

Fiscal Influences on Inflation in OECD Countries, 2020-2022

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Fiscal Theory of the Price Level, FTPL

- Theory around since early 1990s.
- Not taken seriously by mainstream macroeconomists as empirical model of inflation.
- Reasons: inflation associated much more with monetary policy; inflation low & stable many countries mid 1980s to 2020.
- Surge of inflation along with surge in fiscal deficits made many economists more receptive to idea of FTPL.

Empirical Study for OECD Countries

- Determinants of headline & core CPI inflation rates across 37 OECD countries, 2020-2022.
- Empirical framework based on simple version of FTPL.
- Frictionless version of model, no nominal rigidities. Abstract from effects on inflation from changes in real interest rates, etc.

Government's Intertemporal Budget Constraint

Centerpiece of FTPL is government's intertemporal budget constraint:

$$(1) \quad \frac{B_t}{P_t} = T_t - G_t + \frac{(T_{t+1} - G_{t+1})}{1+r} + \frac{(T_{t+2} - G_{t+2})}{(1+r)^2} + \dots$$

- B_t : nominal market value short- and long-term public debt, start of period t.
- P_t : price level start of period t.
- T_t, G_t : real taxes, real primary spending period t.
- r : constant real interest rate.
- Assumes no-Ponzi condition for long-term financing.
- Stock of real government bonds equals p.v. of real primary surpluses.

Government Bonds

A series of simplifying assumptions to obtain a **theory-based** relation between the fiscal stimulus and pandemic inflation:

1. Crisis leads to an increase in spending for M periods. Spending returns to the pre-pandemic level afterwards

$$(2) \quad \Delta G_t + \frac{\Delta G_{t+1}}{1+r} + \frac{\Delta G_{t+2}}{(1+r)^2} + \dots + \frac{\Delta G_{t+M}}{(1+r)^M}$$

2. Output Y_t grows at constant rate $g=r$
3. Jump in inflation following the fiscal stimulus is a surprise, but its path is fully anticipated afterwards. Reflation remains elevated for a finite number of periods: $\pi > \pi^*$ for $i=1, \dots, T$. Nominal interest rates adjust accordingly.
4. Aggregate nominal payments on bonds assumed to rise over time with baseline (past) inflation rate, π^* , and growth rate of real GDP, $g=r$. That is, government arranges composition of public debt so that, in absence of shocks, payments rise with nominal GDP.

Formula for Inflation Rate

- If increase in government expenditure fully financed by increase in inflation, change in real value of debt $\Delta B/P_t$ must equal present value of increase in real primary deficits.
- Generalize to case where surge in inflation pays for fraction η of spending surge; fraction $1-\eta$ paid for by cuts in spending beyond $t+M$ or increases in current or future government revenue. Then, we get an expression for rise in inflation rate:

$$(3) \quad \pi - \pi^* = \eta \cdot \left[\Delta \left(\frac{G_t}{Y_t} \right) + \Delta \left(\frac{G_{t+1}}{Y_{t+1}} \right) + \dots + \Delta \left(\frac{G_{t+M}}{Y_{t+M}} \right) \right] / \left[\left(\frac{B_t^*}{P_t Y_t} \right) \cdot \left(\frac{T}{2} \right) \right]$$

where $\pi - \pi^*$ is the predicted rise in inflation, $\left(\frac{B_t^*}{P_t Y_t} \right)$ is the real value of outstanding debt at the time of the shock, $T/2$ represents “average maturity” of outstanding stock of public debt.

- Eq. (11) implies non-negative slope coefficient, η , and intercept of zero; that is, $\pi = \pi^*$ when increments to ratios of government spending to GDP add to zero.

State-Contingent Public Finance

- $\eta=0$ when surge in government spending matched by expectations of offsetting cuts in spending further in future or increases in current and future government revenue. Corresponds to standard intertemporal public finance in sense of government always respecting constraint that increase in today's real primary deficit balanced by corresponding reductions in future real primary deficits (all measured as real present values).
- $\eta=0$ holds in most circumstances, with $\eta>0$ applying only during economic emergencies, such as COVID crisis or large war. Discussion fits with state-contingent fiscal-deficit policies of Lucas/Stokey (1983) in context of wartime, notably WWII. Upshot is fiscal deficits and inflation not much related during “normal” economic times but could be closely connected during unusual events. Perspective fits with empirical application to OECD countries in context of COVID crisis.

Functional Form for Empirical Work

- Equation (3) provides functional form used in main empirical work. Form implies, not surprisingly, that rise in inflation rate higher the larger cumulative rise in G_{t+i}/Y_{t+i} , $i=1, \dots, M$.
- Less intuitively, rise in inflation rate larger the *smaller* baseline debt-GDP ratio, $B_t^*/P_t Y_t$. Result follows because smaller debt-GDP ratio implies higher inflation rate required to get decline in real market value of public debt needed to balance surge in real primary deficits.
- Higher average debt maturity, $T/2$, also implies smaller rise in inflation rate. Reason is that, with cumulative increase in G/Y held fixed and inflation rate equalized over T periods, higher T implies smaller inflation rate required each period to generate requisite reduction in real public debt.

Ukraine-Russia War

- Overall, model says that inflation rate reacts to composite government-spending variable, which equals cumulative surge in ratios of government spending to GDP divided by initial debt-GDP ratio and average debt maturity.
- Empirical application to inflation rates allows for additional effect from Ukraine-Russia War (started 2022). Countries that share common border with Ukraine or Russia found to have higher inflation rates than would otherwise be predicted.
- From perspective of Eq. (11), effects from Ukraine/Russia War can be viewed as reflecting choices to finance more or less government expenditure through inflation or to deviate more or less from smoothing of inflation rates to place more or less weight on short-term inflation.

Empirical Setup

- Sample comprises 37 OECD countries (all except Turkey), 20 outside Euro zone, 17 Euro zone. Because of common currency, main setting treats Euro zone as single economy (with variables measured as weighted averages).
- Table 1, cols. 1 & 2, has headline inflation; cols. 3 & 4, core inflation. Cols. 1 & 3 use only composite govt-spending variable. Cols. 2 & 4 add Ukraine-Russia border dummy.
- Coefficient of govt-spending variable corresponds to η in model; share of spending “financed” by unanticipated inflation.

Table 1: Regressions for change in inflation rate Euro zone treated as one economy

	Headline CPI inflation rate		Core CPI inflation rate	
	(1)	(2)	(3)	(4)
Constant	0.0134** (0.0037)	0.0080*** (0.0025)	0.0038 (0.0033)	-0.0005 (0.0025)
Excess govt spending/(gross debt)*duration	0.369*** (0.099)	0.423*** (0.062)	0.422*** (0.087)	0.465*** (0.062)
Border with Ukraine or Russia	--	0.0278*** (0.0049)	--	0.0222*** (0.0049)
Number of observations	21	21	21	21
R-squared	0.423	0.791	0.555	0.790
s.e. of regression	0.0126	0.0078	0.0111	0.0078

Regressions by OLS, s.e.'s in parentheses. Dependent variable is inflation rate for 2020-22 less that for 2010-19.

***significant at 1%, **significant at 5%, *significant at 10%

Empirical results on government spending

- Estimated coefficients of govt-spending variable in cols. 1 & 3 positive, around 0.4, highly significant.
- In cols. 2 & 4, Ukraine-Russia border dummy positive, highly significant, sharply raises R-squared. Moderately raises coefficient of govt-spending variable—to 0.42 and 0.46 for headline, core, respectively.
- Estimated coefficients of govt-spending variable significantly less than one. Around 40-50% of spending surge financed by unanticipated inflation, rest by standard public finance.

Inflation versus Govt Spending

- Figures 1 & 2 depict relationship between change in CPI inflation rate (headline & core, respectively) and govt-spending variable. (Effects of border dummy filtered out here.)
- U.S. not outlier. Lies slightly above average for govt-spending variable (0.034 vs. 0.025) and changes in inflation rates (headline: 0.029 vs. 0.023; core: 0.020 vs. 0.015). Points for Euro area below U.S. for inflation (headline: 0.023; core: 0.009), slightly below for govt-spending variable (0.029).
- Figures show clear positive slopes that do not seem to be driven by extreme observations.

Figure 1
Change in headline CPI inflation rate versus govt spending

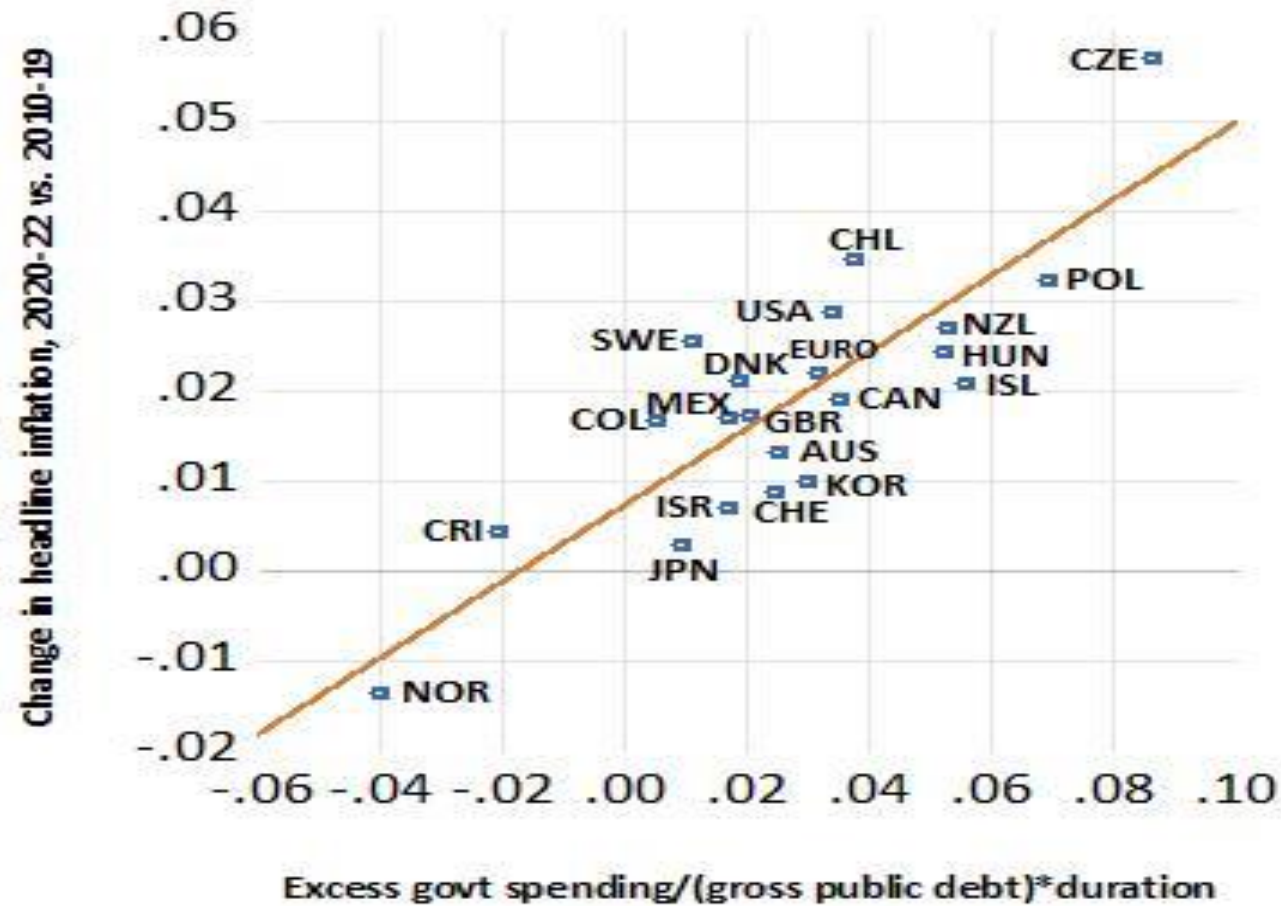
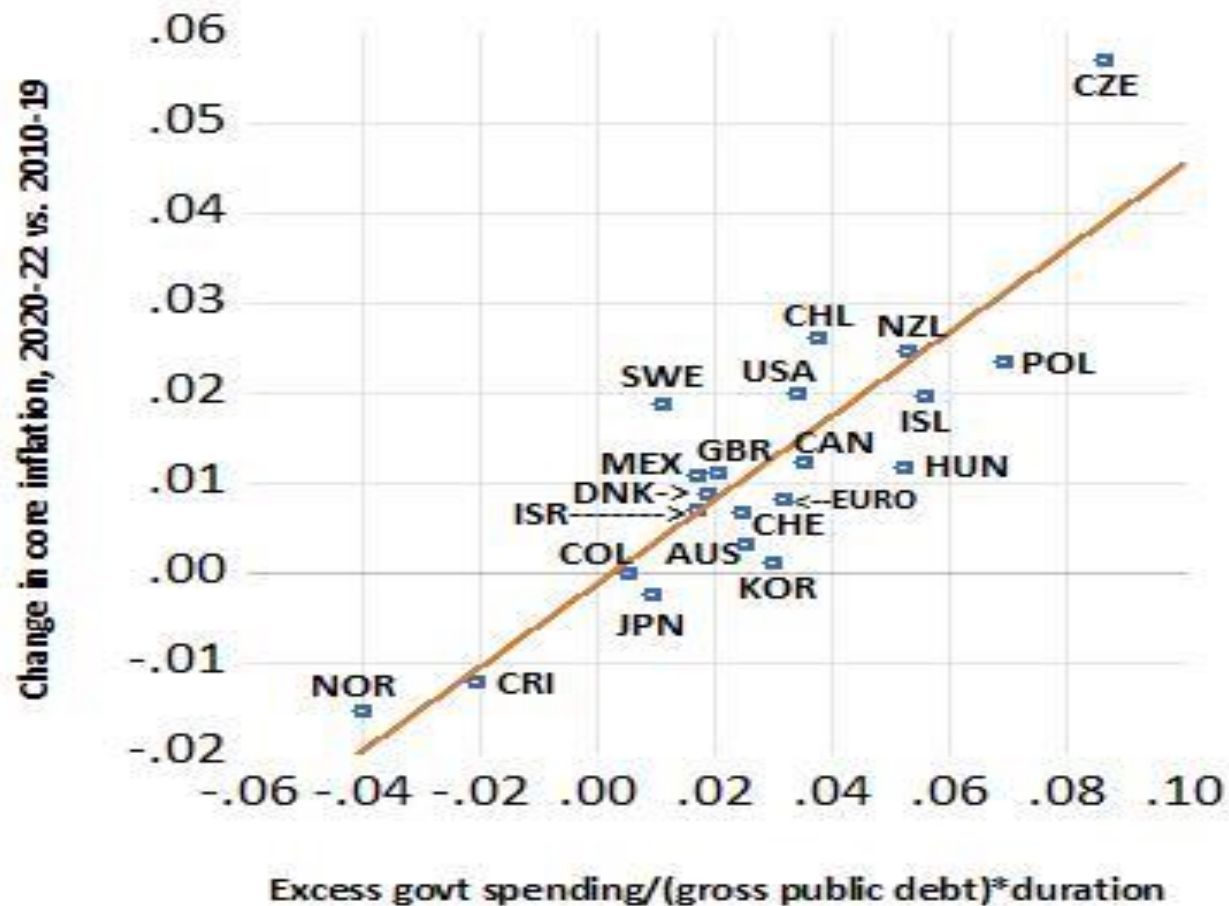


Figure 2
Change in core CPI inflation rate versus govt spending



Components of Govt-Spending Variable

- Composite government-spending variable equals $\Delta(G/Y)$, cumulation from 2020 to 2022 of ratios of general government spending to GDP gauged relative to ratios for 2019, divided by ratio of gross public debt to GDP in 2019 and debt duration in 2019. Estimated coefficients positive and highly statistically significant.
- Can assess how statistical significance of composite government-spending variable relates to contributions from three components: $\Delta(G/Y)$, debt-GDP ratio, debt duration.
- Each component of government-spending variable set, one at a time, at sample mean. That is, designated variable restricted not to contribute to explanation of cross-sectional variations in inflation rates.
- The baseline model clearly dominates any of the restricted models, implying that each of the components of the government spending variable plays a role in explaining the cross-sectional variation in inflation, as predicted by the FTPL.

Euro-zone countries entered separately

- Table 2. For Euro zone (17 countries), estimate coefficient on individual G variable relative to Euro-area weighted average. With border dummy included, estimated coefficient differs insignificantly from zero at 5% level: 0.12 (0.07) headline, 0.00 (0.07) core.
- One constant term and one coefficient for border dummy.
- Main conclusion is aggregating Euro-zone countries into one economy satisfactory for analyzing effects of G variable on inflation rates. (But border dummy affects Euro countries individually.)
- See Figures 3 & 4 on results.

Table 2: Regressions for Change in Inflation Rate Euro-zone countries entered individually

	Headline CPI inflation rate		Core CPI inflation rate	
	(1)	(2)	(3)	(4)
Constant	0.0152*** (0.0034)	0.0092*** (0.0022)	0.0032 (0.0028)	-0.0010 (0.0022)
Excess govt spending/(gross debt)*duration	0.374*** (0.099)	0.422*** (0.061)	0.420*** (0.083)	0.455*** (0.062)
Excess govt spending/(gross debt)*duration: Euro area country – Euro area average	0.353*** (0.109)	0.125* (0.073)	0.160* (0.092)	-0.005 (0.074)
Border with Ukraine or Russia	--	0.0258*** (0.0034)	--	0.0186*** (0.0034)
Number of observations	37	37	37	37
R-squared	0.424	0.790	0.460	0.714
s.e. of regression	0.0126	0.0077	0.0106	0.0078

Regressions by OLS, s.e.'s in parentheses. Dependent variable is inflation rate for 2020-22 less that for 2010-19.

***significant at 1%, **significant at 5%, *significant at 10%

Figure 3

Change in headline CPI inflation rate versus govt spending

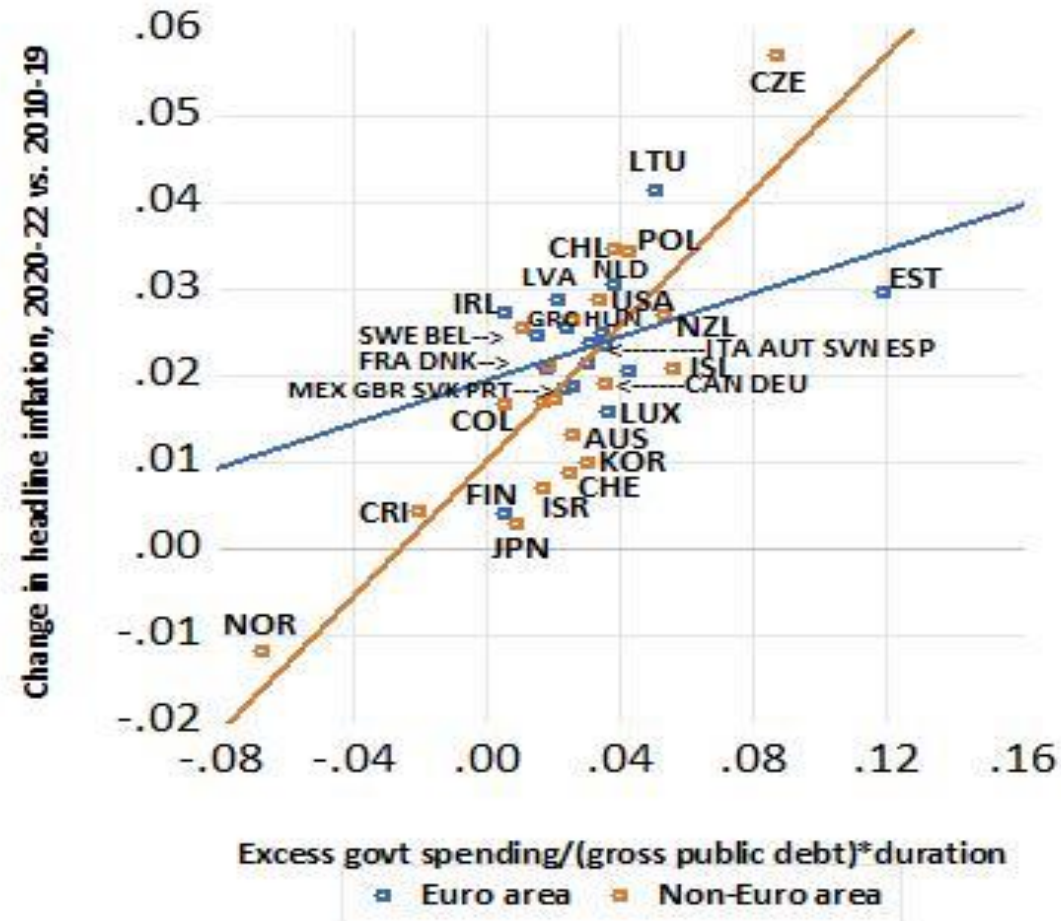
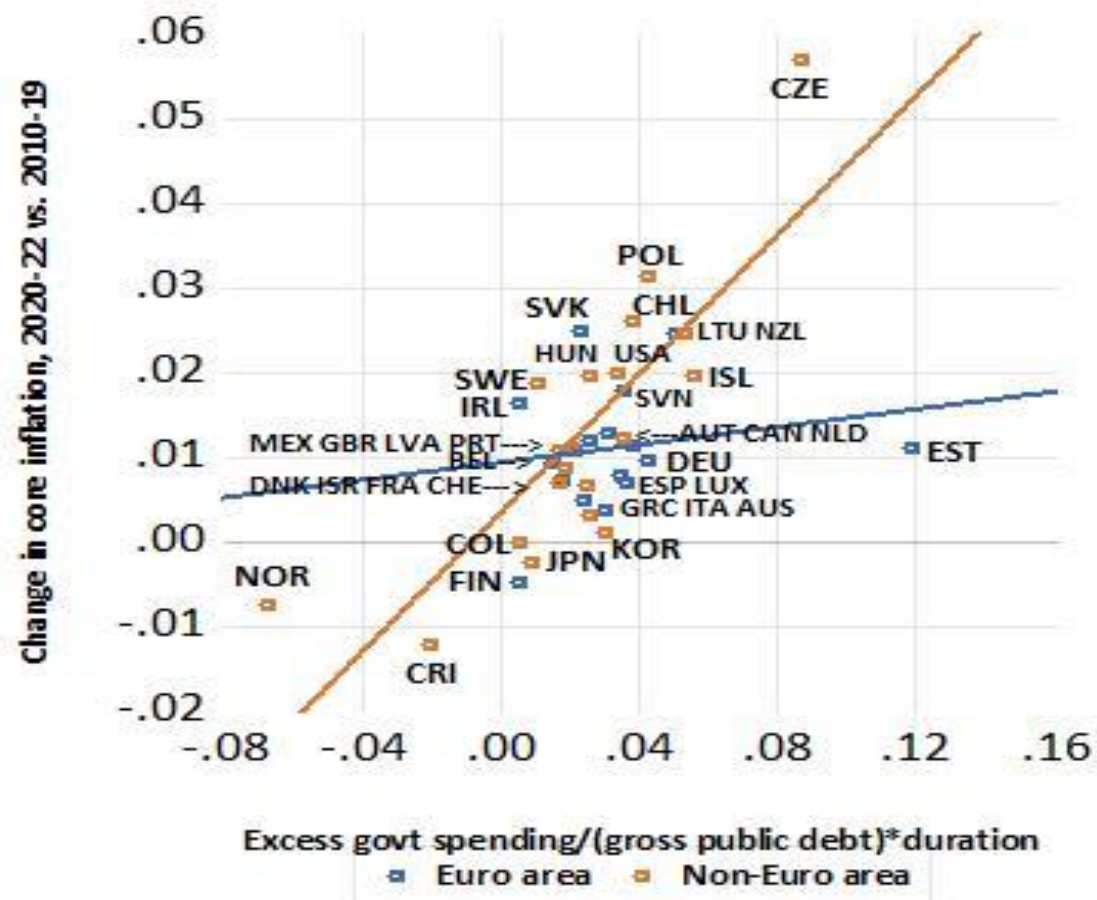


Figure 4

Change in core CPI inflation rate versus govt spending



Conclusions

- In response to COVID pandemic, many countries implemented large increases in deficit-financed government spending 2020 to 2022. To extent fiscal interventions perceived as not backed by current and future tax increases or future spending cuts, fiscal theory of price level, FTPL, predicts rise in inflation.
- In setting that neglects effects on inflation from changes in real variables, predicted increases in inflation rates proportional to size of fiscal stimulus, measured by increases in ratio of primary govt. spending to GDP. For given fiscal stimulus, country's surge in inflation lower if starts with larger ratio of public debt to GDP or longer duration of debt.

Conclusions

- Support for theoretical predictions of FTPL in OECD data. 21 economies—20 non-Euro-zone and aggregate of 17 Euro-zone—headline and core inflation rates 2020-2022 responded positively to theory-motivated government-spending variable.
- Across 17 Euro-zone countries, differences in government-spending variable do not generate significant differences in inflation rates.
- While positive and statistically significant, coefficient that gauges response of inflation to scaled measure of government spending significantly less than one.
- Coefficients of 0.4-0.5 suggest 40-50% of extra spending financed through inflation. Remaining 50-60% through conventional method of intertemporal public finance and real effects.

Extensions

Border dummy:

- For border dummy, estimated coefficient of core inflation almost as large as headline. Main effect likely not through energy prices.
- When estimated only through 2021, estimated coefficient on border dummy about one-third size as that through 2022. Still statistically significant at 5% for headline inflation, not core. Some part of effect does not involve Ukraine-Russia war itself?

Lagged inflation:

- Model examines inflation rate 2020-2022 relative to baseline rate for 2010-2019. (Means of inflation rates 2020-2022 are 0.042 headline, 0.033 core. For 2010-2019, 0.020 headline, 0.018 core.)
- With inflation rate 2020-2022 as dependent variable, estimated coefficients on inflation rate 2010-2019 are 1.21 (s.e.=0.17) headline, 0.97 (0.18) core.