Tempting FAIT: Flexible Average Inflation Targeting and the Post-Covid U.S. Inflation Surge*

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Abstract

In August 2020, the Federal Reserve implemented Flexible Average Inflation Targeting (FAIT) replacing its previous Flexible Inflation Targeting (FIT) framework. Given that in previous years the U.S. inflation was below the 2% target, on average, the adoption of FAIT and concurrent forward guidance opened up the possibility of letting inflation move above its target for a while. In this paper, we analyze the causal effect of this intervention on the U.S. inflation rate. Our synthetic control (SC) estimates suggest, first, that FAIT implied a rise in observed CPI inflation around 1 percentage point, on average. Second, when we investigate the effect on core CPI inflation, we find effects ranging from 0.3 to 0.4 percentage points. If this indicator is an adequate approximation to the underlying trend inflation, these two findings taken together would suggest that the public might have perceived FAIT's impact on inflation as largely temporary. Finally, we conduct a similar set of estimations with expected inflation rates at different horizons as the outcomes of interest to explore a possible transmission mechanism. Our estimates fluctuate around 0.8 percentage points for short to medium-term expectations and are almost negligible for long-term expected inflation. Overall, our findings are statistically significant and robust across several dimensions, including alternative price indices, auxiliary predictors, SC estimators, control units, and covariates for residualization (i.e., controlling for global supply chain pressures, global economic activity, government deficit, international food price and energy price inflation, policy rates, and monetary aggregates, among others).

JEL Classification: **E52, E58, E61, E65, C32, C54**

KEY WORDS: Monetary Policy, Flexible Average Inflation Targeting, Flexible Inflation Targeting, Synthetic Control Methods.

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Resumen

En agosto de 2020, la Reserva Federal implementó un objetivo de inflación promedio flexible (FAIT, por sus siglas en inglés) en sustitución de su anterior marco de objetivos de inflación flexible (FIT, por sus siglas en inglés). Dado que en años anteriores la inflación estadounidense estuvo por debajo de la meta del 2%, en promedio, la adopción de FAIT y políticas de orientación monetaria abrieron la puerta a permitir que la inflación supere su objetivo por un tiempo. En este artículo analizamos el efecto causal de esta intervención sobre la tasa de inflación de EE.UU. Nuestras estimaciones de control sintético (SC) sugieren, en primer lugar, que FAIT implicó un aumento en la inflación observada alrededor de 1 punto porcentual, en promedio. En segundo lugar, cuando investigamos el efecto sobre la inflación del IPC subyacente, encontramos efectos que oscilan entre $0,3$ y $0,4$ puntos porcentuales. Si este indicador es una aproximación adecuada a la tendencia subyacente de la inflación, estos dos hallazgos tomados en conjunto sugerirían que el público podría haber percibido el impacto del FAIT sobre la inflación como en gran medida temporal. Finalmente, realizamos unas estimaciones similares con tasas de inflación esperada a diferentes horizontes de tiempo con el fin de explorar un posible mecanismo de transmisión. Nuestras estimaciones son significativas y fluctúan alrededor de $0,8$ puntos porcentuales para expectativas de corto a mediano plazo, y son casi negligible a largo plazo. En general, nuestros resultados son estadísticamente significativos y sólidos en varias dimensiones, incluidas especificaciones alternativas, estimadores SC alternativos, unidades de control y covariables para la residualización (es decir, controlando las presiones de la cadena de suministro global, la actividad económica global, el déficit público y los agregados monetarios, entre otros).

Códigos de clasificación JEL: **E52, E58, E61, E65, C32, C54**

PALABRAS CLAVE: Política monetaria, Meta flexible de inflación promedio, Meta flexible de inflación, Método de Control Sintético.

1 Introduction

In August 2020, at the Jackson Hole economic symposium, Federal Reserve Chairman Jerome Powell unveiled a significant shift in the Federal Reserve's monetary policy framework. This shift marked the adoption of a flexible average inflation targeting (FAIT) strategy. The new approach aimed to address concerns stemming from below-target inflation and the risk of re-anchoring inflation expectations at levels below the 2% target. Under FAIT, the Federal Reserve explicitly acknowledges the possibility of temporary inflation overshoots to compensate for extended periods of below-target inflation. While the new monetary strategy represents a commitment to maintaining long-term inflation expectations, it also signals a tolerance for inflation temporarily exceeding the target. The new strategy also elevated the importance of the Fed's maximum employment objective (Board of Governors (2020)).

This significant shift in the monetary policy framework coincided with the beginning of an inflation surge unlike anything the U.S. had experienced since the Great Inflation period. Much has been written already unmasking the suspects—notably among them, supply chain disruptions, shocks in commodity prices, fiscal stimulus, etc. (Ball et al. (2022); Bernanke and Blanchard (2023); Borio et al. (2023); Gagliardone and Gertler (2023)). As noted by Waller (2022), Bernanke and Blanchard (2023), and Eggertsson and Kohn (2023), among others, the question of whether the adoption of FAIT—by itself or in the context of a period of perceived fiscal dominance—has been one of the causes of the inflation surge also entered the policy and academic debate from early on. This paper comes closest to that of Eggertsson and Kohn (2023) in its emphasis on the contribution of FAIT, but providing the first empirically quantifiable assessment of the likely causal effects of that shift in the U.S. monetary policy strategy on key macro variables, namely, actual inflation, expected inflation, and measures of economic activity.

Much of the existing literature that formally analyzes FAIT has emphasized its key features and possible advantages from a theoretical point of view. One of the first references in the theoretical literature proposing FAIT is Nessen and Vestin (2005). The more recent (largely theoretical) explorations of FAIT after the Federal Reserve's adoption include the seminal work of Duncan et al. (2022) and the research of Honkapohja and McClung (2023) and Jia and Wu (2023). Among these papers, particularly those that have come out after the Federal Reserve adopted FAIT, Duncan et al. (2022) stands out for it includes a superficial analysis that comes closest to us even though its main focus is on the theoretical effects of FAIT on the transmission of monetary policy. Our paper complements this literature because it provides a first empirical analysis of the likely causal effects of FAIT on the inflation surge, showcasing the influence it has had in practice on the trade-offs of monetary policy.[1]

In this paper, we investigate empirically how U.S. inflation rates (monthly headline CPI, headline PCE, and Core CPI inflation rates) has been affected by the implementation of FAIT using synthetic control methods (SCMs). Our empirical strategy considers several key aspects. First, we limit our pool of potential control units to countries that adopted inflation targeting (IT) during our period of study. This selection is consistent with the Federal Reserve's implementation of flexible inflation targeting (FIT) in January 2012, which marks the outset of our analysis. From among these IT countries, we specifically choose those that consistently maintained an inflation target of 2% annually throughout our period of analysis. This mirrors the Federal Reserve's own 2% target from its adoption of FIT. We further refine our selection by focusing exclusively on OECD economies.

Second, we restrict the evaluation of effects to the period spanning from the adoption of FAIT to the onset of the Russia invasion of Ukraine. This approach aims to mitigate the impact of this conflict on commodity prices (oil, natural gas, food items, etc.), and consequently, the possibly differentiated effects on domestic CPI inflation, particularly in several European economies in our control group. That said, we relax this restriction as a robustness check obtaining qualitatively similar results.

Third, aside from the canonical SCM (Abadie (2021)), we employ the augmented SCM (Ben-Michael et al. (2021)). The latter corrects the bias resulting from a possibly imperfect pre-intervention fit in the canonical SCM estimates.

Lastly, and equally importantly, we incorporate covariates commonly associated with inflation, as suggested by recent studies (e.g., see Ball et al. (2022); Bernanke and Blanchard (2023); Borio et al. (2023); Gagliardone and Gertler (2023)). Following the suggestion of Doudchenko and Imbens (2016), we residualize outcomes (inflation rates) using covariates that capture both global and domestic determinants such as global supply chain disruptions, global economic activity, commodity prices, government deficit, and monetary aggregates, among others.

We find that the inflation rate increased excessively compared with our estimated counterfactual during the period of analysis. Our estimated causal impacts on CPI inflation fall within the range of 0.8 to 1.2 percentage points, on average. This result is statistically significant and remarkably robust across several dimensions, including alternative specifications,

[1]There is also a related body of work that has explored the impact of FAIT on expectations using surveys—notable contributions include Hoffmann et al. (2022) and Coibion et al. (2023). This strand of research complements the work presented in this paper that is more focused on outcomes by emphasizing the influence of FAIT on the formation of expectations and the trade-offs that this poses for policymakers.

covariates sets, and SC estimators. Second, we investigate the causal impact on Core CPI inflation, considered a proxy for the underlying inflation trend. Our preferred specifications produce significant estimated values ranging from 0.3 to 0.4 percentage points. This may suggest that the public perceived the impact of FAIT on inflation as predominantly transitory in nature. Third, we conduct a parallel set of estimations with measures of the expected inflation rate as the outcome of interest in search of a possible transmission mechanism. Our preferred specifications produce significant estimates that fluctuate around 0.8 percentage points for short to medium-term expectations and are almost negligible for long-term expected inflation. Finally, we also analyze the impact on the unemployment rate and the industrial production index. We find little (convincing) evidence of a causal effect in this measures of economic activity.

The remainder of the paper proceeds as follows: Section 2 discusses the identification strategy, data, and SC methods used in the paper. Section 3 describes the main findings of the exercise and provides multiple robustness checks validating our findings indicating that FAIT played a role in the post-COVID inflation surge. Section 4 concludes with some final remarks. We report details about the data sources, discuss the background of the new monetary policy framework (FAIT), and provide additional results in the Appendix.

2 Identification, Data, and Methods

We hypothesize that the adoption of FAIT does not have an effect on the U.S. inflation rate. In order to test this hypothesis, we need to estimate a counterfactual. For this, we use the Synthetic Control Method (SCM). As a first step, we therefore need to select control units to form a donor pool.

Our donor pool is constructed using a set of requirements so as to work well with the SCM. First, we restrict the set of potential control units to those countries whose central banks adopted inflation targeting (IT) during the period of study. Recall that the Federal Reserve adopted (flexible) inflation targeting (FIT) explicitly in January 2012. This date marks the beginning of our period of study. Second, among the inflation targeters, we choose those that maintained an inflation target of 2% per year over the full period of analysis. The Federal Reserve established an explicit 2% target since the adoption of FIT. For the confirmation of these two conditions we consult central banks documents and Duncan et al. (2022). Finally, we narrow down our selection to OECD economies, which are characterized by similar macroeconomic policies and objectives, including countercyclical measures and a commitment to financial, fiscal, and price stability. As a result, our donor pool is composed of six economies: Canada, Czech Republic, the U.K., Israel, New Zealand, and Sweden.

We restrict the evaluation of effects to the period spanning from the adoption of FAIT to the onset of the Russian invasion of Ukraine (that began on February 24, 2022). This conflict may have caused heterogeneous effects especially on domestic energy and food prices (and hence CPI inflation) across countries, especially in several European economies that are part of our donor pool.[2] In sum, the pre-intervention period starts in 2012:M1 and ends in 2020:M7, whereas the post-intervention covers the 2020:M8-2022:M2 period.

To be precise, our variable of interest is the year-over-year change in the log of (seasonally-adjusted) headline consumer price index: $\pi_t^{CPI} \equiv 100 \cdot (\ln(CPI_t) - \ln(CPI_{t-12}))$. Table A1 in the Appendix shows summary statistics of the inflation rates in the U.S. and the donor pool. Note that we use the CPI inflation rate to have fully consistent data for the intervened unit and the donor pool. However, the Federal Reserve targets the PCE inflation rate. Studies report relatively modest differences between PCE and CPI inflation, especially in recent years, due to the different basket of goods and calculation methods. For example, Janson et al. (2020) find that CPI inflation averages 0.3 percentage points above PCE inflation between 1978 and 2018.[3] Table A1 reports that these rates are 1.58% and 1.40% during the pre-intervention period. That is, our estimated difference is around 0.18 p.p. Moreover, the correlation between both inflation rates is about 0.993 (p-value=0.00) as Figure A1 in the Appendix illustrates. That said, we analyze the sensitivity of our results employing PCE inflation in our estimations as well. In addition, Table A1 presents statistics for Core CPI inflation rates (excluding food and energy). While subject to critique, this core inflation measure is sometimes used as an approximation for the underlying inflation trend because it removes highly volatile components such as domestic food and energy prices.

After defining the donor pool and the outcome variable, we proceed to select the estimation strategy, opting for synthetic control methods (SCMs) in his context.[4] For a technical exposition, see Abadie (2021). To provide a concise overview of SCM, let us simplify it. As

[2] We relax this restriction in the section of robustness checks obtaining qualitatively similar results.

[3] As discussed in Board of Governors (2000), the FOMC prioritized CPI inflation prior to 2000 but, after an extensive evaluation process, switched to the PCE inflation for several reasons: (1) expenditure weights in the PCE deflator change as people substitute away from some goods and services toward others, (2) the PCE deflator includes more comprehensive coverage of goods and services, and (3) the PCE deflator gets revised for more than seasonal factors, incorporating new information as it becomes available. In practice, however, headline CPI inflation has been only 0.3 percentage points higher than the corresponding headline PCE inflation rate over the period from 2000:M1 until 2022:M2.

[4] The SCM was originally proposed by Abadie and Gardeazabal (2003), Abadie et al. (2010), and Abadie et al. (2015).

widely known, the canonical SCM uses data of an outcome variable (OV) and its predictors from intervened and control units to estimate a counterfactual of such OV under the absence of the intervention. The counterfactual OV or synthetic control is defined using a weighted average of the control units. In turn, the weights are estimated by minimizing the (quadratic) differences between the synthetic control and the intervened unit using pre-intervention data. Put differently, the estimation process involves finding the combination of control units that best matches the intervened unit's pre-intervention trends.

The causal impact of the intervention is the difference between the actual outcome and the synthetic control ($\pi_t - \pi_t^S$) and it can be computed for every post-intervention period ($1 \leq t \leq T$). In the SCM literature, this estimate is known as the dynamic treatment effect (DTE). Once we obtain the DTE for each post-intervention period, we can compute the average treatment effect on the treated unit (ATT). Put differently, the ATT is the average of the DTEs over the post-intervention period. Symbolically,

$$ATT = \frac{1}{T}\sum_{t=1}^{T} DTE_t, \tag{1}$$

where T is the number of post-intervention periods.

Overall, our design owns some interesting features that are worth mentioning: (1) a relatively long pre-intervention period (103 months), (2) a relatively small donor pool with (6) control units whose OV is similar to that of the intervened unit, and (3) a pre-intervention period with a relatively low variability of inflation shocks (see descriptive statistics of inflation rates in Table A1 in the Appendix). These features are recommendable when using the SCM according to Abadie et al. (2010) and Abadie (2021). They show that, under certain conditions, the SC estimator is unbiased if the data generating process (DGP) is a vector autoregressive model, and provide a bias bound if the DGP is a linear factor model (Abadie (2021)). This bias bound tends to zero when conditions similar to (1)-(3) are satisfied and, as a result, a very close pre-intervention fit is achieved.

When it is challenging to attain the desired level of pre-intervention fit quality, we turn to an alternative method introduced by Ben-Michael et al. (2021) called the augmented SCM (ASCM). The ASCM considers an outcome model based on ridge regression and a set of auxiliary predictors to estimate and correct the bias resulting from an imperfect pre-intervention fit in the canonical SCM estimate.

The ASCM also diverges from the original SCM by allowing the assignment of negative weights to select control units while simultaneously guarding against the risk of overfitting to noise (Ben-Michael et al. (2021)). The rationale for incorporating negative weights within synthetic control methods lies in their capacity to account for intricate relationships between the intervened unit and the control units. Inspired by Bove et al. (2014), we can interpret negative weights as follows. Consider the hypothetical case of an intervened unit and two control units. It is possible that a linear combination with a negative weight arises under certain scenarios. Suppose that before the policy implementation, the intervened unit is mainly driven by global factor A, the control unit 1 by global factors A and B, and the control unit 2 by global factor B. Then, the control unit 1 minus control unit 2 provides an estimate of global factor A, which drives the intervened unit.

Inspired by Doudchenko and Imbens (2016), we also consider the use of residualized outcome variables to control for global and domestic factors that have affected inflation rates in recent times. This is an important feature of our empirical strategy. As in Ben-Michael et al. (2021), we follow a two-step procedure. We first residualize pre- and post-intervention outcomes against a set of covariates and country effects, and then we fit ASCM on the residualized OVs. The main set of covariates include global factors like the Global Supply Chain Pressures Index (GSCPI), the Kilian index (as a measure of global real economic activity), international energy price inflation (ENERGY), and domestic drivers like the government surplus as a share of GDP (GSGDP), and percent changes in M3 (M3P). For robustness, we employ an extended set of covariates that also includes international food price inflation (FOOD), industrial production (percent change) (IPP), and the overnight interest rate (ONR).

All these covariates attempt to capture global and domestic inflation drivers as suggested in recent works (e.g., see Ball et al. (2022); Bernanke and Blanchard (2023); Borio et al. (2023); Gagliardone and Gertler (2023)). Also, as argued by Waller (2022) and more recently by Eggertsson and Kohn (2023), the adoption of FAIT as the new Fed's strategy in August 2020 was quickly followed by major policy actions by the FOMC on September and December 2020 that moved the needle on the important issues of policy rate liftoff (forward guidance; henceforth FG) and balance sheet normalization (BSN) after the federal funds rate was brought down to the zero-lower bound (henceforth ZLB) at the onset of the pandemic. We use overnight interest rates and M3P in certain specifications with residualization so we might pick up, at least in part, the likely effects of moves in FG and BSN.

It is important to distinguish here between SCM predictors and the covariates used in the residualization of the OV. Even though there is an overlap between these two sets of variables, they play different roles in the empirical strategy. While the predictors are employed in the matching process of the SC estimation, the covariates are used to residualize and remove their possible effects from the OV.

Finally, for inference purposes, we evaluate the significance of the treatment effects using p-values and and 95% confidence intervals introduced by Chernozhukov et al. (2021).

3 Empirical Results

3.1 Main Findings

Table 1 shows our main results using CPI inflation as the outcome variable. The first two rows display the ATT estimates and corresponding p-values. For sensitivity purposes, we report estimates from different specifications and estimators. Aside from the past values of the OV, we use auxiliary predictors such as the government surplus as a share of GDP (GSGDP) and percent changes in M3 (M3P) (columns 2-4, 7, and 8). Likewise, when we use the ASCM, we show bias-corrected estimates (columns $3-8$). When we perform residualization, we use two samples: the full period (column 4) and the pre-pandemic period (columns $5-8$). In this case, we use either the main set of covariates (columns 5 and 7) or an extended set (columns 6 and 8) as described above.

In summary, we obtain the expected sign and statistically significant effects. When employing residualized inflation rates, our preferred specifications, ATT estimates fall within the range of 0.7 to 1.1 p.p., with lower values associated with the utilization of pre-COVID data.

Moreover, Table 1 provides information on synthetic weights, pre-intervention root mean squared prediction error (RMSPE), pre-intervention mean absolute prediction error (MAPE), as well as details on diagnostic and robustness tests (further elaborated below). Regarding the estimated weights, several noteworthy observations can be made. Firstly, the weights show an interesting level of sparsity, with some units having a minimal contribution to the synthetic control. Secondly, none of the control units possesses a weight that approaches unity. Thirdly, the countries with the most substantial contributions to the synthetic control tend to be primarily from the core Anglosphere, mainly Canada and the U.K., occasionally New Zealand. Lastly, while there are some cases of negative weights, they are of relatively small magnitude.

As previously discussed, the Federal Reserve's primary focus is on PCE inflation rather than CPI inflation. Despite the modest discrepancy observed between these two indices, as Table A1 in the Appendix suggests, we assess the robustness of our estimates by using the PCE inflation rate for the U.S., while maintaining the CPI inflation rates for the remaining countries, as an equivalent index is not available for the donor pool. Table 2 presents the updated ATT estimates comparable to columns 4 and 7 in Table 1 (specifications utilizing residualized inflation rates), which are 0.76 and 0.91 p.p. (columns $1-2$ in Table 2).

Additionally, we investigate the causal impact of FAIT on Core CPI inflation, considered a proxy for the underlying inflation trend. As illustrated in Table 3, the specifications that incorporate residualization (see columns $3-4$) produce estimated ATT values ranging from 0.3 to 0.4 p.p. Notably, these ATTs exhibit a lower magnitude compared to those calculated using CPI inflation. This observation may suggest that the economic agents perceived the impact of FAIT on inflation as predominantly transitory in nature.

Table 1. The Effect of Adopting FAIT on the CPI Inflation Rate

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
ATT	1.257	1.305	1.296	1.102	0.713	0.739	0.997	0.775
p-value	0.066	0.066	0.049	0.090	0.041	0.008	0.016	0.016
Auxiliary predictors	*No*	*Yes*	*Yes*	*Yes*	*No*	*No*	*Yes*	*Yes*
Bias correction	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Residualization – Full sample	*No*	*No*	*No*	*Yes*	*No*	*No*	*No*	*No*
Residualization – Pre-COVID sample	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*
Extended set of covariates	...	...	...	*No*	*No*	*Yes*	*No*	*Yes*
Weights								
Canada	0.438	0.438	0.438	0.413	0.519	0.528	0.416	0.527
Czech Republic	0.061	0.047	0.047	0.193	−0.029	−0.031	−0.012	−0.034
Israel	0.000	0.000	−0.006	−0.019	−0.001	0.050	0.015	0.042
New Zealand	0.080	0.063	0.065	0.118	0.117	0.105	0.093	0.091
Sweden	0.039	0.040	0.041	−0.021	0.040	0.005	0.138	0.008
United Kingdom	0.381	0.413	0.414	0.317	0.354	0.343	0.350	0.366
Diagnostics & Robustness								
RMSPE	0.282	0.283	0.283	0.370	0.323	0.316	0.310	0.317
MAPE	0.226	0.227	0.226	0.298	0.260	0.258	0.239	0.257
Estimated Bias	...	...	−0.009	0.002	−0.036	−0.039	−0.050	−0.074
Improvement w.r.t. uniform weights (%)	40.89	40.66	40.78	12.04	39.01	40.05	22.53	40.04
No anticipation test (p-val)	0.350	0.320	0.330	0.621	0.583	0.553	0.893	0.670
In-time placebo tests (p-val)	0.932	0.903	0.932	0.592	0.709	0.515	0.845	0.563
Leave-one-out test (#p-val> 0.1)	1	0	1	1	0	0	0	0

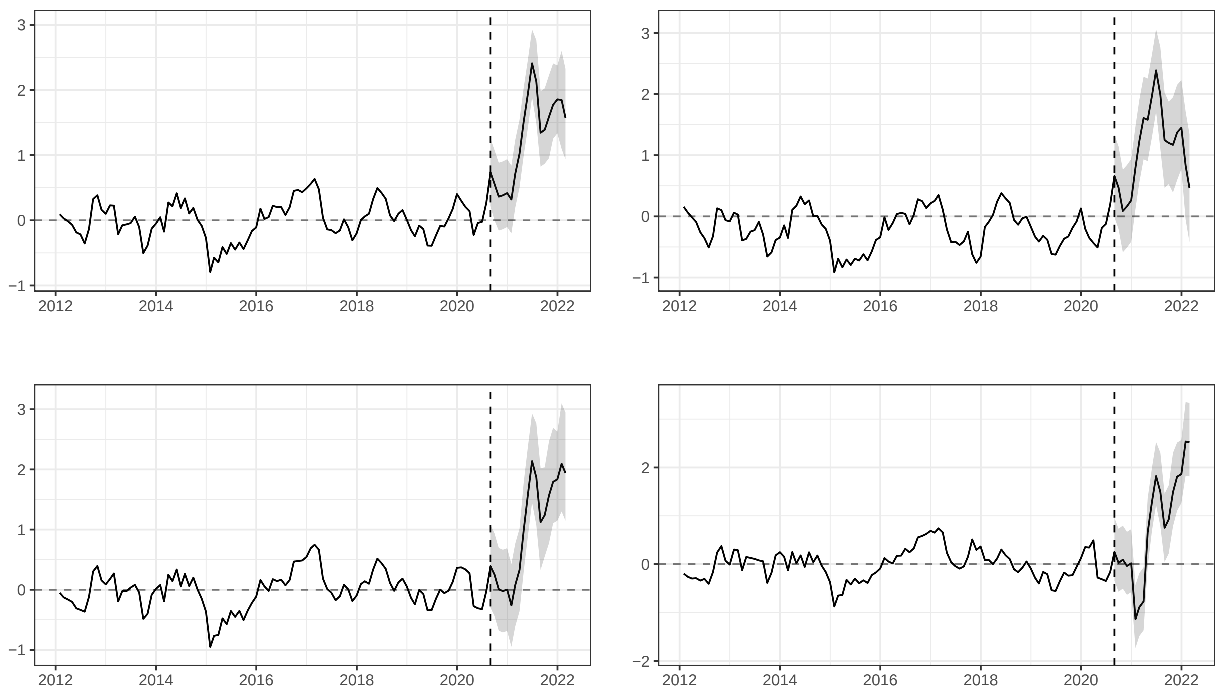
Note: The p-value related to average treatment effect on the treated unit is that related to the joint null hypothesis that every effect is zero over the post-intervention period. RMSPE and MAPE stand for the pre-intervention root mean squared prediction error and the pre-intervention mean absolute prediction error, respectively. The bias estimate and the percent improvement with respect to the use of uniform weights are reported when we use the Augmented SCM. The no anticipation test (p-val) reports the p-value of the null hypothesis that the outcome gap is zero one month prior to FAIT adoption. The p-value of the in-time placebo test is related to the null hypothesis that the ATT is zero for the 24-month period between the fake treatment date (2018M8) and actual treatment date (2020M8). The row leave-one-out test (#p-val> 0.1) shows the number of p-values higher than 0.10 over the cases in which one of the control units with positive weight is excluded from the SC estimation. Residualization of the CPI inflation rates is carried out using country effects, the Global Supply Chain Pressures Index (GSCPI), the Kilian index, global energy price inflation (ENERGY), government surplus as a share of GDP (GSGDP), and M3 (percent change) (M3P). The extended set of covariates includes also international food price inflation (FOOD), the industrial production (percent change) (IPP), and the overnight rate (ONR).

Table 2. The Effect of Adopting FAIT on the PCE and Core Inflation Rates

	[1]	[2]	[3]	[4]
Price index	*PCE*	*PCE*	*Core CPI*	*Core CPI*
ATT	0.910	0.761	0.429	0.313
p-value	0.057	0.041	0.008	0.025
Auxiliary predictors	*Yes*	*Yes*	*Yes*	*Yes*
Bias correction	*Yes*	*Yes*	*Yes*	*Yes*
Residualization – Full sample	*Yes*	*No*	*Yes*	*No*
Residualization – Pre-COVID sample	*No*	*Yes*	*No*	*Yes*
Extended set of covariates	*No*	*No*	*No*	*No*
Weights				
Canada	0.379	0.395	0.400	0.611
Czech Republic	0.130	−0.020	−0.004	−0.020
Israel	0.026	0.095	0.103	0.309
New Zealand	0.182	0.136	0.263	0.000
Sweden	−0.026	0.100	0.006	0.052
United Kingdom	0.309	0.295	0.231	0.047
Diagnostics & Robustness				
RMSPE	0.298	0.198	0.261	0.229
MAPE	0.241	0.161	0.212	0.187
Estimated Bias	−0.006	−0.065	−0.022	−0.096
Improvement w.r.t. uniform weights (%)	14.64	37.53	23.11	44.93
No anticipation test (p-val)	0.233	0.641	0.816	0.272
In-time placebo tests (p-val)	0.010	0.544	0.835	0.233
Leave-one-out test (#p-val> 0.1)	1	1	1	0

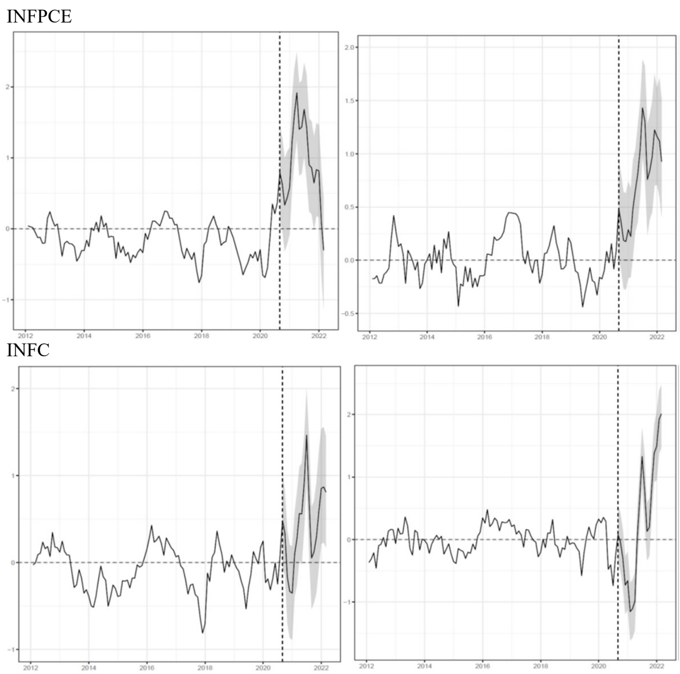
Note: The p-value related to average treatment effect on the treated unit is that related to the joint null hypothesis that every effect is zero over the post-intervention period. RMSPE and MAPE stand for the pre-intervention root mean squared prediction error and the pre-intervention mean absolute prediction error, respectively. The bias estimate and the percent improvement with respect to the use of uniform weights are reported when we use the Augmented SCM. The no anticipation test (p-val) reports the p-value of the null hypothesis that the outcome gap is zero one month prior to FAIT adoption. The p-value of the in-time placebo test is related to the null hypothesis that the ATT is zero for the 24-month period between the fake treatment date ($2018 : M8$) and actual treatment date ($2020 : M8$). The row leave-one-out test (#p-val> 0.1) shows the number of p-values higher than 0.10 over the cases in which one of the control units with positive weight is excluded from the SC estimation. Residualization of the CPI inflation rates is carried out using country effects, the Global Supply Chain Pressures Index (GSCPI), the Kilian index, global energy price inflation (ENERGY), government surplus as a share of GDP (GSGDP), and M3 (percent change) (M3P). The extended set of covariates includes also international food price inflation (FOOD), the industrial production (percent change) (IPP), and the overnight rate (ONR).

Figure 1. Outcome Gap: CPI Inflation Rate.



Source: Dallas Fed' Database of Global Economic Indicators (Grossman et al. (2014)); authors' calculations. Note: The figures display the gap between the actual values and the synthetic estimates of the outcome variable, alongside the 95% confidence intervals. Each figure marks the treatment date (August 2020) with a dashed vertical line. The top left graph presents canonical synthetic control estimation using only pre-intervention outcomes as predictors. The top right graph shows the results using residualization of the outcome variable. This is carried out using country fixed effects, the Global Supply Chain Pressures Index (GSCPI), the Kilian index, global energy price inflation (ENERGY), government surplus as a share of GDP (GSGDP), and the percent change in M3 money supply (M3P) over the full sample. The bottom left graph presents the results from residualization using data until February 2020 to estimate coefficients. These estimates are then used to calculate residuals for the up to February 2022, considering August 2020 as the treatment date, and including GSGDP and M3P as auxiliary predictors in the SC estimation. The bottom right graph extends the bottom left's method by adding FOOD, IPP, and ONR as covariates in the residualization phase.

Figure 2. Outcome Gap: PCE and Core Inflation Rates.



Source: Dallas Fed' Database of Global Economic Indicators (Grossman et al. (2014)); authors' calculations. Note: The figures display the gap between the actual values and the synthetic estimates of the outcome variable, alongside the 95% confidence intervals. Each figure marks the treatment date (August 2020) with a dashed vertical line. The graphs present the results using residualization of the outcome variables: the PCE inflation rate (INFPCE) is shown on the top graphs, while the Core CPI inflation rate (INFC) is featured on the bottom graphs. For the top graphs, residuals are calculated using the PCE inflation rate (in 12-month percent change) for the U.S. and the CPI inflation rate (in 12-month percent change) for the donor pool as the dependent variables, with the Global Supply Chain Pressures Index (GSCPI), the Kilian index, global energy price inflation (ENERGY), government surplus as a share of GDP (GSGDP), and the percent change in M3 money supply (M3P) serving as covariates. The top left graphs estimate coefficients across the full sample, whereas the top right graphs limit the data to February 2020. In contrast, the bottom graphs calculate residuals in a similar manner but use the Core CPI inflation rates as the outcome variables for both the treated and control groups.

3.2 Exploring Possible Transmission Mechanisms

To initiate an examination of potential transmission mechanisms, we conduct a parallel set of estimations using measures of expected inflation over various time horizons (short, medium, and long-term). Table 3 presents the results. As observed, our estimated ATTs range between 0.7 and 0.9 p.p. for the short and short-to-medium terms (columns $1-4$). In the medium and long term, expectations appear to be less influenced by FAIT, exhibiting values between 0.01 and 0.2 p.p., and may become statistically insignificant (columns $5-8$).

We further explore potential transmission mechanisms through measures of economic activity such as the unemployment rate and industrial production, with results detailed in Table A2 in the Appendix. Our findings provide scant compelling evidence of a causal relationship through these macroeconomic indicators.[5] We utilize the unemployment rate as an additional variable of interest to capture the trade-off between inflation and unemployment, traditionally represented by the Phillips curve. Although we observe the anticipated negative effects, in this case within the range of -0.2 to -0.3, these effects are statistically insignificant (columns $1-2$). This finding aligns with the frequently discussed hypothesis that the Phillips curve's slope might have flattened during the COVID pandemic. However, the extent to which this flattening is associated with the implementation of FAIT remains unclear. Furthermore, the pre-treatment fit, as assessed by metrics such as the RMPSE or MAPE, along with other diagnostic and robustness checks, necessitates caution in interpreting the impacts on unemployment and industrial production as definitive causal effects.

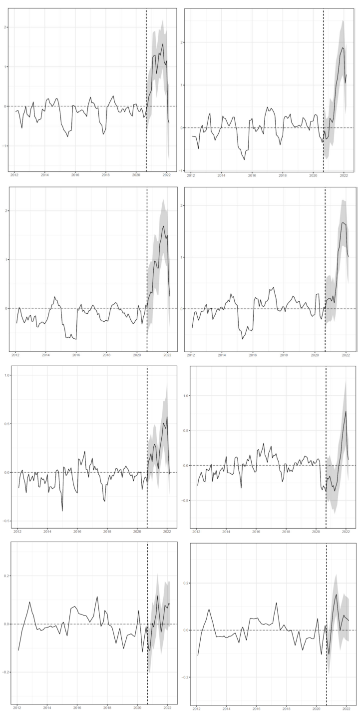
[5] Another potential transmission mechanism frequently cited involves an energy shock precipitating a wage spiral and consequently contributing to an inflation surge. To account for this, we include covariates such as international energy price inflation (ENERGY) and specifically focus on the period of escalating inflation before the onset of the Ukraine war on February 24, 2022, which prompted a significant energy shock.

Table 3. The Effect of Adopting FAIT on Short-Term, Medium-Term, and Long-Term Inflation Expectations

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Horizon of the inflation expectations	Short-Term		Short/Medium-Term		Medium-Term		Long-Term	
ATT	0.780	0.713	0.881	0.769	0.234	0.013	0.016	0.037
p-value	0.008	0.049	0.025	0.008	0.033	0.066	0.189	0.115
Auxiliary predictors	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Bias correction	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Residualization – Full sample	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*
Residualization – Pre-COVID sample	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*
Weights								
Canada	0.631	0.651	0.518	0.496	0.782	0.774	0.611	0.473
Czech Republic	0.197	−0.035	0.125	−0.064	0.061	−0.024	0.200	0.335
Israel	−0.082	−0.031	−0.036	−0.066	−0.027	−0.024	...	...
New Zealand	0.050	0.018	0.006	−0.010	−0.023	−0.042	0.088	0.045
Sweden	−0.084	0.129	−0.005	0.189	0.076	0.227	−0.004	0.010
United Kingdom	0.288	0.269	0.391	0.455	0.131	0.089	0.105	0.137
Diagnostics & Robustness								
RMSPE	0.277	0.267	0.255	0.213	0.109	0.140	0.047	0.042
MAPE	0.202	0.212	0.196	0.163	0.081	0.113	0.038	0.035
Estimated Bias	0.097	−0.047	0.005	−0.104	0.020	−0.010	−0.002	−0.001
Improvement w.r.t. uniform weights (%)	28.43	32.65	23.02	41.16	51.29	44.27	16.91	16.52
No anticipation test (p-val)	0.282	0.194	0.728	0.845	0.563	0.029	0.816	0.777
In-time placebo tests (p-val)	0.883	0.961	0.699	0.680	0.932	0.621	0.117	0.301
Leave-one-out test (#p-val> 0.1)	0	0	0	0	1	2	3	2

Note: The p-value related to average treatment effect on the treated unit is that related to the joint null hypothesis that every effect is zero over the post-intervention period. RMSPE and MAPE stand for the pre-intervention root mean squared prediction error and the pre-intervention mean absolute prediction error, respectively. The bias estimate and the percent improvement with respect to the use of uniform weights are reported when we use the Augmented SCM. The no anticipation test (p-val) reports the p-value of the null hypothesis that the outcome gap is zero one month prior to FAIT adoption. The p-value of the in-time placebo test is related to the null hypothesis that the ATT is zero for the 24-month period between the fake treatment date (2018M8) and actual treatment date (2020M8). The row leave-one-out test (#p-val> 0.1) shows the number of p-values higher than 0.10 over the cases in which one of the control units with positive weight is excluded from the SC estimation. Residualization of the outcome variables is carried out using country fixed effects, the Global Supply Chain Pressures Index (GSCPI), the Kilian index, global energy price inflation (ENERGY), government surplus as a share of GDP (GSGDP), and M3 (percent change) (M3P).

Figure 3. Outcome Gap: Core CPI Inflation Rate.



Source: Dallas Fed' Database of Global Economic Indicators (Grossman et al. (2014)); authors' calculations. Note: The figures display the gap between the actual values and the synthetic estimates of the outcome variable, alongside the 95% confidence intervals. Each figure marks the treatment date (August 2020) with a dashed vertical line. Residualization of the outcome variables is carried out using country fixed effects, the Global Supply Chain Pressures Index (GSCPI), the Kilian index, global energy price inflation (ENERGY), government surplus as a share of GDP (GSGDP), and M3 (percent change) (M3P). The graphs are stratified by inflation expectation horizons: the first row for short-term, the second for short/medium-term, the third for medium-term, and the last row for long-term expectations. Graphs on the left use data from the entire sample for coefficient estimation, while graphs on the right restrict the dataset to February 2020.

3.3 Additional Diagnostics and Robustness Checks

For a causal interpretation of the aforementioned findings, it is imperative to establish a credible synthetic control counterfactual. Therefore, conducting diagnostic tests and robustness exercises is crucial to evaluate the sensitivity of the results to variations in the study's design. The lower panel of Table 1 through Table 3 present this information.

3.3.1 Absence of anticipation effects and time placebos

We test that the absence of anticipation effects. We estimate the SC backdating the period of intervention one month prior to the adoption of FAIT. We report the p-value of the null hypothesis that the treatment effect (difference between the actual outcome variable and its synthetic counterpart) is zero in 2020:M7. Our results suggest that there is no evidence of anticipation effects on actual or expected inflation rates (see, e.g., Table 1−Table 3).

In a similar vein, we conduct an in-time placebo test by backdating the period of intervention 24 months before the adoption of FAIT. The row labeled "In-time placebo test (p-val)" quantifies the p-value of the null hypothesis that the ATT is zero during this adjusted period. Ideally, a high value, preferably above 0.1, in this row would provide greater confidence in the credibility of our empirical design. With the exception of the first specification for PCE inflation, the vast majority of the specifications in Table 1 through Table 3 provide evidence supporting the resilience of our design to this type of backdating exercise.

3.3.2 Leave-one-out test and potential spillover effects

It is crucial to assess the robustness of our principal findings to variations in country weights and to consider the potential for biased estimates stemming from spillover effects. The row labeled "Leave-one-out (No. of p-values > 0.1)" in Table 1−Table 3 enumerates instances where p-values surpass 0.1 upon the exclusion of a control unit carrying non-zero weight from the SC estimation. Generally, this test suggests that our designs, and consequently our estimates, remain stable even with the removal of a significantly weighted control unit. For illustrative purposes, plots depicting the synthetic estimates from these leave-one-out exercises are provided in the Appendix. For example, Table 1 indicates that the number of p-values exceeding 0.1 is one for certain specifications (columns 1, $3-4$). Specifically, these tests show that omitting Canada—the control unit with the most substantial synthetic weight—impacts our estimated ATTs and their corresponding p-values to a certain degree.

This observation requires thorough analysis, particularly in light of the SCM literature (e.g., Abadie (2021); Di Stefano and Mellace (2023)), which recognizes a potential conflict between the utility of an impacted control unit in the donor pool and the bias resulting from a spillover effect. Abadie (2021) advises incorporating control units that may be affected by the intervention, particularly when researchers anticipate the direction of the bias. In our case, the inclusion of Canada is presumed to introduce a negative bias (underestimated ATT), given that FAIT might have marginally elevated the CPI inflation rate in Canada, possibly due to its geographic proximity and economic ties with the US.

Table A3 in the Appendix delves into this analysis further. The table reiterates the ATT, p-value, RMSPE, and (interpolation) bias estimate for CPI inflation, comparing results from using the complete donor pool to those derived from a pool excluding Canada. Additionally, it presents the differential between these estimates and statistics. On average, the discrepancy in ATTs is relatively minor (around -0.2) across the four specified models, indicating a slightly higher, yet modest, average ATT upon excluding Canada from the donor pool. Conversely, the exclusion of Canada is observed to adversely affect the pre-intervention fit, as evidenced by an increase in RMSPE to the first or second decimal place. Furthermore, comparing the absolute differences in (interpolation) bias estimates using ASCM reveals an average improvement of approximately 0.12 p.p. In summary, this analysis underlines the benefits of retaining Canada in our donor pool in terms of pre-intervention fit and (interpolation) bias estimation, while acknowledging the manageable cost associated with a potential spillover effect.

3.3.3 Extended post-intervention period

Until now, our analysis has deliberately limited the post-intervention period until 2022:M2 to mitigate potential distortions in domestic inflation rates arising from the Russian invasion of Ukraine and its subsequent impact, particularly on the control units. This event could introduce a downward bias in our estimates from that point forward. To evaluate the robustness of our findings against this temporal restriction, we have extended the post-intervention analysis up to 2022:M12 (adding ten additional periods). This extension is dictated by the availability of data concerning expected inflation measures. The revised results, presented in Table A4 of the Appendix, continue to affirm the robustness of our initial findings but with lower ATTs. Specifically, we observe that the ATTs remain positive and statistically significant. Qualitatively, our principal conclusions hold, even when accounting for a broader post-intervention timeline.

4 Concluding Remarks

In this paper, we investigate empirically how the U.S. economy's performance has been affected by the implementation of FAIT. Using the synthetic control method (SCM) to evaluate the likely impact of FAIT on monthly headline CPI inflation, headline PCE inflation, and core CPI inflation, we find that the inflation rate increased excessively compared with our estimated counterfactual during the post-FAIT period (between 0.7 and 1.3 percentage points, on average, during 2020:M8-2022:M2).[6] In contrast to previous applications of the SCM method, we use the residualization proposed by Doudchenko and Imbens (2016) to "clean" the inflation rates from the effects of usual covariates such as those related to fiscal policy, global supply chain disruptions, commodity prices, and other domestic and global factors.

Our counterfactual analysis lends some support for the view that the adoption of FAIT and forward guidance contributed to the recent inflation surge—even when we try to abstract from other potential explanations and even from the heightened disruptions and commodity price spikes caused by Russia's invasion of Ukraine. Forward guidance played a role in keeping policy rates low for too long since the COVID pandemic. In that sense, our findings suggest that—apart from the new FAIT strategy—we cannot ignore the part played by the Fed's forward guidance communication on monetary policy normalization given in September and December 2020 in influencing the Fed's slow response to the rising tide of inflation in the later part of 2020 and during 2021.

While a quicker Fed response to the build up of inflationary pressures likely would not have prevented the upturn in inflation or its persistence, had the Fed moved sooner, our findings suggest that inflation likely would not have risen so much and the Fed might have been able to raise interest rates more gradually and end at a somewhat lower terminal rate.

[6] This complements the structural approach adopted by Duncan et al. (2022) to investigate the implications of FAIT on cyclical inflation through the lens of the workhorse two-country New Keynesian dynamic stochastic general equilibrium model of Martínez-García and Wynne (2010) and Martínez-García (2019). That model captures monetary policy prior to the adoption of FAIT with a Taylor (1993) rule as in Martínez-García (2021), augmented with monetary policy news shocks as in Del Negro et al. (2012), assuming that the Federal Reserve could choose to react to current as well as past inflation over one-year, two-year or five-year windows using either a simple moving average or an exponentially-weighted moving average in order to reflect alternative ways of responding to past inflation misses under the new FAIT monetary policy framework.

References

Abadie, A. (2021). Using Synthetic Controls: Feasibility, Data Requirements, and Methodological Aspects. *Journal of Economic Literature 59*(2), 391–425. https://doi.org/10.1257/jel.20191450.

Abadie, A., A. Diamond, and J. Hainmueller (2010). Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program. *Journal of the American Statistical Association 105*(490), 493–505. https://doi.org/10.1198/jasa.2009.ap08746.

Abadie, A., A. Diamond, and J. Hainmueller (2015). Comparative Politics and the Synthetic Control Method. *American Journal of Political Science 59*(2), 495–510. https://doi.org/10.1111/ajps.12116.

Abadie, A. and J. Gardeazabal (2003). The Economic Costs of Conflict: A Case Study of the Basque Country. *American Economic Review 93*(1), 113–132. https://doi.org/10.1257/000282803321455188.

Ball, L., D. Leigh, and P. Mishra (2022). Understanding U.S. Inflation During the COVID Era. *NBER Working Papers 30613, National Bureau of Economic Research, Inc.*. https://doi.org/10.3386/w30613.

Ben-Michael, E., A. Feller, and J. Rothstein (2021). The Augmented Synthetic Control Method. *Journal of the American Statistical Association 116*(536), 1789–1803. https://doi.org/10.1080/01621459.2021.1929245.

Bernanke, B. and O. Blanchard (2023). What Caused the U.S. Pandemic-Era Inflation? *Hutchins Center Working Paper No. 86*. https://www.brookings.edu/research/what-caused-the-u-s-pandemic-era-inflation/.

Bernanke, B. S. and F. S. Mishkin (1997). Inflation Targeting: A New Framework for Monetary Policy? *Journal of Economic Perspectives 11*(2), 97–116. https://doi.org/10.1257/jep.11.2.97.

Board of Governors (2000). Monetary Policy Report to the Congress Pursuant to the Full Employment and Balanced Growth Act of 1978. *Board of Governors of the Federal Reserve System*. February 17, 2000. https://www.federalreserve.gov/boarddocs/hh/2000/february/fullreport.pdf.

Board of Governors (2020). Guide to Changes in the Statement on Longer-Run Goals and Monetary Policy Strategy. *Board of Governors of the Federal Reserve System*.

August 27, 2020. https://www.federalreserve.gov/monetarypolicy/guide-to-changes-in-statement-on-longer-run-goals-monetary-policy-strategy.htm.

Borio, C., B. Hofmann, and E. Zakrajsek (2023). Does Money Growth Help Explain the Recent Inflation Surge? *BIS Bulletin No. 67*. https://doi.org/10.1257/000282803321455188.

Bove, V., L. Elia, and R. Smith (2014). The Relationship Between Panel and Synthetic Control Estimators of the Effect of Civil War. *BCAM Working Papers from Birkbeck Centre for Applied Macroeconomics, No. 1406*. https://eprints.bbk.ac.uk/id/eprint/26601/.

Caldara, D., E. Gagnon, E. Martínez-García, and C. J. Neely (2021). Monetary Policy and Economic Performance Since the Financial Crisis. *Federal Reserve Bank of St. Louis Review 103*(4), 425–460. https://doi.org/10.20955/r.103.425-60.

Chernozhukov, V., K. Wuthrich, and Y. Zhu (2021). An Exact and Robust Conformal Inference Method for Counterfactual and Synthetic Controls. *Journal of the American Statistical Association 116*(536), 1849–1864. https://doi.org/10.1080/01621459.2021.1920957.

Coibion, O., Y. Gorodnichenko, E. Knotek, and R. Schoenle (2023). Average Inflation Targeting and Household Expectations. *Journal of Political Economy: Macroeconomics 1*(2), 403–446. https://doi.org/10.1086/722962.

Del Negro, M., M. P. Giannoni, and C. Patterson (2012). The Forward Guidance Puzzle. *FRB of New York Staff Report No. 574*. http://dx.doi.org/10.2139/ssrn.2163750.

Di Stefano, R. and G. Mellace (2023). The Inclusive Synthetic Control Method. *Unppublished manuscript*. https://rb.gy/6rpqvi.

Doudchenko, N. and G. Imbens (2016). Balancing, Regression, Difference-In-Differences and Synthetic Control Methods: A Synthesis. *NBER Working Paper No. 22791*. https://doi.org/10.3386/w22791.

Duncan, R., E. Martínez García, and J. Coulter (2022). Flexible Average Inflation Targeting: How Much Is U.S. Monetary Policy Changing? *Economia 45*(89), 102–149. https://doi.org/10.18800/economia.202201.005.

Duncan, R., E. Martínez García, and P. Toledo (2022). Just Do IT? An Assessment of Inflation Targeting in a Global Comparative Case Study. Federal Reserve

Bank of Dallas *Globalization and Monetary Policy Institute Working Paper No. 418*. https://doi.org/10.24149/gwp418.

Eggertsson, G. and D. Kohn (2023). The Inflation Surge of the 2020s: The Role of Monetary Policy. *Hutchins Center Working Paper No. 87*. https://www.brookings.edu/articles/the-inflation-surge-of-the-2020s-the-role-of-monetary-policy.

Gagliardone, L. and M. Gertler (2023). Oil Prices, Monetary Policy and Inflation Surges. *NBER Working Paper 31263*. https://doi.org/10.1257/000282803321455188.

Grossman, V., A. Mack, and E. Martínez-García (2014). A New Database of Global Economic Indicators. *The Journal of Economic and Social Measurement 39*(3), 163–197. https://www.doi.org/10.3233/JEM-140391. The database can be accessed at: https://www.dallasfed.org/institute/dgei.

Hoffmann, M., E. Moench, L. Pavlova, and G. Schultefrankenfeld (2022). Would Households Understand Average Inflation Targeting? *Journal of Monetary Economics 129*, S52–S66. https://doi.org/10.1016/j.jmoneco.2022.02.006.

Honkapohja, S. and N. McClung (2023). On Robustness of Average Inflation Targeting. *SSRN Working Paper No. 4021712*. https://dx.doi.org/10.2139/ssrn.4021712.

Janson, W., R. Verbrugge, and C. Binder (2020). The CPIŰPCEPI Inflation Differential: Causes and Prospects. *Economic Commentary Number 2020-06 93*(1), 113–132. https://doi.org/10.26509/frbc-ec-202006.

Jia, C. and J. C. Wu (2023). Average Inflation Targeting: Time Inconsistency and Ambiguous Communication. *Journal of Monetary Economics 138*, 69–86. https://doi.org/10.1016/j.jmoneco.2023.05.010.

Martínez-García, E. (2018). Modeling Time-Variation Over the Business Cycle (1960-2017): An International Perspective. *Studies in Nonlinear Dynamics and Econometrics 22*(5), 1–25. https://doi.org/10.1515/snde-2017-0101.

Martínez-García, E. (2019). Good Policies or Good Luck? New Insights on Globalization and the International Monetary Policy Transmission Mechanism. *Computational Economics 54*(1), 419–454. https://doi.org/10.1007/s10614-017-9746-9.

Martínez-García, E. (2021). Get the Lowdown: The International Side of the Fall in the U.S. Natural Rate of Interest. *Economic Modelling 100*, 105486. https://doi.org/10.1016/j.econmod.2021.03.005.

Martínez-García, E. and M. A. Wynne (2010). The Global Slack Hypothesis. Federal Reserve Bank of Dallas *Staff Papers, 10*. September. https://goo.gl/uqSXM1.

Nessen, M. and D. Vestin (2005). Average Inflation Targeting. *Journal of Money, Credit and Banking 37*(5), 837–863. https://doi.org/10.1353/mcb.2005.0055.

Taylor, J. B. (1993). Discretion versus Policy Rules in Practice. *Carnegie-Rochester Conference Series on Public Policy 39*, 195–214. https://doi.org/10.1016/0167-2231(93)90009-l.

Waller, C. J. (2022). Lessons Learned on Normalizing Monetary Policy. *Speech at Monetary Policy at a Crossroads, a panel discussion hosted by the Dallas Fed in Dallas, Texas*. Dallas, Texas. June 18, 2022. https://www.federalreserve.gov/newsevents/speech/waller20220618a.htm.

Appendix

A Data Sources

All data is collected from the national sources identified and used by the Federal Reserve Bank of Dallas' Database of Global Economic Indicators (Grossman et al. (2014)). All series are expressed at monthly frequency and seasonally adjusted. The time coverage of the transformed series goes from January 2012 until June 2023. The country coverage includes: U.S. (Treated Country); Canada, Czechia, Israel, New Zealand, Sweden, and U.K. (Control Countries). Other countries that we also investigate as potential controls units are the Euro-zone, Poland, Norway, South Korea, Japan, Iceland, and Australia.

CPI Inflation (INF). The headline Consumer Price Index (CPI) inflation rate is the year-over-year inflation rate (12-month change in the logged Consumer Price Index). The headline CPI data refer to the preferred national source and come from U.S. Bureau of Labor Statistics, Statistics Canada, Czech Statistical Office, Israel Central Bureau of Statistics, Statistics New Zealand, Sweden Statistiska Centralbyran, and U.K. Office for National Statistics. Haver Analytics mnemonics: PCU@USECON, S156PC@G10, H935PC@EMERGECW, H436PC@EMERGEMA, H196PC@G10, H144PC@G10, and H112PC@G10. *Note*: The CPI for New Zealand is interpolated at monthly frequency because the series is reported only at quarterly frequency.

Core CPI Inflation (INFC). The core Consumer Price Index (CPI) inflation rate is the year-over-year inflation rate (12-month change in the logged core Consumer Price Index). The core CPI (ex. food and energy) data refer to the preferred national source and come from U.S. Bureau of Labor Statistics, Statistics Canada, Czech National Bank, Bank of Israel, Statistics New Zealand, Organization for Economic Cooperation & Development, and U.K. Office for National Statistics. Haver Analytics mnemonics: S111PCXG@G10, S156PCXG@G10, N935PCXU@EMERGECW, H436PCXG@EMERGEMA, H196PCXG@G10, N144PCXG@OECDMEI, and H112PCXF@G10. *Note*: The core CPI for Czechia and Sweden are seasonally adjusted since they are obtained unadjusted from their respective sources; the New Zealand series is interpolated at monthly frequency because the series is reported only at quarterly frequency.

U.S. PCE Inflation (INFPCE). The Personal Consumption Expenditures (PCE) inflation rate is the year-over-year inflation rate (12-month change in the logged Personal Consumption Expenditures deflator index). The PCE data comes from U.S. Bureau of Economic Analysis. Haver Analytics mnemonics: S111NCPJ@G10.

Unemployment Rate (UR). The unemployment rate is the fraction of active population unemployed expressed in percent. The unemployment rate data come from U.S. Bureau of Labor Statistics, Statistics Canada, Czech Statistical Office, Israel Central Bureau of Statistics, Statistics New Zealand, Sweden Statistiska Centralbyran, and U.K. Office for National Statistics. Haver Analytics mnemonics: S111ELUR@G10, S156ELUR@G10, S935ELUR@EMERGECW, S436ELUR@EMERGEMA, S196ELUR@G10, S144ELUR@G10, and S112ELUR@G10. *Note*: The unemployment rate for New Zealand is interpolated at monthly frequency because the series is reported only at quarterly frequency.

Overnight Interest Rates (ONR). The U.S. Federal Funds [Effective] Rate and the overnight nominal rate (ONR) of interest for the control countries are expressed in percent per annum and reported at the end-of-period (EOP) values. The ONR data come from U.S. Federal Reserve Board, Bank of Canada, Czech National Bank, Bank of Israel, Reserve Bank of New Zealand, Tullett Prebon Information, and Bank of England. Haver Analytics mnemonics: R111RDE@INTWKLY, R156RME@INTWKLY, N935RIOE@EMERGECW, R436IONE@INTWKLY, R196RCE@INTWKLY, L144MTNE@INTWKLY, and R112LOSE@INTWKLY.

Industrial Production Growth (IPP). Industrial Production (IP) is the output of the industrial sector of the economy.The transformed variable IPP is the 12-month percent change defined by $100 \cdot \left(\ln\left(\frac{IP_t}{IP_{t-12}}\right)\right)$ where IP_t is the measure of industrial production at time t, and IP_{t-12} is the measure of industrial production 12 months prior. The IP data come from U.S. Federal Reserve Board, Statistics Canada, Czech Statistical Office, Israel Central Bureau of Statistics, Statistics New Zealand, Sweden Statistiska Centralbyran, and U.K. Office for National Statistics. Haver Analytics mnemonics: S111D@G10, S156D@G10, S935D@EMERGECW, S436DMBC@EMERGEMA, S196D@G10, S144D@G10, and S112D@G10. *Note*: The IP data for New Zealand is interpolated at monthly frequency because the series is reported only at quarterly frequency.

M3 Growth (M3P). The M3 aggregate refers to a conventional measure of Broad money. The transformed variable M3P is the 12-month percent change defined by $100 \cdot \left(\ln\left(\frac{M_t}{M_{t-12}}\right)\right)$ where M_t is the measure of M3 at time t and M_{t-12} is the measure of M3 12 months prior. The M3 data is reported in local currency and at end-of-period (EOP) values. The data come from Organization for Economic Cooperation & Development for the U.S. and Canada, Czech National Bank, Bank of Israel, Reserve Bank of New Zealand, Sveriges Riksbank, and Bank of England. Haver Analytics mnemonics: C111FM3@OECDMEI, C156FM3@OECDMEI, H935FM3@EMERGECW, S436FM3@EMERGEMA, H196FM3@G10, H144FM3@G10, and S112FM3@G10. *Note*: On March 23, 2006, the Board of Governors of the Federal Reserve System ceased publication of the M3 monetary aggregate and its components. The Organization for Economic Cooperation & Development has continued producing a consistent series for M3 which is the one we use as reference for the U.S.

Government surplus as a share of GDP (GSGDP). General Government surplus as a share of GDP measures the government net lending in percent of GDP. The data come from Organization for Economic Cooperation & Development for the U.S. and Canada, Statistical Office of the European Communities for Czechia, Israel Ministry of Finance, Organization for Economic Cooperation & Development for New Zealand, Statistical Office of the European Communities for Sweden, and Organization for Economic Cooperation & Development for New Zealand for the U.K. Haver Analytics mnemonics: Q111PGNL@OUTLOOK, Q156PGNL@OUTLOOK, N935GDSG@EUGOV, N436FGBP@EMERGEMA, A196PGNL@OUTLOOK, S144GDSG@EUGOV, and Q112PGNL@OUTLOOK. *Note*: All data is interpolated at monthly frequency because the series are available only at quarterly frequency (except for New Zealand which is available only at annual frequency); the series for Czechia and Israel are seasonally adjusted since they are obtained unadjusted from their respective sources.

ENERGY. The energy price index is constructed by the International Monetary Fund (IMF). The transformed variable ENERGY is the 12-month percent change defined by $100 \cdot \left(\ln\left(\frac{P_t}{P_{t-12}}\right)\right)$ where P_t denotes the energy price index, t the date of observation, and $t-12$ the previous year's monthly observation. Haver Analytics mnemonic: C001CXE2@IFS.

FOOD. The food price index is constructed by the International Monetary Fund (IMF). The transformed variable (FOOD) is the 12-month percent change defined by $100 \cdot \left(\ln\left(\frac{P_t}{P_{t-12}}\right)\right)$ where P_t denotes the food price index, t the date of observation, and $t-12$ the previous year's monthly observation. Haver Analytics mnemonic: C001CXF2@IFS.

Kilian Index. This is an index which uses ocean bulk dry cargo freight rates to proxy for global real economic activity. The value of the index is given in percent deviations from trend. The index is obtained from the Federal Reserve Bank of Dallas at https://www.dallasfed.org/research/igrea. Haver Analytics mnemonic: N001GVI@G10. *Note*: The Kilian index is seasonally adjusted since it is obtained unadjusted from the source.

Global Supply Chain Pressure Index (GSCPI). The Global Supply Chain Pressure Index (GSCPI) reflects the state of global supply chain conditions. The index combines data on the cost of transportation and from manufacturing indicators. Cost of transportation includes information on the expenses associated with shipping raw materials, fluctuations in the cost of container shipping rates, and costs in air transportation to and from the U.S.

Global supply chain conditions are derived from Purchase Manager Index surveys for China, Japan, South Korea, Taiwan, the U.K., and the U.S. The GSCPI is normalized such that a zero indicates the index is at its average. Positive values (negative values) indicate how many standard deviations the index is above (below) the average. The GSCPI is obtained from the Federal Reserve Bank of New York at https://www.newyorkfed.org/research/policy/gscpi#/overview. Haver Analytics mnemonic: GSCPI@SURVEYS.

Expected CPI Inflation Measures (INFEXP). Proxies used: (1) Short-Term Inflation Expectations (4q change, one quarter ahead; INFEXPSR-QC), (2) A Medium-Term Inflation Expectations (Annual Inflation Current Year; INFEXPMR-AICY), (3) A Medium-Term Inflation Expectations (Annual Inflation Next Year; INFEXPMR-AINY), (4) Long-Term Inflation Expectations (INFEXPLR).

Codes. All results are obtained with R 4.2.2. based on Ben-Michael et al. (2021)'s R code posted on https://github.com/ebenmichael/augsynth.

B Background Details: FAIT, FG, and BSN

At the 2020 economic symposium at Jackson Hole on August 27, 2020, Federal Reserve Chairman Jerome Powell announced that the Federal Reserve was adopting a new monetary policy framework based on a flexible average inflation targeting (FAIT) strategy. The Statement on Longer-Run Goals and Monetary Policy Strategy amended that day spelled out the Federal Reserve's own understanding of the new FAIT strategy.

A key lesson of the Great Inflation period during the 1970s and early 1980s is that a strong commitment and robust action were needed for households and businesses to internalize the Federal Reserve's low inflation objective, anchor long-run inflation expectations at lower levels, and curb inflation. Although inflation would stay above 10% until 1981, Chairman Volcker managed to gradually bring inflation down by sticking with a monetary policy strategy that kept interest rates high even when confronted with a severe recession. Having earned its credibility during the 1980s, the Federal Reserve gained significant policy leeway to respond to the short-term trade-offs posed by its dual mandate of price stability and full employment.

The Federal Reserve's monetary policy framework has continued to gradually evolve and adapt since the 1980s, but it has done so with the ultimate goal of strengthening the Fed's inflation credibility to anchor long-run expectations and retain its short-term policy leeway for macroeconomic stabilization. Long-term CPI inflation expectations became progressively anchored at a lower level, above but increasingly closer to 2%, during the 1980s and 1990s.

This translated into more stable prices and observed inflation averaging about 3% during the Great Moderation period.[7]

The Federal Reserve kept long-term CPI inflation expectations solidly anchored close to 2% even after the federal funds rate first hit the zero lower bound (ZLB henceforth) during the 2007 – 09 Global Financial Crisis (GFC henceforth). In spite of the resilience shown by long-term inflation expectations, CPI inflation readings remained persistently below-target in the aftermath of the GFC, prior to the COVID pandemic, seemingly defying the Federal Reserve's many efforts to prop up inflation (Caldara et al. (2021)).

In 2012, concerns about a Japan-style liquidity trap and the de-anchoring of long-run inflation expectations led the Federal Reserve to formally adopt a flexible inflation targeting (FIT) strategy with the release of its first-ever Statement on Longer-Run Goals and Monetary Policy Strategy. In doing so, policymakers adopted *de jure* an explicit numerical 2% inflation target validating the by-then widely held private sector view about the Fed's *de facto* inflation target of 2%.

This shift to adopt FIT sought to increase accountability and, in that way, further strengthen the credibility of the Federal Reserve's inflation expectations anchor. In doing so, the Federal Reserve was adopting a monetary policy framework that had become quite popular among many advanced and emerging market economies (see, e.g., Bernanke and Mishkin (1997) and Duncan et al. (2022) on this point). However, policymakers' concerns about the risks that below-target inflation would become entrenched in the expectations of the private sector continue unabated. Those concerns were a major motivation of the Fed's first-ever public review of its monetary policy framework (strategy, tools, and communication practices) conducted during 2019 – 20.[8]

The Fed's framework review highlighted that below-target inflation misses at the ZLB like those experienced post-GFC pose a major risk of eroding the Fed's 2% long-term inflation anchor if they persist, particularly if households and businesses come to believe that 2% is to be understood more as a ceiling than a mid-point for inflation. To dispel that risk, Chairman Powell announced on behalf of the Federal Open Market Committee (FOMC) the Fed's new FAIT strategy—formalized in a revised Statement on Longer-Run Goals and Monetary Policy Strategy—at Jackson Hole on August 27, 2020.

[7] More information about the evolution of U.S. monetary policy during the Great Moderation period can be found in Martínez-García (2018), Martínez-García (2019), and, more recently, in Duncan et al. (2022).

[8] More information about the Federal Reserve's 2019 – 20 Monetary Policy Framework Review and the resulting changes to the Fed's Statement on Longer-Run Goals and Monetary Policy Strategy (first adopted on January 24, 2012; amended effective January 29, 2019) that were announced publicly on August 27, 2020 can be found here: Board of Governors (2020).

The fundamental change introduced by the Fed with the adoption of FAIT is the explicit recognition of an asymetric inflation bias—the Fed announced that it was open to a temporary inflation overshoot to make-up for prolonged periods of below-target inflation.[9] This committed the Federal Reserve to preempt a downward shift in long-term inflation expectations even at the cost of permitting realized inflation to rise above target for a while. In the FOMC's own words:

> "The Committee judges that longer-term inflation expectations that are well anchored at 2 percent foster price stability and moderate long-term interest rates and enhance the Committee's ability to promote maximum employment in the face of significant economic disturbances. In order to anchor longer-term inflation expectations at this level, the Committee seeks to achieve inflation that averages 2 percent over time, and therefore judges that, following periods when inflation has been running persistently below 2 percent, appropriate monetary policy will likely aim to achieve inflation moderately above 2 percent for some time." Federal Reserve's Statement on Longer-Run Goals and Monetary Policy Strategy amended effective August 27, 2020 (Board of Governors (2020)).

However, that asymetric inflation bias was only part of the story. The revised Statement on Longer-Run Goals and Monetary Policy Strategy also elevated the importance of the maximum employment objective, the other side of the Fed's dual mandate, promising that "the Committee's policy decisions must be informed by assessments of the shortfalls of employment from its maximum level" (Board of Governors (2020)). The Statement also added language allowing for a more granular understanding of what achieving full employment meant emphasizing that it ought to be broad-based and inclusive.

The shift from a FIT monetary policy framework to FAIT one in August 2020 coincided with the beginning of an inflation surge unlike anything the U.S. had experienced since the Great Inflation period (in the 1970s and early 1980s). As noted by Waller (2022), Bernanke and Blanchard (2023), and Eggertsson and Kohn (2023), among others, the question of what role FAIT itself may have played in the inflation surge became hotly-debated.

As we indicated earlier, the Fed's FAIT framework implied an inflationary bias in reaction to the persistence of below-target inflation post-GFC. Moreover, this new strategy came to take effect right after the pandemic as the economy was getting back on its feet from the sharp COVID recession, inflation was still below-target and unemployment very elevated. In this context, the inflation bias and elevated importance given to the full employment objective

[9] As argued by Nessen and Vestin (2005), average inflation targeting can have sizeable effects over short periods of time by delaying the response to inflation fluctuations and, in doing so, may preclude the central bank from overreacting to transitory inflation shocks.

incorporated in the Fed's understanding of FAIT through its Statement on Longer-Run Goals and Monetary Policy Strategy may not have been the medicine the economy of the 2020s shaped needed most (a point made explicit by Eggertsson and Kohn (2023), among others).

Not only FAIT could have played a role in the inflation surge. As argued by Waller (2022), the Fed's forward guidance may have amplified the inflationary bias implicit in the framework too:

> "There are some other lessons (...) from the experience of tightening monetary policy, a process which was put in motion by the [forward] guidance that the FOMC issued in 2020 about how long it would keep the federal funds rate at the effective lower bound and continue asset purchases. In September and December of 2020, the FOMC provided criteria or conditions in the meeting statement that would need to be met before the FOMC would consider raising interest rates and begin to reduce asset purchases, respectively. These conditions were, in effect, the FOMC's plan for starting the process of tightening policy.
>
> (...) Based on our positive experience with unwinding after the Global Financial Crisis (GFC), we thought it would be appropriate to use the same sequence of steps: taper asset purchases until they ceased, then lift rates off the effective lower bound, then gradually and passively reduce our balance sheet by redeeming maturing securities.
>
> (...) For asset purchases, the Committee declared that tapering would wait "until substantial further progress has been made toward the Committee's maximum employment and price stability goals." Meanwhile, the FOMC said that it would keep rates near zero until our employment goal had been reached and until inflation had reached 2 percent and was "on track to moderately exceed 2 percent for some time."
>
> (...) Unlike the normalization timeline after the financial crisis, we did not have flexibility to raise the target range sooner. However, if we had less restrictive tapering criteria and had started tapering sooner, the Committee could have had more flexibility on when to begin raising rates. So, by requiring substantial further progress toward maximum employment to even begin the process of tightening policy [liftoff], one might argue that it locked the Committee into holding the policy rate at the zero lower bound longer than was optimal." Excerpts from Lessons Learned on Normalizing Monetary Policy, speech by Governor Christopher J. Waller, at the Dallas Fed's sponsored policy panel on *Monetary Policy at a Crossroads*, June 18, 2022 (Waller (2022)).

By promising that the Fed would not raise rates from zero "until substantial further progress has been made toward (...) maximum employment," the Fed essentially prioritized the employment goal and did not put a ceiling on how high inflation could be allowed to go before any tightening would take place. This pledge to delay any rate increases until the end of asset purchases and language to the effect that substantial advance notice of rate increases would be provided added to the inertia and amplified the inflation bias. The empirical question for us is, therefore, whether there is evidence for any effects on inflation or the unemployment rate in the data as a result of the adoption of FAIT in August 2020 and forward guidance on policy normalization during the second half of 2020.

C Tables and Figures

Table A1. Descriptive Statistics

Variable/Unit/Period		Mean	Median	Min	Max	Std. Dev.
CPI Inflation						
U.S.	Pre-intervention	1.58	1.70	−0.23	2.96	0.76
U.S.	Post-intervention	4.00	4.80	1.16	7.65	2.38
U.S.	Full sample	1.95	1.71	−0.23	7.65	1.45
Control group	Pre-intervention	1.27	1.36	−1.60	3.67	1.00
Control group	Post-intervention	2.64	2.35	−0.80	10.62	2.10
Control group	Full sample	1.48	1.44	−1.60	10.62	1.33
PCE Inflation						
U.S.	Pre-intervention	1.34	1.45	0.04	2.54	0.59
U.S.	Post-intervention	3.55	4.07	1.11	6.34	1.93
U.S.	Full sample	1.68	1.49	0.04	6.34	1.22
Core CPI Inflation						
U.S.	Pre-intervention	1.94	1.97	1.17	2.35	0.26
U.S.	Post-intervention	3.28	3.73	1.28	6.24	1.67
U.S.	Full sample	2.15	1.98	1.17	6.24	0.84
Control group	Pre-intervention	1.22	1.28	−0.89	3.64	0.82
Control group	Post-intervention	2.53	2.04	−0.31	9.87	1.90
Control group	Full sample	1.42	1.36	−0.89	9.87	1.16

Sources: Haver/U.S. Bureau of Labor Statistics; Haver/U.S. Bureau of Economic Analysis; Dallas Fed' Database of Global Economic Indicators (Grossman et al. (2014)); authors' calculations.

Note: The control group includes Canada, Czech Republic, United Kingdom, Israel, New Zealand, and Sweden. The pre-intervention period covers 2012:M1 to 2020:M7, the post-intervention period ranges from 2020:M8 to 2022:M2.

Table A2. The Effect of Adopting FAIT on Economic Activity

	[1]	[2]	[3]	[4]
Outcome variable	Unemployment Rate		Industrial Production	
ATT	−0.372	−0.247	−0.039	−0.218
P-value	0.279	0.533	0.246	0.172
Auxiliary predictors	*Yes*	*Yes*	*Yes*	*Yes*
Bias correction	*Yes*	*Yes*	*Yes*	*Yes*
Residualization – Full sample	*Yes*	*No*	*Yes*	*No*
Residualization – Pre-COVID sample	*No*	*Yes*	*No*	*Yes*
Extended set of covariates	*No*	*No*	*No*	*Yes*
Weights				
Canada	0.653	1.151	0.695	0.707
Czech Republic	0.451	0.220	−0.024	−0.024
Israel	−0.021	0.156	0.039	0.042
New Zealand	−0.057	−0.898	0.160	0.130
Sweden	0.005	−0.319	−0.041	−0.039
United Kingdom	−0.031	0.690	0.171	0.184
Diagnostics & Robustness				
RMSPE	0.783	0.602	1.875	1.760
MAPE	0.565	0.426	1.481	1.404
Estimated Bias	0.061	0.538	−0.079	−0.135
Improvement w.r.t. uniform weights (%)	28.028	59.617	32.286	35.131
No anticipation test (p-val)	0.049	0.029	0.136	0.087
In-time placebo tests (p-val)	0.282	0.379	0.417	0.466
Leave-one-out test (#p-val> 0.1)	6	6	5	5

Note: The p-value related to average treatment effect on the treated unit is that related to the joint null hypothesis that every effect is zero over the post-intervention period. RMSPE and MAPE stand for the pre-intervention root mean squared prediction error and the pre-intervention mean absolute prediction error, respectively. The bias estimate and the percent improvement with respect to the use of uniform weights are reported when we use the Augmented SCM. The no anticipation test (p-val) reports the p-value of the null hypothesis that the outcome gap is zero one month prior to FAIT adoption. The p-value of the in-time placebo test is related to the null hypothesis that the ATT is zero for the 24-month period between the fake treatment date ($2018 : M8$) and actual treatment date ($2020 : M8$). The row leave-one-out test (#p-val> 0.1) shows the number of p-values higher than 0.10 over the cases in which one of the control units with positive weight is excluded from the SC estimation. Residualization of the CPI inflation rates is carried out using country effects, the Global Supply Chain Pressures Index (GSCPI), the Kilian index, global energy price inflation (ENERGY), government surplus as a share of GDP (GSGDP), and M3 (percent change) (M3P).

Table A3. Analyzing Possible Spillover Effects

	[1]	[2]	[3]	[4]
CPI Inflation rate (full donor pool)				
Average ATT	1.257	1.102	0.997	0.775
P-value join null	0.066	0.090	0.016	0.016
RMSPE	0.282	0.370	0.310	0.317
Bias estimate	...	0.002	−0.050	−0.074
CPI Inflation rate (dropping Canada)				
Average ATT	1.315	1.005	1.157	1.316
P-value join null	0.115	0.123	0.066	0.016
RMSPE	0.410	0.439	0.371	0.406
Bias estimate	...	−0.023	−0.121	−0.343
Differences				
Average ATT	−0.058	0.097	−0.160	−0.542
P-value join null	−0.049	−0.033	−0.049	0.000
RMSPE	−0.128	−0.069	−0.061	−0.089
Bias estimate (diffs. of absolute values)	...	−0.021	−0.070	−0.268
Auxiliary predictors	*No*	*Yes*	*Yes*	*Yes*
Bias correction	*No*	*Yes*	*Yes*	*Yes*
Residualization – Full sample	*No*	*Yes*	*No*	*No*
Residualization – Pre-COVID sample	*No*	*No*	*Yes*	*Yes*
Extended set of covariates	*No*	*No*	*No*	*Yes*

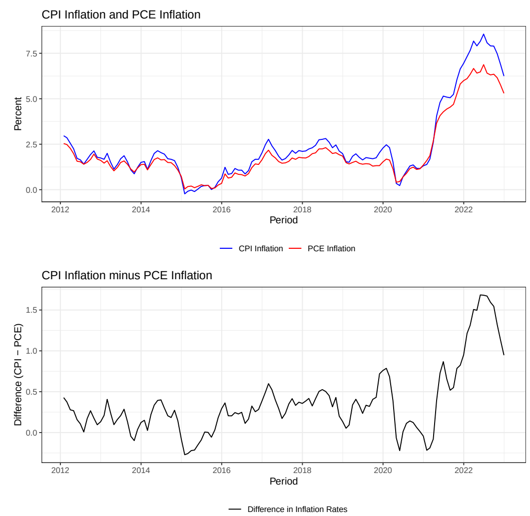
Note: The p-value related to average treatment effect on the treated unit is that related to the joint null hypothesis that every effect is zero over the post-intervention period. RMSPE stands for the pre-intervention root mean squared prediction error. The bias estimate is reported when we use the Augmented SCM. Residualization of the CPI inflation rates is carried out using country effects, the Global Supply Chain Pressures Index (GSCPI), the Kilian index, global energy price inflation (ENERGY), government surplus as a share of GDP (GSGDP), and M3 (percent change) (M3P). The extended set of covariates includes also international food price inflation (FOOD), the industrial production (percent change) (IPP), and the overnight rate (ONR).

Table A4. The Effect on the CPI Inflation Rate—Extended Post-Intervention Period (2020:M8-2022:M12)

	[1]	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**	**[7]**	**[8]**
ATT	0.618	0.664	0.651	0.325	0.696	0.774	0.643	0.787
p-value	0.083	0.061	0.061	0.053	0.121	0.083	0.083	0.083
Auxiliary predictors	*No*	*Yes*	*Yes*	*Yes*	*No*	*No*	*Yes*	*Yes*
Bias correction	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Residualization – Full sample	*No*	*No*	*No*	*Yes*	*No*	*No*	*No*	*No*
Residualization – Pre-COVID sample	*No*	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*
Extended set of covariates	...	...	...	*No*	*No*	*Yes*	*No*	*Yes*
Weights								
Canada	0.438	0.438	0.438	0.417	0.519	0.528	0.416	0.527
Czech Republic	0.061	0.047	0.047	0.277	−0.029	−0.031	−0.012	−0.034
Israel	0.000	0.000	−0.006	0.026	−0.001	0.050	0.015	0.042
New Zealand	0.080	0.063	0.065	−0.007	0.117	0.105	0.093	0.091
Sweden	0.039	0.040	0.041	−0.037	0.040	0.005	0.138	0.008
United Kingdom	0.381	0.413	0.414	0.323	0.354	0.343	0.350	0.366
Diagnostics & Robustness								
RMSPE	0.282	0.283	0.283	0.380	0.323	0.316	0.310	0.317
MAPE	0.226	0.227	0.226	0.317	0.260	0.258	0.239	0.257
Estimated Bias	...	...	−0.009	−0.002	−0.082	−0.092	−0.076	−0.129
Improvement w.r.t. uniform weights (%)	40.89	40.66	40.78	15.81	39.01	40.05	22.53	40.04
No anticipation test (p-val)	0.350	0.320	0.330	0.621	0.583	0.553	0.893	0.670
In-time placebo tests (p-val)	0.932	0.903	0.932	0.592	0.709	0.515	0.845	0.563
Leave-one-out test (#p-val> 0.1)	0	0	1	0	2	1	0	0

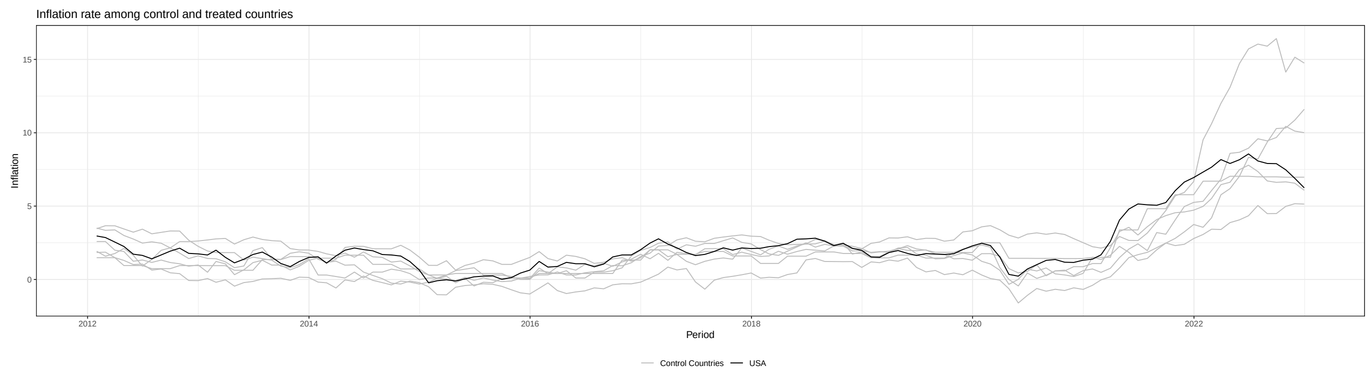
Note: The p-value related to average treatment effect on the treated unit is that related to the joint null hypothesis that every effect is zero over the post-intervention period. RMSPE and MAPE stand for the pre-intervention root mean squared prediction error and the pre-intervention mean absolute prediction error, respectively. The bias estimate and the percent improvement with respect to the use of uniform weights are reported when we use the Augmented SCM. The no anticipation test (p-val) reports the p-value of the null hypothesis that the outcome gap is zero one month prior to FAIT adoption. The p-value of the in-time placebo test is related to the null hypothesis that the ATT is zero for the 24-month period between the fake treatment date ($2018 : M8$) and actual treatment date ($2020 : M8$). The row leave-one-out test (#p-val> 0.1) shows the number of p-values higher than 0.10 over the cases in which one of the control units with positive weight is excluded from the SC estimation. Residualization of the CPI inflation rates is carried out using country effects, the Global Supply Chain Pressures Index (GSCPI), the Kilian index, global energy price inflation (ENERGY), government surplus as a share of GDP (GSGDP), and M3 (percent change) (M3P). The extended set of covariates includes also international food price inflation (FOOD), the industrial production (percent change) (IPP), and the overnight rate (ONR).

Figure A1. CPI and PCE Inflation Rates for the U.S. and Their Differential.



Sources: Haver/U.S. Bureau of Labor Statistics; Haver/U.S. Bureau of Economic Analysis; authors' calculations.
Note: The year-over-year inflation rates for the CPI and PCE series are plotted in the top panel. The differential series plotted in the bottom panel is calculated as the difference between the year-over-year inflation rate (12-month percent change in the logged index) of each series.

Figure A2. CPI Inflation Rates for the U.S. and the Control Units.

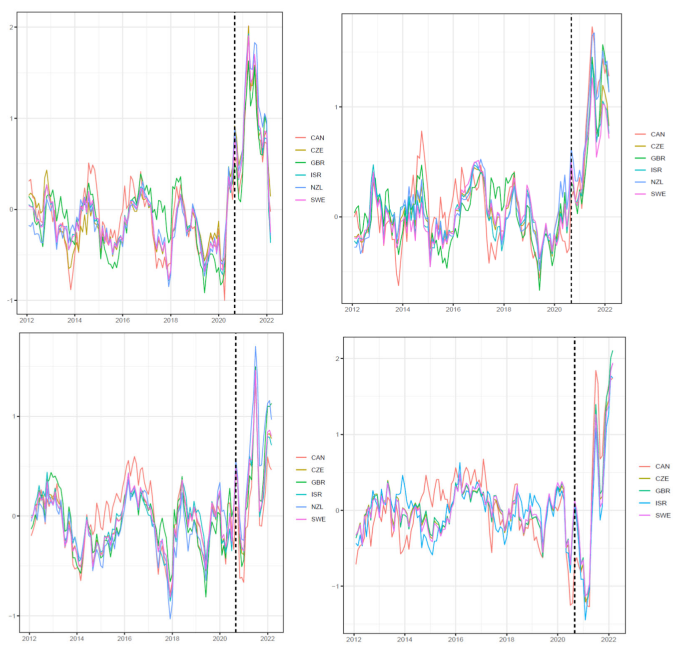


Sources: Haver/U.S. Bureau of Labor Statistics; Dallas Fed' Database of Global Economic Indicators (Grossman et al. (2014)); authors' calculations.
Note: The CPI inflation rate is calculated as the year-over-year percent change (12-month percent change in the logged index). The plot includes the CPI inflation rate for the U.S. (dark line) and the corresponding CPI inflation rates for the control units (gray lines).

Figure A3. Leave-One-Out Test: CPI Inflation Rate

Source: Dallas Fed' Database of Global Economic Indicators (Grossman et al. (2014)); authors' calculations. Note: The figures show the results of the SC estimations when removing a single donor country. The corresponding country in the legend indicates which country was removed in the estimation. Each figure marks the treatment date (August 2020) with a dashed vertical line. The top left graph presents canonical synthetic control estimation using only pre-intervention outcomes as predictors. The top right graph shows the results using residualization of the outcome variable. This is carried out using country fixed effects, the Global Supply Chain Pressures Index (GSCPI), the Kilian index, global energy price inflation (ENERGY), government surplus as a share of GDP (GSGDP), and the percent change in M3 money supply (M3P) over the full sample. The bottom left graph presents the results from residualization using data until February 2020 to estimate coefficients. These estimates are then used to calculate residuals for the up to February 2022, considering August 2020 as the treatment date, and including GSGDP and M3P as auxiliary predictors in the SC estimation. The bottom right graph extends the bottom left's method by adding FOOD, IPP, and ONR as covariates in the residualization phase.

Figure A4. Leave-One-Out Test: PCE Inflation Rate



Source: Dallas Fed' Database of Global Economic Indicators (Grossman et al. (2014)); authors' calculations. Note: The figures show the results of the SC estimations when removing a single donor country. The corresponding country in the legend indicates which country was removed in the estimation. Each figure marks the treatment date (August 2020) with a dashed vertical line. The top left graph presents canonical synthetic control estimation using only pre-intervention outcomes as predictors. The top right graph shows the results using residualization of the outcome variable. This is carried out using country fixed effects, the Global Supply Chain Pressures Index (GSCPI), the Kilian index, global energy price inflation (ENERGY), government surplus as a share of GDP (GSGDP), and the percent change in M3 money supply (M3P) over the full sample. The bottom left graph presents the results from residualization using data until February 2020 to estimate coefficients. These estimates are then used to calculate residuals for the up to February 2022, considering August 2020 as the treatment date, and including GSGDP and M3P as auxiliary predictors in the SC estimation. The bottom right graph extends the bottom left's method by adding FOOD, IPP, and ONR as covariates in the residualization phase.