DISCUSSION PAPER SERIES

DP17856

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Galina Hale, John Leer and Fernanda Nechio

INTERNATIONAL MACROECONOMICS AND FINANCE AND MONETARY ECONOMICS AND FLUCTUATIONS

ISSN 0265-8003

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Discussion Paper DP17856
Published 30 January 2023
Submitted 24 January 2023

Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

This Discussion Paper is issued under the auspices of the Centre's research programmes:

- International Macroeconomics and Finance
- Monetary Economics and Fluctuations

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JEL Classification: E31, E62, E65

Keywords: Covid-19 pandemic, inflation

Galina Hale - gbhale@ucsc.edu
UC Santa Cruz, NBER and CEPR

John Leer - jleer@morningconsult.com
Morning Consult

Fernanda Nechio - fernanda.nechio@sf.frb.org
Federal Reserve Bank of San Francisco and CEPR

Acknowledgements
We thank Ayaz Valetdinov, Viktoria Berestova, Ted Liu and Fabi´an Rivera-Reyes for excellent research assistance. We benefited from the comments of the participants of the Oslo Macro Conference in August 2022 as well as seminar participants at the University of Michigan. The views expressed in this paper are those of the authors and do not necessarily reflect the position of the Federal Reserve Bank of San Francisco, the Federal Reserve System or the Morning Consult Economics Intelligence.

Inflationary effects of fiscal support to households and firms*

Galina Hale† John Leer‡ Fernanda Nechio§

December 20, 2022

Abstract

Fiscal support measures in response to the COVID-19 pandemic varied in their targeted beneficiaries. Relying on variability across 10 large economies, we study differences in the inflationary effects of fiscal support measures targeting consumers or businesses. Because conventional measures of real activity were distorted, we control for the underlying state of real economy using households sentiment data. We find that fiscal support measures to consumers, but not firms, had inflationary effects that manifested 5 weeks following the announcement and peaked at 12 weeks. The magnitude of the effect was larger in an environment of improving consumer sentiment.

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†University of California, Santa Cruz, NBER, CEPR. E-mail: gbhale@ucsc.edu.

‡Morning Consult. E-mail: jleer@morningconsult.com.

§Federal Reserve Bank of San Francisco, CEPR. E-mail: fernanda.nechio@sf.frb.org.

1 Introduction

At the onset of the COVID-19 economic crisis many governments rapidly introduced support measures to alleviate the effects of lockdowns on consumer incomes and business revenues (Makin and Layton, 2021). Not surprisingly, the amount of support varied across countries and it was generally much larger in advanced than in emerging economies, partly due to limited fiscal space (Alberola-Ila et al., 2020, Benmelech and Tzur-Ilan (2020), Hürtgen (2020)). The types of fiscal support also varied across countries in a number of dimensions. Some countries focused on support in the form of income supplement or debt relief, while others had it directed at housing needs, or disbursed directly to households or indirectly through companies (such as Paycheck Protection Program in the U.S.). Some of the patterns of fiscal support are documented in Hale et al. (2021*a*) who constructed and keep updated a database of government responses to the crisis: the Oxford COVID-19 Government Response Tracker (OxCGRT).[1]

Textbook economics tells us that a fiscal expansion can lead to temporary increases in output, employment, and have effects on prices. Moreover, the literature has shown that fiscal policies were effective at mitigating some of the pandemic-related economic downturn (see, for example, empirical analysis by Chudik, Mohaddes and Raissi (2021) and theoretical treatment by Guerrieri et al. (2020) and Fornaro and Wolf, 2020).[2] At a disaggregated level, Gourinchas et al. (2020) and Gourinchas et al. (2021) document that fiscal support measures, while poorly targeted, reduced small and medium enterprise failures and alleviated demand constraints, relative to the counterfactual. More generally, there appears to be a consensus that such measures were necessary at the time (Baldwin and di Mauro, 2020).

Our paper contributes to this literature by studying the effects of fiscal measures on inflation in a sample of 10 large economies, including both advanced and emerging economies. Our approach is distinct in two ways. First, we consider a direct effect of fiscal support measures as well as its amplification through real activity. Because of the widespread lockdowns, conventional measures of economic activity were very sluggish during the COVID-19 economic crisis, which is why we resort to measures of consumer sentiment as reported in weekly surveys conducted by the Morning Consult.[3] These high-frequency sentiment data allows us to proxy for underlying economic conditions in a period when most of the usual measures of activity were severely impacted by mandatory or voluntary lockdowns. Second,

[1] Additional analysis, using the same data, is in Chen et al. (2021). The data are described in Hale et al. (2021*b*).

[2] Given the specifics of the COVID-19 recession, however, the real effects of the stimulus were lower than in a regular recession, at least in the U.S. (Baqaee and Farhi, 2020).

[3] Coibion, Gorodnichenko and Weber (2020) also rely on consumer sentiment data to document effects of lockdowns across U.S. regions.

we analyze differences in outcomes depending on the characteristics of the fiscal support. In particular, we compare the effects of policy measures depending on their main targeted beneficiaries — *i.e.*, households versus businesses.

We rely on two main sources of data. The Oxford Government Response Tracker (OxCGRT) database is the main source used to inform on countries' fiscal support by size and targeted groups. We turn to textual analysis of policy announcements, using supervised machine learning, to construct a breakdown of fiscal policies focused on consumers or businesses. The OxCGRT database is provided at daily frequency, but we aggregate it to weekly frequency to avoid unnecessary noise. In addition, we draw sentiment data from the Morning Consult Economic Intelligence Global Consumer Confidence survey, which we also aggregate to weekly frequency. Additional data on main economic aggregates come from standard sources (and detailed below).

We find that fiscal support measures, especially those targeting consumers directly, had a positive effect on inflation even in the early stages of the pandemic, when most economies were still closed. More specifically, our estimates show that a 10 percent GDP fiscal support announcement is associated with a 40 basis points increase in inflation rate within three months of the announcement. This effect is amplified if fiscal support is announced at the time of improving consumer sentiment about current conditions — raising total inflationary effect to about 60 basis points three months following the announcements. Interestingly, consumer expectations of future conditions do not seem to have the same impact.

In our analysis, we control for the severity of COVID-19 crisis, the extent of lockdowns, monetary policy changes, and monthly fixed effects. We also show that a) without controlling for consumer sentiment the inflationary effects of fiscal support are biased downwards and are less precisely estimated, and b) the same results could not be observed by relying on conventional measures of real activity, such as PMI, which shows very little dynamics in most countries. Our results are robust to a variety of specification changes, such as controlling for supply chain disruptions using Cavallo and Kryvtsov (2021) index of stockouts, excluding some of our controls, including additional controls, or varying the sample of countries.

A large number of papers have studied the economic impact of the pandemic and the effectiveness of mitigation policies. In addition to many country-specific studies,[4] there are a few cross-country studies that are closely related to the topic of our analysis. Furceri et al. (2021) study effectiveness of fiscal support measures for a large set of countries, including analysis by measure type, using fiscal measures classification methodology that is very different from ours. Jordà and Nechio (2022) study the impact of the rise in real disposable

[4]Outside of the U.S. studies, Andersen et al. (2022) study the effects of lockdowns on consumer spending in Denmark.

income, due to pandemic-related fiscal transfers on OECD-countries price and wage inflation. They find that countries that were more aggressive in their policies during the early stages of the pandemic, experienced a disproportionate rise in inflation rates in 2021. Makin and Layton (2021) divide fiscal policies into "stimulus" and "relief" and show that relief measures worked better to address short-term unemployment. These results are consistent with predictions of the theoretical contribution by Faria-e-Castro (2021). Karakaplan (2021) shows that the Paycheck Protection Program helped small businesses obtain credit, while Aizenman, Jinjarak and Spiegel (2022) show that fiscal support measures stimulated bank lending globally. Kahn and Wagner (2021) show that the ability of liquidity provision to address externalities depends on whether funds are distributed through banks or directly to non-financial firms. Finally, while our estimated magnitude of the effects of fiscal transfers on inflation are relatively small when compared to those estimated with a sample that includes 2021 (*e.g.*, de Soyres and Young, 2022 and Jordà and Nechio, 2022), the latter relied on a longer time sample, which included 2021 and 2022, when most economies had reopened and inflation started to pick up. Therefore, our estimates can be seen as the early stages of inflationary pressures that most countries faced through 2021 and 2022. Moreover, our findings highlight the role for the design of the fiscal support and show that whether it focused on households or businesses mattered to help explain the rise in inflation following the pandemic.

We proceed by describing our data sources and variable construction in Section 2. Section 3 describes our empirical methodology and findings. Section 4 concludes.

2 Data

Our sample includes data from February 19, 2020 to September 10, 2021 for 10 countries: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, the United Kingdom and the United States. This yields a unbalanced panel with either 77 (Australia, Brazil, Japan, Russia) or 82 weekly series per country.

Table A.1 provides summary statistics while Figure A.1 plots time series of all variables used in our estimates for each country.

2.1 Sentiment data

The time period we explore is characterized by compulsory and voluntary economic shut downs, with drastic declines and changes to the composition of aggregate demand. During

the early stages of the COVID-19 pandemic, lockdowns were preventing or delaying the responses of real economic activity to policy measures.[5] For this reason, standard measures of real economic activity might not have been reflecting the true state of the economy.

To bypass this issue, in our empirical analysis, we rely on measures of consumer sentiment extracted from surveys. These measures remained responsive to economic news, while real activity measures were sluggish or non-responsive due to lockdowns. As we show below, these measures can provide good proxies for underlying economic activity — they are both strongly correlated and also serve as good leading indicators of real activity.

We obtain consumer sentiment data from Morning Consult, which currently surveys about 19,000 adults per day across 44 countries.[6] This paper relies data from 10 of those countries. In the survey, households are asked about their views on current and expected personal financial conditions, future business conditions and current buying conditions. Morning Consult uses a stratified sampling process based on age and gender to reach a broad and nationally representative audience in each country. The interviews are conducted online through multiple nationally recognized vendors.

The survey includes five questions:

1. Personal Finances – Current Conditions: "We are interested in how people are getting along financially these days. Would you say that you (and your family living there) are better off or worse off financially than you were a year ago?"

2. Personal Finances – 12-month Expectations: "Now looking ahead — do you think that a year from now you (and your family living there) will be better off financially, or worse off, or just about the same as now?"

3. Business Conditions – 12-month Expectations: "Now turning to business conditions in the country as a whole — do you think that during the next twelve months we'll have good times financially, or bad times, or what?"

4. Business Conditions – 5-year Expectations: "Looking ahead, which would you say is more likely — that in the country as a whole we'll have continuous good times during the next 5 years or so, or that we will have periods of widespread unemployment or depression, or what?"

[5] For example, Auerbach et al. (2021) show that fiscal support was ineffective in U.S. cities that were subject to stricter lockdown measures.

[6] Additional description of the survey questions, collection methods and details on the indices construction are available at Morning Consult Economic Intelligence (2022).

5. Current Buying Conditions: "Thinking about the big things people buy for their homes — such as furniture, a refrigerator, stove, television, and things like that. Generally speaking, do you think now is a good or bad time for people to buy major household items?"

From these questions, Morning Consult produces three consumer confidence indices for each country:

- Index of Consumer Sentiment (ICS) that captures consumers' views regarding current and future personal financial conditions and business conditions in the country as a whole.
- Index of Consumer Expectations (ICE) measures consumers' expectations of their future personal financial conditions and business conditions in the country as a whole.
- Index of Current Conditions (ICC) reflects consumers' views of their current personal financial conditions and of current buying conditions for large household goods.

All three indices rely on the net scores of the five individual questions. For a given question, the net score equals the percentage of weighted positive values minus the percentage of weighted negative values plus 100. The Index of Consumer Sentiment (ICS) is a simple average of all five net scores. The Index of Consumer Expectations (ICE) is a simple average of the net scores of questions 2, 3 and 4. Finally, the Index of Current Conditions (ICC) is a simple average of the net scores of questions 1 and 5.

In our estimations we focus on consumers' answers from the aforementioned 10 countries. Moreover, for brevity, we focus on the ICS index as describing general economic conditions and separate it into its current and expectation components, ICC and ICE, respectively. The responses are highly correlated across all five questions and across the indices. Therefore, our results are robust to using any of the above measures. However, the contemporaneous correlation between ICC and ICE is somewhat lower, 66%.

2.2 Fiscal measures data

The data on fiscal support measures were obtained from the Oxford University "COVID-19 Government Response Tracker." More specifically, we rely on the indexes of economic support and on measures of crisis severity, such as the number of deaths and the stringency of health and mobility restrictions.

In addition, we relied on the notes associated with each country fiscal measure to obtain details of policy announcements.[7] We conducted a textual analysis of these announcements using a supervised machine-learning algorithm. This allows us to further classify the types of fiscal support provided and get information on the duration of each measure. As a result, we classify fiscal measures as focused on consumer, businesses or both. The data are available at daily frequency, which we aggregate to weekly for our analysis. Moreover, we inspect each data point of our fiscal series to make sure that fiscal package data are reported in U.S. dollars, as detailed below. For further details on this dataset, see Hale et al. (2021*b*).

The data provide four indexes for economic support. The first is an ordinal index of the presence and scale of income support with 0 indicating no income support, 1 indicating income support replacing less than 50% of lost salary, and 2 indicating income support replacing more than 50% of lost salary. The lack of data is indicated with missing values. This index is accompanied by a binary variable indicating whether only formal sector workers or all workers are affected. The second index measures whether this is a debt contract relief for households, which also entails a ordinal index that equals 0 to indicate no debt/contract relief, 1 to indicate a relief specific to a particular contract, and 2 for a broad relief. The third variable is a monetary value in U.S. dollars of the fiscal stimuli, only reflecting new spending announced at a particular day, with 0 indicating no new announcements.[8] The fourth index provides information on financial aid to other countries, which we do not use.

We further analyzed the narrative information provided in the notes associated with the package to gather additional information when possible. Using these notes, we are able to identify whether particular fiscal support is disbursed directly to consumers or if it is distributed to businesses, even if for the purpose of payroll support. We were also able to flag any support that is related directly to medical or health expenses, whether at individual or medical establishment level, which we exclude from fiscal support measures. The details of our textual analysis procedure are reported in Appendix A.

We scale the support measures by country's nominal 2019 GDP, which we obtained from the OECD Quarterly National Accounts and from the St. Louis Fed FRED.

2.3 Crisis severity data

We also draw on "COVID-19 Government Response Tracker" data to control for the pandemic severity in each country. These data include the stringency index, which reflects the

[7] At times, the notes provide links to the policy announcements which we rely on to obtain additional details or clarifications.

[8] Some data points are reported in local currency. For those, we used the average exchange rate of the corresponding month to convert the announced value to U.S. dollars.

severity of lockdown policies, a containment health index that reflects measures addressing the spread of the virus, and the number of confirmed deaths due to COVID-19 virus, which serves as a proxy for the severity of the pandemic in the country. We believe the number of deaths is a good measurement for the pandemic severity in cross-country analysis, as other measures such as the number of confirmed cases or hospitalizations could reflect countries' differences in infrastructure and testing availability. Moreover, another candidate measure, test positivity rates, is not available for the full sample we consider. Many of these measures are highly correlated, and we find that only the number of deaths has a significant coefficient in our regressions, thus we retain this as the control variable.

Finally, we collect data on 2019 population from The World Bank "World Development Indicators Database" to scale number of deaths by country.

2.4 Macroeconomic data

We obtain year-on-year inflation rates from the International Monetary Fund database and interpolate them linearly from monthly to weekly frequency.

To assess whether sentiment measures provide a good forward-looking proxy for real economic activity, we collect data for purchasing managers index (PMI) for the manufacturing and service sectors from Bloomberg.

We also collect from Bloomberg data on 3-month and 2-year government bond yields for each country in the sample. We use both the 3-month rates and the difference between 2-year and 3-month yields as measures of monetary policy stance, which we include as control variables in our regressions. We do not use policy rates because some countries have hit their effective lower bounds and relied on unconventional monetary policies during the pandemic. The aforementioned yields have been shown to better reflect the monetary policy stance in such cases (*e.g.*, Swanson and Williams, 2014*a* and Swanson and Williams, 2014*b*).

3 Empirical analysis

We conduct our analysis using local projections (Jordà, 2005) at weekly frequency, using a panel of 10 countries, i, over about 80 weeks, t, and a forecast horizon of 16 weeks, j. We consider a series of regression specifications, which we detail below. In all them we include 4 lags of dependent and explanatory variables.[9] We consider as outcome variables

[9]We estimated the same set of regressions with 8 lags and the results are robust to this change. However, lags over 4 are not statistically significant and the resulting coefficients of interest are less precisely estimated.

either inflation π or sentiment S, and include as explanatory variables the fiscal support measures ($Fiscal$). We also rely on a set of control variables (X), which include, without lags, the number of COVID-related deaths per capita, the severity of the lockdowns, 3-month government bond rate and the difference between 2-year and 3-month government bond rates, as well as country and time (monthly) fixed effects. The latter fixed effects absorb all time-invariant country-level factors as well as other common trends and fluctuations. Robust standard errors ε are clustered by country to allow for autocorrelation in error terms at each country.

3.1 Sentiment measures as a proxy for economic activity

We begin by verifying that sentiment measures are good forward-looking proxies for real activity by estimating a local projection model of the change in PMI on the change in ICS, ICC, or ICE, controlling for the extent of lockdowns as measured by stringency index and COVID-related deaths per capita, at weekly frequency.

$$\text{PMI}_{it+s} = \alpha_i + \alpha_{tm} + \sum_{r=1}^{4} \beta_{PMI,r} \text{PMI}_{it-r} + \sum_{r=1}^{4} \beta_{S,r} S_{it-r} + X'_{it}\gamma + \varepsilon_{it}, \quad s \in [0, 16], \qquad (1)$$

where α_i is a set of country fixed effects, α_{tm} is a set of monthly time fixed effects, S_{it} is a Consumer Sentiment Index (ICS), or its components, ICC or ICE, and X_{it} is a set of controls.

The results are reported in Figure 1. The figure shows that all three sentiment indexes are strong predictors of PMI, with the latter reacting with a lag of about 2 weeks and the effect persisting through week 4. The peak effect of ICC on PMI is about twice as large as the ICE. This suggests that at short horizons, sentiment measures, especially those reflecting current conditions, can provide a good proxy for real activity. This is particularly important for our next set of estimates since during the pandemic real activity was severely impacted by lockdowns.[10]

3.2 Fiscal support and real activity

Next, we assess the effects of fiscal support by testing whether fiscal support measures had any effect on consumer sentiment (our proxy for the underlying economic activity). We

[10]This holds despite the low contemporaneous correlation (about 10%) between PMI and sentiment measures in the sample.

estimate:

$$Y_{it+s} = \alpha_i + \alpha_{tm} + \sum_{r=1}^{4} \beta_{Y,r} Y_{it-r} + \sum_{r=1}^{4} \beta_{F,r} \text{Fiscal}_{it-r} + X'_{it}\gamma + \varepsilon_{it}, \quad s \in [0, 16], \tag{2}$$

where Y is the change in ICS, ICC, or ICE.

We analyze separately the effects of total fiscal support, fiscal support to consumers, and fiscal support to firms. The results are reported in Figure A.2 for overall sentiment index (ICS), and for the effect on current (ICC) and expectation components of sentiment (ICE). The figure shows that fiscal support slightly improves consumer sentiment (especially its current conditions component) with a lag of about two weeks, but by a small and not statistically significant amount. As we would expect, given the lockdowns in place early during the COVID-19 recession and later due to supply chain constraints, there is no effect of fiscal support on PMI (see the top panel of the Appendix Figure A.3).[11] Given this small response in economic activity to fiscal stimulus, it is possible that fiscal support may be inflationary, which is the central question of our analysis and to which we turn next.

3.3 Fiscal support and inflation

We turn now to the question on whether the fiscal package announcements had effects on inflation. As a first pass, we estimate the effect of fiscal measures on inflation without accounting for their effect on sentiment, our proxy for real activity. In particular, we estimate:

$$\pi_{it+s} = \alpha_i + \sum_{r=1}^{4} \beta_{\pi,r} \pi_{it-r} + \sum_{r=1}^{4} \beta_{F,r} \text{Fiscal}_{it-r} + X'_{it}\gamma + \varepsilon_{it}, \quad s \in [0, 16]. \tag{3}$$

We estimate this regression for overall fiscal support as well as separately for fiscal support to consumers and fiscal support to firms (three separate regressions). The results are reported in Figure 2. They show the response of inflation to a 1 percentage point of GDP increase in fiscal support. For completeness, the Appendix Table A.2 reports coefficient estimates associated with equation (3) for the first six forecast horizons.

Figure 2 shows that on impact, the effect of fiscal support on inflation is negative but not statistically significant. However, with about a three-month lag (13 weeks), the effects turn positive and statistically significant. The figure shows that a one standard deviation

[11] This result is in contrast with that in Furceri et al. (2021) who find an effect of fiscal support on PMI. However, our analysis is based on different data sources, sample, and methodology. Moreover, since this correlation is not central to our analysis we do not delve into the exact reason for such differences.

increase in fiscal support (1.3 percent of GDP) leads to about 2.5 basis points increase in the inflation rate. Comparing the three panels of Figure 2 shows that the overall effect of fiscal measures on inflation is driven by the response of inflation to fiscal support to consumers, while the effect of the fiscal support to firms is much smaller and not statistically significant across all horizons.

Our next step is to introduce consumer sentiment (measured by the ICS and its four lags) to our set of control variables. Our findings of Figure 1 suggest that changes to sentiment serve as good proxies for response of real economic activity despite the muted responses in PMI during the early stages of the pandemic. Therefore, this additional control allow us to get closer to the effects of fiscal stimulus on inflation through demand channels. More specifically, we estimate:

$$\pi_{it+s} = \alpha_i + \sum_{r=1}^{4} \beta_{\pi,r}\pi_{it-r} + \sum_{r=1}^{4} \beta_{F,r}\text{Fiscal}_{it-r} + \sum_{r=1}^{4} \beta_{S,r}S_{it-r} + X'_{it}\gamma + \varepsilon_{it}, \quad s \in [0, 16].$$

The results are reported in Figure A.4. We can see that simply controlling for consumer sentiment, apart from increasing the precision of estimates somewhat, does not alter the results of the naive specification (3) – fiscal support to consumers appears to have only a small, delayed, and non-persistent effect on inflation, while fiscal support to firms has none.[12]

Finally, we test for the possibility that the inflationary effect of fiscal support may be amplified (or dampened) when accompanied by an improvement in consumer sentiment. Thus, we depart from the above estimation to include the interaction of fiscal and consumer sentiment:

$$\begin{aligned} \pi_{it+s} = \quad & \alpha_i + \sum_{r=1}^{4} \beta_{\pi,r}\pi_{it-r} + \sum_{r=1}^{4} \beta_{F,r}\text{Fiscal}_{it-r} + \sum_{r=1}^{4} \beta_{S,r}S_{it-r} \\ + \quad & \sum_{r=1}^{4} \beta_{FS,r}S_{it-r} * \text{Fiscal}_{it-r} + X'_{it}\gamma + \varepsilon_{it}, \quad s \in [0, 16]. \end{aligned} \tag{4}$$

The results are reported in Figures A.6-A.9, which show the effects of fiscal support (β_F) and its interaction with changes in ICS, ICC, and ICE, respectively (β_{FS}). The Appendix Figures A.7-A.10 report the main effects of fiscal support on inflation (β_S), for completeness.

Focusing on the results with the overall sentiment index (ICS), Figure A.6 shows that the main effect a 1 percent of GDP increase in fiscal support increases inflation gradually by about 3 basis points, becoming statistically significant at about the 3-months mark. It also shows that the effect of the interaction between fiscal and sentiment is initially positive, gradually declining to zero over four months, but is never statistically significant. The results

[12]Controlling instead for ICC or ICE produces similar results that are available upon request.

are similar, albeit a bit noisier, if we focus on the expectations component of consumer sentiment in Figure A.9.

However, when we turn to Figure 3, which reports the coefficient estimates when considering current conditions component (ICC) as our measure of sentiment, the findings of Figure 3 are amplified. More specifically, both the main effect of fiscal support on inflation (β_F) and the effects of the interaction between fiscal and sentiment (β_{FS}) are positive and statistically significant.

The results show that, in the absence of consumer sentiment changes, inflationary effects are about 2 basis points per 1 percent of GDP stimulus after one month, and it increases to about 4 basis points in the following months. If an increase in fiscal support is accompanied by an improvement in consumer sentiment, there is an additional inflationary effect: a combination of a one percent of GDP increase in fiscal support with one standard deviation increase in ICC (which is 2.23) leads to an overall effect on inflation of about 6 basis points.[13]

To make proper sense of these magnitudes, however, we should consider the actual extent of the fiscal support observed during the COVID-19 crisis in each country. Overall, some countries' announcements were as large as 25 percent of GDP (Figure A.1), and the cumulative fiscal support over the course of our sample reached as high as 48 percent of GDP for total support, 33 percent of GDP for support to consumers and 32 percent of GDP for support to firms (Appendix Figure A.11). Therefore, in Figure 4 we plot the predicted effect of a 10 percent of GDP fiscal support on inflation with and without a simultaneous one standard deviation increase in ICC (which is 2.23) or the same increase in ICE, using our results reported in Figures 3 and A.9. The figure shows that a 10 percent of GDP fiscal support, which is relatively modest during the COVID-19 crisis has inflationary effects of about 40 basis points in the absence of any changes to ICC. When this effect is combined with an increase in ICC, the inflationary effect reaches as high as 60 basis points. The increase in ICE by the same amount has a much smaller amplification effect (omitted, for brevity), as already indicated by the findings reported in Figure A.9.

Overall, our results show that the direct inflationary effect of fiscal policy is amplified when conducted in an environment of improving consumer sentiment, especially, for consumers' perceptions of current conditions. It is worth noting that in our analysis we include monthly time fixed effects, therefore, our results are not driven by the inflationary trends.

[13]Importantly, the same effect is not observed when we, instead, include an interaction of fiscal support with the change in PMI rather than sentiment in equation (4). As Appendix Figure A.5 shows, the interaction of fiscal support with PMI does not show any additional effect on inflation.

3.4 Robustness tests

In this section we consider a few variations of our main estimates to test for the robustness of our findings.

First, we narrow down the set of announcements we include in our regressions. More specifically, many announcements of fiscal support included both measures directed to firms as well as measures directed to consumers. As a result, there is a considerable overlap in our breakdown of fiscal support measures by type. If we instead isolate announcements of fiscal support that targeted consumers and not firms and announcement that targeted firms and not consumers, we will miss a large number of announcements. However, we tested whether our result that fiscal support to consumers has a stronger impact on inflation by applying such exclusionary definitions. The results are reported in Appendix Figure A.12. We can see that inflationary effects come from support to consumers, but not to firms.

Next, we turn to our proxy for economic conditions. Given that we found no strong contemporaneous correlation between ICC and PMI, we can include both measures, simultaneously, in our regressions. We depart from equation (4) to include PMI (and its lags) both directly and interacted with the fiscal variable:

$$\begin{aligned}\pi_{it+s} = \quad & \alpha_i + \sum_{r=1}^{4}\beta_{\pi,r}\pi_{it-r} + \sum_{r=1}^{4}\beta_{F,r}\text{Fiscal}_{it-r} + \sum_{r=1}^{4}\beta_{S,r}S_{it-r} \\ + \quad & \sum_{r=1}^{4}\beta_{FS,r}S_{it-r} * \text{Fiscal}_{it-r} + \sum_{r=1}^{4}\beta_{PMI,r}\text{PMI}_{it-r} \\ + \quad & \sum_{r=1}^{4}\beta_{FPMI,r}\text{PMI}_{it-r} * \text{Fiscal}_{it-r} + X'_{it}\gamma + \varepsilon_{it}, \quad s \in [0,16].\end{aligned} \tag{5}$$

The results are reported in Appendix Figure A.13. It shows the findings reported on Figure 3 are qualitatively unchanged.

In a recent paper, Cavallo and Kryvtsov (2021) show that stockouts tend to have inflationary effects. Therefore, stockouts might be an omitted variable in our analysis. In Figure A.14 we show that for the sample for which stockout data are available (6 out of 10 countries), the response of sentiment measures or PMI is minimal. Thus, we are not too concerned about omitted variable bias. However, we test for the robustness of our results by including "all stockouts" indicator as a control variable, along with others. The results for the main effect are reported in Figure A.15 and show smaller standard errors but basically the same response of inflation to fiscal support. Note that the differences between these and benchmark results are driven by both the change to the sample of countries and by the inclusion of an additional control. Because of the more limited sample of the stockout data,

we do not include it as control in our benchmark results.

We also assessed the robustness of our findings with respect to the regressions specifications.[14] We find that:

- Our results are robust to including up to 8 lags in the regression (instead of 4), with lags above 4 showing coefficients that are not statistically significant.
- We include a contemporaneous measure of the stringency of lockdowns in all regressions. However, in most specifications it does not result in a significant coefficient. Our results are robust to excluding this measure from the list of controls.
- Our results are robust to excluding monetary policy controls, which are also not statistically significant in most specifications. Without such controls, the effects are slightly smaller in magnitude (by about 0.5 basis points on the main effect at the peak) and are less precisely estimated.
- Our results are robust to including fixed effects for years instead of months or to including quadratic trends. However, we believe that monthly fixed effects are the most flexible specification.
- Our results do not change if exclude the U.S. from our sample.

We also considered alternative measures of real activity and inflation. First, we estimated the effect of fiscal support on core inflation, as reported in Figure A.16 and found that the results are very similar to those with headline inflation. Next, instead of PMI we used the growth rate of industrial production (IP). The bottom half of Figure A.3 and Figure A.17 show the effects of fiscal support and of the sentiment index on IP. We can see that the IP does not increase due to fiscal support and, in fact, shows a lagged decline that is small in magnitude. The response of IP to sentiment is similar to that of the PMI shown in Figure 1. Thus, our results are robust to these alternative measures.

Finally, we explored another dimension of our data — whether the inflationary effects of fiscal support were different depending on whether it took form of cash payments or any other support that did not involve cash. We did not find robust differences across these support types.

[14] The results of these tests are available upon request.

4 Conclusion

We study a straightforward question of whether there is evidence that fiscal support measures during COVID-19 crisis had inflationary effects. We show that two refinements to the analysis are important. First, most of the inflationary effect of fiscal support occurs when measures are directed at consumers rather than firms.[15] Second, we find that controlling for real economic conditions, proxied with measures of consumer sentiment, rather than conventional real activity measures, is important for obtaining more accurate results. We find that the inflationary effect of fiscal support was relatively quick to ensue but moderate in the early stages of the pandemic. Importantly, fiscal support conducted in an environment of improving sentiment about current conditions, was 50 percent more inflationary than in the absence of improving sentiment.

Note that our analysis focuses on the 2020 to mid-2021 developments, and therefore, our analysis and findings are not designed to explain the recent increase in inflation globally. Our estimated effects reflect the effects of fiscal packages in the early stages of the pandemic and we focus on the different impacts depending whether the policies were directed to consumers or firms. Because we focus the analysis on the weeks following the announcements of fiscal packages, we assess their inflationary effects even when economies were partially or completely shut down. For that reason, our estimates do not capture the significant rise in inflation that followed the economies' reopening from mid-2021 on. Therefore, we cannot compare our estimates to those who studied inflation since then.

Finally, while our analysis shows that fiscal support to consumers was more inflationary than the support directed to businesses, it is important to keep in mind that in some countries such support can also be more effective in terms of achieving its goals, especially those beyond aggregate macroeconomic stimulus.[16]

[15] These findings are in line with Didier et al. (2020), which shows that fiscal support to firms may allow for firm "hibernation," and argue that the support was important to avoid externalities associated with firm failures and is less likely to be inflationary.

[16] For example, a recent study by Chetty et al. (2020) shows that social insurance was more effective in alleviating hardship in the U.S. than other measures.

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Figure 1: Effect of Sentiment on Manufacturing PMI

Notes: Local projections regressions are estimated by OLS: $\text{PMI}_{it+s} = \alpha_i + \sum_{r=1}^{4} \beta_{PMI,r}\text{PMI}_{it-r} + \sum_{r=1}^{4} \beta_{S,r} S_{it-r} + X'_{it}\gamma + \varepsilon_{it}, \quad s \in [0, 20]$. Time period t is a week. All regression include country fixed effects, trend, an indicator of year 2021, stringency index, and the number of COVID-related deaths per capita. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.

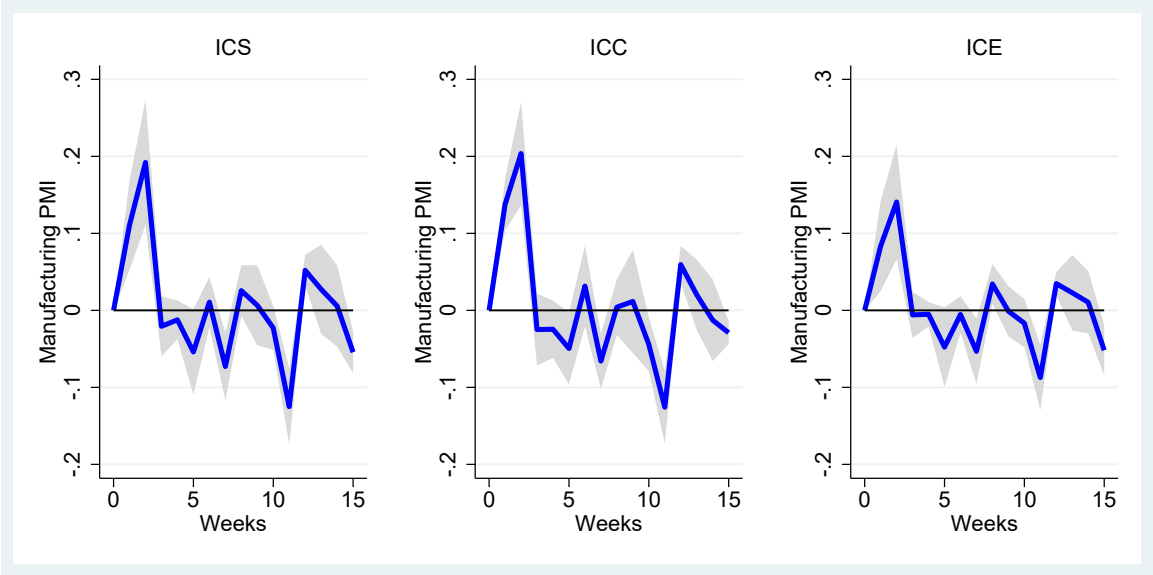


Figure 2: Effects of Fiscal Support on Inflation

Notes: Local projections regressions are estimated by OLS: $\pi_{it+s} = \alpha_i + \sum_{r=1}^{4} \beta_{\pi,r}\pi_{it-r} + \sum_{r=1}^{4} \beta_{F,r}\text{Fiscal}_{it-r} + X'_{it}\gamma + \varepsilon_{it}, \quad s \in [0, 20]$. Time period t is a week. All regression include country fixed effects. Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. X includes trend, an indicator of year 2021, stringency index, and the number of COVID-related deaths per capita. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.

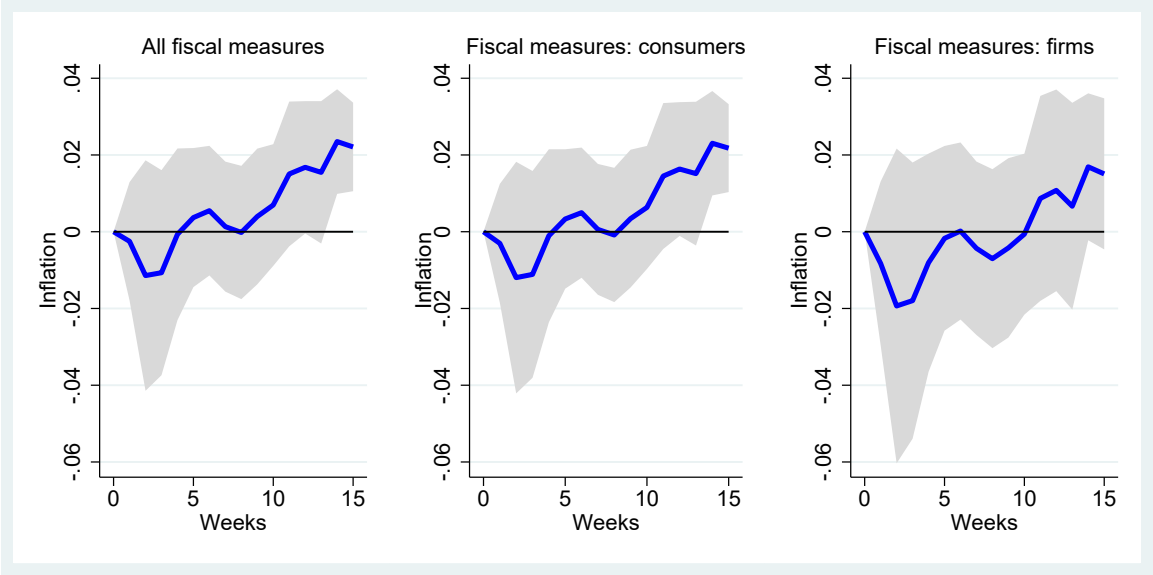


Figure 3: Effects of Fiscal Support on Inflation, Interactions with Sentiment : ICC

Notes: Reported are β_F and β_{FS} effects from local projections regressions estimated by OLS specified in equation (4) Time period t is a week. All regression include country fixed effects. Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. Controls include trend, an indicator of year 2021, stringency index, and the number of COVID-related deaths per capita. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.

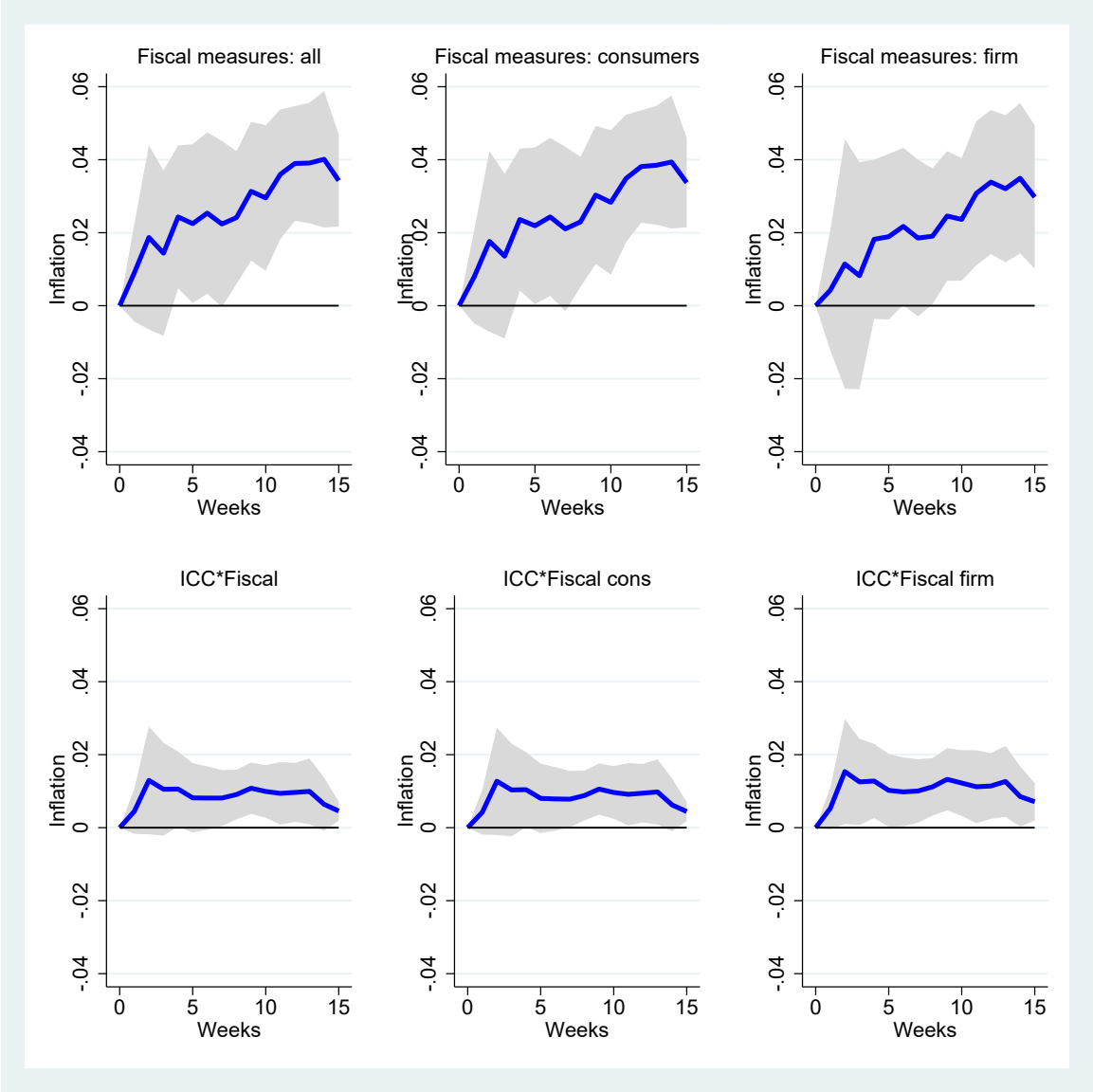
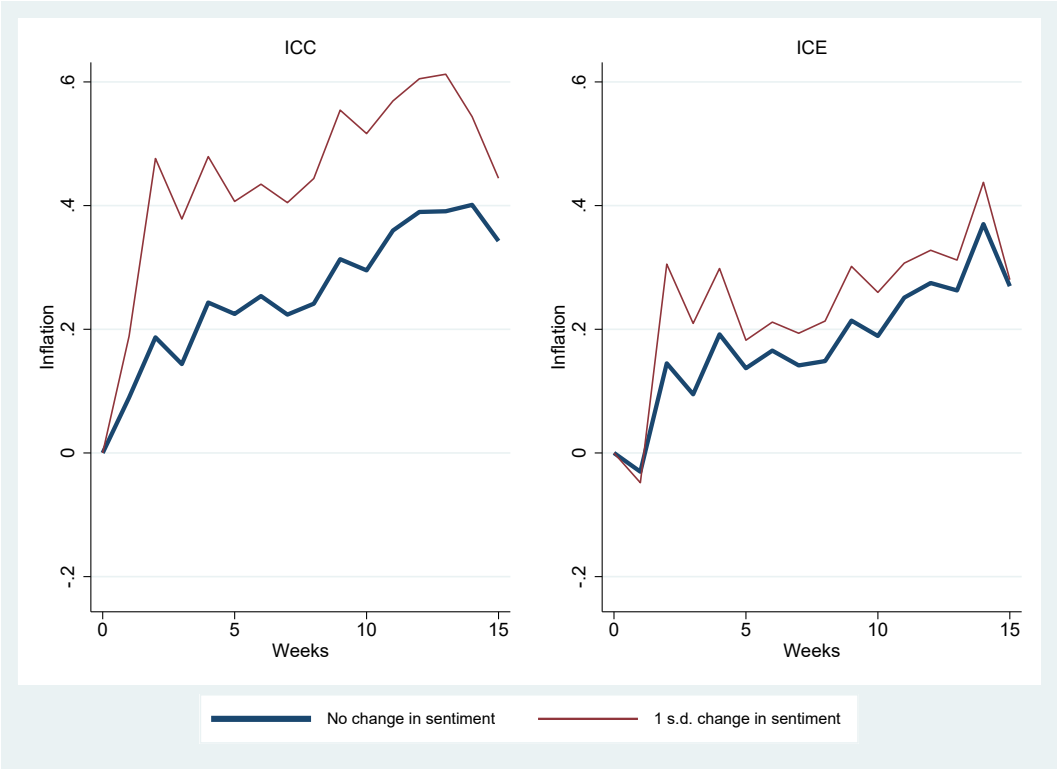


Figure 4: Magnitudes of the Effects of Fiscal Support on Inflation, Interactions with Sentiment : ICC

Notes: Reported is the predicted effect of total fiscal support of 10 percent of GDP on inflation, from equation (4). 1 s.d. of ICC is 2.23 and the same change is applied to ICE. These predictions correspond to impulse response functions in Figures A.9 and A.9.



A Appendix

A. Fiscal support measures classification process

We followed the following procedure to classify fiscal support measures into those directed at consumers or firms:

1. We collected from OxCGRT raw data spreadsheet with sources that were either direct text of fiscal support communications or links to such texts. We looked for English versions. [17]

2. We saved each announcement as an individual data field and used textual analysis for harvesting common terms.

3. We manually classified common terms harvested from the data into categories that would allow various classification types. This step produced narrow (overlapping) classification vocabularies. For example, a narrow vocabulary of "support to students" was the following list: "students" "education" "schools" "high school" "public schools" "school students" "learning recovery" "support learning" "students returning" "students work" "college students."

4. We used string search to code whether each policy contained terms from a specific classification vocabulary, assigning 0 or 1, depending on whether such terms were found.

5. We aggregated the results that were based on narrow classification into broader categories — for this project, whether a given measure was directed at consumers, firms, or both. For support for consumers we combined support to students, to poor, to employees, to unemployed, to self-employed, to households, for housing, and for sick leave, unless sick leave was part of the support of the program directed at firms. We also explored classification for whether the support measure included cash payments or not (that, is only fiscal support that included debt forgiveness, payment deferrals, but no cash payments).

[17] During this step we also cleaned the OxCGRT data for errors in the amounts, many of which came from incorrect interpretation of the currency. We used exchange rates on the day of the announcement to translate all amounts to U.S. dollars.

Table A.1: Summary Statistics

Notes: Fiscal is a cumulative fiscal support as a share of GDP, Fiscal^C for consumers, Fiscal^F for firms. Deaths per capita is the number of COVID-related deaths per 1000 people. Unbalanced panel includes 1100 observations weekly starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.

Variable	Mean	Std. Dev.	Min	Max
Inflation rate (π)	2.376	2.399	-1.194	10.74
Fiscal	0.16	1.34	0	25.99
Fiscal^C	0.16	1.33	0	25.99
Fiscal^F	0.13	1.19	0	25.99
Manufacturing PMI	52.59	6.59	30.8	66.7
ΔManufacturing PMI	0.050	1.81	-16.2	13.3
ICS	82.47	15.08	46.5	128.6
ICC	85.24	10.11	58.6	115.3
ICE	80.62	20.89	37.7	137.9
ΔICS (S)	-0.023	2.17	-15.3	6
ΔICC (S)	-0.047	2.23	-15.0	7.4
ΔICE (S)	-0.0074	2.46	-15.5	7.6
Stringency index	57.46	18.04	0	87.96
COVID-related deaths per capita	0.571	0.572	0	2.346
3-month government bond rate	0.78	2.10	-0.96	10.2
2yr-3m government bond rate	0.34	0.84	-0.35	6.02

B. Data description and additional empirical results

This Appendix contains summary statistics, a representative regression table, and additional impulse response functions.

Table A.2: Effect of Fiscal Support on Inflation

$\pi_{it+s} = \alpha_i + \sum_{r=1}^{4} \beta_{\pi,r}\pi_{it-r} + \sum_{r=1}^{4} \beta_{F,r}\text{Fiscal}_{it-r} + X'_{it}\gamma + \varepsilon_{it}$,
$s \in [0, 20]$

LHS:	π_t	π_{t+1}	π_{t+2}	π_{t+3}	π_{t+4}	π_{t+5}
π_{t-1}	0.724***	0.639***	0.745***	0.731***	0.646***	0.588***
	(0.051)	(0.057)	(0.051)	(0.060)	(0.052)	(0.046)
π_{t-2}	-0.003	0.187**	0.098*	0.002	-0.008**	0.063*
	(0.008)	(0.069)	(0.044)	(0.003)	(0.004)	(0.031)
π_{t-3}	0.193**	0.094*	-0.005	-0.007	0.073**	0.131*
	(0.071)	(0.042)	(0.005)	(0.007)	(0.028)	(0.062)
π_{t-4}	-0.007	-0.054	-0.002	0.079	0.056	-0.048
	(0.050)	(0.076)	(0.080)	(0.081)	(0.087)	(0.083)
Fiscal_{t-1}	-0.011	-0.011	-0.001	0.004	0.005	0.001
	(0.018)	(0.016)	(0.014)	(0.011)	(0.010)	(0.010)
Fiscal_{t-2}	-0.007	0.002	0.005	0.010	0.007	0.003
	(0.012)	(0.011)	(0.009)	(0.008)	(0.008)	(0.009)
Fiscal_{t-3}	0.006	0.006	0.009	0.006	0.004	0.005
	(0.007)	(0.007)	(0.007)	(0.008)	(0.009)	(0.010)
Fiscal_{t-4}	0.009*	0.012*	0.010	0.009	0.009	0.011
	(0.005)	(0.006)	(0.008)	(0.009)	(0.010)	(0.010)
Stringency Index	-0.002	-0.003	-0.003	-0.001	-0.002	-0.002
	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)
Deaths per capita	0.314*	0.432*	0.516*	0.616*	0.742*	0.847*
	(0.152)	(0.217)	(0.258)	(0.313)	(0.376)	(0.431)
3m bond rate	-0.051	-0.075	-0.102	-0.126	-0.154	-0.178
	(0.033)	(0.046)	(0.063)	(0.080)	(0.090)	(0.099)
2y-3m bond rate	0.028	0.044	0.065	0.092	0.118	0.145
	(0.025)	(0.037)	(0.048)	(0.067)	(0.082)	(0.095)
Observations	965	961	957	953	949	939
R^2	0.969	0.961	0.956	0.950	0.940	0.934

Notes: Local projections regressions are estimated by OLS. Only first four regressions (out of 20) are reported. Time period t is a week. π is inflation rate, annualized and interpolated to weeks from months, Fiscal is a cumulative fiscal support as a share of GDP, ICS is Consumer Sentiment Index, Deaths per capita is the number of COVID-related deaths per capita. All regression include country and monthly time fixed effects. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors clustered on country are reported in parentheses. * = significant at 10%, ** = significant at 5%, *** = significant at 1%.

Figure A.1: Time series of all variables

Notes: The left-hand-side variables are indices, with PMI centered at 50 and ICS, ICC and ICE centered at 100. The right-hand-side variables are reported as percentages. Inflation rate corresponds to year-on-year change to prices, and the remaining three fiscal variables are reported as shares of 2019 nominal GDP.

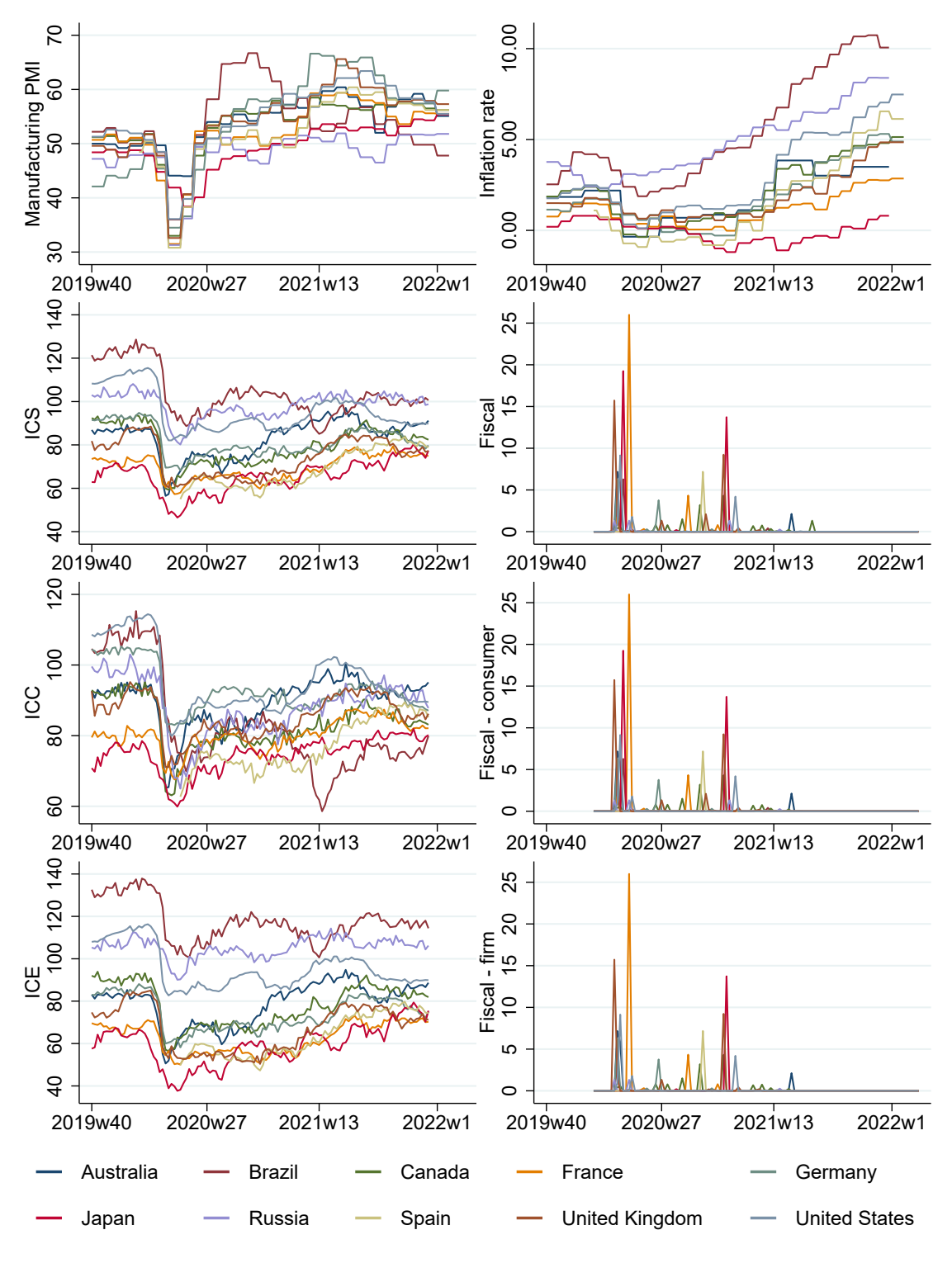


Figure A.2: Effects of Fiscal Support on Sentiment

Notes: Local projections regressions are estimated by OLS: $Y_{it+s} = \alpha_i + \sum_{r=1}^{4} \beta_{Y,r} Y_{it-r} + \sum_{r=1}^{4} \beta_{F,r} \text{Fiscal}_{it-r} + X'_{it}\gamma + \varepsilon_{it}, \quad s \in [0, 20]$. Y is either change in ICS, ICC, or ICE. Time period t is a week. All regression include country fixed effects Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. X includes trend, an indicator of year 2021, stringency index, and the number of COVID-related deaths per capita. All regression include country and time fixed effects. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.

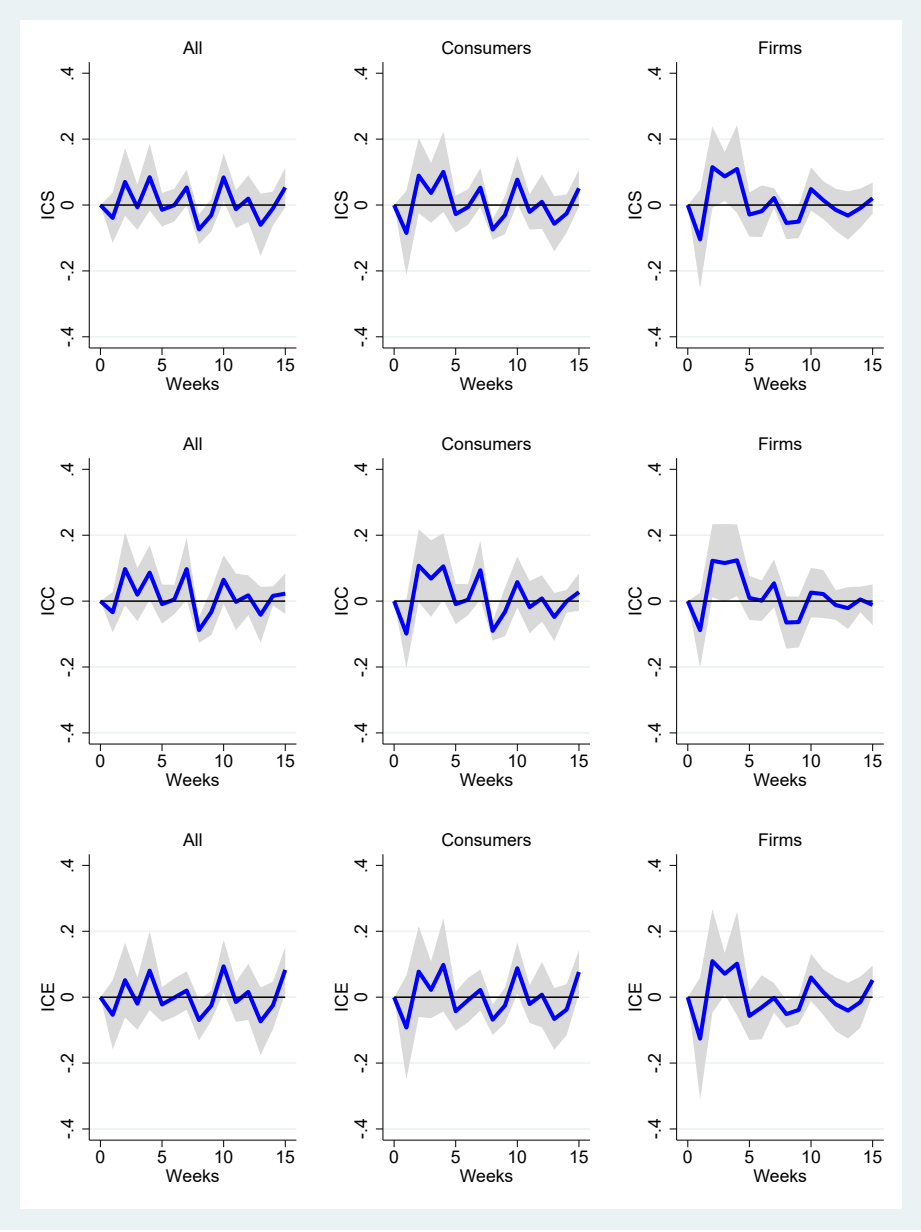


Figure A.3: Effects of Fiscal support on PMI and Industrial Production (IP)

Notes: Local projections regressions are estimated by OLS: $Y_{it+s} = \alpha_i + \sum_{r=1}^{4} \beta_{Y,r} Y_{it-r} + \sum_{r=1}^{4} \beta_{F,r} \text{Fiscal}_{it-r} + X'_{it}\gamma + \varepsilon_{it}, \quad s \in [0, 20]$. Y change in PMI. Time period t is a week. All regression include country fixed effects Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. X includes trend, an indicator of year 2021, stringency index, and the number of COVID-related deaths per capita. All regression include country and time fixed effects. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.

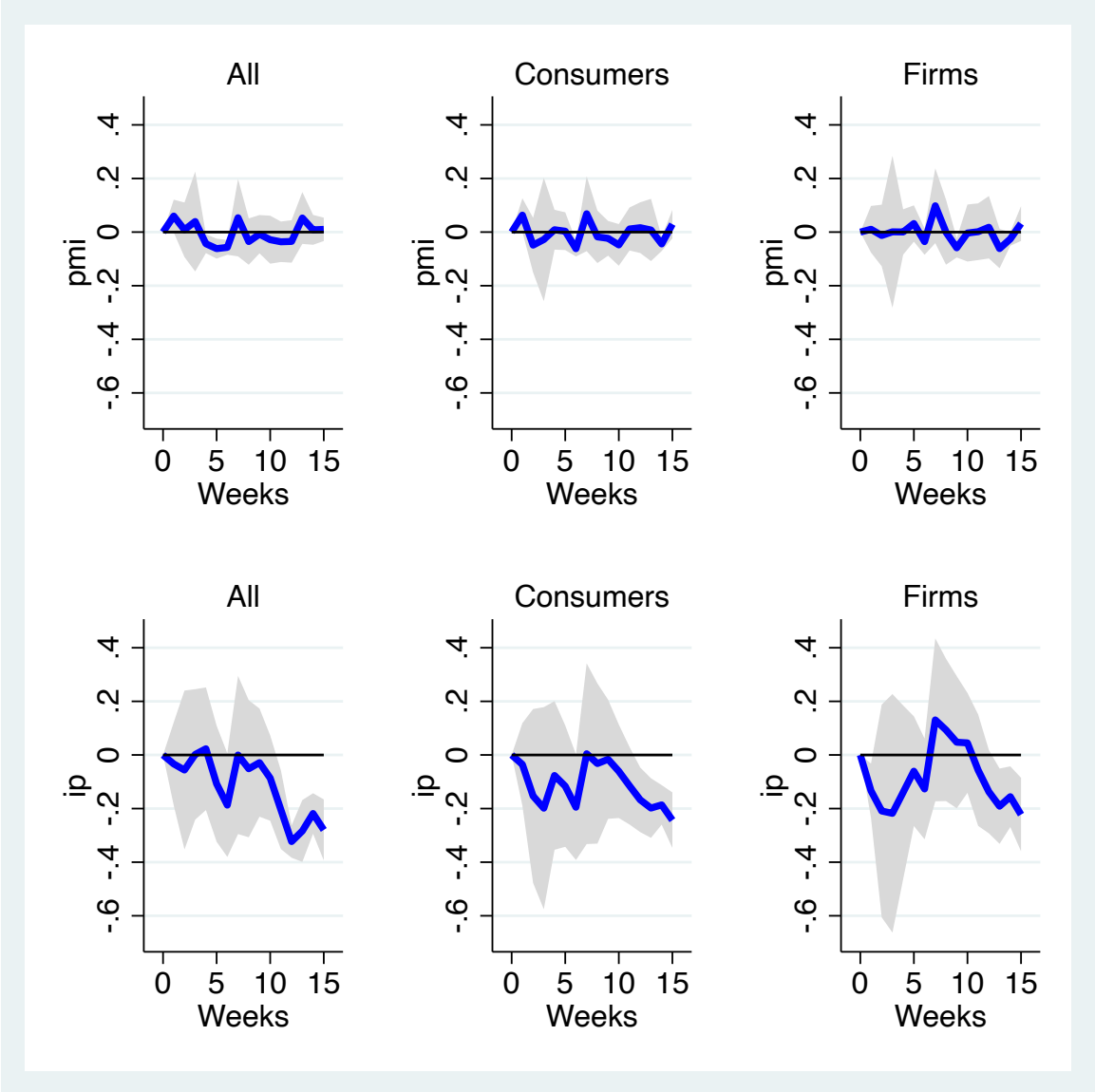


Figure A.4: Effects of Fiscal Support on Inflation, Controlling for Sentiment

Notes: Reported are β_F from local projections regressions are estimated by OLS: $\pi_{it+s} = \alpha_i + \alpha_{tm} + \sum_{r=1}^{4} \beta_{\pi,r}\pi_{it-r} + \sum_{r=1}^{4} \beta_{F,r}\text{Fiscal}_{it-r} + \sum_{r=1}^{4} \beta_{S,r}S_{it-r} + X'_{it}\gamma + \varepsilon_{it}, \quad s \in [0, 20]$. Time period t is a week. All regression include country and monthly time fixed effects. Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. X includes stringency index and the number of COVID-related deaths per capita. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.

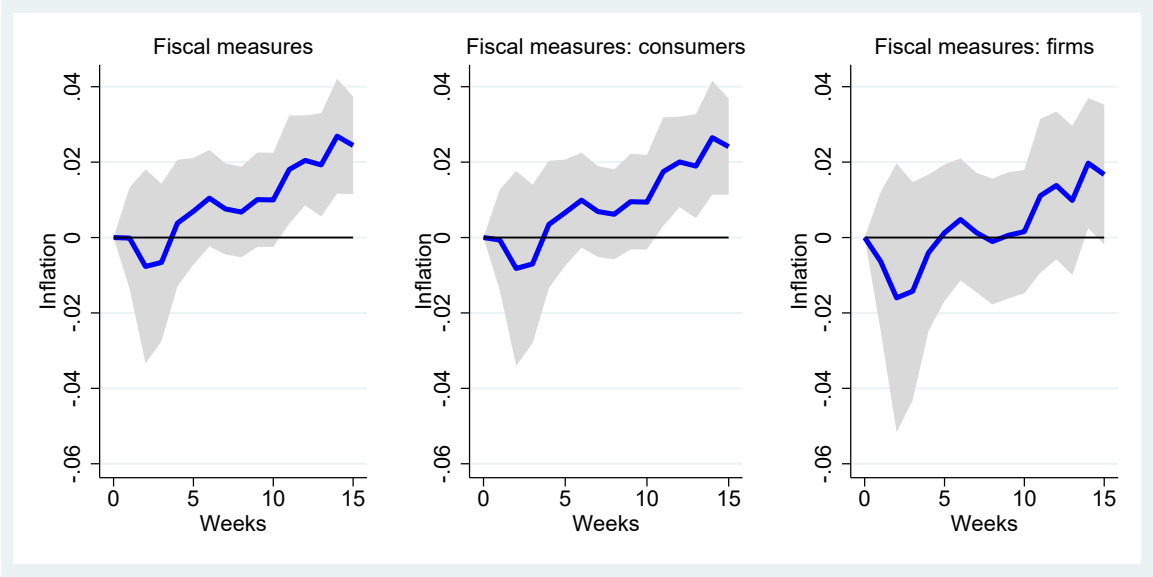


Figure A.5: Effects of Fiscal support on Inflation, Interactions with PMI

Notes: Reported are β_F $\beta_F S$, and $\beta_F PMI$ effects from local projections regressions estimated by OLS specified in equation (4) with S replaced with PMI. Time period t is a week. All regression include country fixed effects. Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. Controls include trend, an indicator of year 2021, stringency index, and the number of COVID-related deaths per capita. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.

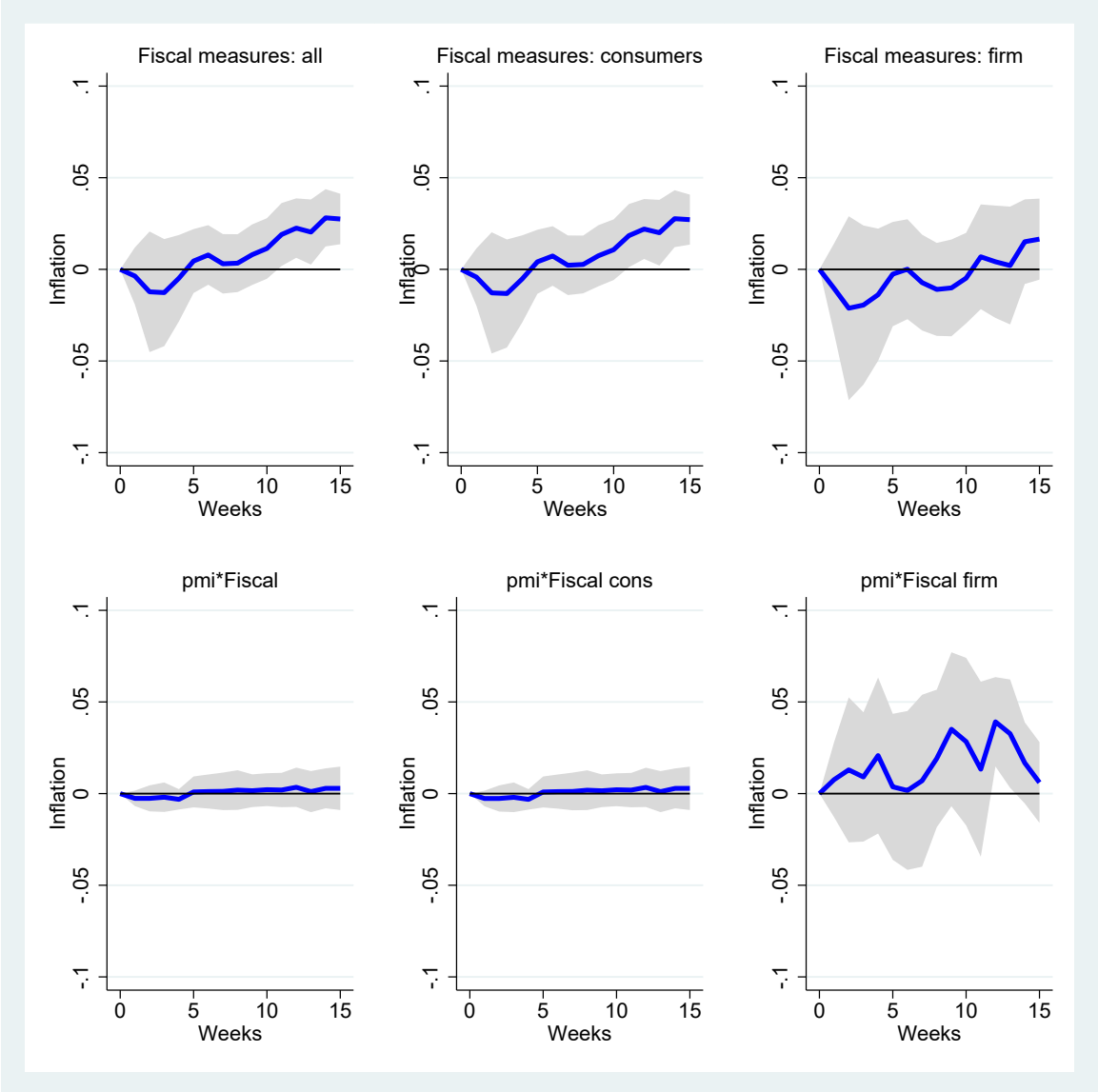


Figure A.6: Effects of Fiscal Support on Inflation, Interactions with Sentiment : ICS

Notes: Reported are β_F and β_{FS} effects from local projections regressions estimated by OLS specified in equation (4) Time period t is a week. All regression include country and monthly time fixed effects. Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. Controls include stringency index and the number of COVID-related deaths per capita. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.

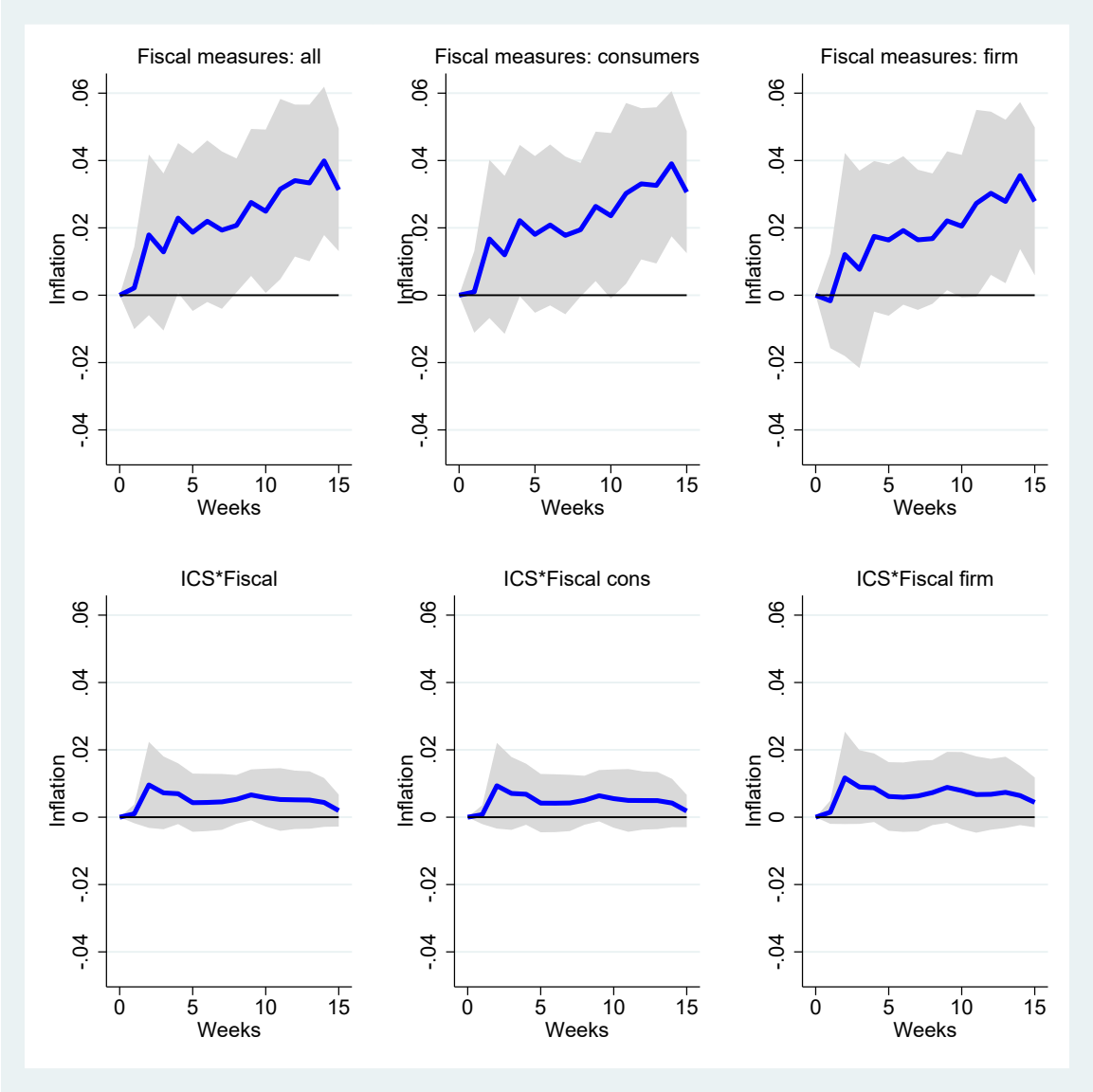


Figure A.7: Effects of Sentiment on Inflation, from the Interaction Regression : ICS

Notes: Reported is β_S effect from local projections regressions estimated by OLS specified in equation (4) Time period t is a week. All regression include country and monthly time fixed effects. Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. Controls include stringency index and the number of COVID-related deaths per capita. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.

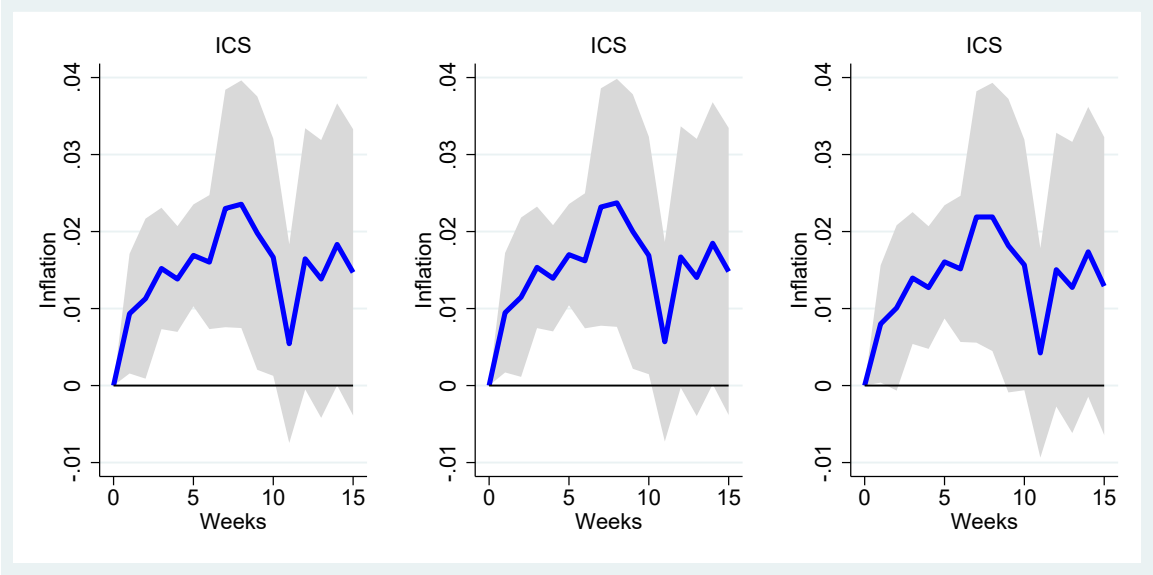


Figure A.8: Effects of Sentiment on Inflation, from the Interaction Regression : ICC

Notes: Reported is β_S effect from local projections regressions estimated by OLS specified in equation (4) Time period t is a week. All regression include country and monthly time fixed effects. Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. Controls include stringency index and the number of COVID-related deaths per capita. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.

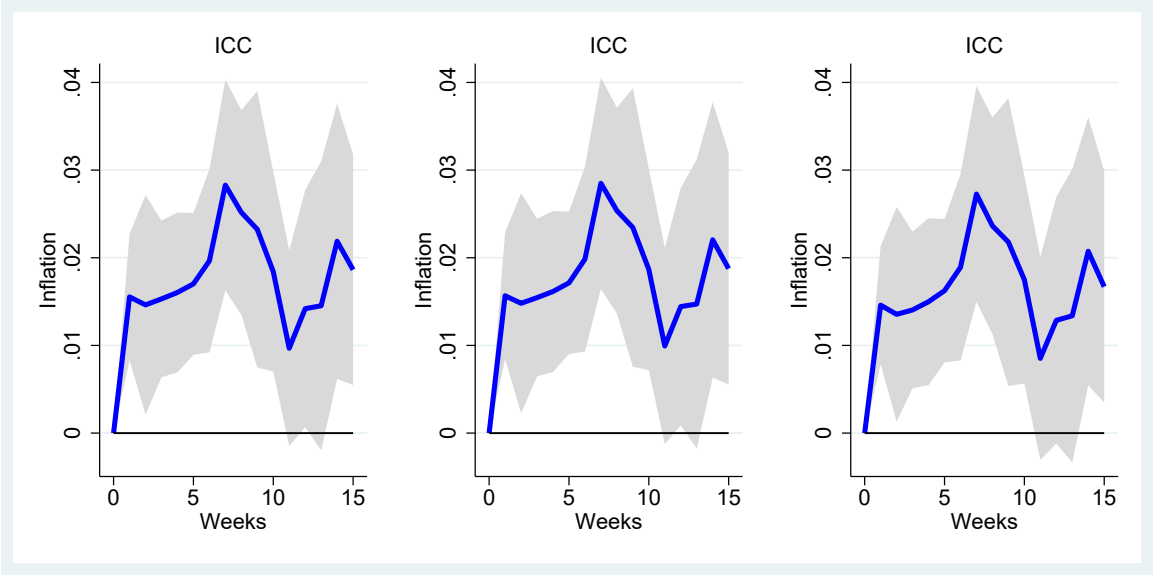


Figure A.9: Effects of Fiscal Support on Inflation, Interactions with Sentiment : ICE

Notes: Reported are β_F and β_{FS} effects from local projections regressions estimated by OLS specified in equation (4) Time period t is a week. All regression include country fixed effects. Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. Controls include trend, an indicator of year 2021, stringency index, and the number of COVID-related deaths per capita. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.

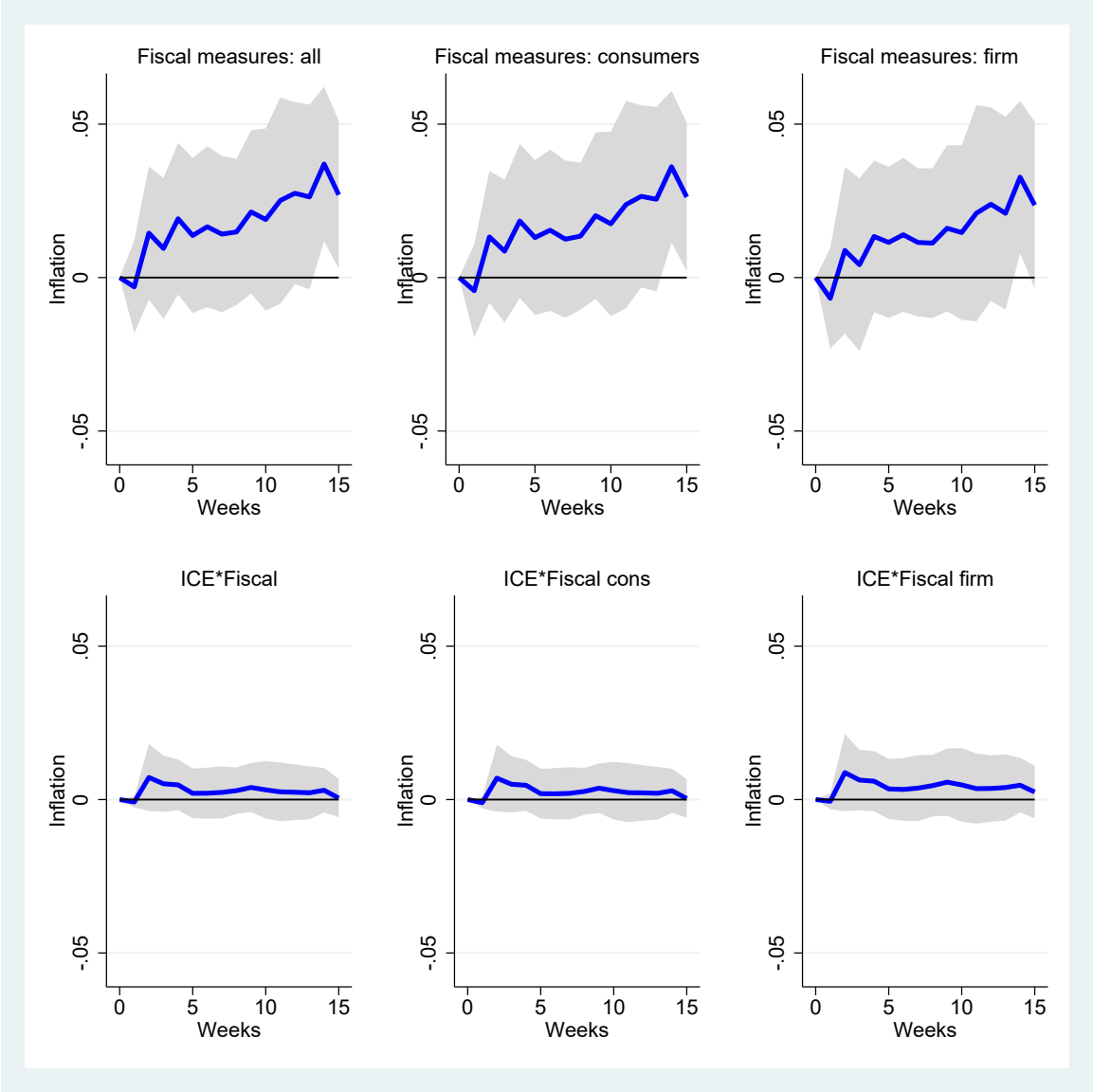


Figure A.10: Effects of Sentiment on Inflation, from the Interaction Regression : ICE

Notes: Reported is β_S effect from local projections regressions estimated by OLS specified in equation (4) Time period t is a week. All regression include country and monthly time fixed effects. Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. Controls include stringency index and the number of COVID-related deaths per capita. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.

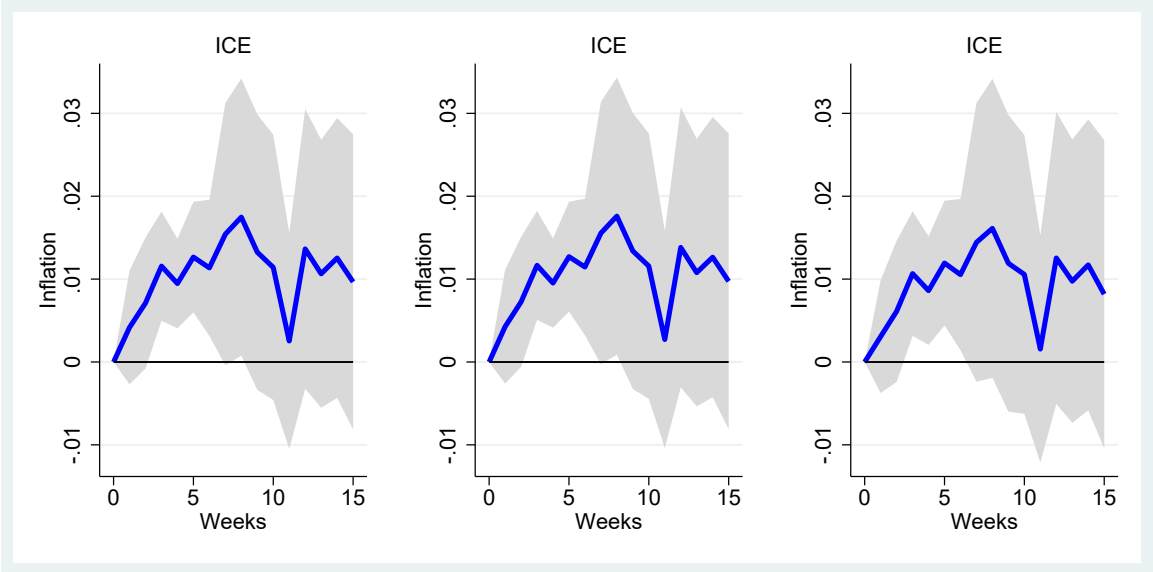


Figure A.11: Time Series of Cumulative Fiscal Support

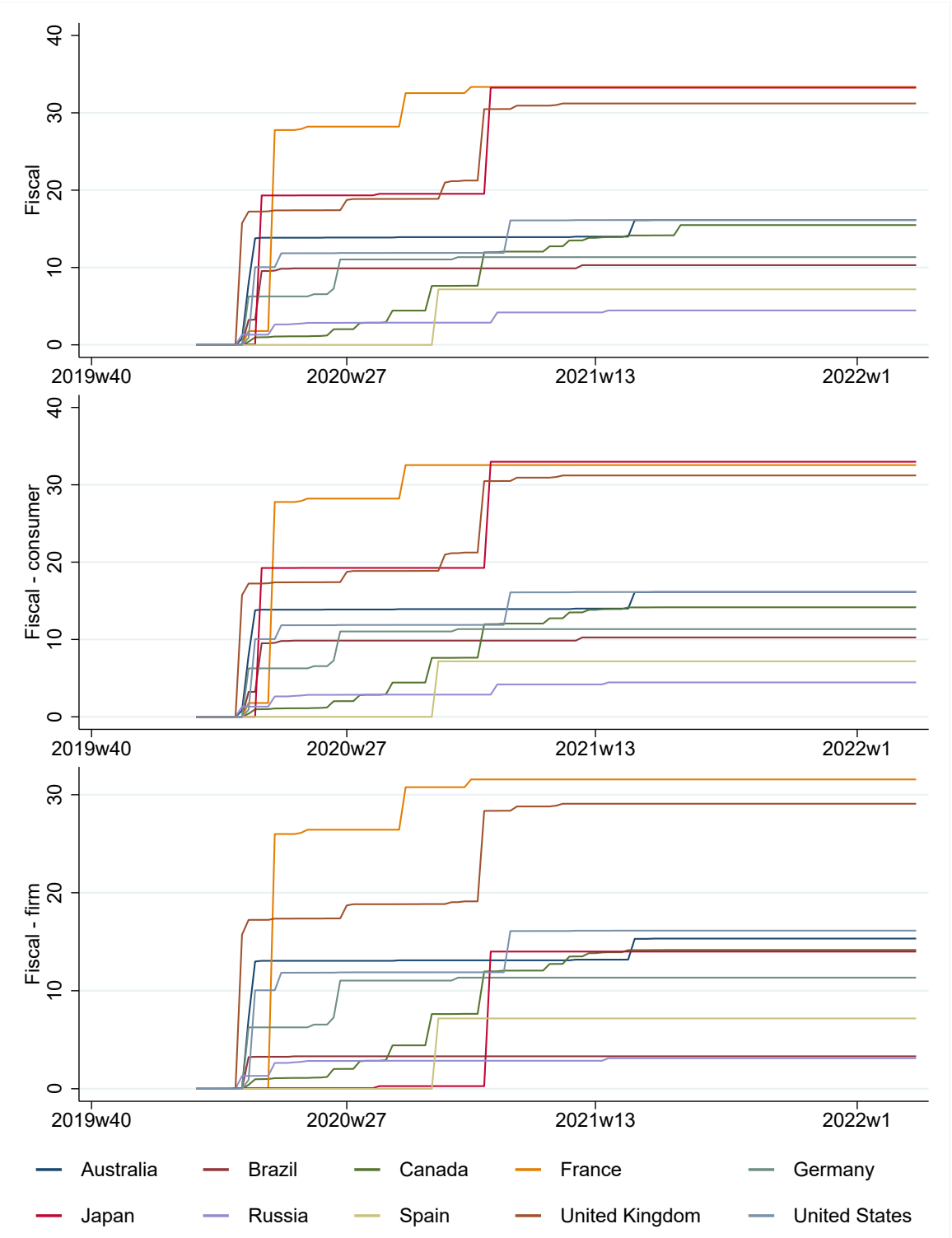


Figure A.12: Effects of Fiscal Support on Inflation: measures directed only to consumers or firms.

Notes: Local projections regressions are estimated by OLS: $\pi_{it+s} = \alpha_i + \sum_{r=1}^{4} \beta_{\pi,r}\pi_{it-r} + \sum_{r=1}^{4} \beta_{F,r}\text{Fiscal}_{it-r} + X'_{it}\gamma + \varepsilon_{it}, \quad s \in [0, 20]$. Time period t is a week. All regression include country fixed effects. Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. X includes trend, an indicator of year 2021, stringency index, and the number of COVID-related deaths per capita. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.

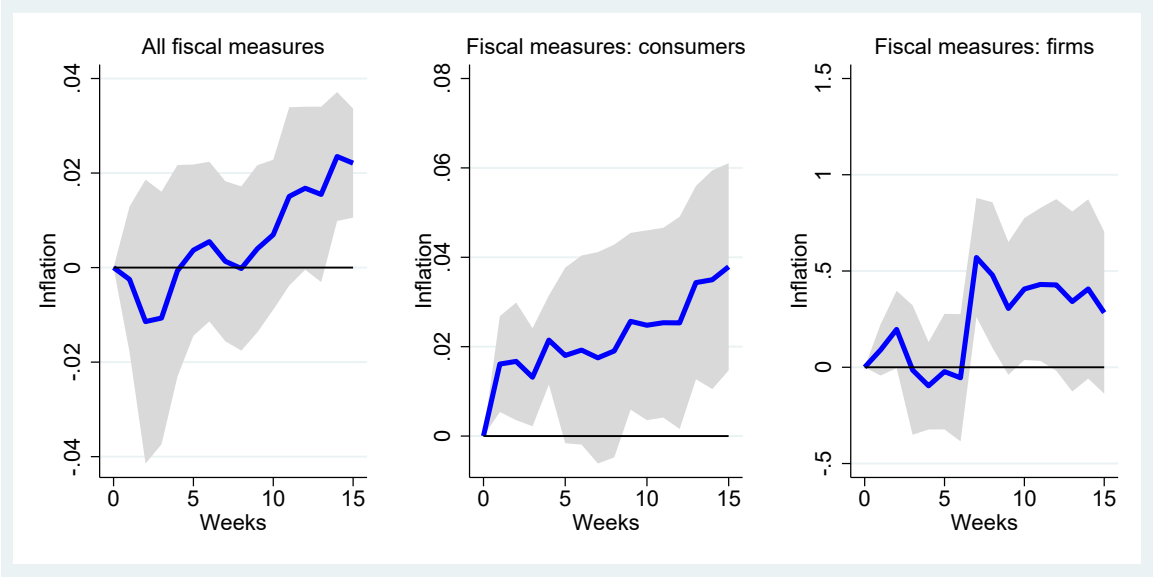


Figure A.13: Effects of Fiscal support on Inflation, Interactions with ICC and PMI

Notes: Reported are β_F $\beta_F S$, and $\beta_F PMI$ effects from local projections regressions estimated by OLS specified in equation (5). Time period t is a week. All regression include country fixed effects. Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. Controls include trend, an indicator of year 2021, stringency index, and the number of COVID-related deaths per capita. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.

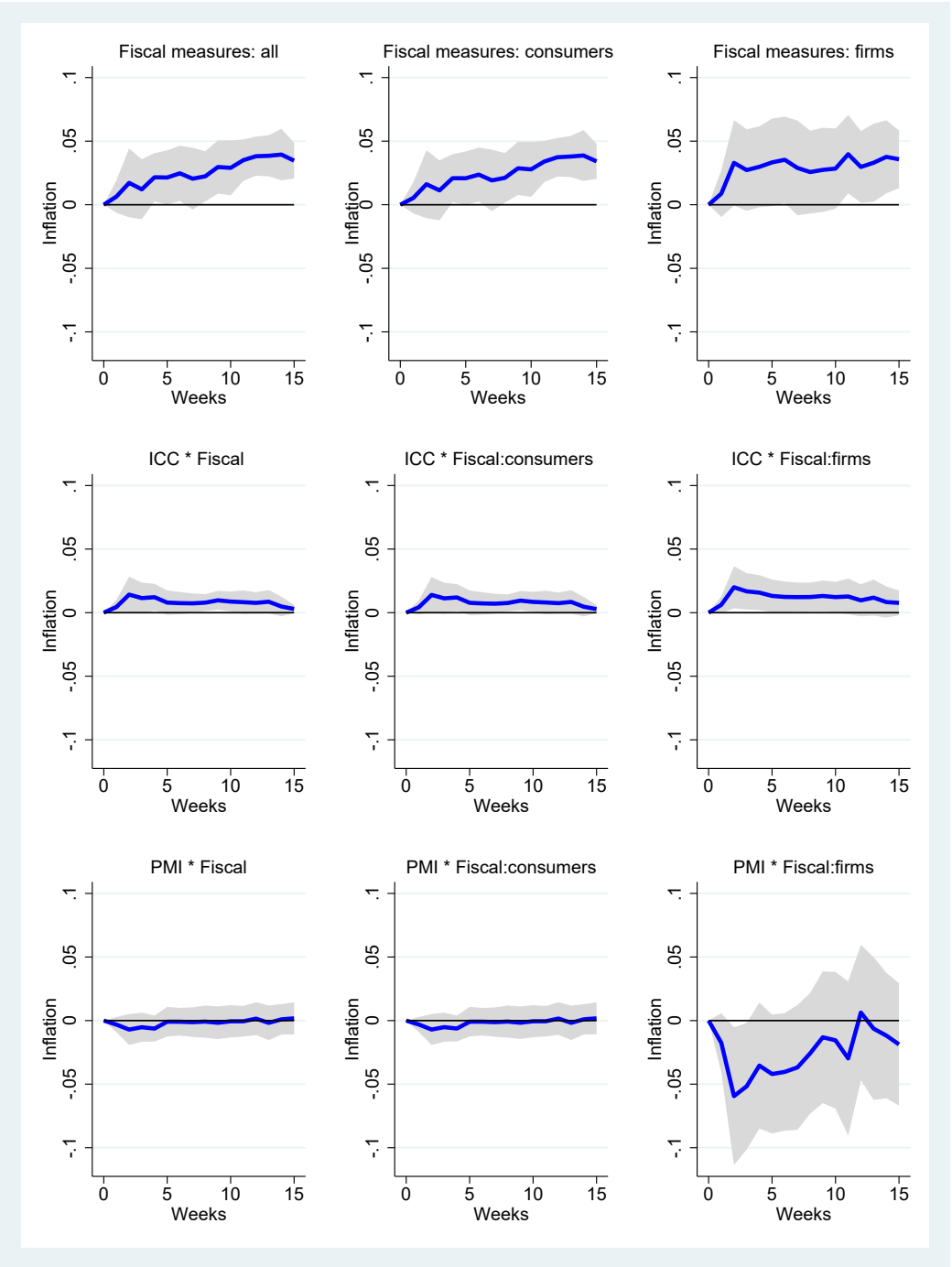


Figure A.14: Effects of Stockouts on Sentiment and PMI

Notes: Effects from local projections regressions estimated by OLS. Time period t is a week. All regression include country and monthly time fixed effects. Controls include stringency index and the number of COVID-related deaths per capita. Unbalanced panel includes 85 weeks per country starting January 22, 2020 and ending September 10, 2021. The following countries are included: Canada, France, Germany, Japan, Spain, and the U.S. Stockout data are from Cavallo and Kryvtsov (2021), kindly shared by the authors. Robust standard errors are clustered on country.

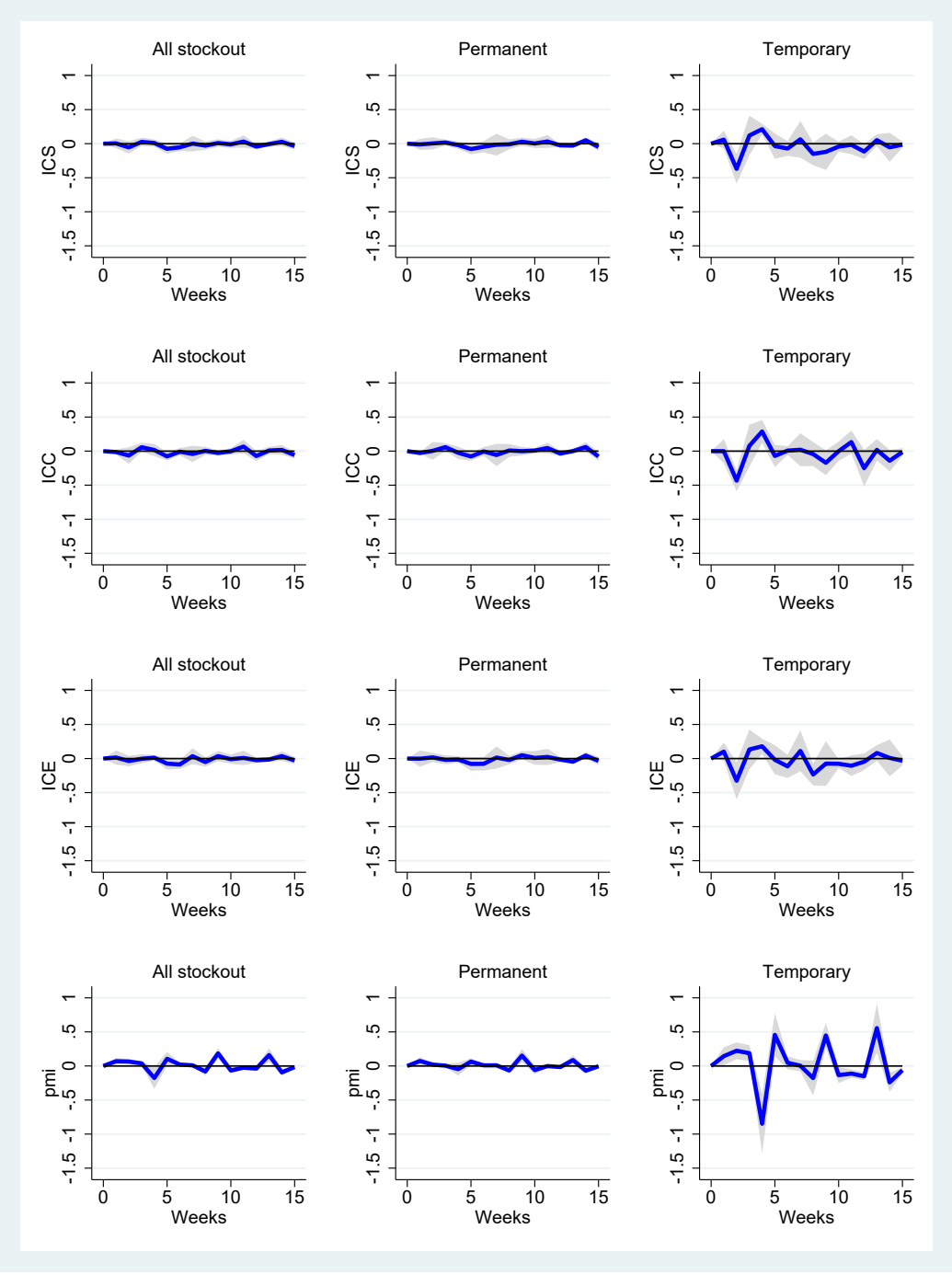


Figure A.15: Effects of Fiscal Support on Inflation, controlling for stockouts (smaller sample)

Notes: Local projections regressions are estimated by OLS: $\pi_{it+s} = \alpha_i + \alpha_{tm} + \sum_{r=1}^{4} \beta_{\pi,r}\pi_{it-r} + \sum_{r=1}^{4} \beta_{F,r}\text{Fiscal}_{it-r} + X'_{it}\gamma + \varepsilon_{it}, \quad s \in [0, 20]$. Time period t is a week. All regression include country and monthly time fixed effects. Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. X includes trend, an indicator of year 2021, stringency index, and the number of COVID-related deaths per capita. Additional control variable is all stockouts from Cavallo and Kryvtsov (2021), kindly shared by the authors. Unbalanced panel includes 77 (Japan) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Canada, France, Germany, Japan, Spain, and the U.S.. Robust standard errors are clustered on country.

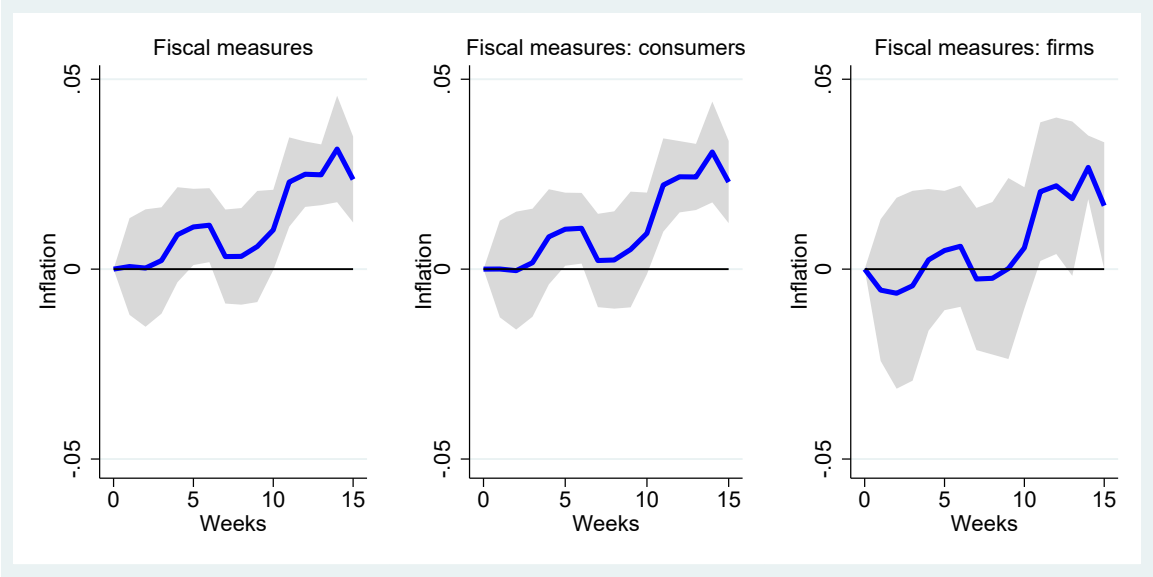


Figure A.16: Effects of Fiscal Support on Core Inflation

Notes: Local projections regressions are estimated by OLS: $\pi^{Core}_{it+s} = \alpha_i + \alpha_{tm} + \sum_{r=1}^{4} \beta_{\pi,r}\pi_{it-r} + \sum_{r=1}^{4} \beta_{F,r}\text{Fiscal}_{it-r} + X'_{it}\gamma + \varepsilon_{it}, \quad s \in [0, 20]$. Time period t is a week. All regression include country and monthly time fixed effects. Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. X includes trend, an indicator of year 2021, stringency index, and the number of COVID-related deaths per capita. Unbalanced panel includes 77 (Japan) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.

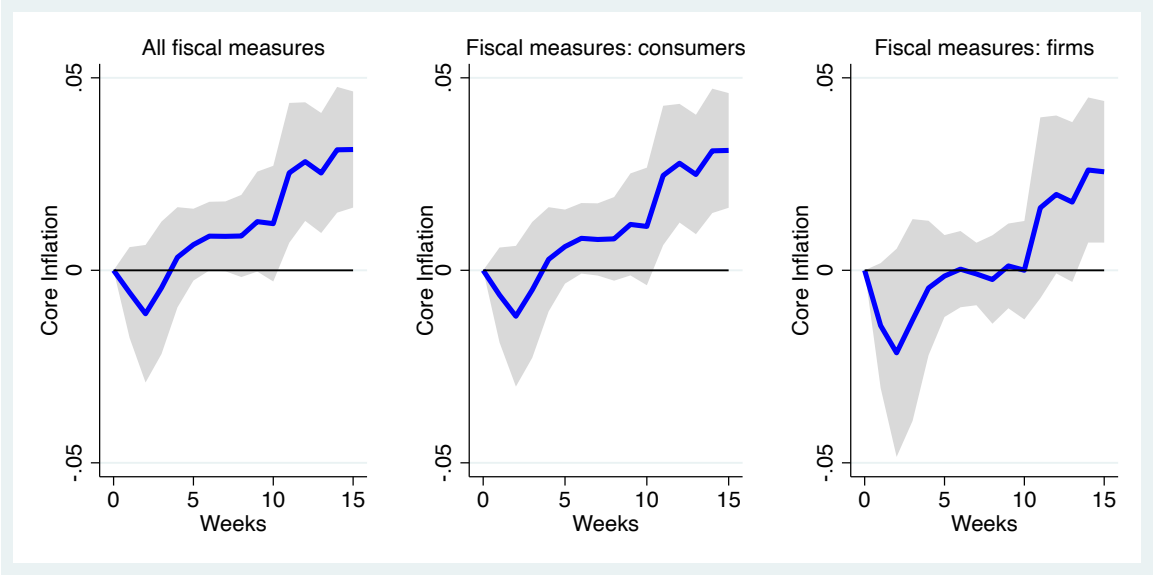


Figure A.17: Effects of Sentiment on Industrial Production (IP)

Notes: Local projections regressions are estimated by OLS: $Y_{it+s} = \alpha_i + \sum_{r=1}^{4} \beta_{Y,r} Y_{it-r} + \sum_{r=1}^{4} \beta_{F,r} \text{Fiscal}_{it-r} + X'_{it}\gamma + \varepsilon_{it}, \quad s \in [0, 20]$. Y change in IP. Time period t is a week. All regression include country fixed effects Fiscal is a cumulative fiscal support overall, to consumers and to firms as a share of GDP. X includes trend, an indicator of year 2021, stringency index, and the number of COVID-related deaths per capita. All regression include country and time fixed effects. Unbalanced panel includes 77 (Australia, Brazil, Japan, Russia) or 82 weeks per country starting February 19, 2020 and ending September 10, 2021. The following countries are included: Australia, Brazil, Canada, France, Germany, Japan, Russia, Spain, U.K. and the U.S.. Robust standard errors are clustered on country.