponds with the intuition that investment dips more significantly than consumption following uncertainty episodes (Caballero, 1990). Carrière-Swallow and Céspedes (2013) highlight that this also holds in the context of emerging economies. Consumption expenditure and hence imports are particularly impacted by precautionary savings by private households. Concomitantly, investment's sensitiveness to uncertainty stems from the option value of waiting, delaying firms' decision to export (Handley and Limão, 2015). Accordingly, exporters are therefore less likely to enter new export markets, when the prevalent level of uncertainty is high. Consistent with this, we find that uncertainty shocks cause emerging economies' local IP to deteriorate less than their trade.

Trade balance. Amidst the rising popularity of protectionist policies across major economies, policy-makers have shown increased interest in measures of potential macroeconomic imbalances, in particular, large and persistent trade surpluses and deficits. If emerging economies' trade balance worsens in response to external uncertainty shocks, these protectionist tendencies may be exacerbated in times of heightened uncertainty. To this end, we investigate the impact of uncertainty on the trade balance to GDP ratio, $TB/Y_{i,t}$, by replacing the latter as the trade variable in our panel VAR in Equation (1). The resulting empirical model is the following panel VAR model with order 1:

$$M \begin{bmatrix} U_{i,t} \\ Glo_t \\ Stk_{i,t} \\ Dom_{i,t} \\ TB/Y_{i,t} \\ REER_{i,t} \end{bmatrix} = \eta_i + \Gamma \begin{bmatrix} U_{t-1} \\ Glo_{t-1} \\ Stk_{i,t-1} \\ Dom_{i,t-1} \\ TB/Y_{i,t-1} \\ REER_{i,t-1} \end{bmatrix} + \begin{bmatrix} \epsilon_t^U \\ \epsilon_t^{Glo} \\ \epsilon_{i,t}^{Stk} \\ \epsilon_{i,t}^{Dom} \\ \epsilon_{i,t}^{TB/Y} \\ \epsilon_{i,t}^{REER} \end{bmatrix}. \tag{2}$$

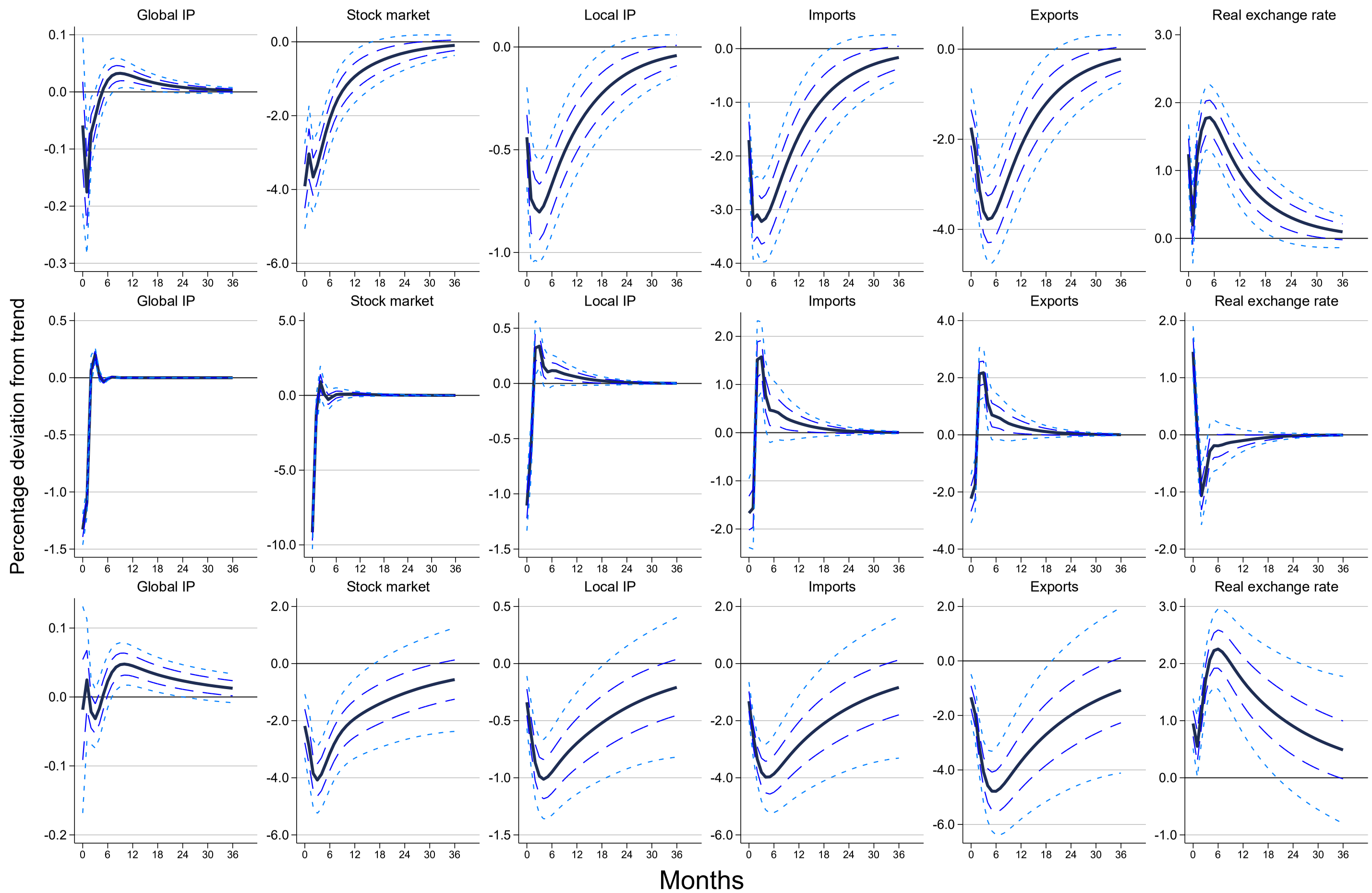
Figure 4 illustrates the impact of external uncertainty on the EM-7's trade balance to GDP ratio. Figure 4 is organized in the same way as Figure 3, i.e., the first row shows the impulse response functions to a one standard deviation GEU shock, the second row tracks a GFU shock, and finally the third row depicts the impulse response functions to a TPU shock. The results broadly echo the results presented in Figure 3. Impulse responses for global IP, local IP, the stock price index and the real exchange rate are qualitatively

Figure 3: Impulse Responses to a Standard Deviation Shock to Different Uncertainty Measures

(1) Model featuring Baker et al. (2016) Global Economic Uncertainty (*GEU*) Index

(2) Model featuring Ludvigson et al. (2020)'s Financial Uncertainty (*GFU*) Index

(3) Model using Caldara et al. (2020)'s Trade Policy Uncertainty (*TPU*) Index



Notes: Solid lines show point estimates of impulse responses. The dashed and dotted lines depict the 68% and 95% confidence bands, based on 500 Monte Carlo simulations, respectively.

in line with the findings presented earlier, except for the fact that the impulse responses turn statistically insignificant at a slightly earlier stage when TB/Y is used.

Trade policy uncertainty comprises the greatest risk to the trade balance to GDP ratio in emerging economies. TB/Y drops by about 0.34 percentage points following a TPU shock, and its impulse response remains negative and statistically significant for 18 months. TB/Y's response to a GEU shock is quite similar, dropping by 0.32 percentage points on impact but turning statistically insignificant rather quicker, by the seventh month after the shock. Meanwhile, TB/Y does not respond contemporaneously to a GFU shock. Although the response is positive and signficant for about six months, the magnitude stays close to zero.

Overall, our results highlight that uncertainty reduces trade flows of emerging economies. Importantly, the source of uncertainty matters. On impact, global financial uncertainty shocks cause emerging economies to be less open, but the effect reverses quickly thereafter. Also, the long term effect of financial uncertainty shocks on openness are not large, as the impulse responses of imports and exports shortly revert to near-zero. To the contrary, global economic uncertainty and trade policy uncertainty pose a challenge to nurturing the degree of openness in EM-7 economies, as indicated by the simultaneous contraction of imports and exports. Global economic uncertainty and trade policy uncertainty also contribute to a worsening of the trade balance.

4.2 Robustness Checks

Different uncertainty measures. Our baseline takes into account how the level of EM-7 trade flows vary with spikes in global economic, global financial and trade policy uncertainty, using the GEU, GFU and TPU indices as the respective measures of uncertainty. Given that uncertainty measures tend to be constructed to capture particular high-uncertainty episodes, uncertainty measures within particular categories should correlate. However, differences may still persist due to the methodology used in computing the different indices. In the first series of robustness tests, we check whether alternative proxies for financial and trade policy uncertainty corroborate our baseline results.

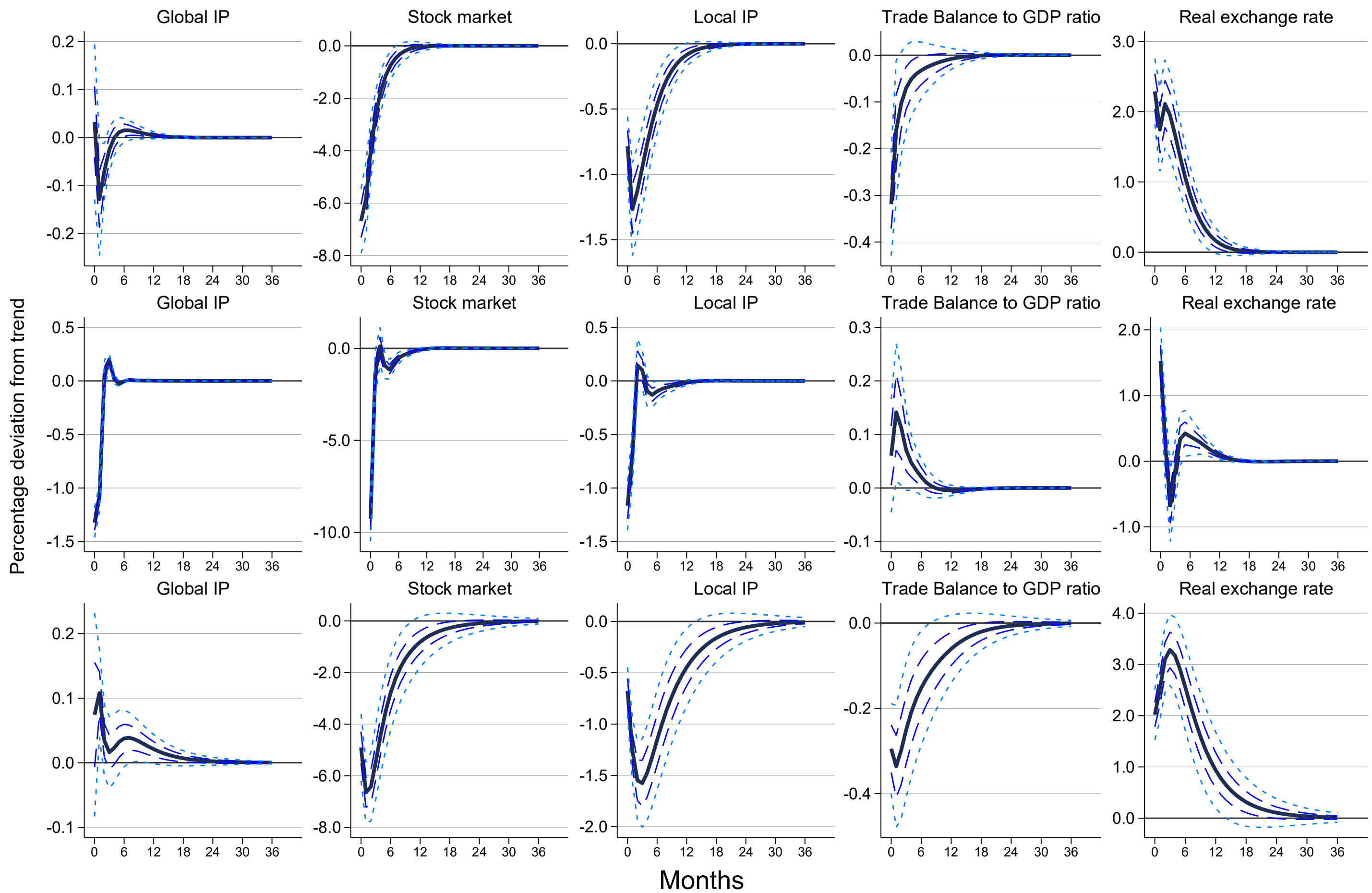
In the first robustness check, we compare financial uncertainty shocks under the baseline to alternatives where financial uncertainty is captured by Caggiano and Castelnuovo (2021)'s global financial uncertainty index, and the Chicago Board Options Exchange's Volatility Index, VIX, respectively. Caggiano and Castelnuovo (2021) derive a global financial uncertainty measure using a large-scale dynamic factor model on financial markets data for 42 countries. The VIX, on its part, commonly referred to as a 'fear gauge', tracks stock market jitters from the implied volatility of the S&P500 index over a 30-day window. It is a widely used measure of uncertainty in the literature (Caggiano et al. (2014); Baker et al. (2016)). Figure A.1 in the Appendix shows that the results with Caggiano and Castelnuovo (2021)'s financial uncertainty measure and the VIX are closely similar to the baseline.

Figure 4: Uncertainty Shocks in a Model with Trade Balance to GDP Ratio

(1) Model featuring Baker et al. (2016) Global Economic Uncertainty (GEU) Index

(2) Model featuring Ludvigson et al. (2020)'s Financial Uncertainty (GFU) Index

(3) Model using Caldara et al. (2020)'s Trade Policy Uncertainty (TPU) Index



Notes: Solid lines show point estimates of impulse responses. The dashed and dotted lines depict the 68% and 95% confidence bands, based on 500 Monte Carlo simulations, respectively.

The second robustness check consists of comparing impulse responses to trade policy uncertainty shocks, by comparing the Caldara et al. (2020)'s measure of TPU (our baseline) with Baker et al. (2016)'s trade policy uncertainty measure. As illustrated in Figure A.2 in the Appendix, the shape of the impulse response functions are preserved, albeit a marginally milder contraction of trade flows, when Baker et al. (2016)'s trade policy uncertainty measure is used.

Using alternative data transformations. To rule out that our results are artefacts of our chosen data transformations, we try out a battery of sensible alternatives. Bloom (2009) and Carrière-Swallow and Céspedes (2013) identify uncertainty periods over the sample by considering months where the *detrended* uncertainty index exceeds its mean by a certain threshold. In our baseline, we chose to identify uncertainty episodes based on the original values rather than the detrended ones. The TPU has only started to increase recently, and log-linear detrending, as we did for other variables in the VAR, would create spurious negative uncertainty shocks in the early period, and underestimate the magnitude of uncertainty disturbances in recent times. Still, a deterministic log-linear trend may simply not be flexible enough. We therefore use the filter recently proposed by Hamilton (2018) to detrend the uncertainty indices before identifying episodes where the detrended values exceed the mean by 1.28 standard deviation. The shape of the impulse responses are maintained, as shown in Figure A.3 in the Appendix.

Some uncertainty episodes may be more important than others; and assigning a value of 1 for all uncertainty shocks may not appropriately portray the intensity of the uncertainty episode. We therefore also check whether results differ, when instead of just using a dummy equalling 1 when the index exceeds the mean$+1.28\sigma$, we set the uncertainty indicator equal to its log-linear detrended value during high-uncertainty episodes, and 0 otherwise, similar to Bloom (2009). Results, as pictured in Figure A.3 in the Appendix, still corroborate our main findings.

Alternative ordering. Our baseline ordering of variables assumes a global block, with the uncertainty index being the most exogenous followed by global IP, and a domestic block with the stock market, local IP, imports, exports and the real exchange rate. Following Caggiano et al. (2014), we try an alternative ordering where we still include the uncertainty index in the foreign block, but order it after global IP, assuming that no emerging economies' shock is able to impact global uncertainty. In another robustness check, we consider an alternative scenario where the EM-7 are large open economies in terms of their effect on global uncertainty even in the short-run, i.e., we allow their domestic shocks to lead to contemporaneous spill-overs on the global uncertainty indices. For this scenario, we order the different uncertainty measures last in the Structural Panel VAR. This means that global IP and EM-7's macroeconomic variables do not react on impact to uncertainty shocks. We show results in Figure A.4 in the Appendix. Despite an expansionary blip in imports and exports following a GFU shock when uncertainty is ordered last, results echo the baseline findings of long-term contractionary effects of economic and trade policy uncertainty, albeit at lower levels.

Different high uncertainty episodes. As the data coverage extends to recent years, some high uncertainty episodes previously identified in the literature get weeded out if a high threshold is used as cut-off, as pointed out by Carrière-Swallow and Céspedes (2013). For example, Bloom (2009) identifies high uncertainty episodes as periods where his HP-filtered uncertainty measure exceeds its mean by 1.65 standard deviations, based on the 5% level of significance for an upper-tailed test, in a sample ending in 2009. Using this cut-off in our sample ending in 2019, for example, the European sovereign debt crisis would no longer be categorized as a high uncertainty episode of the GEU index. To avoid this, we chose a lower cut-off of 1.28σ for our main specifications for all indices. As a robustness check, we follow Bloom (2009) and identify high uncertainty episodes as periods where the underlying indices exceed their respective mean by 1.65 standard deviations. We illustrate the high uncertainty episodes using this definition as shaded areas in Figure A.5 in the Appendix. For the impulse response functions, these differences in cut-offs still lead to results qualitatively similar to the baseline, as pictured in A.6 in the Appendix.

4.3 How Much of the Variation in Trade Flows Can Be Explained by Uncertainty Shocks?

Sections 4.1 and 4.2 document the dynamic adjustment of trade flows and the trade balance in the aftermath of a given exogenous shock to global economic, financial, and trade policy uncertainty. It is still unclear, however, to what extent uncertainty shocks explain the observed variation in trade flows and the trade balance, compared to shocks to other macroeconomic variables. In other words, we would like to know whether uncertainty shocks are a major driver of trade flows. To answer this question, we conduct a variance decomposition to ascertain the degree to which the various uncertainty shocks contribute to explaining the movements in variables in the VAR model given by Equation (1). We show the forecast error variance decomposition up to the three-year horizon. The forecast error variance decompositions for the uncertainty shocks are shown in Figures 5 and 6. Figure 5 presents the variance decompositions of the model containing imports and exports, whilst Figure 6 shows the variance decompositions when the trade balance to GDP ratio is used instead. In each of the figures, the first row illustrates the variance decomposition of the GEU shock, the second portrays the GFU's shock variance decomposition and the third row depicts the variance decomposition of the TPU shock.

Figure 5 suggests that the contribution of uncertainty shocks in explaining imports and exports of EM-7 economies differs, depending on the type of uncertainty being considered. Global economic uncertainty shocks explain 7 to 8% of the variation in imports and exports. Trade policy uncertainty shocks explain more than 11%, the highest proportion of the variation in imports and exports of all uncertainty measures we consider. These figures are non-negligible, as we are talking about second-moment shocks (i.e., mean-preserving increases in variance), as opposed to realised first-moment shocks. In comparison, financial uncertainty shocks do not seem to matter much, and explain less than 2% of the variation in imports and exports at the three-year horizon. Once again, EM-7 trade flows appear to be insulated from GFU shocks.

It also becomes clear that global economic uncertainty shocks and trade policy uncertainty shocks explain the largest amount of variation in exports and imports among all the variables considered in our panel VAR. This highlights the importance of uncertainty shocks for trade and trade policy discussions. Trade flows of emerging economies are particularly vulnerable to uncertainty shocks, more so than, e.g., local IP or the domestic stock market.

Turning to the variance decomposition using the trade balance to GDP ratio in Figure 6, we find that global economic uncertainty and financial uncertainty shocks do not particularly help explaining the movement in the trade balance in emerging economies. This is in stark contrast to trade policy uncertainty: it explains more than 5% of the variation in the trade balance to GDP ratio. The corresponding proportion explained by GEU shock is only 1.6%, whereas the contribution of GFU shocks is close to zero.

Summing up, our results demonstrate the importance of uncertainty shocks for trade flows in emerging economies and call for a consideration of trade effects in studies on the macroeconomic effects of uncertainty. Particularly trade policy uncertainty shocks explain a sizeable share of the variance of imports and exports, illustrating their importance in an absolute sense. Trade policy uncertainty shocks are also more important in a relative sense, as their contribution in explaining the variation in trade flows is higher than the contribution of global economic and financial uncertainty shocks.

5 Conclusion

Uncertainty has become a major concern around the globe. While financial uncertainty was at the forefront of policy makers' minds during the global financial crisis, trade policy uncertainty surged during the Trump presidency, and global economic uncertainty has increased, not least during the ongoing pandemic. While the macroeconomic effects of these different dimensions of uncertainty have been studied in detail, less is known about their effects on international trade.

Our paper illustrates the detrimental impact of global economic, financial, and trade policy uncertainty on the trade flows of the seven largest emerging economies. Using a panel VAR model, we find that global economic and trade policy uncertainty shocks induce a protracted decline in emerging economies' imports and exports. We find that trade policy uncertainty is important in an absolute sense: It explains more than 10% of the variation in imports and exports. Trade policy uncertainty is also important in a relative sense: it explains a larger share of the variation in emerging economies' trade flows than global economic uncertainty or financial uncertainty. Hence, macroeconomic studies on the effect of uncertainty should consider its impact on trade flows, and trade studies should investigate the trade effects of uncertainty, particularly if their interest lies

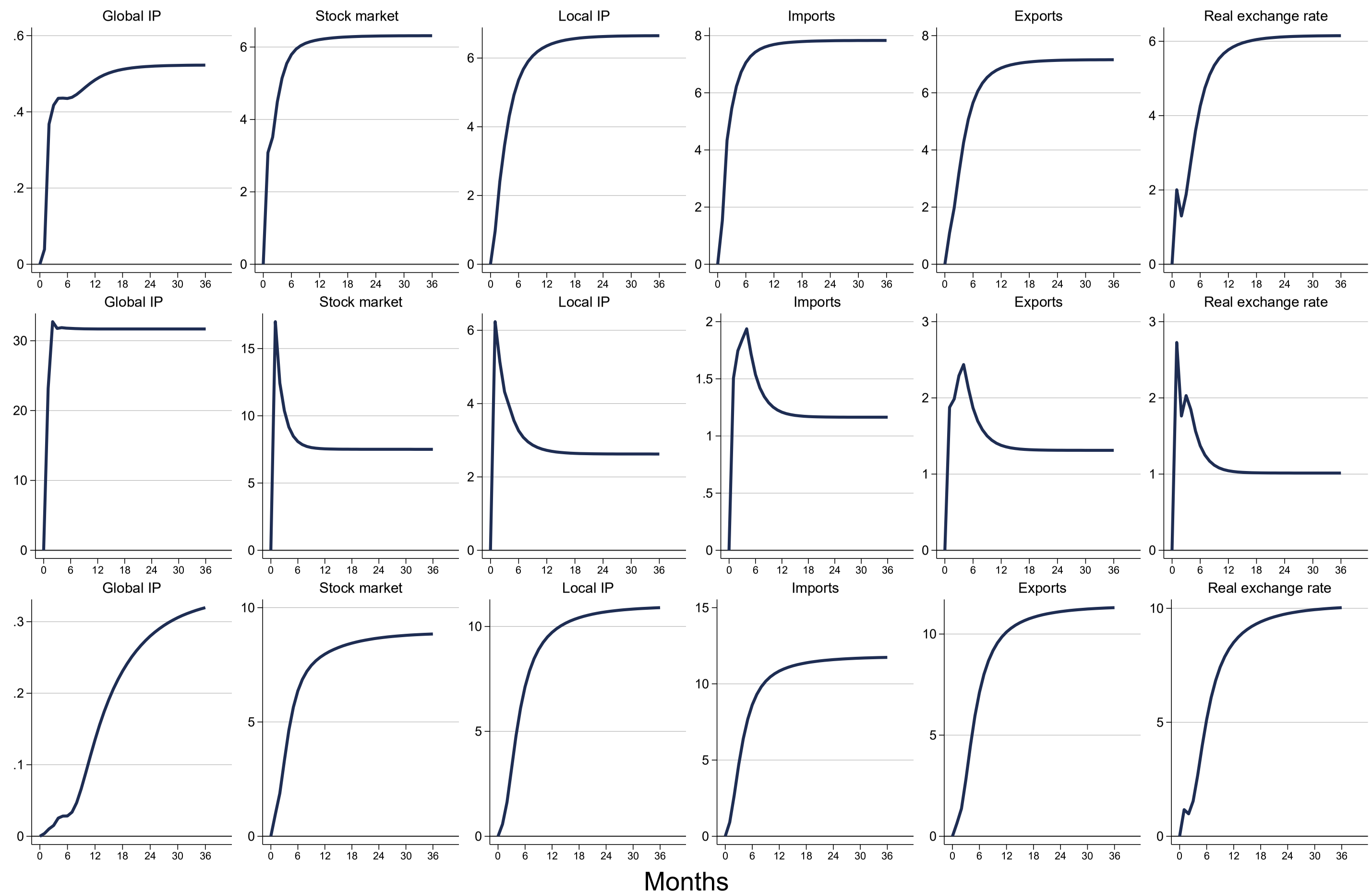
Figure 5: Forecast Error Variance Decomposition

Percentage Variation Explained by an Uncertainty Shock

(1) Model featuring Baker et al. (2016) Global Economic Uncertainty (*GEU*) Index

(3) Model featuring Ludvigson et al. (2020)'s Financial Uncertainty (*GFU*) Index

(3) Model using Caldara et al. (2020)'s Trade Policy Uncertainty (*TPU*) Index



Notes: The graphs show the percentage variation in the respective variable explained by the respective uncertainty shock.

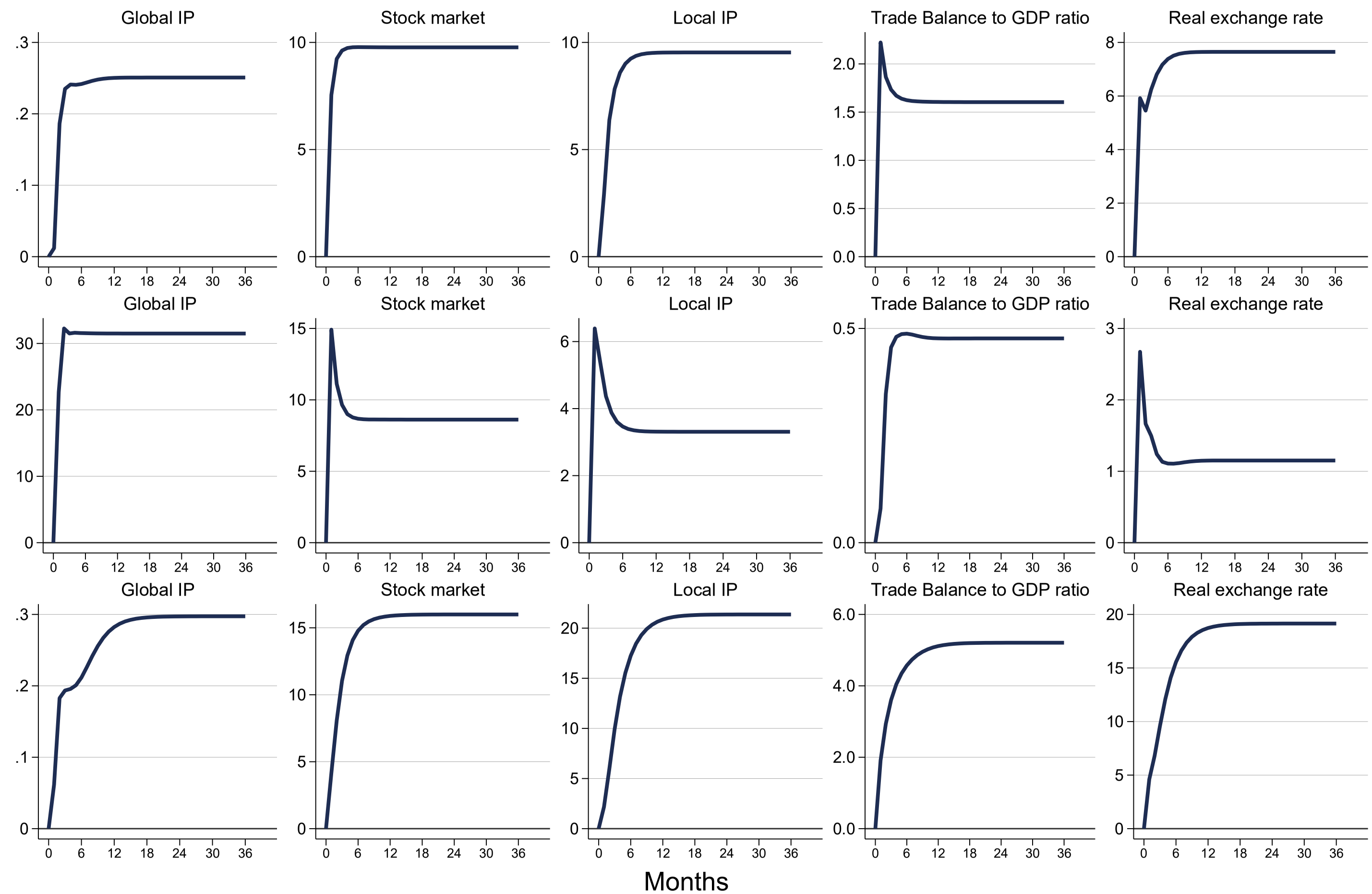
Figure 6: Forecast Error Variance Decomposition in a Model with Trade Balance to GDP Ratio

Percentage Variation Explained by an Uncertainty Shock

(1) Model featuring Baker et al. (2016) Global Economic Uncertainty (GEU) Index

(3) Model featuring Ludvigson et al. (2020)'s Financial Uncertainty (GFU) Index

(3) Model using Caldara et al. (2020)'s Trade Policy Uncertainty (TPU) Index



Notes: The graphs show the percentage variation in the respective variable explained by the respective uncertainty shock.

on short-run adjustment dynamics.

Our results provide evidence for the concern of policy makers about the return of more volatile trade policy discussions in the wake of the Trump era and the ongoing pandemic. Heightened trade policy uncertainty not only fills newspaper columns and twitter feeds, but has real consequences for emerging economies' integration into the world economy.

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Appendix

A.1 Lag Selection Criteria

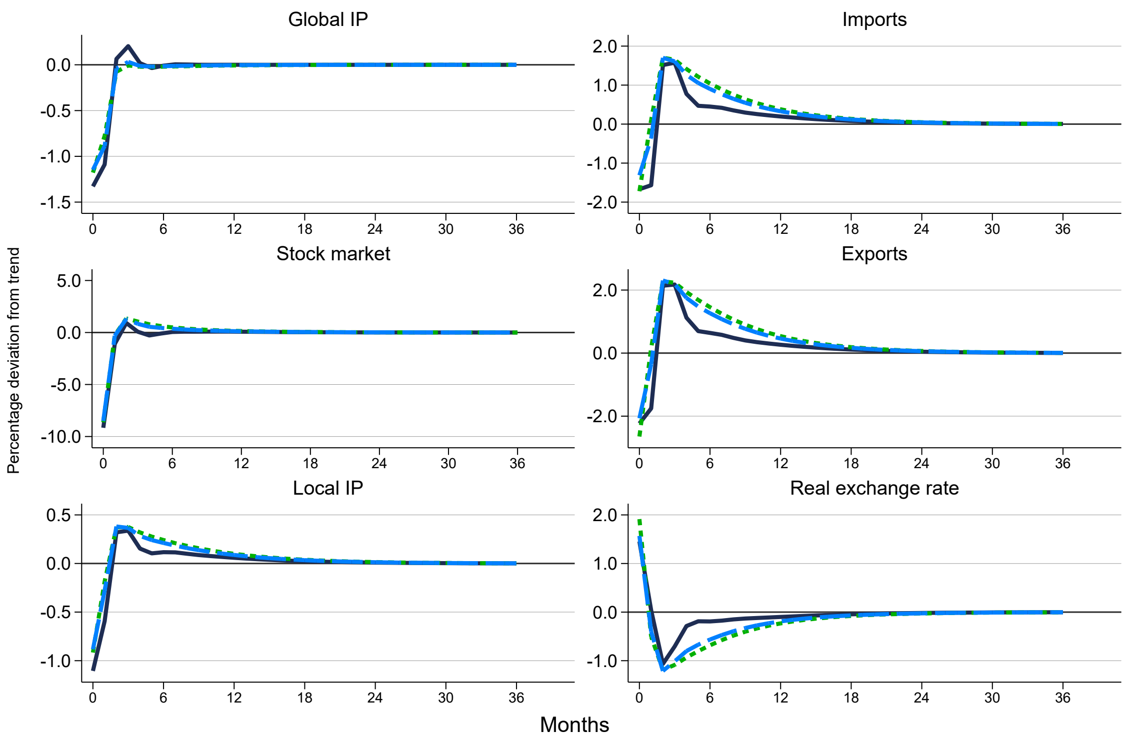
Table A.1: VAR Order Selection Criteria

Lag length	Andrews and Lu (2001)'s model selection criteria BIC	AIC	QIC
Global Economic Uncertainty (GEU)			
1	−2456.159*	−431.950*	−1224.648*
2	−2170.937	−355.541	−1066.466
3	−1874.371	−271.789	−900.941
Global Financial Uncertainty (GFU)			
1	−2457.093*	−432.885*	−1225.582*
2	−2168.619	−353.223	−1064.148
3	−1800.619	−266.4827	−867.264
Trade Policy Uncertainty (TPU)			
1	−2454.042*	−429.834*	−1222.531*
2	−2166.950	−351.554	−1062.479
3	−1872.255	−265.672	−894.824

Notes: Table presents three moment model selection criteria developed by Andrews and Lu (2001) for the panel VAR presented in Equation (1) in the main text for different lag lengths: Bayesian Information Criterion (BIC), the Akaike Information Criterion (AIC), and the Hannan-Quinn Information Criterion (QIC). * indicates the minimum of the respective criterion.

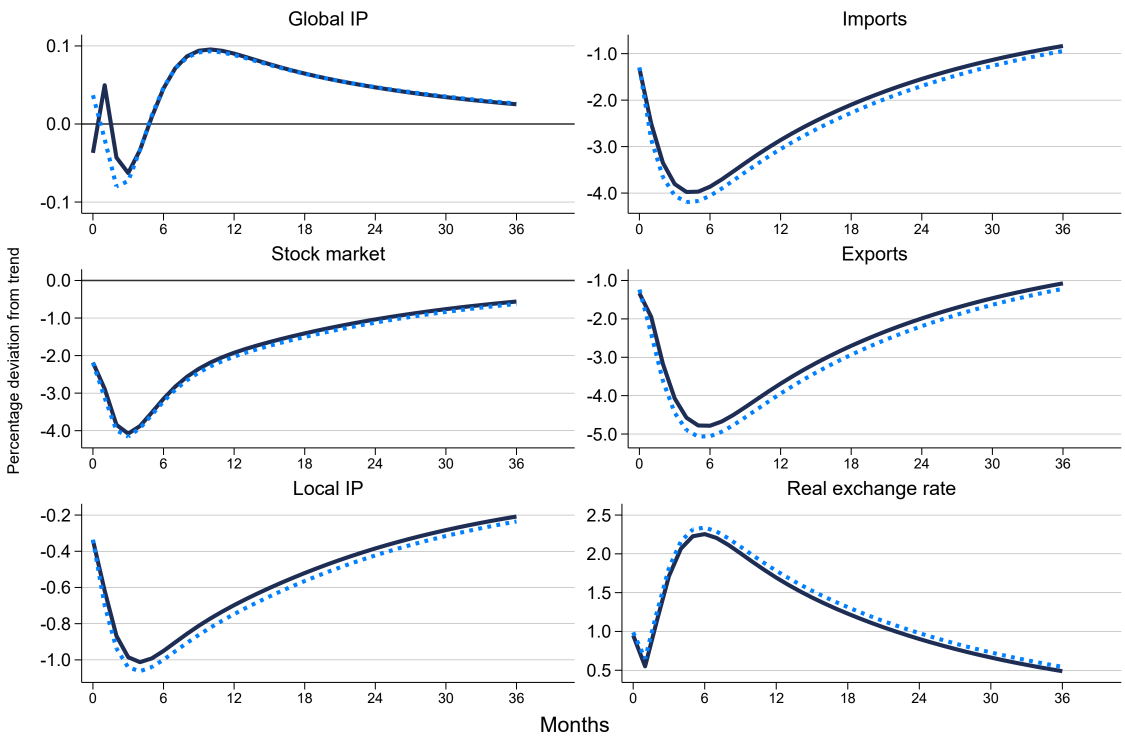
A.2 Robustness Checks

Figure A.1: Impulse Responses to a Standard Deviation Shock to Different Global Financial Uncertainty Measures



Notes: The green dotted line depicts the results when Caggiano and Castelnuovo (2021)'s measure is used as an alternative global financial uncertainty indicator. The bright blue dashed line depicts the impulse responses to a VIX shock. The solid blue line shows the baseline estimates from Figure 3 using the Ludvigson et al. (2020)'s global financial uncertainty index (GFU) for comparison.

Figure A.2: Impulse Responses to a Standard Deviation Shock to Different Trade Policy Uncertainty Measures



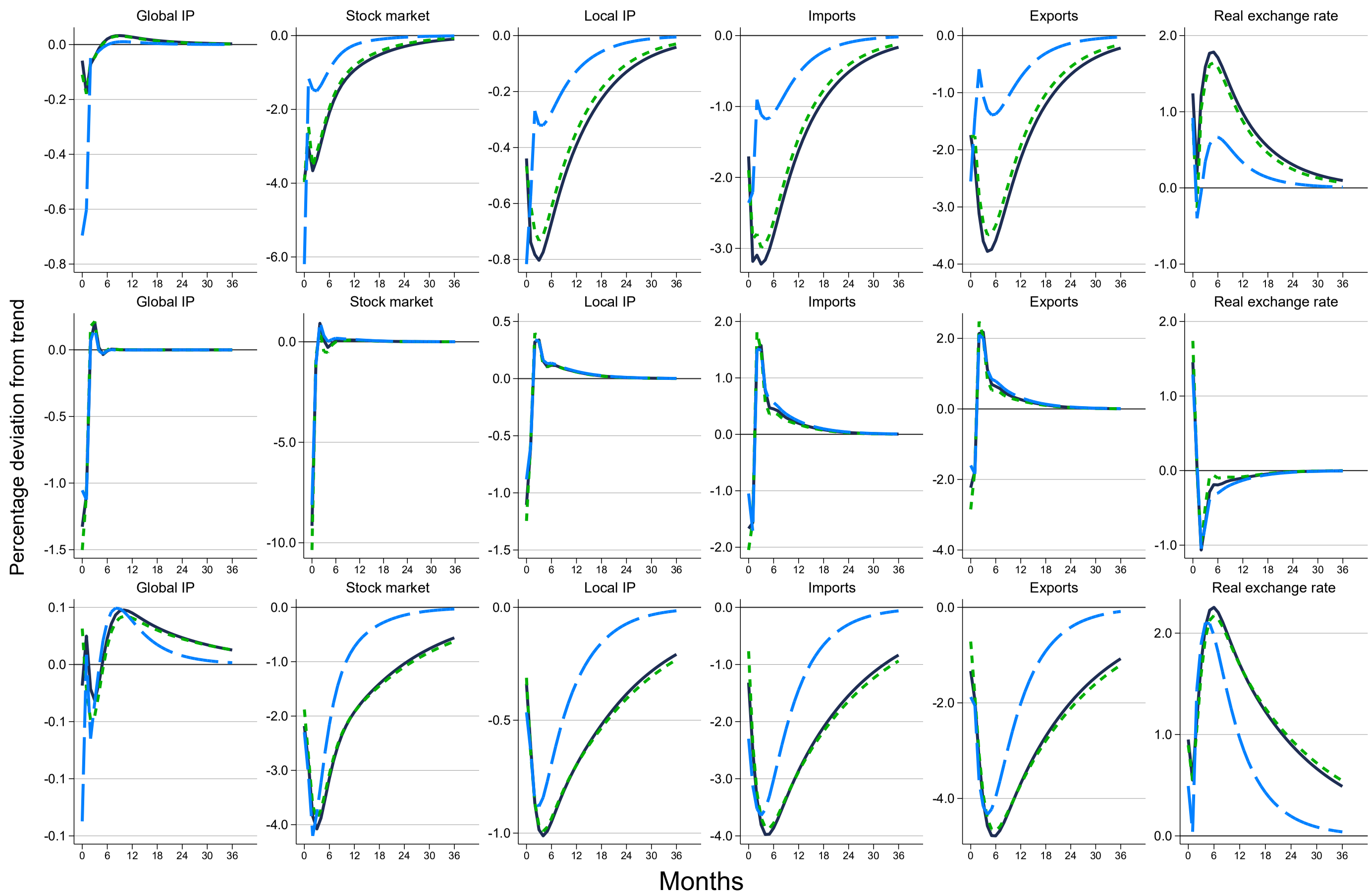
Notes: The dashed line depicts the impulse responses using Baker et al. (2016)'s measure of Trade Policy Uncertainty. The solid blue line shows the baseline estimates from Figure 3 using the Caldara et al. (2020)'s Trade Policy Uncertainty index (TPU) for comparison.

Figure A.3: Impulse Responses to a Standard Deviation Shock to Different Uncertainty Measures Using Alternative Data Transformations

(1)
Model featuring Baker et al. (2016) Global Economic Uncertainty (*GEU*) Index

(3)
Model featuring Ludvigson et al. (2020)'s Financial Uncertainty (*GFU*) Index

(3)
Model using Caldara et al. (2020)'s Trade Policy Uncertainty (*TPU*) Index



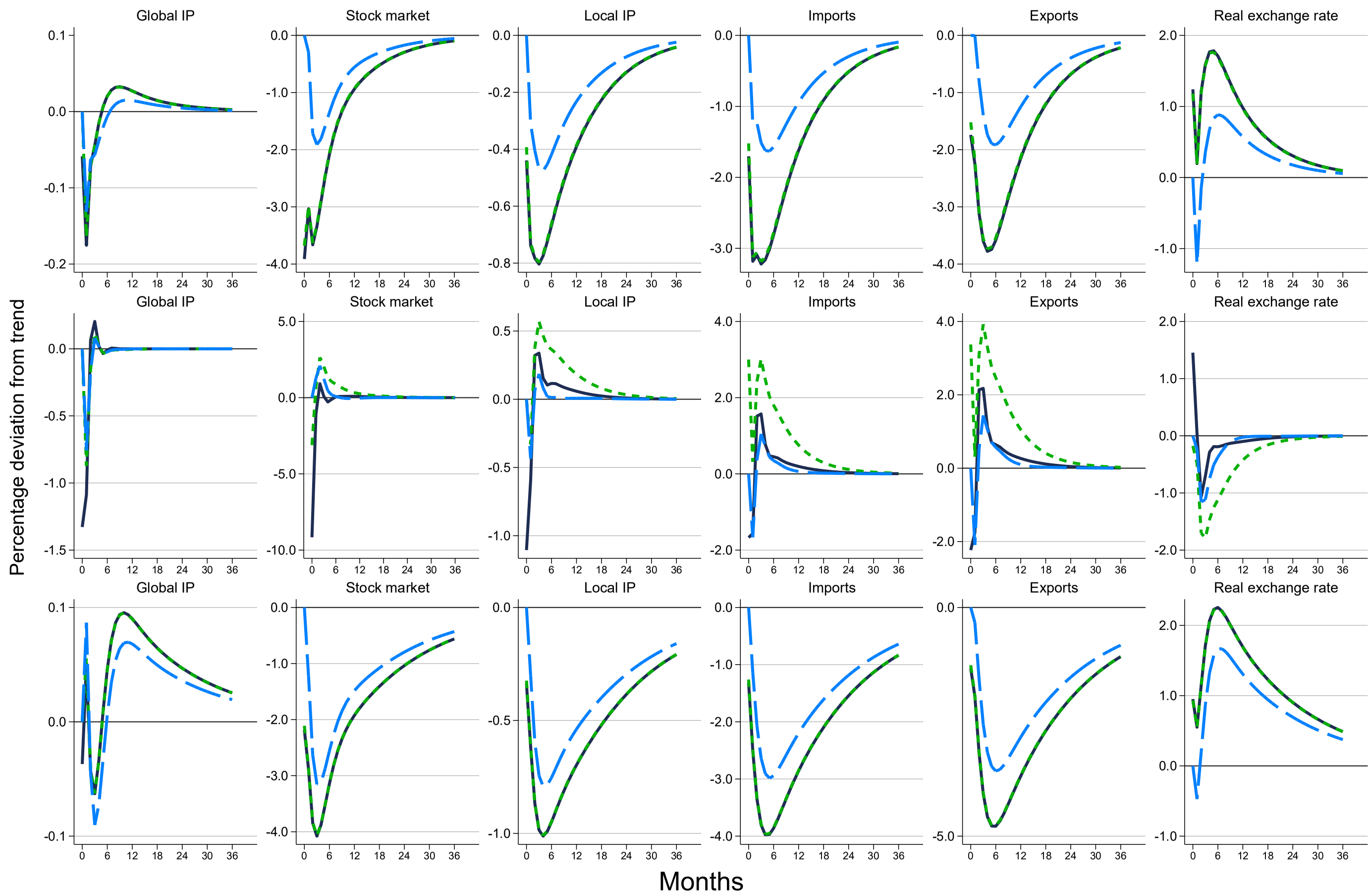
Notes: The green dotted lines depict results when the instead of using a dummy equalling 1 when the index exceeds the mean+1.28σ, we set the uncertainty indicator equal to its log-linear detrended value during high-uncertainty episodes, and 0 otherwise. The bright blue dashed lines illustrate results when the uncertainty index is detrended using the Hamilton (2018) Filter before identifying high-uncertainty episodes. Solid dark blue lines show the baseline results from Figure 3 for comparison.

Figure A.4: Impulse Responses to a Standard Deviation Shock to Different Uncertainty Measures with Alternative Ordering

(1) Model featuring Baker et al. (2016) Global Economic Uncertainty (*GEU*) Index

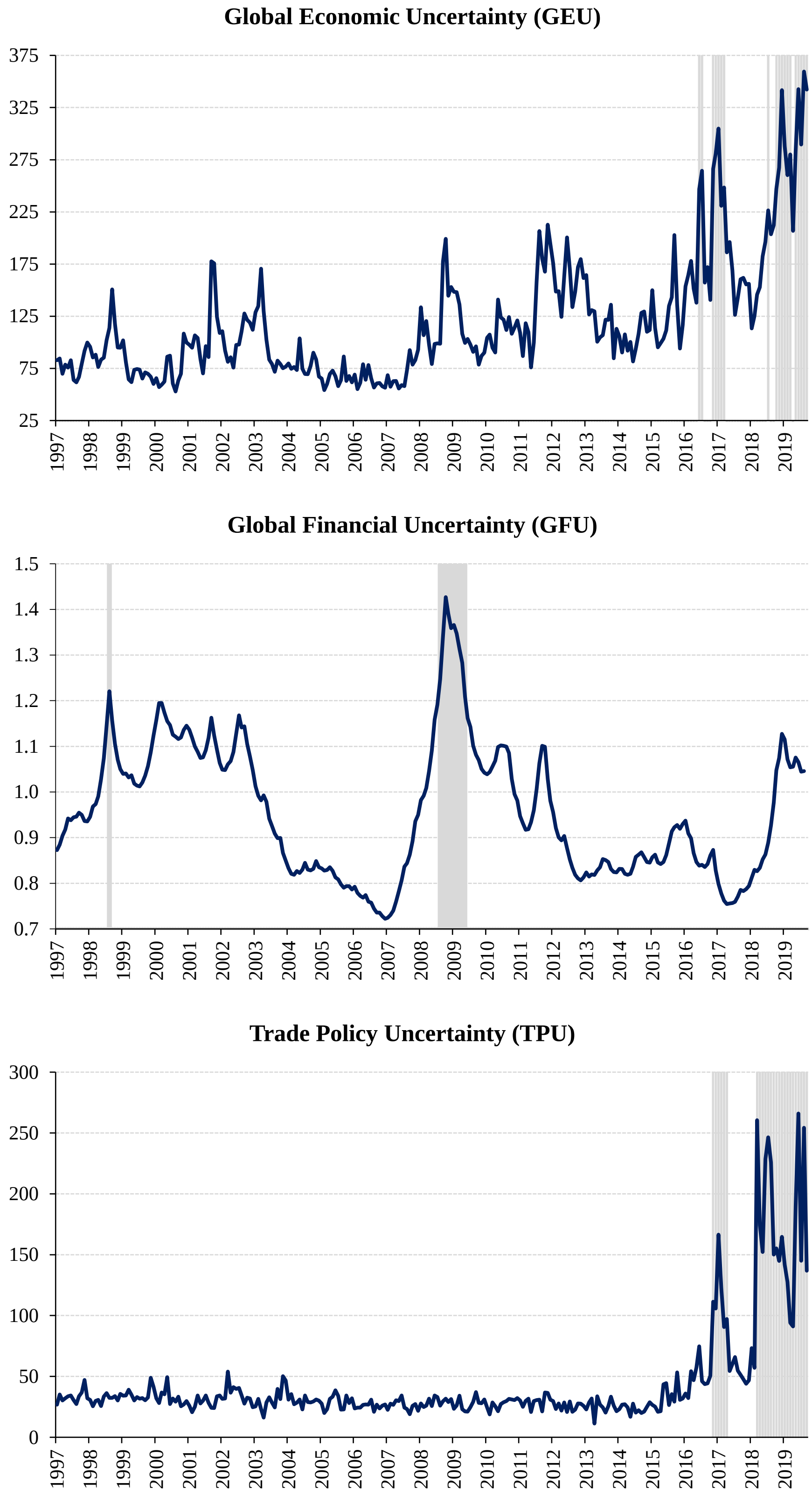
(3) Model featuring Ludvigson et al. (2020)'s Financial Uncertainty (*GFU*) Index

(3) Model using Caldara et al. (2020)'s Trade Policy Uncertainty (*TPU*) Index



Notes: The green dotted lines depict results when the uncertainty episode is ordered last in the Structural Panel VAR. The bright blue dashed lines illustrate results when the uncertainty index is still within the foreign block, but is ordered after global IP. Solid dark blue lines show the baseline results from Figure 3 for comparison.

Figure A.5: High Uncertainty Episodes Defined Using a Different Cut-off



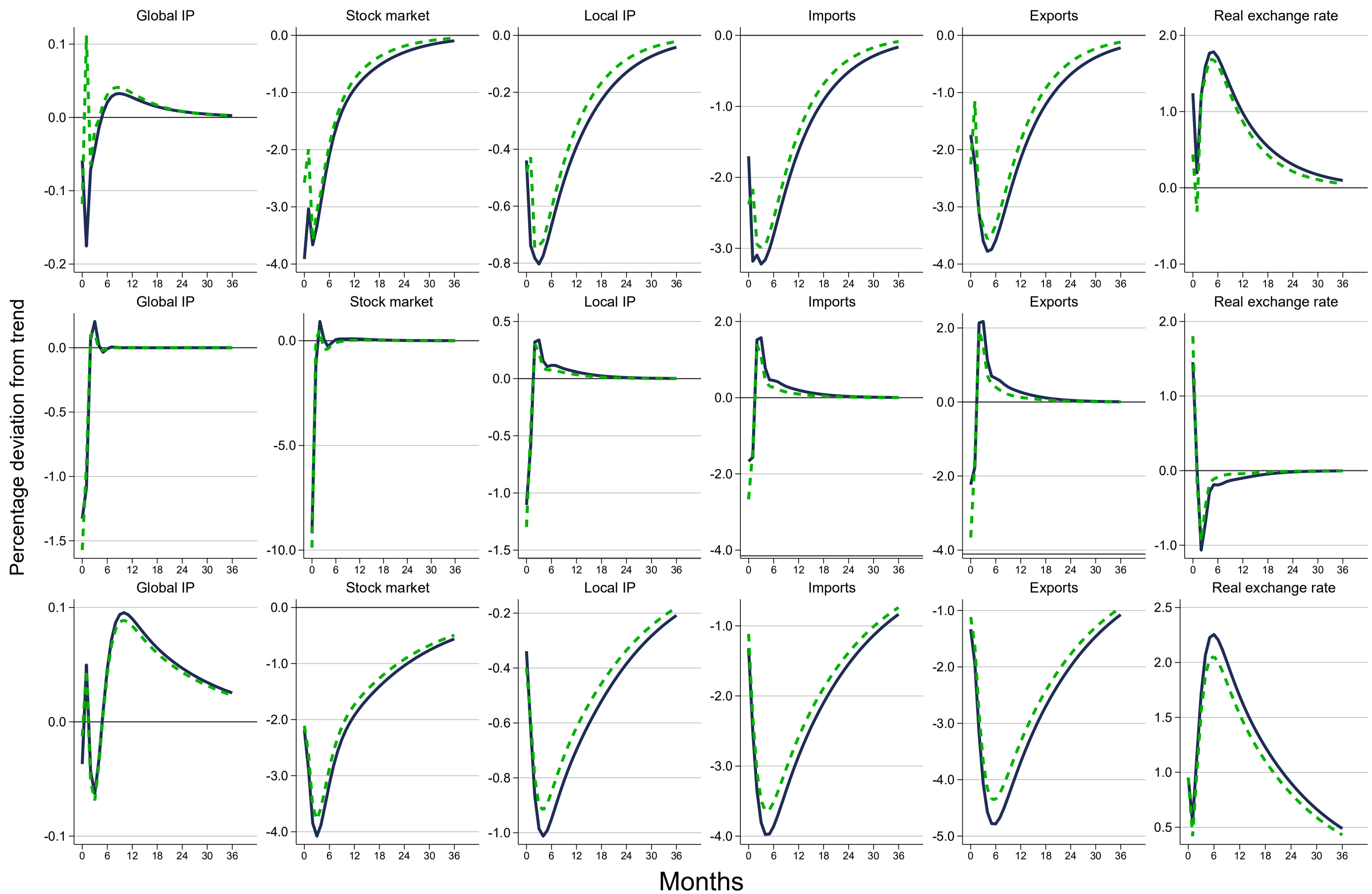
Notes: Shaded areas highlight high uncertainty episodes which we define as periods wherein the underlying uncertainty index exceeds its mean by 1.65 standard deviations. Data source: *GEU*: Baker et al. (2016); *GFU*: Ludvigson et al. (2020); *TPU*: Caldara et al. (2020).

Figure A.6: Impulse Responses to a Standard Deviation Shock to Different Uncertainty Measures with Different Threshold for High Uncertainty Episodes

(1) Model featuring Baker et al. (2016) Global Economic Uncertainty (*GEU*) Index

(3) Model featuring Ludvigson et al. (2020)'s Financial Uncertainty (*GFU*) Index

(3) Model using Caldara et al. (2020)'s Trade Policy Uncertainty (*TPU*) Index



Notes: The green dotted lines depict results when the high uncertainty episode is identified as periods wherein the underlying uncertainty index exceeds its mean by 1.65 standard deviations. Solid dark blue lines show the baseline results from Figure 3 for comparison.