Extending the Range of Robust PCE Inflation Measures *

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Abstract

We evaluate the forecasting performance of a wide set of robust inflation measures between 1960 and 2022, including official median and trimmed-mean personal-consumption-expenditure inflation. When trimming out different expenditure categories with the highest and lowest inflation rates, we find that the optimal trim points vary widely across time and also depend on the choice of target; optimal trims are higher when targeting future trend inflation or for a 1970s–1980s subsample. Surprisingly, there are no grounds to select a single series on the basis of forecasting performance. A wide range of trims—including those of the official robust measures—have an average prediction error that makes them statistically indistinguishable from the best-performing trim. Despite indistinguishable average errors, these trims imply different predictions for trend inflation in any given month, within a range of 0.5 to 1 percentage points, suggesting the use of a set of near-optimal trims.

JEL Codes: E3, E5, E6

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1 Introduction

The return of high inflation after the pandemic of 2020 has renewed attention to robust measures of inflation such as trimmed-mean measures. These measures trim out the expenditure categories with the highest and lowest inflation rates before computing mean inflation. Economists use these series to describe the behavior of underlying trend inflation and to differentiate it from transitory movements in inflation in a way that is easy to communicate to the public.[1] Two series used for this purpose are the official trimmed-mean inflation measure constructed by the Federal Reserve Bank of Dallas and the median inflation measure constructed by the Federal Reserve Bank of Cleveland. These series have received much attention during the recent high-inflation episode.[2] In this paper, we evaluate the forecasting performance of a wide set of robust measures of inflation, including these two prominent measures used by central banks.

In doing so, our analysis makes two contributions. First, we address a key data limitation: The behavior of robust measures of inflation in high-inflation regimes is hard to gauge because official releases of the series start in 1977, covering only one episode of high inflation before 2020. We therefore extend the official trimmed-mean and median personal-consumption-expenditure (PCE) inflation series back to 1960.[3] Doing so extends the sample size by over 40 percent, providing us with two additional episodes of rising inflation (1968 and 1973) and covering a total of 129 months of high inflation (inflation above 5 percent). To construct the extended series, we use the underlying PCE data release from the Bureau of Economic Analysis (BEA) and replicate the methodologies of the Federal Reserve Banks

[1] Communication about inflation and inflation targets affects inflation expectations and monetary policy. See, for example, Coibion, Gorodnichenko, and Weber (2022), Handlan (2022), and Gorodnichenko, Pham, and Talavera (2023) for recent applications and Blinder, Ehrmann, Fratzscher, De Haan, and Jansen (2008) for a review of previous results.

[2] For instance, the president of the Federal Reserve Bank of Richmond has stated that "I want to see inflation, and median and trimmed mean, compellingly headed back to our target" (Torres, 2023a,b).

[3] By contrast, extending back in time the median and trimmed-mean Consumer Price Index series published by the Federal Reserve Bank of Cleveland is of limited use because the headline Consumer Price Index data are not revised when the methodology used to calculate inflation for individual components is changed. However, changes in methodology can imply significant changes in the volatility of inflation as shown by Hazell, Herreño, Nakamura, and Steinsson (2022) and Bolhuis, Cramer, and Summers (2022).

of Dallas and Cleveland (see Bryan and Pike, 1991,Bryan and Cecchetti, 1994, Carroll and Verbrugge, 2019, and Dolmas, 2005). We make them publicly available for analysis at https://ocamp020.github.io/Robust_Inflation_Series.xlsx.

Second, based on these data, we evaluate the predictive performance of these two extended robust inflation series and a wide set of robust measures of inflation against ex-post measures of current and future trend inflation. Our analysis follows the methodology used to select the trimming cutoffs of the official trimmed-mean inflation series, described by Dolmas (2005). Specifically, we construct a measure of current trend inflation as a 36-month centered moving average of headline inflation centered on the current period. For future trend inflation, we construct a 12-month forward moving average of headline inflation that starts one year ahead of the current period (using data between 13 and 24 months ahead).[4] We then contrast a wide set of robust inflation measures with trend inflation over our extended sample, a restricted sample that captures times of high and volatile inflation (1970–89), and a recent sample with overall low and stable inflation (2000–2022).

Two main findings emerge from our extended data. First, the official measures have a similar root-mean-square error (RMSE) against both measures of trend inflation, with a lower RMSE against current trend inflation than against future trend inflation. The performance of both series is stable over time, with the Dallas Fed's trimmed-mean measure slightly outperforming the Cleveland Fed's median inflation measure except for the period of highest and most volatile inflation: between 1970 and 1989. Moreover, the official measures perform nearly as well as the best of the alternative robust measures we construct. In fact, the difference between the RMSEs of the different series is often not statistically significant.

Second, we find that the similarity in the predictive performance of the robust inflation measures—according to their RMSE—obscures economically significant differences in the

[4] We consider an alternative measure of current trend inflation constructed using Christiano and Fitzgerald's (2003) band-pass filter and an alternative measure of future trend inflation constructed as a 24-month forward moving average. Results for these measures can be found in the appendix.

behavior of the series in any given period and across time. The average range between the *levels* of the official robust inflation series is wide, with an average of 0.70 percentage points before 2020, growing to 1.20 percentage points after 2020. This finding implies that these measures often provide different signals about current and future inflation in any given month, while tracking the trend equally as well on *average*.

This pattern also holds when we broaden the set of robust inflation measures to include alternative trimmed-mean measures chosen based on their average predictive performance. Even among the measures whose RMSEs against trend inflation are statistically equivalent, the range remains wide. The range between these measures is between 0.59 and 1.16 percentage points on average depending on the trend inflation series being targeted.

Notably, the set of such near-optimal trimmed-mean measures is more informative about the state of current trend inflation than about future trend inflation. The RMSE of the best trimmed mean measure is at least twice as large when predicting future trend inflation, relative to current trend inflation. Moreover, during high inflation periods at the beginning and end of our extended sample, the set of best trimmed mean measures of inflation are slow to react and lag behind in their prediction of future trend inflation. This insight from our extended sample aligns with the finding that trimmed mean measures appear better at nowcasting than forecasting without further adjustments (Verbrugge and Zaman, 2023).

Overall, while these results may appear negative, in that *no single* best measure emerges, a positive and practically important message also arises: Policymakers trying to communicate inflation may prefer to rely on a set of trimmed-mean measures that provide a range of inflation, as there are no grounds to select a single series on the basis of predictive performance. In doing so, the range implied by the set of trimmed-mean measures with the lowest prediction errors provides a naturally interpretable picture of the implied behavior of trend inflation that accounts for the uncertainty in selecting predictors.

Relationship to the literature. Our analysis contributes to a large literature that focuses on which measures of inflation provide the best signal about the underlying inflation trend. We add to the literature in a simple but important way by extending robust PCE inflation measures to periods of high inflation and by focusing on the performance of a wide set of robust measures of inflation in this extended sample. Related work has focused on the forecasting properties of different series, but has used samples in which inflation has been consistently low and stable (see, for example, Dolmas, 2005; Rich and Steindel, 2007; Crane, Khettry, Mester, and Novak, 2013).

Other robust measures of inflation have been proposed, such as median inflation excluding owners' equivalent rent (Carroll and Verbrugge, 2019) and a version of the Consumer Price Index (CPI) that excludes the eight most volatile components (Clark, 2001). Much research has focused on core inflation, as summarized in a report by the Bank for International Settlements (1999) and recently evaluated by Verbrugge (2022). Prominently, the Federal Reserve Bank of New York's measure of underlying inflation presents an alternative measure of trend inflation that takes into account the time-series dimension in the distribution of inflation rates based on a large dynamic factor model as in Forni, Hallin, Lippi, and Reichlin (2000). While such statistical measures of underlying inflation are not the focus of our analysis, Amstad, Potter, and Rich (2017) discuss them and their advantages relative to trimmed-mean measures of inflation, which we analyze based on a new, extended data set. In line with a stable time-series factor loading, we find that many identical components are consistently included across time in our robust measures of inflation.

2 Long Series for Robust Inflation Measures

This section details our computation of headline, core, median, and trimmed-mean PCE inflation series beginning in 1959 and ending in October 2022, extending the official median and trimmed-mean inflation series to cover 1960–77. This extension increases the number of months in the sample by almost 40 percent relative to the conventionally available official series published by the Federal Reserve Banks of Cleveland and Dallas.

Extending the official robust inflation measures to the 1960–77 period is of interest for two reasons: First, it is of independent interest because it provides a more consistent view of the patterns for these robust inflation measures in periods of rising and high inflation. The 1960–77 period provides us with two additional episodes of rising inflation (1968 and 1973), adding to the four episodes of rising inflation in the post-1977 period. There are only three episodes between 1960 and 2022 for which headline PCE inflation is above 5 percent, covering a total of 129 months, 44 of which are in the 1960–77 period. Second, we can use the series as reference points when we evaluate the predictive performance of a wide set of inflation series in the next section.

We proceed by describing the data we use, how the series are computed, and their properties.

2.1 PCE Inflation Data

We use the underlying data supplements of the National Income and Product Accounts PCE data release (Bureau of Economic Analysis, 2022) between January 1959 and October 2022 to construct series for robust inflation measures.[5] The PCE data provide disaggregated price indexes and expenditure weights that cover US consumer spending.

Two main issues accompany the use of these data and the replication of official robust inflation measures. First, new expenditure categories are introduced over time, as is the case with expenditure on personal computers, a category introduced in 1977. The changes in the set of expenditure categories are reflected in differences between the set of categories used in the construction of official trimmed-mean inflation and that used for median inflation. We harmonize the set of expenditure categories by establishing a set of 183 series that are

[5] The main input for BEA price indexes is the CPI, but unlike the CPI, the PCE is revised when methods change.

available either for the entire period or are available as soon as a new good is introduced.[6] We compare the behavior of trimmed-mean and median inflation using this consistent set of categories.[7] Second, the price series for multiple expenditure categories were not updated on a monthly basis before 1970, including owner's equivalent rent, the category with the highest weight. Thus, measures of monthly inflation rates before 1970 contain multiple series with zero inflation. This issue is mostly reflected in the median inflation series as we show in Figure 1. We therefore focus most of our analysis on the 1970–2022 period.

2.2 Headline and Core PCE Inflation

Headline inflation is calculated as a Fisher index of the underlying inflation components at the lowest level of aggregation. A Fisher index is the geometric mean of a Laspeyres and a Paasche index, which are calculated respectively as

$$\pi_t^L = \frac{\sum_i q_{t-1}^i p_t^i}{\sum_i q_{t-1}^i p_{t-1}^i}; \quad \pi_t^P = \frac{\sum_i q_t^i p_t^i}{\sum_i q_t^i p_{t-1}^i}, \tag{1}$$

where p_t^i and q_t^i are, respectively, the price level and quantity of expenditure category i at time t. Core inflation is computed in the same way but excludes all series under food and beverages purchased for off-premises consumption, gasoline and other energy goods, and electricity and gas. We take headline and core PCE inflation directly from the tables published by the BEA.[8]

[6] When new expenditure categories are introduced, they often have almost-zero spending, as they represent new goods. In those cases, we assume that the goods they represent were not available before their introduction in the PCE, and we assign to them a retroactive weight of zero.

[7] The set of categories we use differs from the 177 categories used by the Dallas Fed and 200 categories used by the Cleveland Fed. The complete list of series included in each inflation measure can be found in `http://dominic-smith.com/data/category_definitions.xlsx`. In a previous version of this paper, we established that these differences do not impact the results (Ocampo, Schoenle, and Smith, 2022).

[8] We use series DPCERG for headline inflation and series DPCCRG for core inflation (Bureau of Economic Analysis, 2022).

2.3 Trimmed-Mean PCE Inflation Measures

Trimmed-mean PCE inflation measures select a sample of expenditure categories in each month by removing the categories with the lowest inflation rates accounting for α percent of expenditure and the categories with the highest inflation rates accounting for β percent of expenditure. The remaining categories are assigned weights using an average of the expenditure on each category at current-period quantities and previous-period quantities, which approximates the weights used in the PCE index formula,

$$\omega_t^i = \frac{1}{2}\frac{p_{t-1}^i q_{t-1}^i}{\sum_i p_{t-1}^i q_{t-1}^i} + \frac{1}{2}\frac{p_{t-1}^i q_t^i}{\sum_i p_t^i q_t^i}. \tag{2}$$

The trimmed-mean PCE inflation series is the expenditure-weighted mean across the selected categories, where the weights are adjusted to reflect the fact that $\alpha + \beta$ percent of expenditure has been trimmed out. Once the monthly rates, $\pi_t^{tm,mo}$, are constructed, they are chained to form a yearly inflation index,

$$\pi_t^{tm} = \prod_{s=0}^{11} \pi_{t-s}^{tm,mo}, \quad \pi_t^{tm,mo} = \sum_i \omega_t^i \frac{p_t^i}{p_{t-1}^i}. \tag{3}$$

The official trimmed-mean inflation measure sets $\alpha = 24$ and $\beta = 31$, it is published monthly by the Federal Reserve Bank of Dallas (Dolmas, 2005), and it is available from 1977 onward (Federal Reserve Bank of Dallas, 2021).

The median inflation series is calculated by trimming out all categories except the one with the median inflation rate (that is, $\alpha = \beta = 50$). The chained index is then

$$\pi_t^m = \prod_{s=0}^{11} \frac{p_{t-s}^{i(m,t-s)}}{p_{t-s-1}^{i(m,t-s)}}, \tag{4}$$

where $i(m, t-s)$ is the index of the series with the median inflation at time $t-s$. The official median PCE inflation is published monthly by the Federal Reserve Bank of Cleveland (Carroll and Verbrugge, 2019; Bryan and Cecchetti, 1994; Bryan and Pike, 1991) and is also available from 1977 onwards (Federal Reserve Bank of Cleveland, 2021).[9]

2.4 Inflation Series

We replicate the official trimmed-mean and median inflation series after 1977 and extend them back to 1960.[10] Figure 1 plots the series together with headline and core PCE inflation. The three robust inflation measures track the behavior of headline inflation despite significant disagreement between them, which translates into similar predictive performance as we show in the next section. The average range between the levels of the robust inflation series is 0.77 percentage points. These differences between the series increase at the end of the sample, with the average range growing to 1.20 percentage points between 2021 and 2022 (see Figure B.1 in Appendix B).[11] As the next section makes clear this pattern of a similar predictive performance (over time) paired with economically significant differences in month-to-month levels is common across a wide range of trimmed-mean measures.

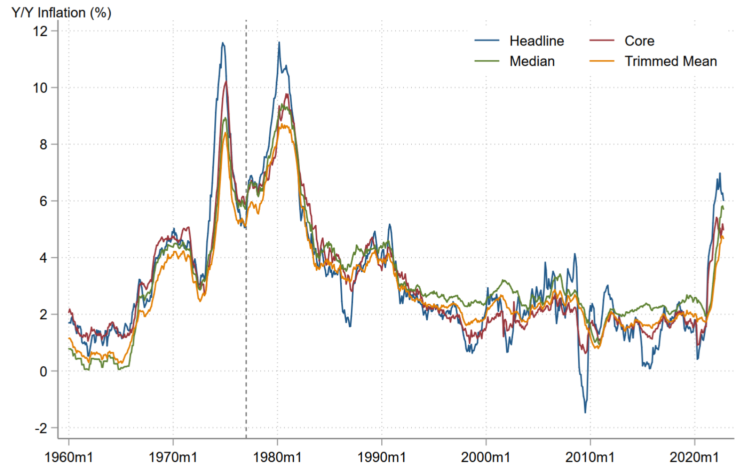
The differences between the inflation measures come from the underlying set of expenditure categories used to compute them. Trimming out categories narrows the range of inflation rates used to construct the robust inflation measures. The distribution of inflation rates across categories is remarkably wide, with a range between the 10th and 90th percentiles of 0.46 percentage points on average, which makes trimming potentially very consequential. Despite this, the distribution of month-to-month inflation rates is concentrated across the median, as reflected by the interquartile range (the range between the 25th and 75th percentiles of the distribution), which is 1.33 percentage point on average. That most categories exhibit relatively small price changes and some categories

[9]The official series for median PCE and trimmed-mean PCE use different weights and categories. A previous version of this paper found those differences have small effects (Ocampo, Schoenle, and Smith, 2022).

[10]See Figures A.1 and A.2 in Appendix A.

[11]There are other disagreements. For instance, the sign of the change (increasing or decreasing) of core PCE inflation matches that of headline PCE in 73 percent of the months in our sample; the values for median and trimmed-mean PCE inflation are 67 and 73 percent, respectively.

Figure 1: Robust Measures of Inflation, 1960–2022



Notes: The figure shows trimmed-mean personal consumption expenditure (PCE) and median PCE as calculated by the authors using the methodologies of Federal Reserve Bank of Cleveland (2021) and Federal Reserve Bank of Dallas (2021). Appendix A shows that these measures match those produced by the relevant Federal Reserve Banks after 1977. The vertical line in January 1977 indicates that the official trimmed-mean and median measures are available starting in 1977. Headline and core inflation are taken directly from the PCE data published by the Bureau of Economic Analysis.

exhibit large changes is reflected in the high kurtosis of price changes.[12]

The set of categories varies over time, as it depends on the contemporaneous distribution of inflation across expenditure categories. However, there are certain regularities. The categories most commonly excluded from the construction of robust inflation measures are food and fuel categories (for example, eggs, vegetables, gasoline), which are the same categories excluded from core PCE. This set is much larger for median inflation. In fact, 71 of the 183 categories we consider never coincide with the median inflation category, while every category has been included in the trimmed mean at some point. Table B.2 lists the categories most commonly excluded and included in the construction of median and trimmed-mean inflation.

[12] Figure B.3 in Appendix B illustrates this by plotting the 10th, 24th, 50th, 69th, and 90th percentiles of month-to-month inflation across expenditure categories. The 24th and 69th percentiles correspond to the trims of the official trimmed-mean inflation series, and the 50th percentile to the trim of the official mean inflation series.

3 Evaluating Official Robust Inflation Measures

How well do the official trimmed-mean and median inflation measures perform in matching current and future inflation trends across multiple samples? Our analysis shows that their performance is indeed robust across the samples we consider, with the official trimmed-mean series slightly outperforming median inflation in terms of capturing both current and future trend inflation. However, the similar performance of the series obscures significant differences in their monthly levels.

3.1 Evaluation Criteria

To evaluate the performance of inflation series, we construct ex-post measures of current and future trend inflation, which aim to smooth out the transitory components of inflation. Then, we compare each inflation measure to these target trend measures and calculate the root mean squared error (RMSE) over three different samples, following the criteria used by Dolmas (2005) to select the trimming cutoffs of the official trimmed mean inflation series.[13] We consider a long sample (1970–2022), a restricted sample (1977–2000), and a recent sample (starting in 2000).[14]

Our main measure of current trend inflation is constructed a 36-month centered moving average of headline inflation centered on the current period. Thus, it includes data from 18 months before to 18 months after the current period. This measure was proposed by Bryan, Cecchetti, and Wiggins (1997) and has been used as a benchmark since. It provides an ex-post proxy for what underlying inflation was at a point in time.

Our main measure of future trend inflation is constructed as a 12-month forward moving average of headline inflation that starts one year ahead of the current period. Thus, it

[13] We do not include core inflation in our exercise because it is outperformed by trimmed-mean and median inflation (see Verbrugge 2022). Additionally, focusing on the official trimmed-mean and median inflation series allows us to extend our analysis to more general trimmed-mean measures that include the official series as special cases (see Section 4).

[14] We conduct the exercise starting in 1970 to avoid the period in which the prices of several PCE categories were not regularly updated. See Figure A.4 in Appendix A.

includes data between 12 and 24 months ahead. Future trend inflation is particularly useful as decision makers, like central bankers, are forward-looking and make decisions based on the future behavior of inflation.

We also construct an alternative measure of current trend inflation using the trend component of Christiano and Fitzgerald's (2003) band-pass filter (removing frequencies below 39 months) and an alternative measure of future trend inflation (constructed as the 24-month forward-looking average rate of inflation as in Dolmas (2005)).[15] We plot all these series in Figure B.4 of Appendix B.2, in which we also provide the results of our evaluation of the official series against the alternative trend inflation measures.

Given a target $\bar{\pi}$ (for current or future trend inflation), we evaluate how well an inflation measure π^i, $i \in \{\text{trimmed mean, median}\}$, tracks it over a given sample. We do so by calculating the RMSE for each candidate robust measure i as[16]

$$rmse^i = \sqrt{\frac{1}{T}\sum_t (\pi_t^i - \bar{\pi}_t)^2}. \tag{5}$$

3.2 Performance of Official Measures

The official trimmed-mean inflation series slightly outperforms the official median inflation series in capturing the behavior of current and future trend inflation, except for the restricted sample (1970–89), for which the pattern reverses (see Table 1).[17] However, the RMSEs produced by the two official measures are not meaningfully different in most cases. We test the difference between the predictions of official series using Diebold and Mariano's (1995)

[15]The trend component of the band pass filter removes high frequency movement in inflation. Dolmas (2005) found that removing frequencies below 29 months maximizes the correlation between the resulting trend series and the Federal Funds rate target set by the Federal Open Market Committee.

[16]We use the level of inflation π^i without transforming it. Transformations such as linear regressions improve the fit of robust inflation measures such as median inflation by removing a consistent bias in certain measures (Rich, Verbrugge, and Zaman, 2022); however, these measures are most often communicated and used in their direct levels.

[17]The table also reports the performance of headline PCE inflation as a benchmark for the exercise. Headline inflation corresponds to the no-trimming limit. The RMSE that the official trimmed-mean and median inflation series produce is between 50 and 75 percent of the RMSE of headline inflation, verifying that trimming does improve the series' predictive performance.

Table 1: Predicting Performance of Official Measures

Target	Sample	PCE Inflation Measure			DM Test
		Headline	Trimmed Mean	Median	$\Pr(z > \|DM\|)$
Current Trend	1970-2022	2.20	1.10	1.16	0.066
	1970-1989	2.28	1.62	1.51	0.047
	2000-2022	2.47	0.75	0.95	0.000
Future Trend	1970-2022	2.93	2.12	2.14	0.476
	1970-1989	3.48	3.02	3.00	0.841
	2000-2022	2.93	1.59	1.61	0.561

Notes: The table presents the predictive performance of different personal-consumption-expenditure (PCE) inflation measures with respect to different trend inflation targets for different samples. The performance is measured with the series' root-mean-square error (RMSE) with respect to trend inflation. The table reports the RMSE for headline, trimmed-mean, and median inflation. The last column reports the p-value of the Diebold and Mariano (1995) test for the difference between the RMSEs of the trimmed-mean and median inflation series.

test and report the p-value in the last column of Table 1 under the null hypothesis of no difference in the prediction error between the official trimmed-mean and median inflation series. The differences between the performances of trimmed-mean and median inflation are higher when predicting current trend inflation than when predicting the future trend, but the null hypothesis is only strongly rejected for the recent sample (starting in 2000). These same patterns hold when looking at alternative trend inflation measures as we show in Table B.3 of Appendix B.2.

Despite the official trimmed-mean and median inflation series' similar prediction errors, their levels differ substantially in most months (as explored above). This reflects the main pattern of the alternative robust measures studied below; namely, relying on the average prediction performance of different robust inflation series obscures underlying differences in their predictions for any given month and provides little guidance in judging these differences.

4 Optimal Trimmed-Mean Measures

We now systematically vary the trim cutoffs used to construct trimmed-mean measures by considering all integer combinations of trims for $\alpha, \beta \in [0, 50]$. Therefore, the resulting set of measures includes the official trimmed-mean, median, and headline inflation series as special cases. As before, we evaluate their performance based on their RMSEs against current and future trend inflation. Then, we contrast their predictive performances with differences in the levels of trend inflation implied by the different measures. We extend these results to alternative measures of trend inflation in Appendix B.3.

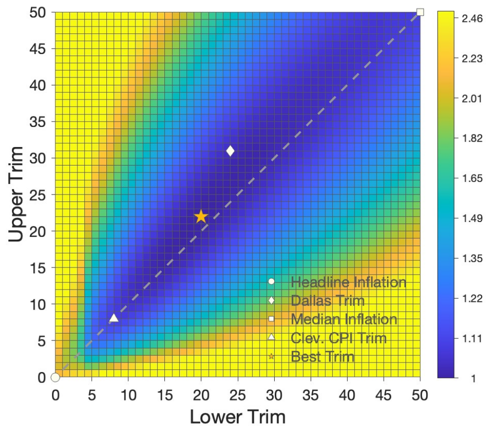
We find large differences between the optimal trimming cutoffs and the trims of the official measures ($\alpha = 24$ and $\beta = 36$, or $\alpha = \beta = 50$). Table 2 presents the results. The optimal cutoffs are asymmetric, usually with more trimmed off the top than the bottom ($\beta > \alpha$), and they vary significantly across time and target. When we target current trend inflation, the optimal trims have α's between 18 and 21 and β's between 16 and 27, varying across the four sample periods we consider. When we target future trend inflation, the trims are slightly higher, with α's between 15 and 28 and β's between 17 and 33.

However, we also find that this large variation in the optimal trims does not translate into a significantly lower RMSE such that the official measures perform almost as well as those with the optimal trimming cutoffs. The RMSE of the optimal trims is at most 4.6 percent lower, and the differences are almost never statistically significant. We verify this result in the last column of Table 2, in which we report the p-value of the Diebold and Mariano (1995) test when comparing the predictive performance of the best trim with the better of the two official robust inflation measures (see Table 1).

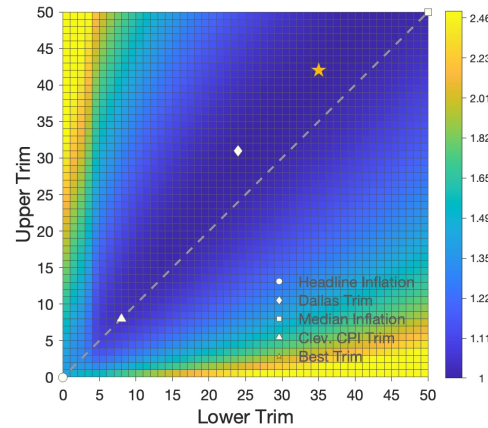
The similarity in the performance of the official robust inflation measures and the optimal trimmed measures is part of a larger pattern: for every target and sample, a wide range of trims perform similarly. These trims are slightly asymmetric—once again trimming more of the high-inflation categories (that is, $\beta > \alpha$)—and the range of trims with similar prediction errors is much larger when targeting future trend inflation, reflecting in part the added

Figure 2: RMSE across Trims

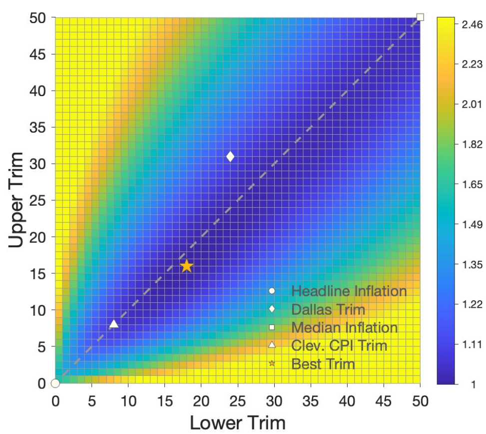
(a) Current Trend: 1970-2022



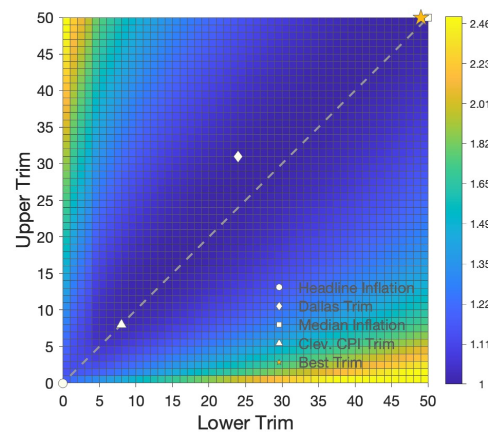
(b) Future Trend: 1970-2022



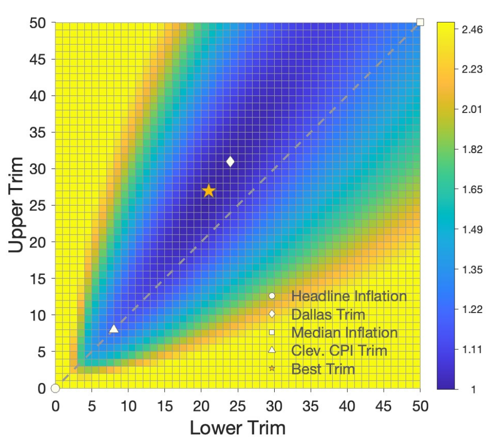
(c) Current Trend: 1970-1989



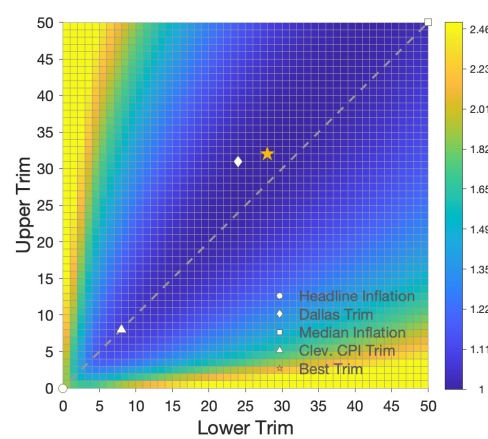
(d) Future Trend: 1970-1989



(e) Current Trend: 2000-2022



(f) Future Trend: 2000-2022



Notes: The figures show heat maps of the root-mean-square error (RMSE) when targeting current and future trend inflation with different trimmed-mean inflation measures. To ensure comparability across plots, the RMSEs are reported relative to the RMSE of the best trim reported in Table 2.

Table 2: Best Trims for Trimmed-Mean Inflation

Target	Sample	Best Trims			Official Trims	DM Test
		Lower	Upper	RMSE	min(RMSE)	$\Pr(z > \|DM\|)$
Current Trend	1970-2022	20	22	1.06	1.10	0.014
	1970-1989	18	16	1.44	1.51	0.238
	2000-2022	21	27	0.74	0.75	0.474
Future Trend	1970-2022	28	33	2.09	2.12	0.192
	1970-1989	15	17	2.91	3.00	0.560
	2000-2022	28	32	1.55	1.59	0.302

Notes: The table reports the best trim as determined by the predictive performance across trims for different targets of trend inflation and different samples. The table also reports the root-mean-square error (RMSE) for the best trims and the lower RMSE of the official trimmed and median inflation series. The last column reports the p-value of the Diebold and Mariano (1995) test for the difference between these RMSEs.

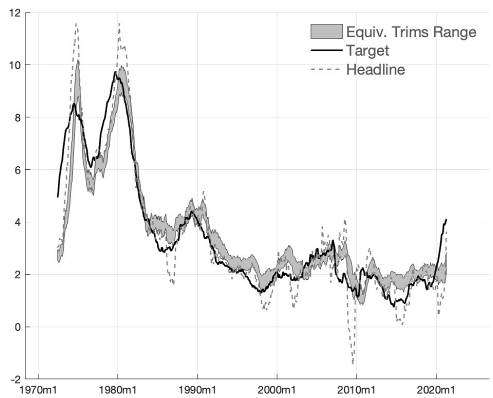
difficulty of this exercise. Figure 2 presents these results by plotting the RMSEs of all trim combinations for the two target trends and the three samples. In Figures B.6 and B.7 of Appendix B.3 we report the sets of trims whose RMSE is not significantly different from the RMSE of the best trim according to the Diebold and Mariano (1995) test. The shapes of these sets mirror the dark blue areas of Figure 2.[18]

This pattern is explained by effect of trimming on the underlying distribution of monthly inflation rates. As trimming cutoffs increase, the range of inflation rates taken into account is reduced, affecting the variability and the mean prediction of the resulting trimmed mean series. Take, for instance, an increase in the upper trim. This reduces the average and the standard deviation of the prediction implied by the trimmed mean series. However, the reduction in variability is empirically smaller than the reduction in the average prediction, actually making the trimmed mean series *relatively* more variable as the upper trim increases. In fact, the coefficient of variation (the ratio of the standard deviation to the mean) increases rapidly with the trimming cutoff, moving from 0.6 to 0.8. As a result, the RMSE of the resulting series does not change much, while, at the same time, similar RMSEs can be

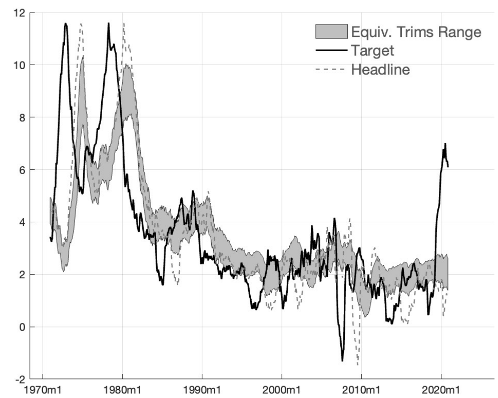
[18]These results are consistent with previous work on the difference between trimmed-mean inflation series (see, for example, Meyer, Venkatu, and Zaman 2013).

Figure 3: Prediction Range across Best Trims across Time

(a) Centered Trend



(b) Future Trend



Notes: The figures plot the range of predictions for the current and future trends between 1970 and 2022 of the set of trimmed-mean measures of inflation that are statistically equivalent at the 5 percent level according to the Diebold and Mariano (1995) test of the difference of their root-mean-square errors (RMSEs) with respect to the RMSE of the best trim for each target (see Table 2). The start- and end-dates for each figure reflect the data requirements for the ex-post measures of trend inflation.

obtained from different trim combinations that imply different average predictions.[19]

Performance beyond prediction errors. A naive reading of the results above might suggest that a wide range of trims is functionally equivalent, with the only change being the adjustment of the range of trims when targeting the behavior of current or future trend inflation. However, the small differences in the RMSEs of different trims hide significant variation in the prediction levels of the implied trimmed-mean series. This makes it complicated to select a single optimal series, as there are other, near-optimal, series with different implications for trend inflation in any given month. Take for instance the predicted levels of trend inflation from the best 50 trim combinations. These trims vary between 22 and 45 percent. In October 2022 the predicted inflation levels are between 7.3 and 7.9 percent, a range of 59 basis points (see Figure B.9).

This pattern of large discrepancies between predictions holds throughout the sample

[19]Figure B.8 makes the effect of trimming precise by plotting the coefficient of variation and the RMSE for trimmed mean series that target current trend inflation. Near the optimal trim, the RMSE does not change much, but the slope of the coefficient of variation is positive.

when looking at the set of trimmed mean inflation measures with the lowest RMSE, that is, those with an RMSE statistically equivalent to that of the best trim, and is even larger when targeting future trend inflation.[20] Figure 3 plots the range of inflation predictions implied by these sets for 1970–2022 sample for trims targeting current and future trend inflation. The average range is 0.59 percentage points when targeting current trend inflation and 1.16 percentage points when targeting future trend inflation. Even when we restrict attention to the best 50 trims (those whose prediction error is closest to the best trim's error), the average prediction range is 42 basis points between 1970 and 2022 and as high as 1 percentage point.

Figure 3 also makes it clear that measures of trimmed mean inflation have a hard time tracking changes in future trend inflation, instead lagging its movements. This is particularly evident in the two instances of high inflation in the pre-1977 sample—that we added to the official series—and at the end of the sample, when inflation rises again. In fact, the predicted range for future trend inflation does not start increasing until inflation has already peaked. By contrast, the range of trimmed mean inflation is more informative about the behavior of current trend inflation and noticeably less variable than the headline PCE inflation series. These results suggest that trimmed mean measures are best used to understand the current inflation situation, with other methods such as those in Verbrugge and Zaman (2023) better suited for predicting future inflation.

5 Conclusion

Policymakers often use robust inflation series to communicate with the public and gauge the behavior of trend inflation. Our evaluation of the performance of the official series for various targets and across various samples shows them to be robust across time and

[20] We determine the set of statistically equivalent trims with the Diebold and Mariano (1995) test using a significance level of 5 percent. Figure B.10 plots the range between the lowest and highest predictions for the current and future trend between 1970 and 2022 for the set of statistically equivalent trims and the best 50 and 100 trims according to their RMSE. Figure B.11 complements this information by presenting the average range of inflation implied by each trim combination.

comparable with the performance of the best trimmed-mean inflation measure (the one that selects trimming cutoffs that minimize prediction error). However, our analysis also finds, perhaps surprisingly, that results based on the average predictive performance of the series obscure an underlying pattern of trimmed-mean measures: While a wide range of measures have the same predictive performance, they produce substantially different predictions in any given month.

We conclude that following a set of trimmed-mean measures rather than a single series may provide additional insight about the behavior of inflation. This information can be effectively communicated by reporting the range of predictions from the set of measures with the best predictive performance. This range then informs us about the behavior of trend inflation while indicating the uncertainty over the selection of predictors in a way that is easy to communicate to the public.

While we also explored alternative trimmed-mean measures not reported here, and found similar results,[21] future work may consider a twist to our analysis. Such work may consider evaluating the predictive power of robust measures of inflation for particular *alternative targets*—current or future inflation rates relevant for different sub-groups of the US population. This differential evaluation may provide valuable new insights into robustness in the context of heterogeneous effects of monetary policy.

[21] In particular, we constructed trimmed-mean measures excluding housing, which is the single largest expenditure category and one of the series most commonly included in the official trimmed-mean and median inflation measures (see Table B.2). We found that housing does not play a large role in the behavior of trimmed-mean inflation measures. All of our results are preserved when excluding housing from the set of expenditure categories, as we show in Appendix B.4.

References

Adams, Brian, Lara Loewenstein, Hugh Montag, and Randal J. Verbrugge. 2022. “Disentangling Rent Index Differences: Data, Methods, and Scope.” Working Paper 22-38, Federal Reserve Bank of Cleveland. URL https://doi.org/10.26509/frbc-wp-202238.

Amstad, Marlene, Simon M. Potter, and Robert W. Rich. 2017. “The New York Fed Staff Underlying Inflation Gauge (UIG).” *Economic Policy Review* 23 (2):1–32. URL https://www.newyorkfed.org/research/epr/2017/epr_2017_underlying_inflation_rich.

Bank for International Settlements. 1999. “Measures Of Underlying Inflation And Their Role In The Conduct Of Monetary Policy.” Conference Proceedings 30116, Bank for International Settlements (BIS). URL https://www.bis.org/publ/bisp05.pdf.

Blinder, Alan S., Michael Ehrmann, Marcel Fratzscher, Jakob De Haan, and David-Jan Jansen. 2008. “Central Bank Communication and Monetary Policy: A Survey of Theory and Evidence.” *Journal of Economic Literature* 46 (4):910–45. URL https://doi.org/10.1257/jel.46.4.910.

Bolhuis, Marijn A, Judd N L Cramer, and Lawrence H Summers. 2022. “Comparing Past and Present Inflation.” *Review of Finance* 26 (5):1073–1100. URL https://doi.org/10.1093/rof/rfac047.

Bryan, Michael F and Stephen G Cecchetti. 1994. “Measuring Core Inflation.” In *Monetary Policy*, edited by N. Gregory Mankiw, chap. 6. The University of Chicago Press, 195–219. URL https://www.nber.org/system/files/chapters/c8333/c8333.pdf.

Bryan, Michael F, Stephen G Cecchetti, and Rodney L Wiggins. 1997. “Efficient inflation estimation.” Working Paper 6183, National Bureau of Economic Research. URL https://www.nber.org/papers/w6183.

Bryan, Michael F. and Christopher J. Pike. 1991. “Median Price Changes: An Alternative Approach to Measuring Current Monetary Inflation.” *Federal Reserve Bank of Cleveland, Economic Commentary* URL https://www.clevelandfed.org/publications/economic-commentary/1991/ec-19911201-median-price-changes-an-alternative-approach-to-measuring-current-monetar

Bureau of Economic Analysis. 2022. “Personal Consumption Expenditure Data.” URL https://apps.bea.gov/national/Release/XLS/Underlying/Section2All_xls.xlsx. Accessed November 30, 2022.

Carroll, Daniel R. and Randal J. Verbrugge. 2019. “Behavior of a New Median PCE Measure: A Tale of Tails.” *Federal Reserve Bank of Cleveland, Economic Commentary* 2019 (10). URL https://doi.org/10.26509/frbc-ec-201910.

Christiano, Lawrence J. and Terry J. Fitzgerald. 2003. “The Band Pass Filter.” *International Economic Review* 44 (2):435–465. URL https://doi.org/10.1111/1468-2354.t01-1-00076.

Clark, Todd E. 2001. "Comparing Measures of Core Inflation." *Federal Reserve Bank of Kansas City, Economic Review* 86 (2):5–31. URL https://www.kansascityfed.org/documents/1417/2001-ComparingMeasuresofCoreInflation.pdf.

Coibion, Olivier, Yuriy Gorodnichenko, and Michael Weber. 2022. "Monetary Policy Communications and Their Effects on Household Inflation Expectations." *Journal of Political Economy* 130 (6):1537–1584. URL https://doi.org/10.1086/718982.

Crane, Theodore M., Neil K. Khettry, Loreeta J. Mester, and Jason A. Novak. 2013. "Core Measures of Inflation as Predictors of Total Inflation." *Journal of Money, Credit, and Banking* 45 (2-3):505–519. URL https://doi.org/10.1111/jmcb.12013.

Diebold, Francis X and Robert S Mariano. 1995. "Comparing Predictive Accuracy." *Journal of Business & Economic Statistics* 13 (1):253–265. URL https://doi.org/10.1198/073500102753410444.

Dolmas, Jim. 2005. "Trimmed Mean PCE Inflation." Tech. rep., Federal Reserve Bank of Dallas. URL https://www.dallasfed.org/research/~/media/documents/research/papers/2005/wp0506.pdf.

Federal Reserve Bank of Cleveland. 2021. "Median CPI." Tech. rep., Federal Reserve Bank of Cleveland. URL https://www.clevelandfed.org/en/our-research/indicators-and-data/median-cpi/background-and-resources.aspx.

Federal Reserve Bank of Dallas. 2021. "Trimmed Mean PCE Inflation Rate [PCETRIM12M159SFFRBDAL]." URL https://fred.stlouisfed.org/series/PCETRIM12M159SFRBDAL. Accessed December 20, 2021.

Forni, Mario, Marc Hallin, Marco Lippi, and Lucrezia Reichlin. 2000. "The Generalized Dynamic-Factor Model: Identification and Estimation." *The Review of Economics and Statistics* 82 (4):540–554. URL https://doi.org/10.1162/003465300559037.

Gorodnichenko, Yuriy, Tho Pham, and Oleksandr Talavera. 2023. "The Voice of Monetary Policy." *American Economic Review* 113 (2):548–84. URL https://doi.org/10.1257/aer.20220129.

Handlan, Amy. 2022. "Text Shocks and Monetary Surprises: Text Analysis of FOMC Statements with Machine Learning." URL https://handlanamy.github.io/MyFiles/Handlan_TextShocks_sub.pdf. Accessed September 6, 2022.

Hazell, Jonathon, Juan Herreño, Emi Nakamura, and Jón Steinsson. 2022. "The Slope of the Phillips Curve: Evidence from U.S. States." *The Quarterly Journal of Economics* 137 (3):1299–1344. URL https://doi.org/10.1093/qje/qjac010.

Meyer, Brent, Guhan Venkatu, and Saeed Zaman. 2013. "Forecasting Inflation? Target the Middle." *Federal Reserve Bank of Cleveland, Economic Commentary* 2013 (05). URL https://doi.org/10.26509/frbc-ec-201305.

Ocampo, Sergio, Raphael Schoenle, and Dominic A. Smith. 2022. "How Robust are Robust Measures of PCE Inflation?" Discussion Paper DP17485, Centre for Economic Policy Research. URL https://cepr.org/active/publications/discussion_papers/dp.php?dpno=17485.

Rich, Robert and Charles Steindel. 2007. "A Comparison of Measures of Core Inflation." *Federal Reserve Bank of New York, Economic Policy Review* :19–38URL https://www.newyorkfed.org/medialibrary/media/research/epr/07v13n3/0712rich.pdf.

Rich, Robert, Randal Verbrugge, and Saeed Zaman. 2022. "Adjusting Median and Trimmed-Mean Inflation Rates for Bias Based on Skewness." *Federal Reserve Bank of Cleveland, Economic Commentary* 2022 (05). URL https://doi.org/10.26509/frbc-ec-202205.

Torres, Craig. 2023a. "Barkin Says It's Too Soon to End Fed Hikes as Inflation Lingers." *Bloomberg* URL https://www.bloomberg.com/news/articles/2023-01-17/barkin-says-it-s-too-soon-to-end-fed-hikes-as-inflation-lingers.

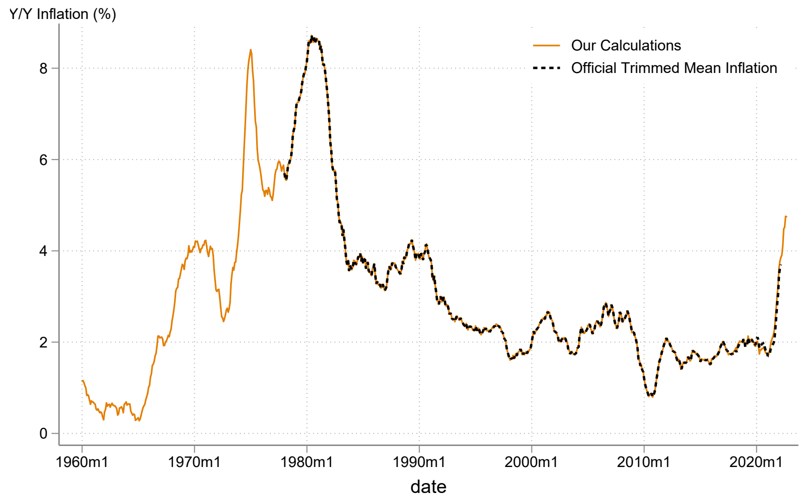
———. 2023b. "Fed's Barkin Says Appropriate to Raise Rates "More Deliberately"." *Bloomberg* URL https://www.bloomberg.com/news/articles/2023-01-12/fed-s-barkin-says-appropriate-to-raise-rates-more-deliberately.

Verbrugge, Randal. 2022. "Is it Time to Reassess the Focal Role of Core PCE Inflation in Assessing the Trend in PCE Inflation?" *Economia* 45 (89):73–101. URL https://doi.org/10.18800/economia.202201.004.

Verbrugge, Randal and Saeed Zaman. 2023. "Improving Inflation Forecasts Using Robust Measures." Working Paper 22-23R, Federal Reserve Bank of Cleveland. URL https://doi.org/10.26509/frbc-wp-202223r.

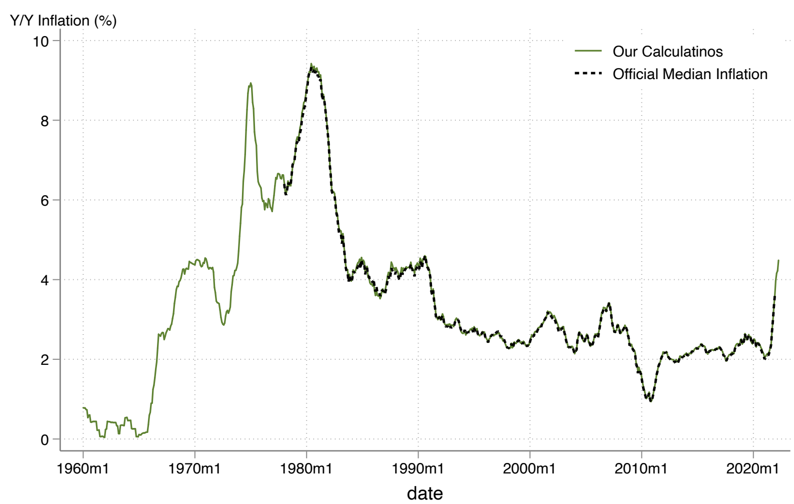
A Replication of Trimmed-Mean and Median PCE Inflation Series

Figure A.1: Replication of Trimmed-Mean PCE Inflation, 1960–2022



Notes: The figure shows the authors' calculation of trimmed-mean PCE inflation along with the official trimmed-mean PCE series.

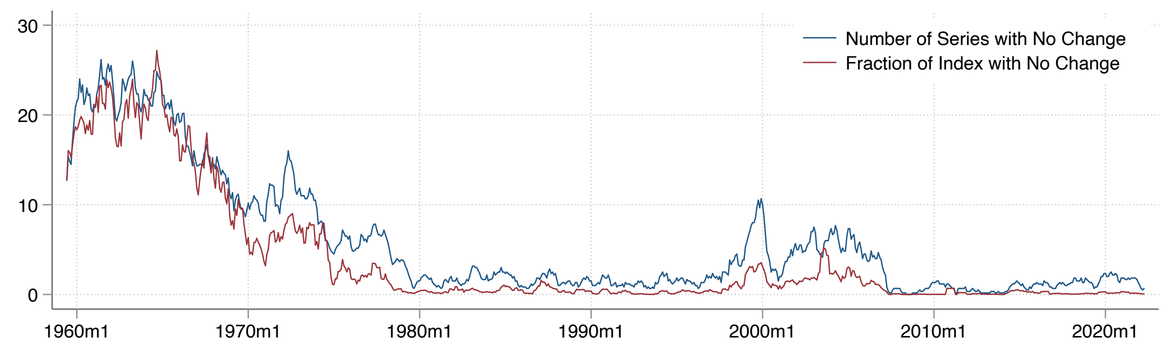
Figure A.2: Replication of Median PCE Inflation, 1960–2022



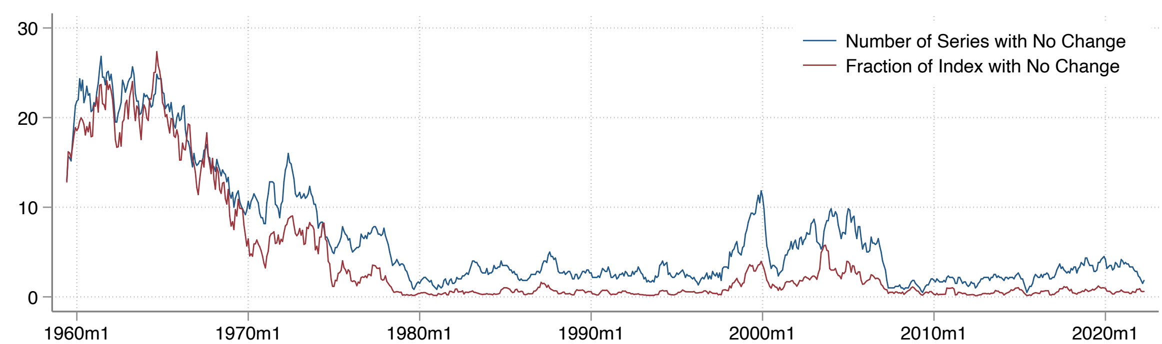
Notes: The figure shows the authors' calculation of median PCE inflation along with the official median PCE series.

Figure A.3: Number of Series with No Monthly Price Changes

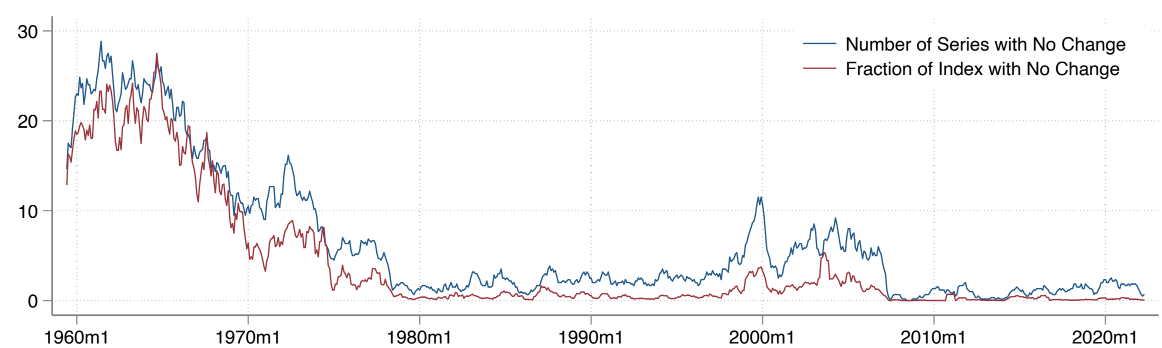
(a) Trimmed Mean



(b) Median



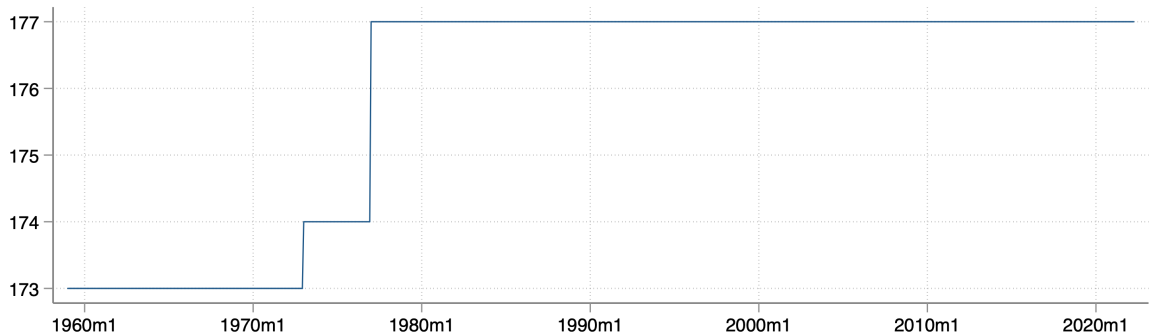
(c) Time Consistent



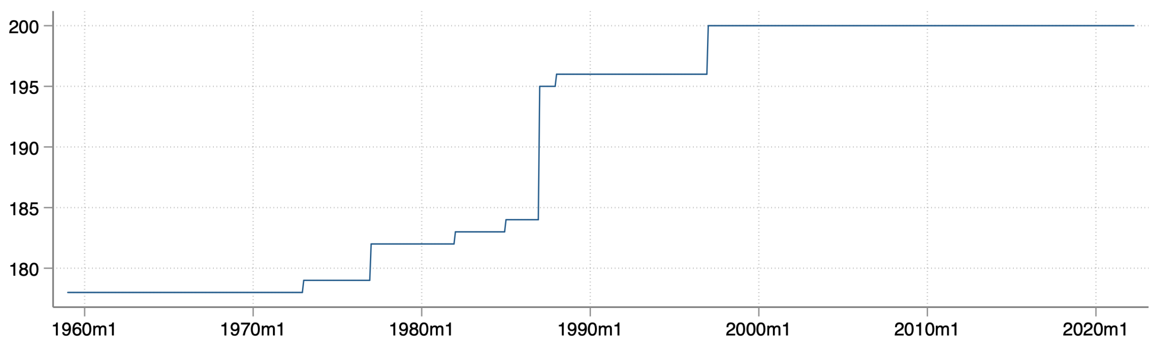
Notes: The lines plot the number of series and fraction of total expenditure (in percent) with no monthly price change for each of the three sets of series used in the paper.

Figure A.4: Number of Series with Positive Expenditure

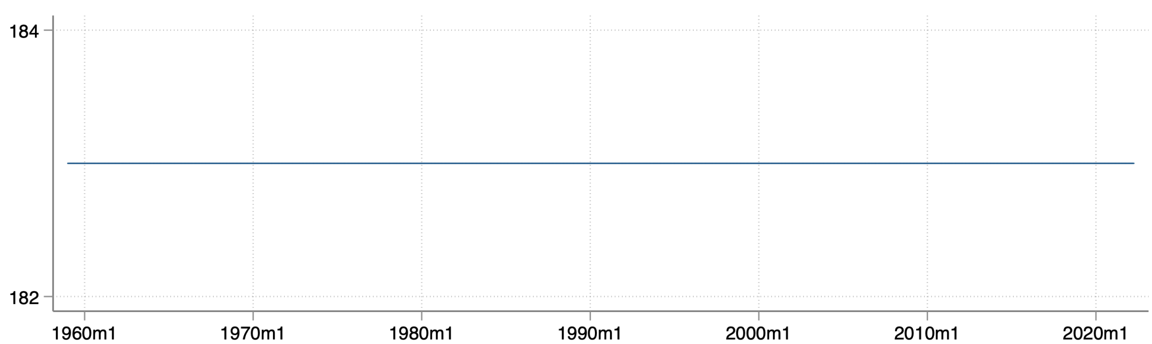
(a) Trimmed Mean



(b) Median



(c) Time Consistent



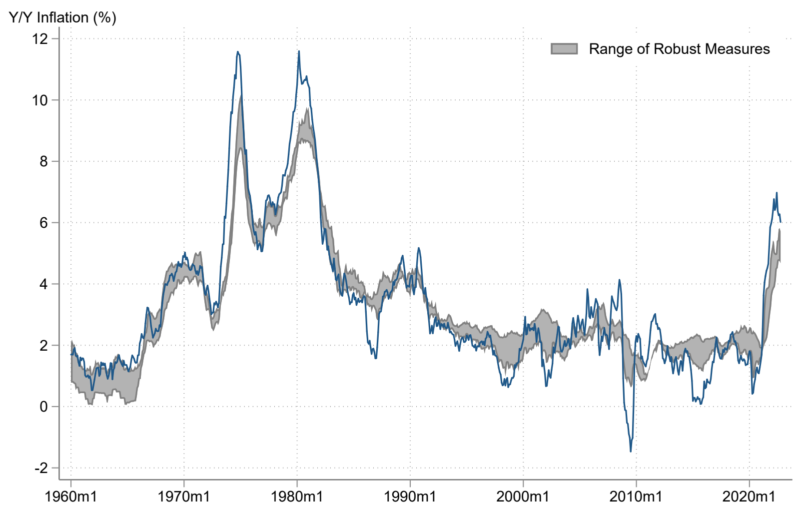
Notes: The lines plot the number of series with positive expenditure in the PCE series over time from the set of series considered by the trimmed-mean inflation, median inflation, and the time consistent set constructed in the paper.

B Additional Results

B.1 Time Series Properties

The level of agreement between the series is also captured by the range of values they cover, shown in Figure B.1 along with the level of headline PCE inflation. The range is 0.77 percentage points on average over the whole sample, 0.80 percentage points when inflation is less than 2.5 percent, and 0.91 percentage points when inflation is above 5 percent. Thus, the range values covered by robust inflation measures is disproportionately wider when inflation is low than when inflation is high. This again shows that there is substantially more agreement between the signals provided by the different inflation measures when inflation is high.

Figure B.1: Range of Robust Inflation Measures, 1960–2022



Notes: The figure shows the authors' calculations of the range of robust inflation measures (core inflation, median inflation, and trimmed-mean inflation) from 1960 to 2022. The range is shown in the shaded area. The blue line corresponds to headline inflation.

The variability of the robust inflation measures is also higher during low-inflation episodes despite these measures being constructed to be less responsive to transitory movements in inflation. Even though the robust inflation measures are overall less volatile than headline inflation, this pattern does not hold throughout the whole sample. Table B.1 reports the mean, standard deviation, and coefficient of variation of the four inflation series for different samples that depend on the level of headline inflation, Figure B.2 plots the time series of the standard deviations.

When inflation is below 2.5 percent, median and trimmed mean inflation are more volatile than headline inflation, and when inflation is between 2.5 and 5 percent all three robust inflation measures are more variable than headline inflation. Moreover, the coefficient of variation is highest when headline inflation is below 2.5 percent. The robust inflation measures also change their ranking in terms of how volatile they are. Core

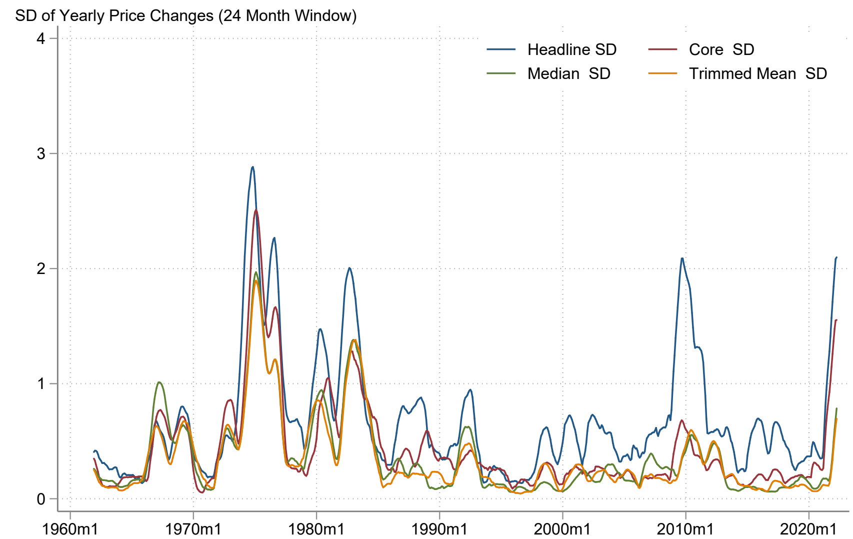
Table B.1: Summary Statistics: Inflation Measures

	Inflation Measures			
	Headline	Core	Median	Trimmed Mean
	Full Sample (748 months)			
Mean	3.27	3.21	3.33	2.96
Std. Dev.	2.42	2.13	2.01	1.86
Coeff. Var.	0.74	0.66	0.60	0.63
	$\pi < 2.5\%$ (373 months)			
Mean	1.55	1.73	2.01	1.72
Std. Dev.	0.67	0.53	0.95	0.70
Coeff. Var.	0.43	0.31	0.47	0.41
	$2.5\% \leq \pi < 5\%$ (252 months)			
Mean	3.61	3.51	3.55	3.17
Std. Dev.	0.71	1.06	0.84	0.77
Coeff. Var.	0.20	0.30	0.24	0.24
	$5\% \leq \pi$ (123 months)			
Mean	7.76	7.09	6.85	6.31
Std. Dev.	2.00	1.59	1.60	1.57
Coeff. Var.	0.26	0.22	0.23	0.25

Notes: The numbers are mean, standard deviation, and coefficient of variation of the different inflation measures for different samples determined by the level of PCE inflation. All numbers are in percentage points.

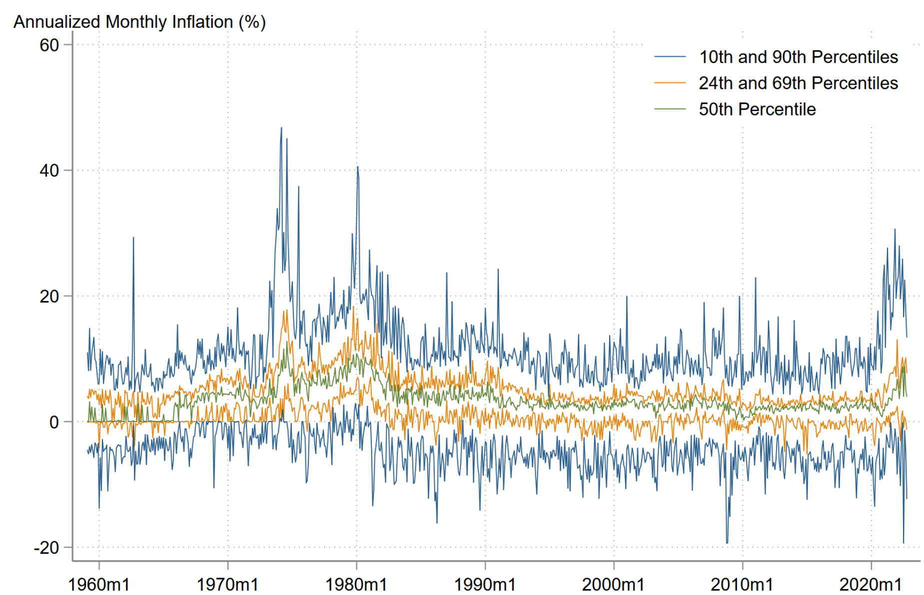
inflation is the most volatile in the complete sample, but median inflation is more volatile when inflation is low (below 2.5 percent) and trimmed mean inflation is more volatile when inflation is high (above 5 percent).

Figure B.2: Time-Series Variability of Measures of Inflation, 1960–2022



Notes: The figure shows the authors' calculations of the standard deviations of headline inflation, core inflation, median inflation, and trimmed-mean inflation for a rolling window of 24 months.

Figure B.3: Range of Underlying Inflation, 1960–2022



Notes: The figure shows the authors' calculations of the range of inflation series used for different inflation measures from 1960 to 2022. The lines correspond to the 10th and 90th percentiles of the cross section of monthly inflation rates in the 177 series considered for the trimmed-mean measure, the 24th and 69th percentiles of the PCE inflation series that correspond to the range used for trimmed-mean inflation, and the median inflation series. Percentiles are weighted using the average real expenditure on each category in months t and $t-1$.

Table B.2: Most Commonly Excluded and Included Expenditure Categories

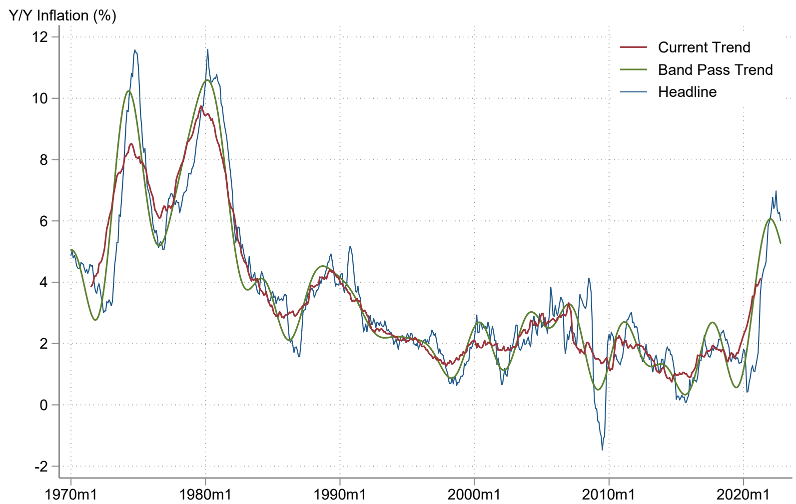
	Median	Trimmed Mean	Middle 90% (10, 10) Trim
		Most Commonly Excluded	
1		Eggs	Eggs
2	71 series are	Food on farms	Vegetables
3	never median	Vegetables	Food on farms
4		Fruit	Used automobile margin
5		Gasoline	Fuel oil
		Most Commonly Included	
1	Owner-occ homes	Owner-occ homes	Owner-occ homes
2	Other purchased meals	Other purchased meals	Other purch meals
3	Tenant-occ homes	Owner-occ mobile homes	Tenant-occ homes
4	Nonprofit hospitals	Casino gambling	Casino gambling
5	Physician services	Tenant-occ homes	Lotteries

Notes: The table reports the five expenditure categories most commonly excluded and the five most commonly included when computing median and trimmed-mean inflation as well as those excluded and included when trimming the middle 90 percent of expenditure, setting trims to $\alpha = \beta = 10$. All the results are from the authors' calculations of the series reported in Figure 1. In the case of median inflation (first column), all categories but one are included in a given month, so we report the number of series that are never included. A series is considered "included" if any of the weight of the series is used in the calculation.

B.2 Alternative Measures of Trend Inflation

Figure B.4: Time Series of Trend Inflation

(a) Measures of Current Trend Inflation



(b) Measures of Future Trend Inflation

Notes: The figures show the authors' calculations of two measures of trend inflation. The first panel presents two measures of current trend inflation, a 36-month centered inflation trend (current trend), and a band-pass filter trend (band-pass trend) as described in Section 3, together with the series of year-on-year headline PCE inflation. The second panel presents two measures of future trend inflation, a 12-month forward moving average of headline inflation with data between 12 and 24 months ahead (future trend), and a 24-month forward moving average (forward trend).

Table B.3: Ranking of Various Methods of Calculating Robust Measures

Target	Sample	PCE Inflation Measure			DM Test
		Headline	Trimmed Mean	Median	$\Pr(z > \lvert DM \rvert)$
Current Trend	1970-2022	2.20	1.10	1.16	0.066
	1970-1989	2.28	1.62	1.51	0.047
	2000-2022	2.47	0.75	0.95	0.000
Band-Pass Trend	1970-2022	2.11	1.25	1.30	0.066
	1970-1989	1.98	1.65	1.55	0.035
	2000-2022	2.42	1.01	1.18	0.000
Future Trend	1970-2022	2.93	2.12	2.14	0.476
	1970-1989	3.48	3.02	3.00	0.841
	2000-2022	2.93	1.59	1.61	0.561
Forward Trend	1970-2022	2.43	1.62	1.66	0.181
	1970-1989	2.74	2.38	2.34	0.393
	2000-2022	2.56	1.09	1.21	0.000

Notes: The table presents the predictive performance of different PCE inflation measures with respect to different trend inflation targets in different samples. The performance is measured with the series' root-mean-square error (RMSE) with respect to trend inflation. The table reports the RMSEs for headline, trimmed-mean, and median inflation. The last column reports the p-value of the Diebold and Mariano (1995) test for the difference between the RMSEs of the trimmed-mean and median inflation series.

B.3 Alternative Trimmed Mean Measures of Inflation

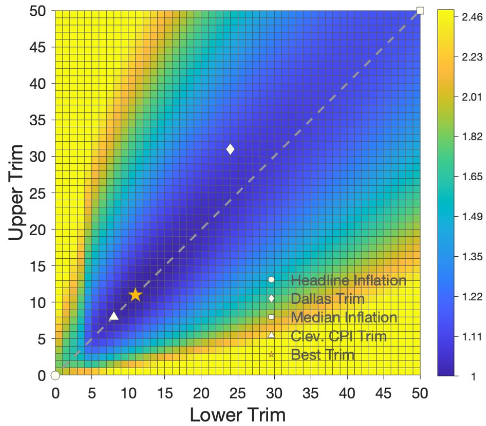
Table B.4: Best Trims for Trimmed-Mean Inflation

Target	Sample	Best Trims			Official Trims	DM Test
		Lower	Upper	RMSE	min(RMSE)	Pr $(z > \|\text{DM}\|)$
Current Trend	1970-2022	20	22	1.06	1.10	0.014
	1970-1989	18	16	1.44	1.51	0.238
	2000-2022	21	27	0.74	0.75	0.474
Band-Pass Trend	1970-2022	11	11	1.12	1.25	0.000
	1970-1989	11	9	1.36	1.55	0.003
	2000-2022	15	18	0.97	1.02	0.050
Future Trend	1970-2022	28	33	2.09	2.12	0.192
	1970-1989	15	17	2.91	3.00	0.560
	2000-2022	28	32	1.55	1.59	0.302
Forward Trend	1970-2022	15	17	1.59	1.62	0.150
	1970-1989	13	13	2.26	2.34	0.158
	2000-2022	23	30	1.09	1.09	0.815

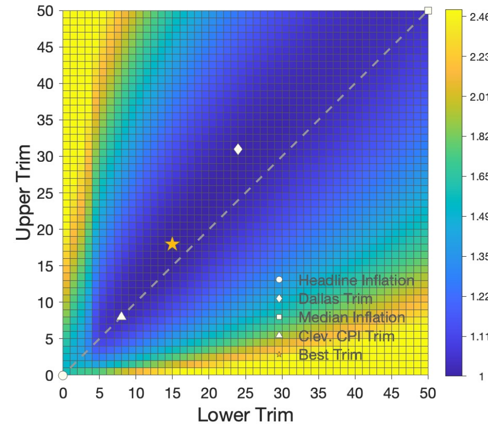
Notes: The table reports the best trims for different targets of trend inflation over different samples as determined by the predictive performance across trims. The root-mean-square error (RMSE) of the best trim is also reported along with the lowest RMSE of the official trimmed and median inflation series. The last column reports the p-value of the Diebold and Mariano (1995) test for the difference between the RMSEs of the best trim and the lowest of the official series.

Figure B.5: RMSE across Trims

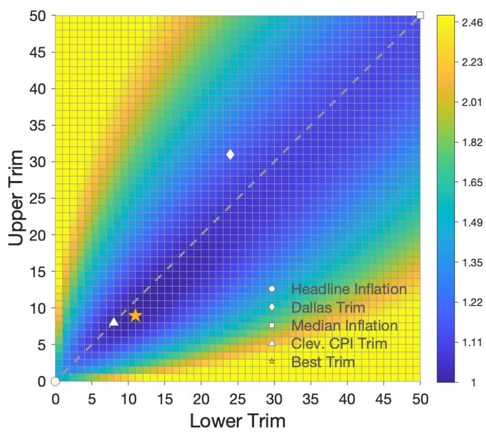
(a) Band-Pass Trend: 1970–2022



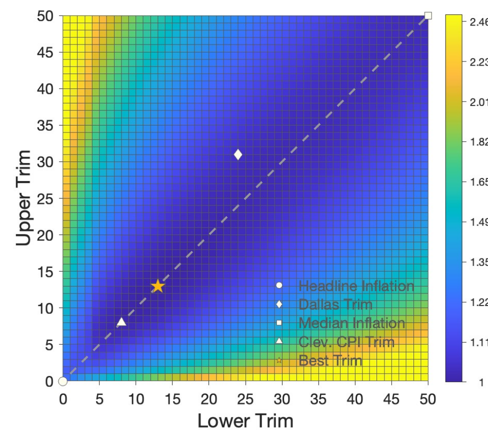
(b) Forward Trend: 1970–2022



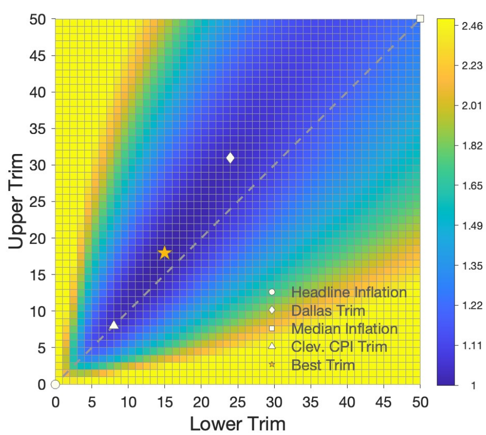
(c) Band Pass Trend: 1970–89



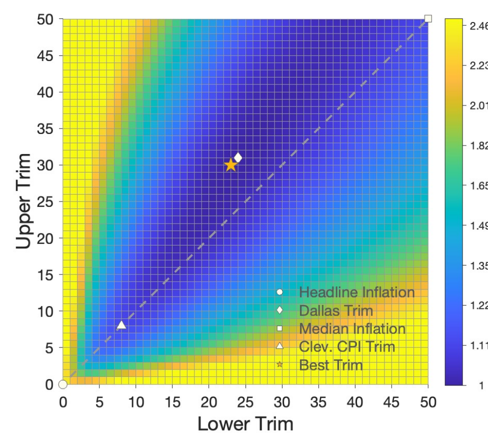
(d) Forward Trend: 1970–89



(e) Band-Pass Trend: 2000–2022



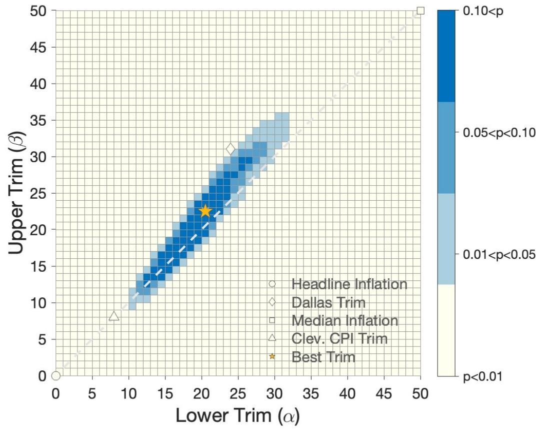
(f) Forward Trend: 2000–2022



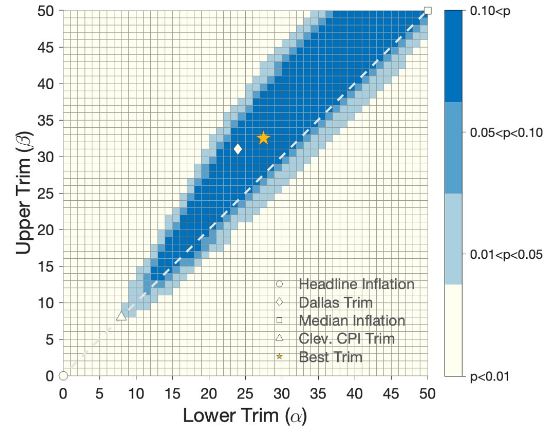
Note: *The figures show heat maps of the root-mean-square error (RMSE) when targeting band-pass and forward trend inflation with different trimmed-mean inflation measures. To ensure comparability across plots, the RMSE numbers are reported relative to the RMSE of the best trim reported in Table B.4.*

Figure B.6: Statistical Difference of RMSE across Trims

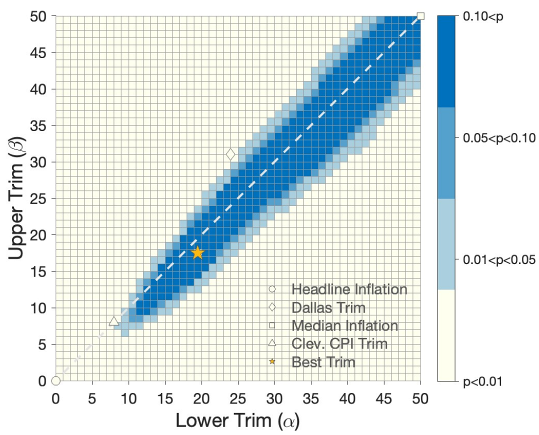
(a) Current Trend: 1970–2022



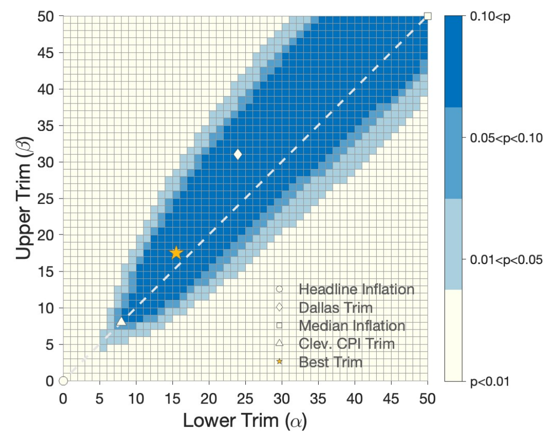
(b) Future Trend: 1970–2022



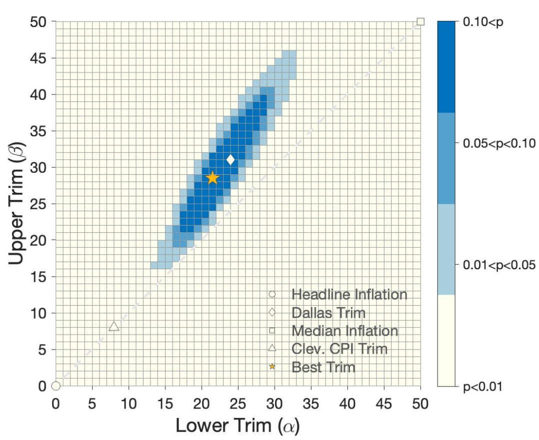
(c) Current Trend: 1970–89



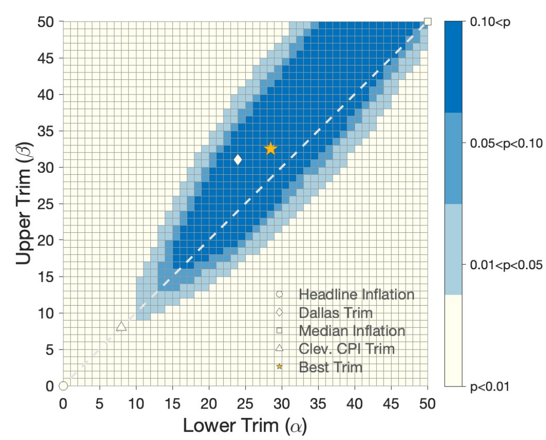
(d) Future Trend: 1970–89



(e) Current Trend: 2000–2022



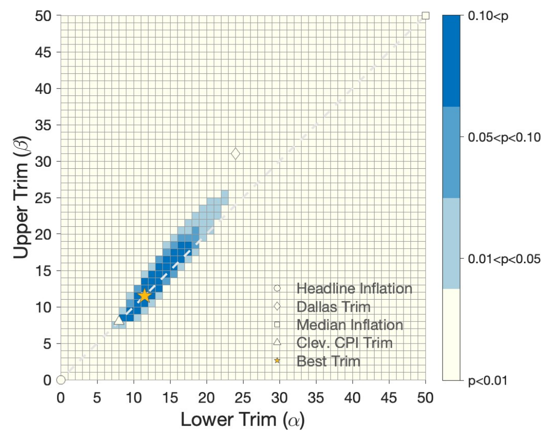
(f) Future Trend: 2000–2022



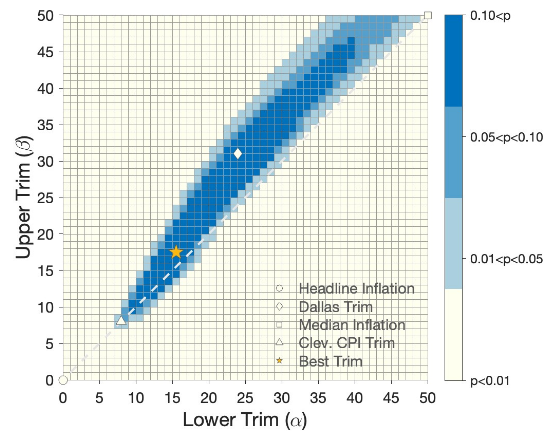
Notes: The figures group trims according to the outcome of the Diebold and Mariano (1995) test, which compares the root-mean-square error (RMSE) implied by the trims with the RMSE of the best trim as presented in Table 2. The trims are grouped based on the p-value of the test. The darkest region consists of trims whose RMSE is statistically equivalent to the lowest RMSE across all trims.

Figure B.7: Statistical Difference of RMSE across Trims - Alternative Trends

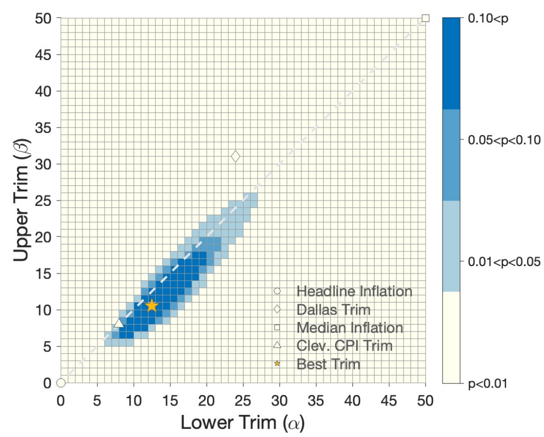
(a) Band-Pass Trend: 1970–2022



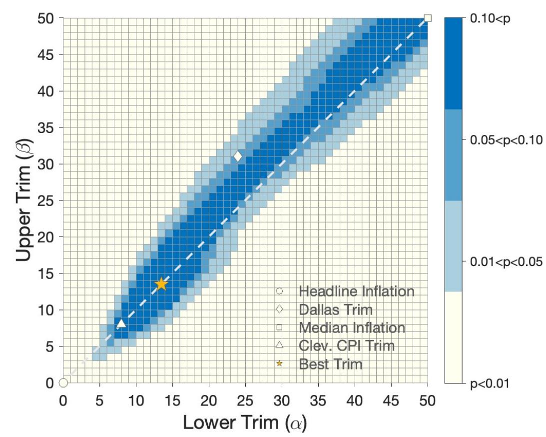
(b) Forward Trend: 1970–2022



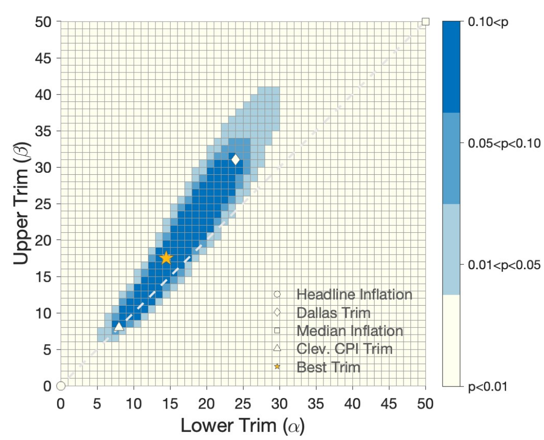
(c) Band-Pass Trend: 1970–89



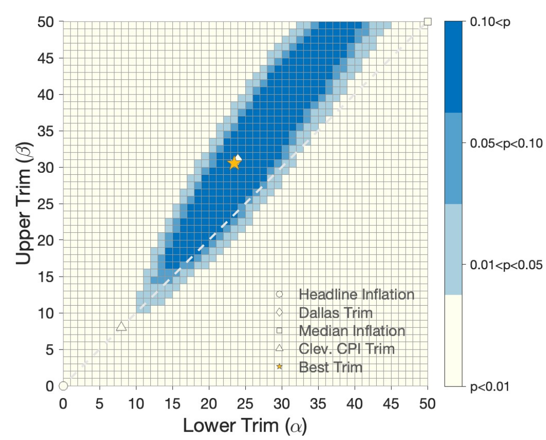
(d) Forward Trend: 1970–89



(e) Band-Pass Trend: 2000–2022



(f) Forward Trend: 2000–2022

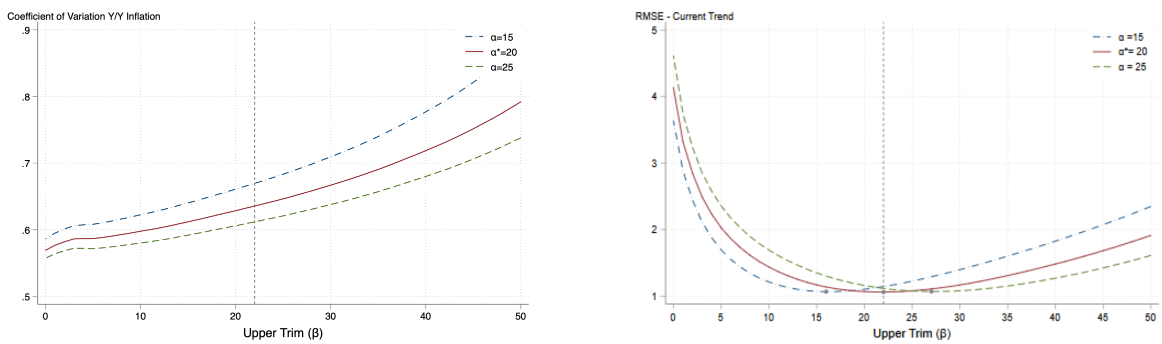


Note: The figures group trims according to the outcome of the Diebold and Mariano (1995) test, which compares the root-mean-square error (RMSE) implied by the trims with the RMSE of the best trim as presented in Table B.4. The trims are grouped based on the p-value of the test. The darkest region consists of trims whose RMSE is statistically equivalent to the lowest RMSE across all trims.

Figure B.8: The Behavior of Trimmed Mean Measures

(a) Coefficient of Variation

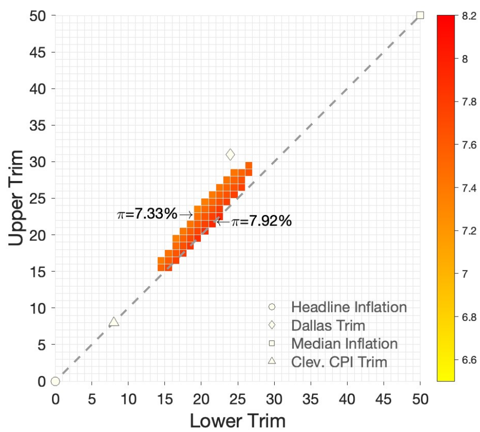
(b) RMSE - Current Trend



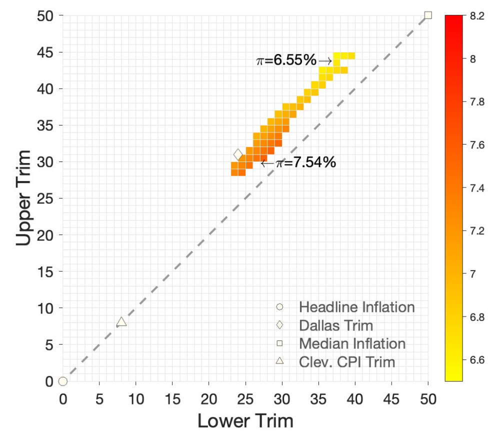
Notes: The left panel shows the coefficient of variation for different upper trims for trimmed mean measures with three different levels of lower trim. The coefficient of variation is the ratio between the standard deviation and the mean of thee series over the 1970–2022 sample. The right panel shows the RMSE of the series when targeting current trend inflation. The dotted vertical line signals the optimal upper trim and the $*$ indicates the optimal lower trim.

Figure B.9: Prediction across Best Trims

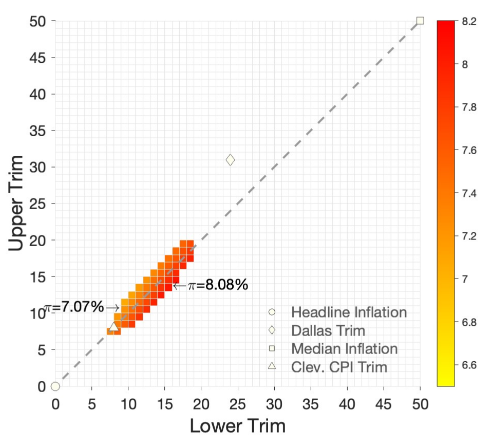
(a) Centered Trend



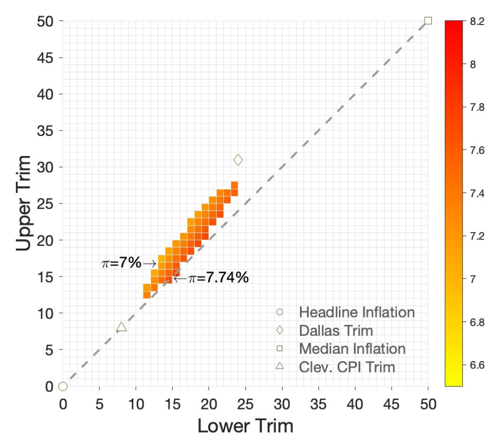
(b) Future Trend



(c) Band-Pass Trend



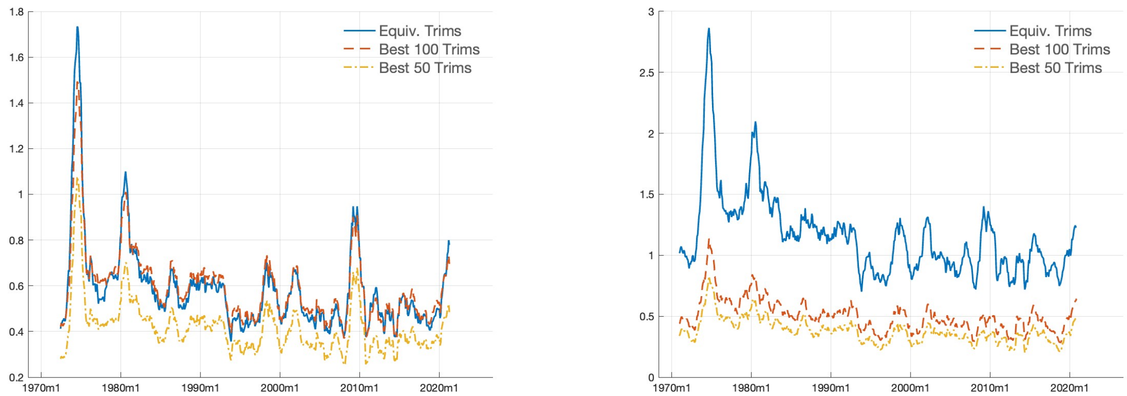
(d) Forward Trend



Note: The figures show heat maps of the prediction level for October 2022 across the best 50 trim combinations, ranked according to their RMSE when targeting band-pass or forward trend inflation over the sample 1970–2022. The best 50 trims vary according to the trend inflation series being targeted.

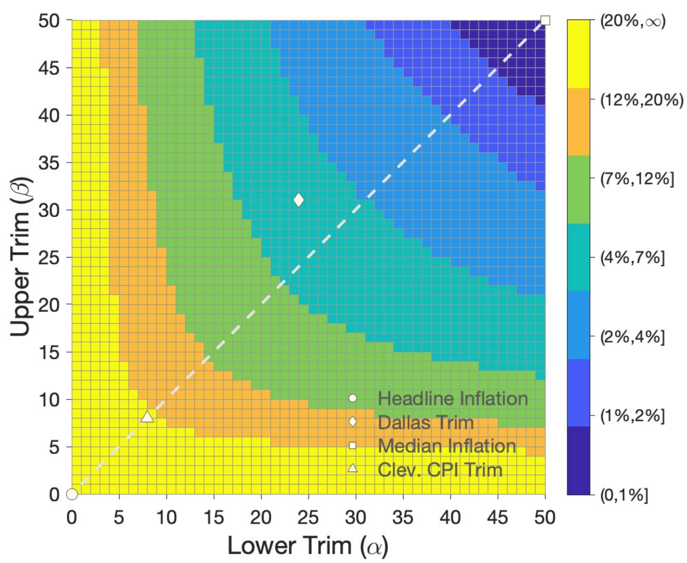
Figure B.10: Prediction Range across Best Trims across Time

(a) Centered Trend (b) Future Trend



Notes: The figures plot the range between the lowest and highest predictions for the current and future trends between 1970 and 2022 given a set of trimmed-mean measures of inflation. There are three ranges for each inflation target: first, the range implied by considering the trims that are statistically equivalent at the 5 percent level according to the Diebold and Mariano (1995) test of the difference of their root-mean-square errors (RMSEs) with respect to the RMSE of the best trim (see Table 2); second, the range implied by considering the best 100 trims as ranked by their RMSE; third, the range implied by considering the best 50 trims as ranked by their RMSE.

Figure B.11: Average Range of Inflation by Trims



Note: The figure shows the average range of inflation rates across individual expenditure categories implied by each trim combination, $\pi_{1-\beta} - \pi_{\alpha}$.

B.4 Excluding Housing from Trimmed-Mean Inflation

Housing is the single largest expenditure category and may have different dynamics from the remainder of the consumption basket (Adams et al., 2022). It is also one of the series most commonly included in the official trimmed mean and median inflation measures (see Table B.2). This can raise questions over housing having too large of a role in the behavior of trimmed mean inflation measures. That is not the case. We now reproduce our main results while excluding owner occupied housing from the construction of trimmed mean measures and re-weighting the remaining categories accordingly. All of our results are preserved, with the obvious exception of the level of the optimal trim cutoffs that changes to reflect the exclusion of housing from the set of expenditure categories.

Table B.5: Best Trims for Trimmed-Mean Inflation without Housing

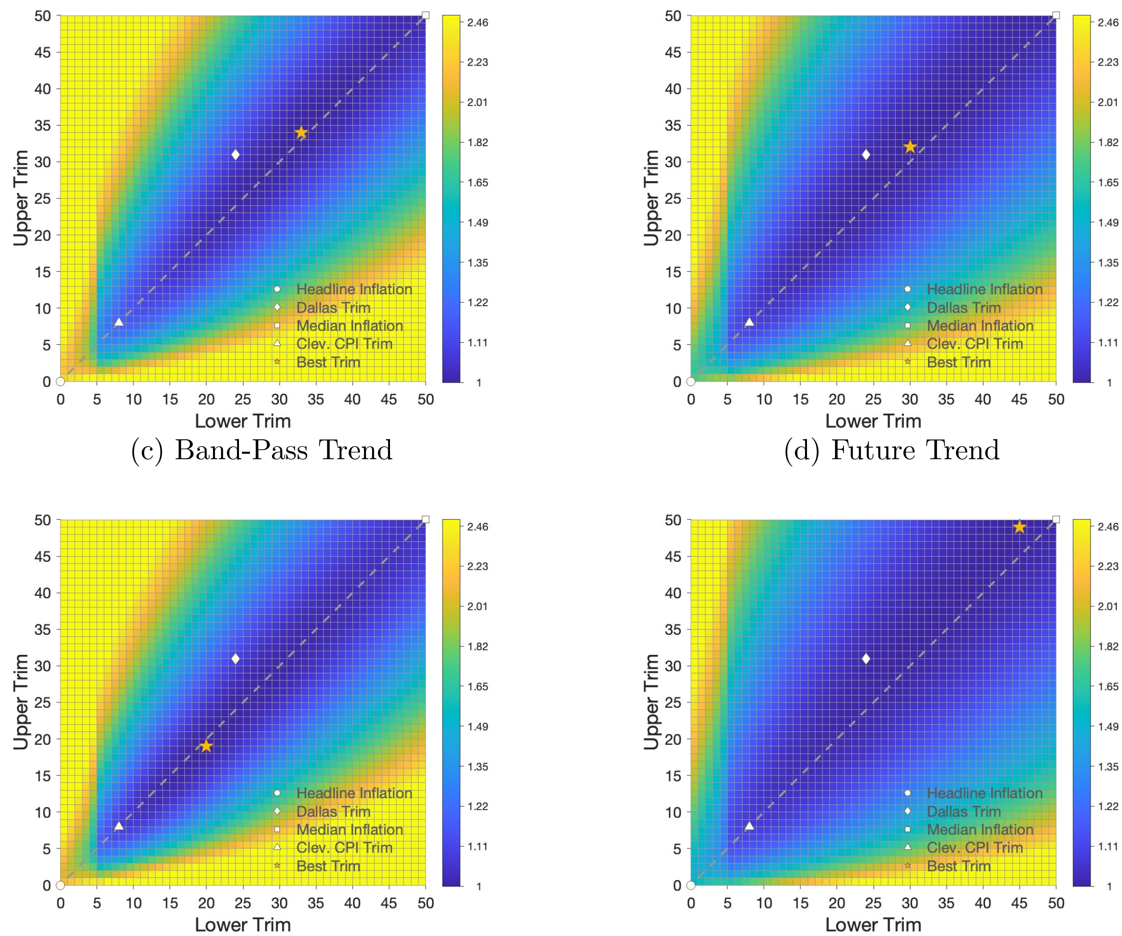
Target	Sample	Best Trim		
		Lower Trim	Upper Trim	RMSE
Centered Trend	1970–2022	33	34	1.18
	1970–89	27	24	1.65
	2000–2022	33	37	0.74
Band-Pass Trend	1970–2022	20	19	1.18
	1970–89	21	18	1.45
	2000–2022	30	32	0.98
Future Trend	1970–2022	45	49	2.13
	1970–89	25	25	3.02
	2000–2022	48	50	1.39
Forward Trend	1970–2022	30	32	1.64
	1970–89	20	19	2.36
	2000–2022	42	46	0.96

Notes: The table reports the best trims for different targets of trend inflation over different samples as determined by the predictive performance across trims. The root-mean-square error (RMSE) of the best trim is also reported along with the lowest RMSE of the official trimmed and median inflation series.

Figure B.12: RMSE across Trims: 1970–2022 (Sample without Housing)

(a) Centered Trend (b) Forward Trend

(c) Band-Pass Trend (d) Future Trend

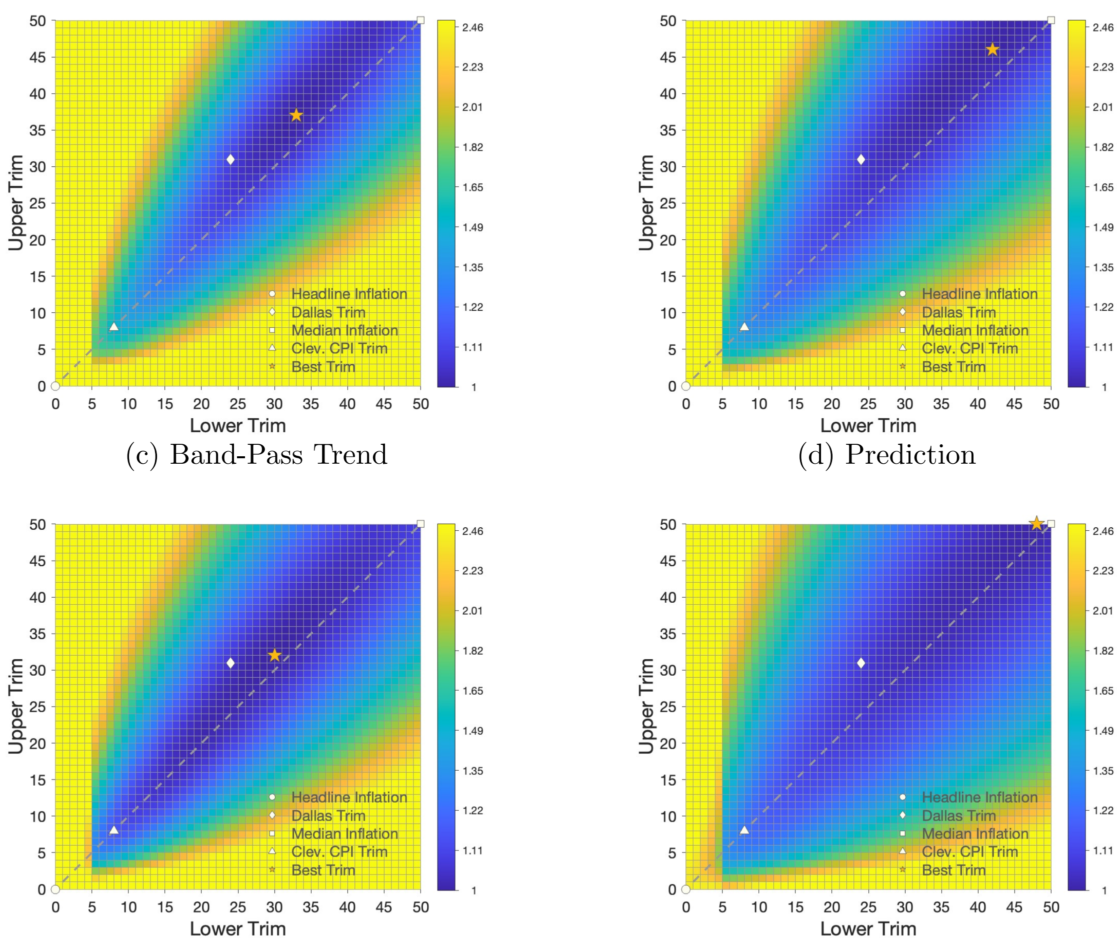


Note: The figures show heat maps of the RMSE when targeting trend inflation with different combinations of trimmed-mean inflation measures. Four measures of trend inflation are considered. To ensure comparability across plots, the RMSE numbers are reported relative to the RMSE of the best trim reported in Table B.5.

Figure B.13: RMSE across Trims: 2000–2022 (Sample without Housing)

(a) Centered Trend (b) Forward Trend

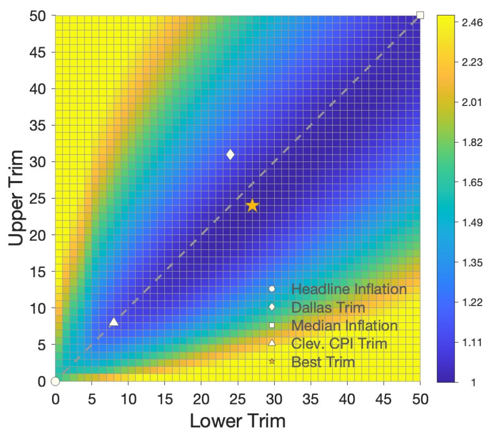
(c) Band-Pass Trend (d) Prediction



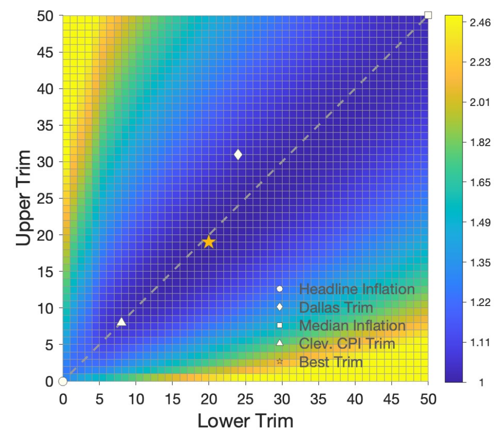
Note: The figures show heat maps of the RMSE when targeting trend inflation with different combinations of trimmed-mean inflation measures. Four measures of trend inflation are considered. To ensure comparability across plots, the RMSE numbers are reported relative to the RMSE of the best trim reported in Table B.5.

Figure B.14: RMSE across Trims: 1970–89 (Sample without Housing)

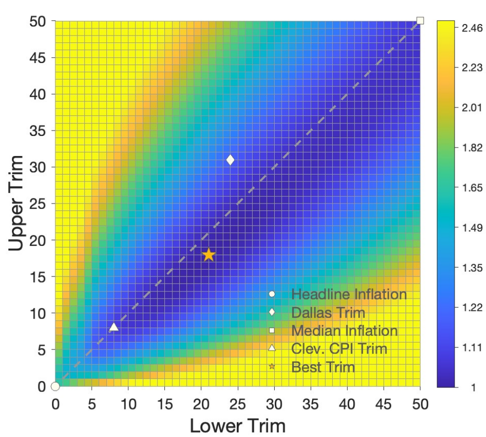
(a) Centered Trend



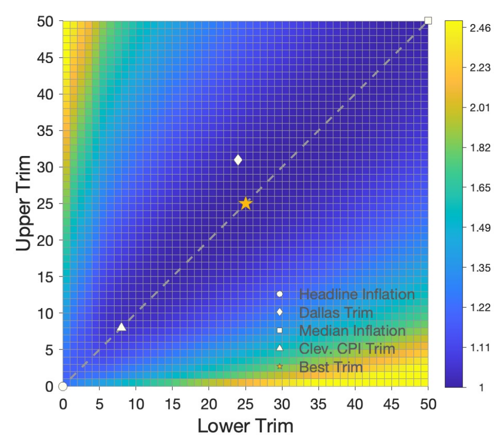
(b) Forward Trend



(c) Band-Pass Trend



(d) Prediction



Note: The figures show heat maps of the RMSE when targeting trend inflation with different combinations of trimmed-mean inflation measures. Four measures of trend inflation are considered. To ensure comparability across plots, the RMSE numbers are reported relative to the RMSE of the best trim reported in Table B.5.