from the United States as a share of country *i*'s total imports, US imports [exports] from [to] country *i* as a share of US total imports [exports], and similar measures for total trade volumes).

Conclusions

We find that preannounced government spending shocks in the United States lead to a sizable real effective appreciation in the dollar and a worsening of the aggregate trade balance. More precisely, preannounced increases in government expenditures appreciate the dollar and lead to a worsening in the US trade balance. Quantitatively, a spending announcement of a stimulus of 1 percent of GDP would appreciate the dollar by about 5–7 percent over 1.5 years while worsening net exports by about 0.6 percentage point over the course of 2–3 years.

For a panel of advanced and emerging market economies that constitute the main US trading partners, we find that a US fiscal expansion results in an economically and statistically significant improvement in the trade balance and deterioration in the bilateral exchange rate for US partner countries. These effects are consistent across regions. Moreover, we find that the spillovers of US fiscal shocks on exchange rates and trade balances may have diminished following the global financial crisis, as the constrained monetary policy at the zero lower bound may have dampened the exchange rate appreciation (in response to expansionary fiscal shocks), potentially contributing to a weaker trade balance response.

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Annex 1. Empirical Approach for the Identification of Anticipated US Fiscal Spending Shocks

The Forni and Gambetti (2016) approach is implemented in this note through the inclusion in an otherwise standard VAR of an additional variable, capturing fiscal "news," for example, the agents' information about future government spending. As in Forni and Gambetti's study, the fiscal "news" variable is defined as the cumulative expectation of future government spending growth rates from SPF forecasts for the subsequent four quarters,[11] for example:

$$\eta_t^1 = F_t(1, H) = \sum_{h=1}^{H} E_t^{P_t} g_{t=h},$$

in which $H = 4$ and $E_t^{P_t} g_{t+h}$ is the expectation at time t conditional on the information set of economic agents P_t of government spending h quarters ahead.[12] The rationale for using the cumulative forecast stems from the fact that it best predicts government spending itself, compared to forecasts made at shorter horizons. In other words, Forni and Gambetti (2016) show that the hypothesis of fiscal foresight does not hold very well in the very short term, while it holds better at the four-quarter horizon.

With the fiscal news variable defined in this way, we conduct a benchmark VAR with the following specification on quarterly US data (fourth quarter of 1981 through third quarter of 2016):

$$X_t = A(L) X_{t-1} + U_t,$$

in which X_t includes, in this order: real federal government consumption expenditures and gross investment, the fiscal news variable based on SPF forecasts, real GDP, private consumption, the federal surplus divided by GDP, net exports of goods and services divided by GDP, the 10-year Treasury constant maturity rate, and the real effective exchange rate. All variables enter in (logged) levels, with the exception of the surplus, trade balance, and bond yield, which are expressed in percent. The SPF news variable is also expressed in percent of US GDP. The benchmark specification includes four lags, in line with standard criteria, and GDP and its components have been seasonally adjusted.

Using Cholesky ordering to identify the shocks implies that the first shock will capture the changes in government spending that have not been anticipated (that is, the "surprises"), while the second shock will reflect the anticipated changes—that is, they are orthogonal to professional forecasts and also not affected contemporaneously by other macroeconomic shocks, which we identify as unanticipated or "surprise" government spending shocks. On the other hand, the residuals from the second equation in the VAR capture innovations in SPF forecasts orthogonal to macroeconomic shocks only, thus capturing the anticipated or news government spending shocks. Macroeconomic variables follow next in the VAR and the financial variables last, on the basis of typical assumptions about the timing of responses.[13] This approach intuitively allows one to disentangle between expected and unexpected changes in fiscal policy in a clear, straightforward way.

Annex 2. Empirical Approach for the Panel Vector Autoregression

The baseline PVAR specification is given by

$$X_{i,t} = a_i + A(L) X_{i,t-1} + U_{i,t},$$

in which a_i is country fixed effects; $U_{i,t}$ is the error term; and X_t includes, in this order: the trade-weighted fiscal news shocks extracted from the US VAR in the

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[11]As in Forni and Gambetti 2016, for robustness purposes, we also use an alternative definition that sets the news variable to equal the difference between the cumulated forecast of government spending made at time t for three quarters ahead and the cumulated forecast, for the same quarters, made at time t–1. This does not change our results. We refer the reader to Forni and Gambetti's paper for further details on the two specifications.

[12]The SPF reports, in every quarter t, the forecasts for government spending (real federal government consumption expenditure and gross investment) for periods t, t+1, . . ., t+4. The first figure is actually a nowcast and may differ substantially from the realized government spending at time t. At time t, forecasters only know the (first release of) government spending at time t–1. Government expenditures are expressed as annualized percentage changes of forecasters' mean response.

[13]As typical in this literature, we have performed various robustness checks with respect to the effects of changing the ordering, and we have also analyzed orthogonalized impulse-response functions.

previous section (US news shock), as explained later; real GDP; the fiscal balance as a percentage of GDP; net exports of goods and services as a share of GDP; the long-term interest rates; and the real bilateral exchange rate. All variables enter in (logged) levels, with the exception of the surplus, trade balance, and bond yield, which are expressed in percent. The benchmark specification includes four lags, in line with standard criteria. The PVAR methodology used in this analysis is the least-squares dummy variable (LSDV) estimator as in Bun and Kiviet 2006.

Because of limitations in data for some of the recipient countries' macroeconomic variables, we are using an unbalanced panel comprising the top 30 US trading partners (23 advanced economies and 7 emerging market economies representing about 80 percent of US imports) and spanning the period from the fourth quarter of 1982 to the third quarter of 2016 (see Annex 3 for additional information on the countries and data sources).

The SPF news shock is also expressed as a 1 percent of US GDP shock, as previously. However, to account for heterogeneity in a country's exposure to US fiscal policy, the fiscal news shock for the PVAR (US news shock) is constructed by weighting US news shocks extracted from the baseline US VAR with intercountry linkages as follows:

$$USNewsShock_{i,t} = w_{i,(t)}^{EXP} \times USNewsShock_t^{US-VAR},$$

in which $w_{i,(t)}^{EXP}$ is the ratio of country i's exports to the United States to its total exports. The intercountry linkages capture country i's exposure to the US fiscal shock from exports from country i to the United States as a share of country i's total exports. This scheme captures the idea that the US fiscal stimulus would have a larger impact on a recipient's economy the stronger is the recipient's trade link with respect to the United States. Moreover, as previously explained, the theoretical models posit that the US fiscal stimulus would increase US imports from other countries through both the demand channel and the price competitiveness channel. Therefore, our preferred weighting scheme uses country i's exports to the United States as

a share of its total exports, which corresponds to US imports from country i.

Annex 3. Data Description

The fiscal news variable based on SPF forecasts (SPFNEWS) is calculated using the annualized percent change in mean responses for the real federal government consumption expenditure and gross investment reported by the Federal Reserve Bank of Philadelphia. Real federal consumption expenditures and gross investment (FEDGOV) is the federal surplus divided by GDP; federal government budget surplus (SUR), real GDP (GDP), and the trade balance are all retrieved from Federal Reserve Economic Data (FRED) at the Federal Reserve Bank of St Louis.

For variables in the PVAR, the trade balance is calculated as $100 \times$ ((country i's real exports to the United States) – (country i's real imports from the United States))/(country i's real GDP), in which nominal exports/imports have been deflated by the partner country's export/import deflators. We use as exports and imports data an average of those reported by the United States and by its partners. The results are robust when we use the trade variables reported by the United States only. The real bilateral exchange rate is calculated as (nominal exchange rate) × (GDP deflator in country i)/(US GDP deflator), normalized to be 100 in 2010, in which the nominal exchange rate in the PVAR is defined as (US dollar/national currency).

Annex Table 3.1. Data Definitions and Sources for the Panel Vector Autoregression

Variable	Description	Frequency	Source	Ticker
SUR	Fiscal balance, percent of GDP	Quarterly	GDS	GB_GDP
STRATE	Short-term interest rate	Quarterly	GDS	FIDR
10YBOND	Long-term interest rate	Quarterly	GDS	FIGB
RGDP	Real gross domestic product	Quarterly	GDS	NGDP_R
TB	Trade balance	Quarterly	DOTS	
RER	Real bilateral exchange rate	Quarterly	DOTS	

Note: DOTS = Direction of Trade Statistics; GDS = Global Data Source.