

Fiscal Multipliers and Foreign Holdings of Public Debt
**SUPPLEMENTARY WEB APPENDIX: NOT
 INTENDED FOR PUBLICATION**

A Additional analysis: Instrumental variables

We use both the defense news shocks and government spending to instrument for the cumulative sum of US real government spending. As emphasised by Ramey and Zubairy (2018), these shocks have quite different properties. We provide their summary statistics in Table A.1. Here, we redo our analysis using only the defense news or BP shock as an instrument.

Table A1: **Summary statistics for U.S. fiscal shocks**

	Defense news shocks	Estimated shocks
No. of observations	255	255
Mean	0.0041	0.0008
Median	0.0000	0.0007
Standard deviation	0.0114	0.0029
Minimum	-0.0913	-0.0071
Maximum	0.0635	0.0131

Notes: The defense news shocks are from Ramey and Zubairy (2018). The estimated shocks are the Blanchard-Perotti shocks.

Both shocks are normalized by potential GDP.

Our results are robust to using only the BP shock as an instrument (Table A.2 and Figure A.1, panel a), but not the defence news shock on its own (Table A.3 and Figure A.1, panel b). This is unsurprising, given that even the baseline (i.e. not state-dependent) output multiplier is significant when government spending is identified using the BP shock (Figure A.2., panel a), but is insignificant when the spending shock is instrumented using only the defence news shock (Figure A.2, panel b).

These results are consistent with those of Ramey and Zubairy (2018), where the news shock is a weak instrument. Ramey and Zubairy (2018) argue that it is natural to consider both instruments because they complement each other: the news shock is weak at short horizons but becomes more relevant at long horizons, whereas the BP shock is relevant at short horizons and loses relevance as the horizon rises.

Table A2: **Foreign share: U.S. output multiplier (BP shock only)**

	Quarter t+1	Quarter t+2	Quarter t+3	Quarter t+4
Fiscal shock _t	0.45 (0.41)	0.46 (0.40)	0.41 (0.33)	0.31 (0.31)
Fiscal shock _t · Foreign Bias _{t-1}	4.78*** (1.77)	5.12*** (1.88)	4.75*** (1.83)	4.53** (1.93)
Other controls	Yes	Yes	Yes	Yes
Observations	254	254	253	252
	Quarter t+5	Quarter t+6	Quarter t+7	Quarter t+8
Fiscal shock _t	0.19 (0.34)	0.16 (0.37)	0.14 (0.39)	0.13 (0.40)
Fiscal shock _t · Foreign Bias _{t-1}	4.71** (2.31)	4.83* (2.60)	4.79* (2.73)	4.46* (2.70)
Other controls	Yes	Yes	Yes	Yes
Observations	251	250	249	248

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

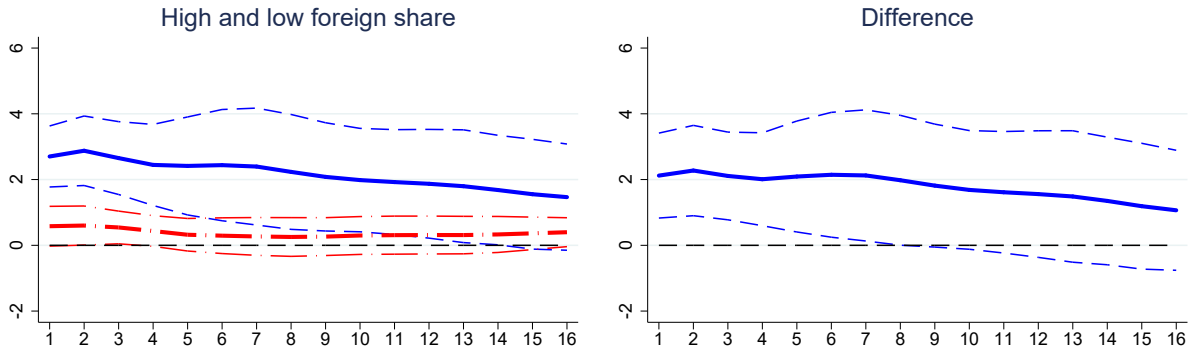
Table A3: **Foreign share: U.S. output multiplier (defense news shock only)**

	Quarter t+1	Quarter t+2	Quarter t+3	Quarter t+4
Fiscal shock _t	-0.13 (1.54)	-0.41 (1.69)	-0.35 (1.56)	-0.08 (1.30)
Fiscal shock _t · Foreign Bias _{t-1}	-0.02 (4.62)	-1.31 (4.87)	-2.82 (4.78)	-4.36 (4.64)
Other controls	Yes	Yes	Yes	Yes
Observations	254	254	253	252
	Quarter t+5	Quarter t+6	Quarter t+7	Quarter t+8
Fiscal shock _t	0.13 (1.14)	0.23 (1.03)	0.22 (0.98)	0.16 (1.00)
Fiscal shock _t · Foreign Bias _{t-1}	-6.69 (5.37)	-7.25 (5.54)	-7.14 (5.50)	-7.25 (5.83)
Other controls	Yes	Yes	Yes	Yes
Observations	251	250	249	248

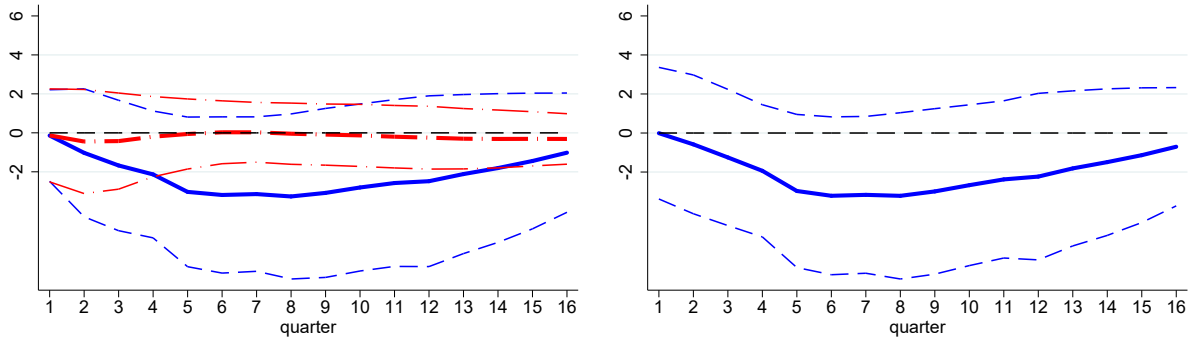
Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure A1: Foreign share: U.S. output multiplier
a. BP shock

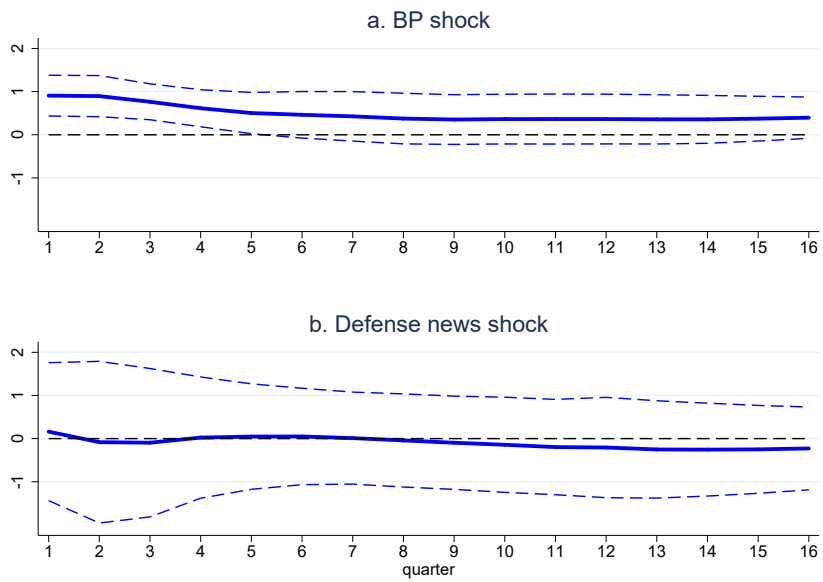


b. Defense news shock



Notes: Cumulative GDP multipliers from a government expenditure shock equal to 1% of GDP with low (10th percentile of foreign holdings in the sample, dashed red line) and high (90th percentile of foreign holdings in the sample, solid blue line) foreign share, and the difference between the two multipliers. In panel a, we instrument US government spending using a Blanchard-Perotti shock. In panel b, we use Ramey (2016)'s defense news shock as the instrument. The (outer dashed lines) confidence bands represent significance at the 10% level.

Figure A2: **Baseline model: U.S. output multiplier**



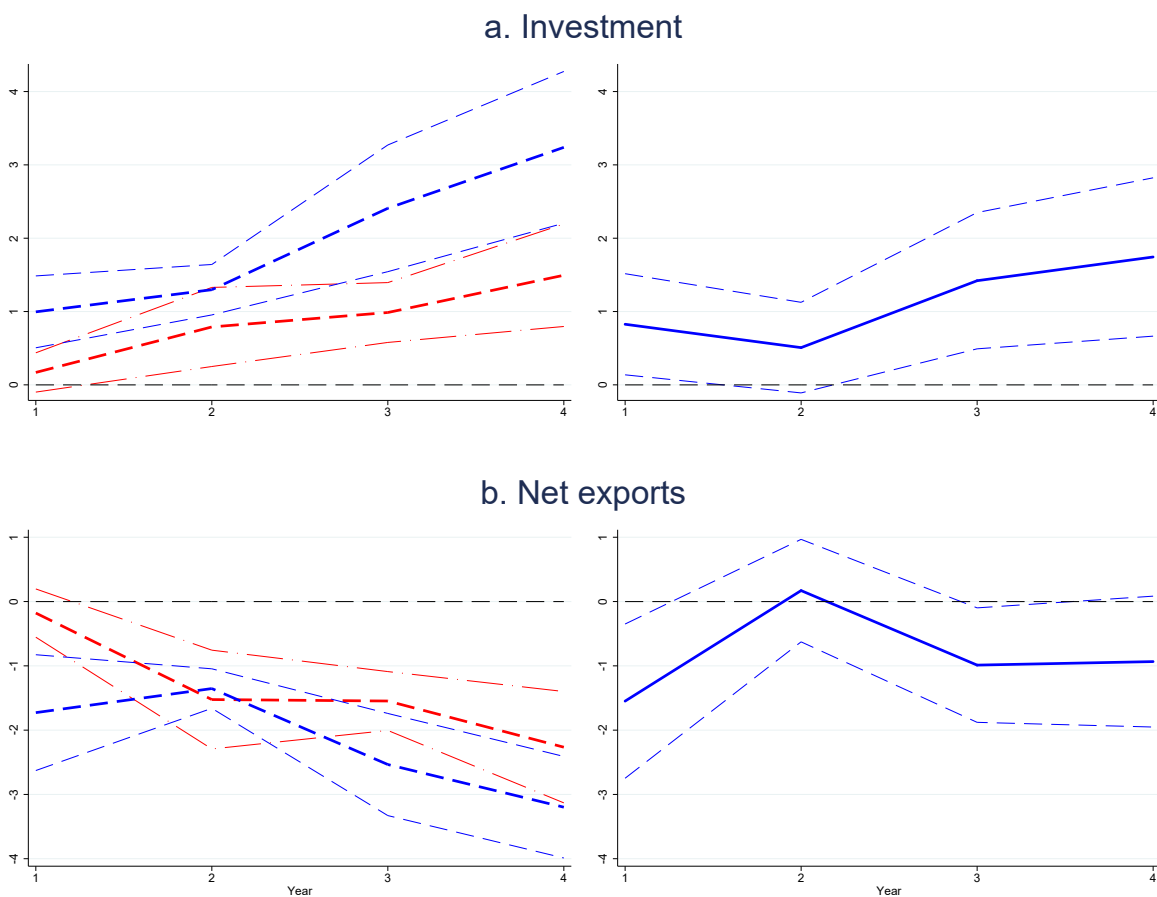
Notes: Cumulative GDP multiplier from a government expenditure shock equal to 1% of GDP. In panel a, we instrument US government spending using a Blanchard-Perotti shock. In panel b, we use Ramey (2016)'s defense news shock as the instrument. The (dashed lines) confidence bands represent significance at the 10% level.

B Additional analysis: International panel

In the main paper, we provide empirical evidence for the mechanism in our simple model by showing a much larger effect on investment and the current account when foreign holdings of US public debt are high. We now extend this analysis to our international panel. In particular, we run different versions of our panel regression that alternatively use investment and net exports instead of output as the dependent variable. The resulting cumulative multipliers are respectively depicted in panels a and b of Figure B.1, which plot these multipliers under a low and a high foreign share, as well as the difference between the two. The results show the same mechanism holds for the international panel.

We also test whether our results hold using cluster-robust standard errors. We show in Tables B.1 and B.2 that the linear and state-dependent results, respectively, are robust to the use of these standard errors.

Figure B1: **Foreign share: International panel multipliers**



Notes: Cumulative investment (panel a) and net exports (panel b) multipliers from a fiscal shock equal to 1% of GDP for low (10th percentile of foreign holdings in the sample, dashed red line) and high (90th percentile of foreign holdings in the sample, solid blue line) foreign share, and the difference between the two multipliers. The fiscal shock is cyclically-adjusted primary deficit instrumented by the narrative shocks from Guajardo et al. (2014), updated by Kataryniuk and Valles (2018). The (outer dashed lines) confidence bands represent significance at the 10% level.

Table B1: **International panel baseline model: output multiplier**

	Year t+1	Year t+2	Year t+3	Year t+4
Fiscal shock _t	0.29** (0.18)	0.41** (0.19)	0.50** (0.23)	0.56 (0.41)
Other controls	Yes	Yes	Yes	Yes
Observations	576	558	540	523

Notes: The fiscal shock is cyclically-adjusted primary deficit instrumented by the narrative shocks from Guajardo et al. (2014), updated by Kataryniuk and Valles (2018). The magnitudes of the shocks reflect the expected future budgetary impact of the consolidations, as a percentage of GDP. Clustered standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B2: **International panel foreign share: output multiplier**

	Year t+1	Year t+2	Year t+3	Year t+4
Fiscal shock _t	-0.69** (0.33)	-0.35 (0.46)	-0.25 (0.45)	-0.61 (0.67)
Fiscal shock _t · Foreign share _{t-1}	2.77*** (0.93)	1.87 (1.15)	2.54 (1.68)	4.64** (2.24)
Other controls	Yes	Yes	Yes	Yes
Observations	405	387	369	352

Notes: The fiscal shock is cyclically-adjusted primary deficit instrumented by the narrative shocks from Guajardo et al. (2014), updated by Kataryniuk and Valles (2018). The magnitudes of the shocks reflect the expected future budgetary impact of the consolidations, as a percentage of GDP. Foreign share is our measure of foreign holdings of public debt as a percentage of total public debt. Clustered standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

C Regression results: International panel

In this section, we provide the regression results underlying all the impulse responses for the international panel analysis contained in the main appendix.

Table C1: **International panel foreign share: Pre-crisis output multiplier**

	Year t+1	Year t+2	Year t+3	Year t+4
Fiscal shock _t	-0.77** (0.38)	-1.28 (0.87)	-1.58 (1.22)	-2.01 (1.39)
Fiscal shock _t · Foreign share _{t-1}	2.73* (1.49)	5.25* (2.70)	8.15 (5.30)	10.78* (5.76)
Other controls	Yes	Yes	Yes	Yes
Observations	272	255	238	221

Notes: The fiscal shock is cyclically-adjusted primary deficit instrumented by the narrative shocks from Guajardo et al. (2014), updated by Kataryniuk and Valles (2018). The magnitudes of the shocks reflect the expected future budgetary impact of the consolidations, as a percentage of GDP. Foreign share is our measure of foreign holdings of public debt as a percentage of total public debt. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C2: **International panel foreign share: Non-programme country output multiplier**

	Year t+1	Year t+2	Year t+3	Year t+4
Fiscal shock _t	-0.83** (0.40)	-1.38* (0.71)	-1.06 (0.75)	-1.25 (0.86)
Fiscal shock _t · Foreign share _{t-1}	3.77** (1.75)	6.81*** (2.33)	8.15** (3.68)	9.84*** (3.65)
Other controls	Yes	Yes	Yes	Yes
Observations	342	328	314	300

Notes: The fiscal shock is cyclically-adjusted primary deficit instrumented by the narrative shocks from Guajardo et al. (2014), updated by Kataryniuk and Valles (2018). The magnitudes of the shocks reflect the expected future budgetary impact of the consolidations, as a percentage of GDP. Foreign share is our measure of foreign holdings of public debt as a percentage of total public debt. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C3: **International panel foreign share: Output multiplier excluding reversals**

	Year t+1	Year t+2	Year t+3	Year t+4
Fiscal shock _t	-0.71 (0.48)	-0.45 (0.47)	-0.42 (0.44)	-0.96 (0.78)
Fiscal shock _t · Foreign share _{t-1}	2.88** (1.36)	2.14** (0.95)	2.65* (1.22)	5.25** (2.62)
Other controls	Yes	Yes	Yes	Yes
Observations	405	387	369	352

Notes: The fiscal shock is cyclically-adjusted primary deficit instrumented by the narrative shocks from Guajardo et al. (2014), updated by Kataryniuk and Valles (2018). The magnitudes of the shocks reflect the expected future budgetary impact of the consolidations, as a percentage of GDP. Foreign share is our measure of foreign holdings of public debt as a percentage of total public debt. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C4: **International panel foreign share: Expenditure-only output multiplier**

	Year t+1	Year t+2	Year t+3	Year t+4
Fiscal shock _t	-0.66 (0.59)	-0.52 (0.69)	-0.68 (0.73)	-1.51 (1.36)
Fiscal shock _t · Foreign share _{t-1}	3.21** (1.42)	2.68** (1.17)	4.01* (2.13)	6.87*** (2.48)
Other controls	Yes	Yes	Yes	Yes
Observations	405	387	369	352

Notes: The fiscal shock is cyclically-adjusted primary deficit instrumented by the narrative shocks from Guajardo et al. (2014), updated by Kataryniuk and Valles (2018). The magnitudes of the shocks reflect the expected future budgetary impact of the consolidations, as a percentage of GDP. Foreign share is our measure of foreign holdings of public debt as a percentage of total public debt. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C5: **International panel foreign share and financial openness: Output multiplier**

	Year t+1	Year t+2	Year t+3	Year t+4
Fiscal shock _t	-0.66 (0.40)	-0.57 (0.51)	-0.19 (0.45)	-0.56 (0.90)
Fiscal shock _t · Foreign share _{t-1}	2.34** (1.13)	2.65** (1.24)	2.85 (1.80)	5.80 (3.80)
Fiscal shock _t · Financial openness _{t-1}	0.03 (0.05)	-0.00 (0.05)	-0.02 (0.05)	-0.05 (0.08)
Other controls	Yes	Yes	Yes	Yes
Observations	405	387	369	352

Notes: The fiscal shock is cyclically-adjusted primary deficit instrumented by the narrative shocks from Guajardo et al. (2014), updated by Kataryniuk and Valles (2018). The magnitudes of the shocks reflect the expected future budgetary impact of the consolidations, as a percentage of GDP. Foreign share is our measure of foreign holdings of public debt as a percentage of total public debt. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C6: **International panel foreign share and credit rating: Output multiplier**

	Year t+1	Year t+2	Year t+3	Year t+4
Fiscal shock _t	-3.35 (4.07)	-5.11*** (1.86)	-7.10** (3.10)	-7.39 (5.34)
Fiscal shock _t · Foreign share _{t-1}	4.54 (5.07)	3.32** (1.51)	3.98* (2.30)	7.91* (4.16)
Fiscal shock _t · Credit rating _{t-1}	0.13 (0.17)	0.25*** (0.09)	0.37** (0.16)	0.34 (0.27)
Other controls	Yes	Yes	Yes	Yes
Observations	405	387	369	352

Notes: The fiscal shock is cyclically-adjusted primary deficit instrumented by the narrative shocks from Guajardo et al. (2014), updated by Kataryniuk and Valles (2018). The magnitudes of the shocks reflect the expected future budgetary impact of the consolidations, as a percentage of GDP. Foreign share is our measure of foreign holdings of public debt as a percentage of total public debt. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C7: **International panel foreign share with AIPW: Output multiplier**

	Year t+1	Year t+2	Year t+3	Year t+4
Fiscal shock _t	-0.76 (0.67)	-0.22 (0.47)	-0.13 (0.46)	-0.50 (0.75)
Fiscal shock _t · Foreign share _{t-1}	2.85 (2.14)	1.72* (0.99)	-2.71** (1.30)	5.03** (2.42)
Other controls	Yes	Yes	Yes	Yes
Observations	356	338	320	302

Notes: The fiscal shock is cyclically-adjusted primary deficit instrumented by the narrative shocks from Guajardo et al. (2014), updated by Kataryniuk and Valles (2018). The magnitudes of the shocks reflect the expected future budgetary impact of the consolidations, as a percentage of GDP. Foreign share is our measure of foreign holdings of public debt as a percentage of total public debt. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

References

- [1] Blanchard, O. J. and Perotti, R. (2002). “An empirical characterization of the dynamic effects of changes in government spending and taxes on output”, *Quarterly Journal of Economics*, 117(4): 1329-68.
- [2] Guajardo, J., Leigh, D., and Pescatori, A. (2014). “Expansionary austerity? International evidence”, *Journal of the European Economic Association*, 12(4): 949-968.
- [3] Kataryniuk, I. and Valles, J. (2018). “Fiscal consolidation after the Great Recession: The role of composition”, *Oxford Economic Papers*, 70(2): 563-585.
- [4] Ramey, V. A. and Zubairy, S. (2018). “Government spending multipliers in good times and in bad: Evidence from US historical data”, *Journal of Political Economy*, 126(2): 850-901.