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Beyond the Pure Consumer: Public Goods, Assets, and the Blind Spots of Inflation Measurement

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Abstract

This paper revisits Gottfried Haberler's 1927 habilitation thesis *Der Sinn der Indexzahlen*, completed in the same year as the founding of the Austrian Institute for Business Cycle Research under Ludwig von Mises and Friedrich Hayek, to argue that modern consumer price indices systematically understate inflation. Haberler's analysis rests, among others, on two assumptions: that the relevant economic subject is a *pure consumer* who spends the whole of nominal income on present consumption, and that all goods and services entering the index are bought and sold voluntarily on free markets. Both assumptions, still implicit in the construction of official price indices today, generate two corresponding blind spots: publicly provided goods and services, which are not exchanged on markets, and assets, which fall outside the horizon of a pure consumer. Using evidence for the United States, the paper shows that prices in those areas have risen disproportionately relative to the Personal Consumption Expenditure Index (PCE) or the Consumer Price Index (CPI), and it constructs an alternative, broader measure of inflation that incorporates them. Reassessing US real wage growth in light of this broader measure suggests that households' true costs of living have risen considerably faster than official statistics indicate.

Keywords: Inflation measurement; Index numbers; Consumer Price Index; Public goods; Asset prices; Monetary policy; Real wages
JEL-Codes: B53; C43; E31; E52; E58; H41

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1 Introduction

The year 2027 marks the centennial of the Austrian Institute for Business Cycle Research (*Österreichisches Institut für Konjunkturforschung*), which began operations in Vienna on January 1, 1927, with Friedrich A. Hayek as its first director (Caldwell and Klausinger, 2022, p. 228). The Institute was Ludwig von Mises’s idea. As Hayek himself put it decades later, it was “Mises to whom I owe the creation of the [Institute], conceived by him, I believe, largely for the purpose of providing scope for me. . . it was he who persuaded the various government offices and trade organizations, etc. to provide the funds and to put me in charge,” after which Mises “left me a completely free hand in the actual conduct of affairs” (Caldwell and Klausinger, 2022, p. 228). Announcing the new venture to Oskar Morgenstern in December 1926, Hayek could not resist a note of irony about its founders’ own reservations: “You will wonder why it would be Professor Mises and me who, having always been rather skeptical of such research methods based on statistical inquiries, are responsible for creating this thing” (Caldwell and Klausinger, 2022, p. 227). Mises’s own biographer confirms the motive from the other side: he had established the Institute chiefly to give his most promising student a viable position in a university system with few openings for young liberal economists (Hülsmann, 2007, pp. 454, 566). Hayek’s tenure at the Institute became the setting in which he developed the empirical and theoretical work on money, credit, and the trade cycle that would eventually earn him the Nobel Memorial Prize in Economic Sciences in 1974 (Hayek, 1933, 1935), and the Institute stands, alongside Mises’s private seminar, as one of the two institutional pillars from which the modern Austrian School of the 20th century emerged.

Less widely remembered is that 1927 also marks the centennial of a second, quieter contribution originating from the same Viennese milieu: the publication of Gottfried Haberler’s *Der Sinn der Indexzahlen* (The Meaning of Index Numbers), which one year later, in 1928, was defended as his habilitation thesis at the University of Vienna. The coincidence is not merely calendrical. Haberler belonged to the same circle of young economists gathered around Mises and Hayek in the 1920s: he read his first paper before Hayek’s private discus-

sion circle, the *Geistkreis*, in 1925 (Caldwell and Klausinger, 2022, p. 201), and he was a regular participant in Mises’s private seminar alongside Hayek, Machlup, and Morgenstern, the group whose members would later become, in the words of Mises’s biographer, “legendary in the post-World War II period” (Hülsmann, 2007, p. 368). Hayek reviewed *Der Sinn der Indexzahlen* himself shortly after its publication, in a 1928 notice for the *Jahrbücher für Nationalökonomie und Statistik* that has been described as “generally sympathetic, if also mildly critical” (Hayek, 1928; Caldwell and Klausinger, 2022, p. 254).

Haberler’s ties to the Institute itself came somewhat later, but they were direct rather than merely circumstantial: in 1932 he joined its scientific staff, where he remained until his 1934 departure for the League of Nations in Geneva (Caldwell and Klausinger, 2022, p. 230). Haberler is remembered today chiefly for his later contributions to the theory of international trade and business cycle theory, most notably his *Prosperity and Depression* (Haberler, 1937) and his revision of Ricardian comparative cost analysis (Haberler, 1929). His habilitation thesis, never translated into English, has been comparatively neglected (Israel, 2024). Yet it addressed a question that has lost none of its urgency a century later: what does it mean to say that the price level, or the purchasing power of money, has changed, and under what conditions can such a claim be given empirical content at all?

This is not an antiquarian question. Since the 1990s, most of the world’s major central banks have adopted some variant of inflation targeting, typically formulated as a numerical objective for a consumer price index: the European Central Bank targets the Harmonised Index of Consumer Prices (HICP) at 2 percent per year over the medium term, and the Federal Reserve pursues a comparable objective in terms of the Personal Consumption Expenditures (PCE) price index. The overarching goal is not merely to stabilize the evolution of the price level but to stabilize the economy as a whole and to reduce cyclical fluctuations.

The entire architecture of contemporary monetary policy therefore rests on the presumption that a consumer price index is a sufficiently complete and theoretically sound measure of the average change in money prices. The surge in measured inflation after 2020, followed

by continued public disquiet over the cost of living even as official inflation rates receded again to some extent, has renewed scrutiny of that presumption (Israel and Schnabl, 2024). Much of the ensuing debate—over whether housing costs, asset prices, or the fiscal burden of government belong in a proper measure of inflation—was in essence anticipated, and can be substantially clarified, by returning to the theoretical foundations that Haberler laid a century ago.

Haberler’s most important theoretical contribution in his book from 1927, according to Hayek (1928, p. 448), was to show that the two standard index formulas, the Laspeyres and the Paasche indices, can be given a rigorous meaning as upper and lower bounds on the change in a consumer’s subjective cost of living. However, this demonstration relied on a specific set of assumptions. Two of these assumptions do the bulk of the theoretical work, and both are worth dwelling on because they are still built, largely without comment, into the official statistics compiled by government agencies today. The first is that the relevant economic subject is a *pure consumer*: someone who spends the whole of nominal income on present consumption, with no residual saving or wealth accumulation to speak of. The second is that all goods and services entering the comparison are bought and sold voluntarily, by a chooser facing genuine alternatives, on free markets. Only under these conditions can observed purchasing decisions be read as revealing anything about the underlying change in welfare.

Both assumptions were reasonable simplifications for the purpose Haberler set himself: to give index numbers a rigorous, non-arbitrary interpretation rather than treating them, in his own words, as objects of either “blind belief” or “negative skepticism” (Haberler, 1927, p. III). But each assumption, taken as a description of how official price statistics are in fact constructed, opens up a corresponding blind spot. Because the pure-consumer assumption abstracts from saving and wealth, it has no place for the prices of assets—equities, real estate, and other stores of value—through which households transfer purchasing power into the future. Because the free-market assumption presupposes voluntary exchange, it has no place

for the goods and services provided by the public sector and financed through compulsory taxation, for which there is no market price and no revealed preference in Haberler’s sense. Both blind spots turn out, on the evidence presented below, to cover areas of the economy in which prices have risen disproportionately fast. The implication is not that the CPI or PCE are calculated incorrectly on their own terms, but that their own terms leave out precisely those parts of the economy that have inflated the most, and that the resulting bias runs in one direction: official inflation measures understate the increase in the cost of living.

The remainder of the paper develops this argument in three steps. Section 2 summarizes Haberler’s analysis without technical detail, focusing on the Laspeyres-Paasche bounds and, in particular, on the two assumptions of the pure consumer and free-market exchange that generate the two blind spots just described. Section 3 turns to the empirical evidence for the United States, comparing government-provided goods and services as well as asset prices to the CPI and PCE, and showing how money growth outpaced real economic growth and official consumer price inflation. Section 4 presents an alternative, broader measure of inflation along the lines developed for Germany in Israel and Schnabl (2024). It reassesses the development of US real wages in light of this broader inflation measure. Section 5 concludes.

2 Theoretical Foundations of the Consumer Price Index

It may come as a surprise that we return to a book published a century ago to discuss the theoretical foundations of consumer price indices. Have there been no theoretical advances since then? The honest answer is hardly any that match Haberler’s findings in significance or that have overturned them. Modern works like Afriat (2014), for example, present a precise solution to the index number problem within the narrow confines of a mathematical model, where everything relevant is known, including a function that maps consumption bundles to the level of utility of the consumer. However, if one takes seriously the subjective value foundations of modern economics—and if the guiding question is what can we realistically

say about changes in the price level, given the actually observable price and quantity data in the real world—Haberler’s habilitation thesis remains the most authoritative source.

2.1 No Objective Price Level: Laspeyres and Paasche as Bounds

Any attempt to measure “the” change in the general price level runs quickly into a basic difficulty: there is more than one plausible way to compute it, and the different ways do not agree. Two of the oldest and still most widely known formulas illustrate the problem. The Laspeyres index prices an earlier period’s basket of goods at today’s prices; the Paasche index prices today’s basket at an earlier period’s prices. Because consumers substitute away from goods that become relatively more expensive, or indeed have changing preferences, these two formulas will almost never coincide, and neither has an obvious claim to being the single correct measure.¹ Statistical agencies have long been aware of this and typically compute something in between.²

Haberler’s decisive contribution was to show that, under a specific set of conditions, the Laspeyres and Paasche indices are not two arbitrary and equally defensible guesses, but can be given a rigorous economic interpretation as bounds: the Laspeyres index sets the *upper* bound and the Paasche index the *lower* bound on the true change in a consumer’s subjective price level (Haberler, 1927, pp. 77-99). The logic rests on revealed preference (Israel, 2024).

If a consumer, free to buy the previous period’s bundle again at the new prices, chooses not to, this reveals that the newly chosen bundle yields at least as much satisfaction. Comparing the cost of the old bundle at new prices to its cost at old prices then yields an upper

¹See Balk (2008, pp. 1-39) for a survey of index formulas through history.

²In the United States, the PCE Price Index is based on the Fisher’s ideal formula, which is defined as the geometric mean of a Laspeyres and a Paasche index computed between adjacent quarters, chain-linked using a fresh set of expenditure weights every quarter (U.S. Bureau of Economic Analysis, 2023). The CPI-U, by contrast, remains closer to a pure fixed-weight index: the Bureau of Labor Statistics aggregates elementary indexes into the headline series using a Lowe-type formula with expenditure weights that, since January 2023, are updated annually using Consumer Expenditure Survey data lagged roughly two years. At the elementary level, a geometric-mean formula is used for most item categories, permitting some substitution within narrowly defined products, but a Laspeyres formula is retained for rent, owners’ equivalent rent, utilities, and medical care services, where substitution is assumed to be minimal (U.S. Bureau of Labor Statistics, 2026a). This formula difference, together with differences in scope and weighting data sources, accounts for much of the persistent gap between CPI and PCE inflation rates (McCully et al., 2007).

limit on how much the cost of living can have risen. A symmetric argument, run in the other direction, yields the Paasche index as the corresponding lower limit. The true change in the cost of maintaining a given standard of living therefore lies somewhere between the two—but nowhere does the argument identify a unique point within that range. There simply is no single, objectively correct rate of inflation, only an interval within which it must fall.³

This result already has an important implication for inflation targeting as it is practiced today: whatever number a central bank targets as “the” inflation rate is, at best, one defensible point estimate within a range that formal index number theory itself cannot narrow further. But the bounding result comes with even more limitations, because it only holds under a set of highly restrictive assumptions that Haberler took great care to spell out. Several of these are technical conditions—that needs and preferences remain unchanged between the periods compared, that the same goods are available in both periods, that a range of side conditions (climatic, social, cultural, political) are held constant—and are not the focus of this paper. Two further assumptions, however, do the bulk of the theoretical work for the argument developed here, and both are still built into the official price statistics compiled by government agencies today.

2.2 The Pure Consumer and the Free Market

The first of these two assumptions is that the relevant economic subject is a *pure consumer*: an individual who spends the whole of nominal income on present consumption, with nothing left over for saving or investment, and who consequently carries no wealth of their own from one period to the next. This is not a realistic description of any actual household, and Haberler knew it. He introduced the simplification because without it a comparison of incomes across time would have to account not only for changes in the prices of currently consumed goods but also for changes in the wealth position, which themselves alter the income structure of that individual and arguably the side constraint that, per assumption,

³Haberler’s analysis is of course much more detailed and requires other auxiliary assumptions, such as constant preferences and constant side constraints. For a detailed exposition, see (Israel, 2024).

need to be held constant. Assuming away saving and wealth accumulation lets index number theory get off the ground in a tractable way. But it also fixes, by construction, what a price index built on these premises can and cannot see. It can see the prices of the goods a consumer buys, and nothing else. Assets—equities, real estate, bonds, and other stores of value through which real households in fact transfer purchasing power into the future—do not enter the picture at all, not because they are unimportant to a household’s true cost of living, but because the pure consumer, by definition, does not hold any.

The second assumption is that all goods and services entering the comparison are bought and sold voluntarily, by an individual facing genuine alternatives, on markets free from coercion. This assumption does more work than it might appear to at first glance. The entire argument for reading price and quantity data as informative about a change in welfare rests on revealed preference: a consumer who, able to afford the previous period’s bundle, chooses a different one instead has thereby revealed a preference for the new bundle. That is a claim about voluntary exchange, and it has no analogue where a payment does not represent a choice freely made among genuine alternatives but a sum extracted under compulsion. Wherever exchange is not free—where a “buyer” cannot decline to buy, or a “seller” is compelled to sell at an administered price—the logic that lets Haberler read welfare-relevant information out of observed transactions simply does not apply. There is no revealed preference in a forced transaction, and consequently no principled way to integrate its price into Haberler’s argument.⁴

Both assumptions were necessary for Haberler’s analytical purpose. But each assumption opens up a corresponding blind spot.

⁴One might add that “revealed” rather than “demonstrated” preference is indeed the more appropriate term to classify Haberler’s argument. Just like revealed preference theory launched by Samuelson (1938), Haberler invoked a constancy assumption over time: preferences do not change. The notion of demonstrated preference used by Rothbard (1956) does not involve such an assumption. Rothbard simply assumes that in any given moment of choice, human actors demonstrate their preferences, whatever they may be in that moment. For a recent discussion of Rothbard’s reconstruction of welfare economics based on that principle, see Fegley and Israel (2024).

2.3 Two Blind Spots

The pure-consumer assumption is what licenses the exclusion of asset prices from the most commonly used price indices, including those that serve as monetary policy targets. Because official statistics implicitly model the household as spending the whole of income on current consumption, they have, by construction, nothing to say about the prices of the assets through which actual households save, invest, and plan for the future. ? argued, decades after Haberler, that a price index intended to capture the true cost of maintaining a constant standard of living cannot, in principle, be indifferent to the prices of the assets that transfer purchasing power between periods; but conventional statistical practice, following Haberler’s pure consumer without revisiting the reasons for the assumption, continues to treat asset prices as lying outside the scope of standard inflation measurement altogether.

The treatment of owner-occupied housing in the CPI illustrates the pure-consumer assumption in practice. Since January 1983, the CPI-U has measured the cost of owner-occupied housing using a rental-equivalence approach: rather than pricing the home itself, BLS estimates Owners’ Equivalent Rent (OER), the amount a homeowner would have to pay to rent their own home, unfurnished and without utilities, on the open market. This replaced an earlier approach that had included mortgage interest costs, house prices, and property taxes directly, which BLS abandoned because it made the index acutely sensitive to swings in interest rates rather than to the cost of housing services actually consumed. Under rental equivalence, the price of the house itself, along with mortgage interest, property taxes, insurance, and home-improvement spending, falls outside the scope of the CPI. The BLS explicitly classifies owned housing units as capital (investment) goods. They are therefore excluded from a cost-of-living index built around a pure consumer (U.S. Bureau of Labor Statistics, 2026b). OER is nonetheless the single largest component of the CPI-U market basket, with a relative importance of just over 26 percent as of December 2025—a striking illustration of how central housing is to household budgets even as the index deliberately looks past the price of the asset itself.

The free-market assumption, in turn, is what licenses the exclusion of publicly provided goods and services. Taxpayers do not choose to buy national defense, the court system, or a regulatory apparatus the way they choose bread or gasoline; they are compelled to pay for these things through taxation, regardless of how highly or how lowly they value them at the price charged. There is no market transaction, no market price and no revealed preference in Haberler's sense. A price index that tries to account for government provided goods and services falls outside of the assumptions of Haberler's argument. Economists did not carelessly forget to include the public sector when constructing the CPI or PCE and their international counterparts. The public sector was excluded because it contradicts the assumptions of basic index number theory.

Neither exclusion, then, reflects a defect in the construction of consumer price indices on their own terms. Both are the predictable consequence of the theoretical assumptions on which such indices were interpreted. The problem is not that they are calculated incorrectly, but that their own terms of reference leave out two entire categories of prices: the prices of assets, and the fiscal cost of publicly provided goods and services. Whether this matters in practice depends on how prices in these two blind spots have actually moved relative to the prices that conventional indices do track. If asset prices and the cost of government provision had risen roughly in step with consumer prices over the past decades, their exclusion would be a matter of theoretical tidiness with little practical import.

3 Government-provided Goods and Services, Asset Prices, and Monetary Expansion in the United States

The available empirical data for the United States speak a clear language: both blind spots cover areas of the economy in which prices have risen persistently and substantially faster than prices for private consumption. This is the central empirical claim on which the paper's broader thesis rests—that official inflation measures, however correctly calculated within

their own terms, systematically understate the true increase in the cost of living.

3.1 Government-Provided Goods and Services

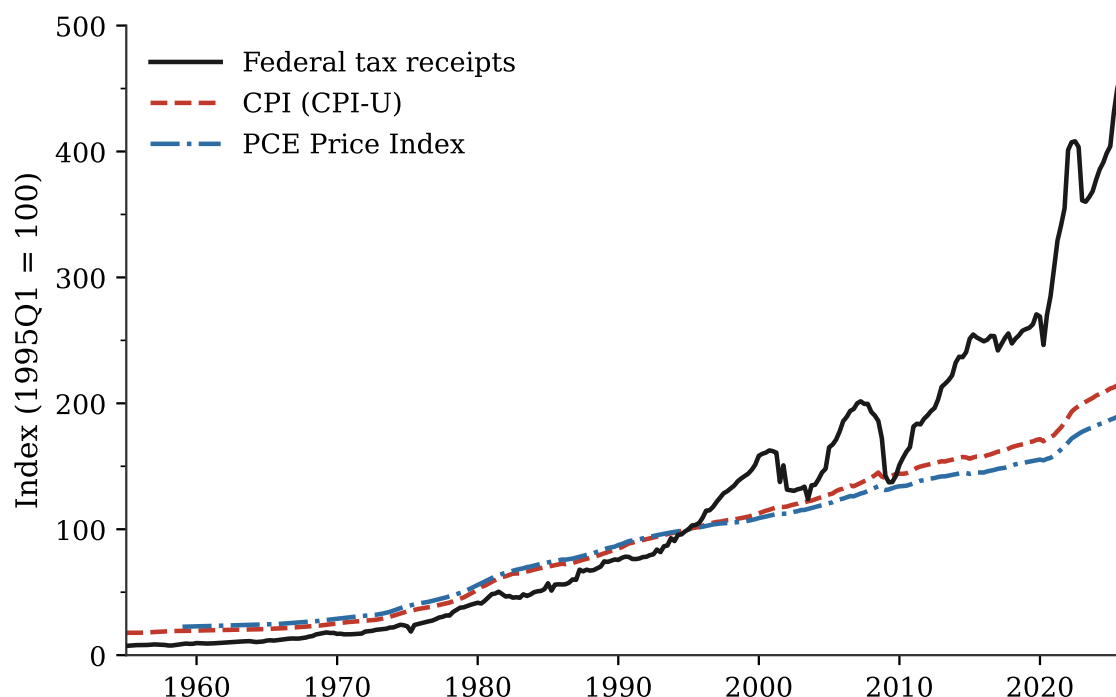
Publicly provided goods and services carry no market price: taxpayers are compelled to pay for them through taxation regardless of how highly or how lowly they value them, so there is no exchange from which a price could be read off. What can be observed instead is the fiscal cost citizens bear for their provision. Following the approach used for Germany in Israel and Schnabl (2024), this paper takes total federal tax receipts as a proxy for the price of government-provided goods and services. Figure 1 plots seasonally adjusted federal current tax receipts against the CPI-U and the PCE Price Index, all rebased to 1995Q1 = 100, from 1955 to 2026.

Two features stand out. Tax receipts are markedly more cyclical than either price index, with sharp contractions around recessions—most visibly in 2001, 2008–09, and 2020—followed by rapid rebounds as income, corporate profits, and capital-gains realizations recover; a further pullback around 2022–23 reflects lower capital-gains tax receipts after the 2022 equity market correction. More importantly for the argument of this paper, tax receipts have grown persistently faster than the CPI or PCE since roughly the mid-1990s, and the gap widens sharply after 2020: by 2026 tax receipts stand at more than double the level implied by either price index. Progressive bracket structures interacting with nominal income growth (“bracket creep”), together with capital-gains realizations tied to the asset-price booms documented in Section 3.2, are natural explanations for this divergence. Whatever the precise mechanism, the fiscal cost citizens bear for government provision has risen substantially faster than the price of the private consumption goods that the CPI and PCE track. Table 1 puts this gap in terms of average annual growth rates, computed as the geometric mean of period-to-period growth over each series’ full available history, over the 1987–2026 window shared with the asset-price series discussed in Section 3.2, and over 1995–2026, the base period to which all series in this section are rebased: tax receipts have

compounded at 5.97 percent per year since 1955, against 3.59 percent for the CPI and 3.25 percent for the PCE; the corresponding rates are 5.33, 2.80, and 2.37 percent since 1987, and 5.00, 2.54, and 2.14 percent since 1995.

An alternative proxy for the aggregate price government-provided goods and services would be government spending, rather than tax receipts. This would not fundamentally change the picture, although the divergence between the series would overall be slightly more pronounced as Appendix A.2 shows.

Figure 1: Federal Tax Receipts vs. CPI and PCE Price Index, 1955–2026



Notes: Federal current tax receipts (seasonally adjusted at an annual rate, nominal) plotted against the CPI-U and the PCE Price Index, both quarterly averages of seasonally adjusted monthly data. All series rebased to 1995Q1 = 100. Sources: Bureau of Economic Analysis via FRED (W006RC1Q027SBEA); Bureau of Labor Statistics via FRED (CPIAUCSL); Bureau of Economic Analysis via FRED (PCEPI).

Table 1: Average Annual Growth: Public Goods vs. CPI and PCE

Measure	Period	Full Range	1987–2026	1995–2026
CPI (CPI-U)	1955–2026	3.59%	2.80%	2.54%
PCE Price Index	1959–2026	3.25%	2.37%	2.14%
Federal tax receipts	1955–2026	5.97%	5.33%	5.00%

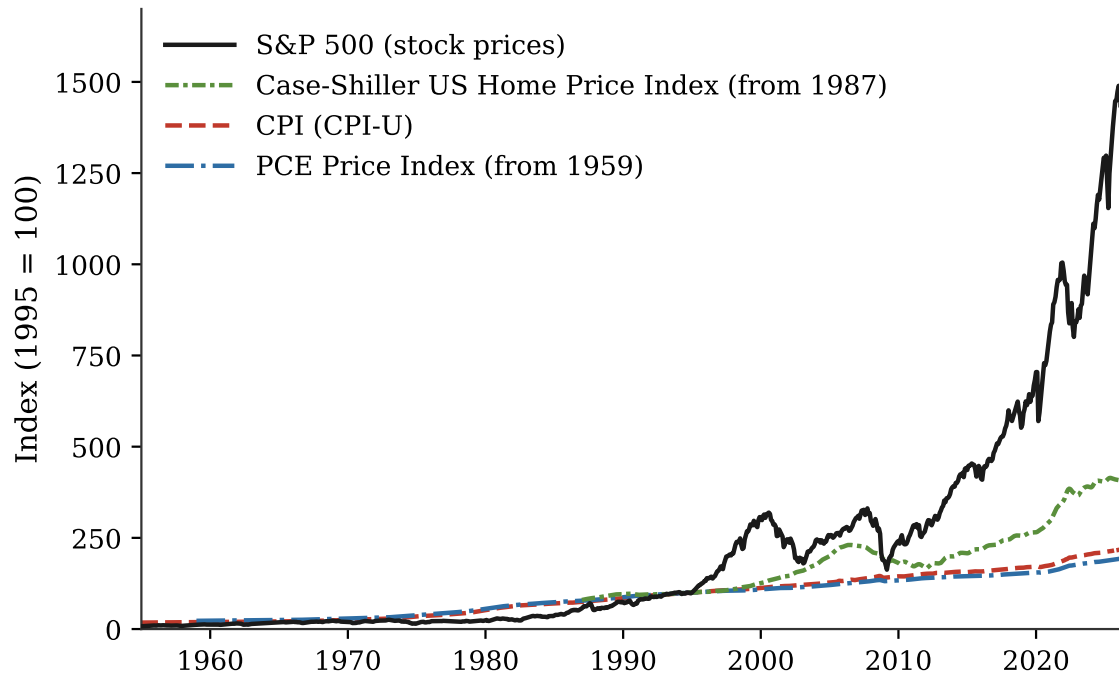
Notes: Average annual growth is the geometric mean of the period-to-period growth rates, computed from the quarterly series underlying Figure 1, over each series’ full available history, over the 1987–2026 window common to all series in this section, and over 1995–2026, the base period to which all series in Section 3 are rebased (1995Q1 = 100).

3.2 Asset Prices

The pure-consumer assumption has, by construction, nothing to say about the prices of assets, yet equities and real estate are the two largest components of US household wealth. Following the DAX-and-residential-property comparison constructed for Germany in Israel and Schnabl (2024), this paper compares the nominal S&P 500 price level and the Case-Shiller U.S. National Home Price Index to the CPI-U and the PCE Price Index. Figure 2 plots all four series, monthly and rebased to 1995 = 100, over 1955–2026 for equities and the CPI (1987–2026 for house prices and 1959–2026 for the PCE, reflecting the earliest available data for each).

The two asset classes diverge sharply in volatility but agree in direction. Equity prices trace the familiar boom-bust pattern of the postwar era—the 1990s bull market, the dot-com bust of 2000–02, the mid-2000s recovery, a decline of roughly one half during the 2008–09 financial crisis, and an extraordinary, largely uninterrupted rise thereafter, particularly after 2020—leaving the index at roughly 1,600 by 2026, more than seven times the CPI level over the same period. House prices are far smoother: a boom into the mid-2000s, a correction of roughly 30 percent during the Great Recession, and a sustained recovery from about 2012 onward that accelerates further during and after the pandemic, reaching an index value of just over 400 by 2026, roughly double the CPI over the same 1987–2026 window. Even the less volatile of the two asset classes, in other words, has appreciated at close to twice the pace of the CPI overall since 1995. Stocks have appreciated at several multiples of it.

Figure 2: Asset Prices vs. CPI and PCE Price Index, 1955–2026



Notes: S&P 500 nominal price and the Case-Shiller U.S. Home Price Index (CSUSHPINSA) plotted against the CPI-U and the PCE Price Index, all series monthly and rebased to 1995 = 100. The PCE series begins in 1959 and the Case-Shiller series in 1987, reflecting the earliest availability of each. Sources: Shiller, *Irrational Exuberance* dataset (S&P Composite nominal price); S&P/FRED (CSUSHPINSA); BLS/FRED (CPIAUCSL); BEA/FRED (PCEPI).

Table 2 puts these patterns in terms of average annual growth rates, computed as the geometric mean of period-to-period growth—i.e. $(\text{End}/\text{Start})^{1/\text{years}} - 1$ —over each series’ full available history, over the 1987–2026 window common to all series in this section, and over 1995–2026, the base period to which all series are rebased. Asset prices grew faster than the conventional price indices across every horizon: the S&P 500 compounded at 7.77 percent per year since 1955 and, reflecting the post-2009 bull market, at an even higher 8.84 percent since 1987 and 9.23 percent since 1995, while the Case-Shiller Home Price Index, available only from 1987, compounded at 4.31 percent since 1987 and 4.68 percent since 1995—still well above the CPI’s 2.81 and 2.56 percent, and the PCE’s 2.38 and 2.16 percent, over the same windows. As in Section 3.1, the series lying outside the conventional CPI/PCE boundary outgrows the CPI and PCE themselves in every case, often by a wide margin.

Table 2: Average Annual Growth: Asset Prices vs. CPI and PCE

Measure	Period	Full Range	1987–2026	1995–2026
CPI (CPI-U)	1955–2026	3.59%	2.81%	2.56%
PCE Price Index	1959–2026	3.25%	2.38%	2.16%
S&P 500 (stock prices)	1955–2026	7.77%	8.84%	9.23%
Case-Shiller US Home Price Index	1987–2026	4.31%	4.31%	4.68%

Notes: Average annual growth is the geometric mean of the period-to-period growth rates, computed from the monthly series underlying Figure 2, over each series’ full available history, over the 1987–2026 window common to all series in this section, and over 1995–2026, the base period to which all series in Section 3 are rebased (1995 = 100). CPI and PCE figures differ marginally from the quarterly-based figures in Table 1 due to the different averaging frequency. The Case-Shiller index is available only from 1987, so its full-range and 1987–2026 figures coincide.

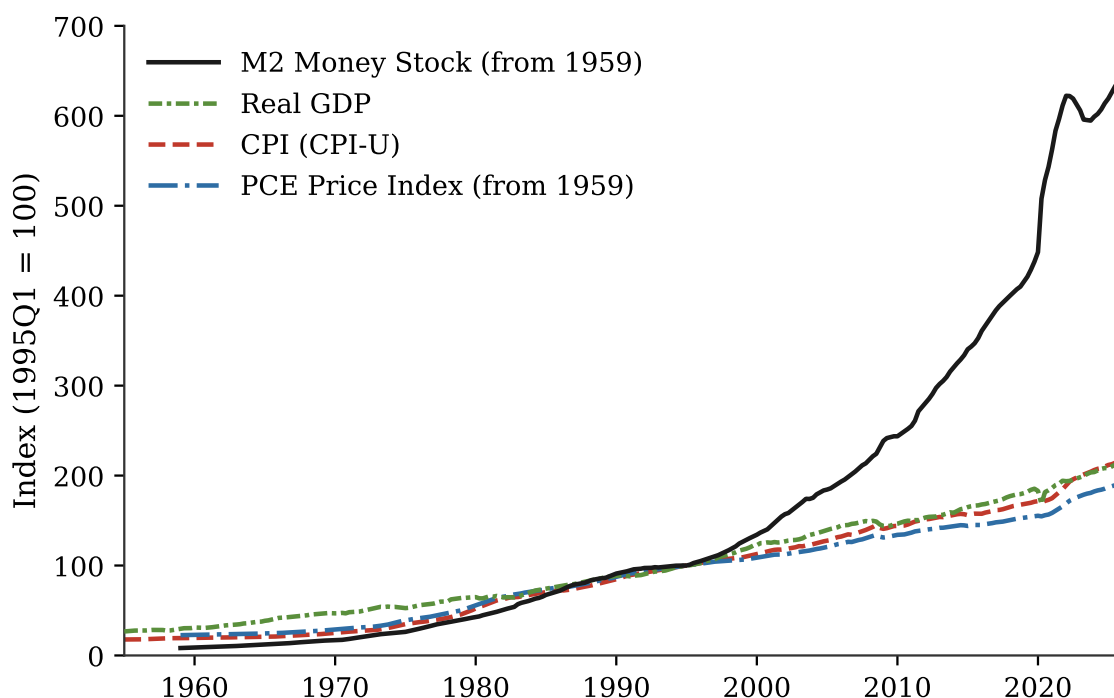
3.3 Monetary Expansion

These strong inflationary tendencies in both government-provided goods and services as well as asset markets coincide with an excessive expansion of the money stock in the US economy. Figure 3 shows the M2 money stock against real GDP and the CPI/PCE Price Index, all rebased to 1995Q1 = 100, over 1955–2026 (1959–2026 for M2 and the PCE).

For roughly four decades the three series track one another fairly closely: M2 growth, real output growth, and consumer price inflation run at broadly comparable rates through

the mid-1990s. Thereafter a wedge opens and widens, gradually through the 2000s and then sharply after the 2008 financial crisis, when the Federal Reserve first turned to large-scale asset purchases. The most dramatic divergence occurs in 2020–21, when M2 expanded at its fastest pace in the post-war record in response to the pandemic, pushing the index to roughly 640 by 2026—nearly three times the level of either real GDP or the CPI/PCE, both of which remain in the low 200s. Real GDP itself grows only modestly faster than the CPI/PCE over the full period, consistent with an economy in which real output and consumer prices have moved within a comparatively narrow band relative to the money stock that, in principle, finances transactions within that same economy. Section 4 asks where the resulting gap between money growth and the combined growth of real output and consumer prices has gone, and argues that the assets and public-sector prices examined above supply much of the answer.

Figure 3: M2 Money Stock vs. Real GDP and CPI/PCE Price Index, 1955–2026



Notes: M2 money stock, real GDP, CPI-U, and the PCE Price Index, all rebased to 1995Q1 = 100. M2 and CPI/PCE are quarterly averages of seasonally adjusted monthly series; real GDP is quarterly, seasonally adjusted at an annual rate, chained 2017 dollars. M2 and PCE begin in 1959, reflecting data availability. Sources: Federal Reserve via FRED (M2SL); Bureau of Economic Analysis via FRED (GDPC1); BLS/FRED (CPIAUCSL); BEA/FRED (PCEPI).

Table 3 puts this monetary backdrop in the same terms as Tables 1 and 2: average annual growth, computed as the geometric mean of period-to-period growth, over each series' full available history, over the 1987–2026 window common to all series in this section, and over 1995–2026. M2 compounded at 6.73 percent per year since 1959, compared with 3.25 percent for the PCE. The CPI and real GDP grew since 1955 on average by 3.59 percent and 2.97 percent per year, respectively. Over 1987–2026 growth rates are all lower at 5.55 (M2), 2.80 (CPI), 2.37 (PCE), and 2.57 percent (real GDP). For the shorter time window since 1995, M2 growth is again higher at 6.21 percent, while the other rates fall further. The bottom row of the table makes the resulting imbalance explicit: subtracting real GDP growth and CPI inflation from M2 growth leaves a modest residual of 0.05 and 0.18 percentage points over the full history (since 1959) and the 1987–2026 window, but a residual of 1.19 percentage points since 1995—more than an order of magnitude larger, and consistent with the sharp post-2008 and post-2020 divergence visible in Figure 3. Money creation, in other words, has increasingly outpaced what real output growth and consumer price inflation alone can account for.

Table 3: Average Annual Growth: Money Stock, Real GDP, and CPI/PCE

Measure	Period	Full Range	1987–2026	1995–2026
M2 Money Stock	1959–2026	6.73%	5.55%	6.21%
CPI (CPI-U)	1955–2026	3.59%	2.80%	2.54%
PCE Price Index	1959–2026	3.25%	2.37%	2.14%
Real GDP	1955–2026	2.97%	2.57%	2.48%
M2 less Real GDP and CPI growth	—	+0.05 pp	+0.18 pp	+1.19 pp

Notes: Average annual growth is the geometric mean of the period-to-period growth rates, computed from the quarterly series underlying Figure 3, over each series' full available history, over the 1987–2026 window common to all series in this section, and over 1995–2026, the base period to which all series in Section 3 are rebased (1995Q1 = 100). The bottom row reports the simple difference, in percentage points, between M2's average annual growth and the sum of real GDP's and the CPI's average annual growth over the same window (M2 – real GDP – CPI). For the Full Range column, this uses CPI and real GDP growth recomputed over M2's own 1959–2026 window (3.69% and 2.99%, respectively) rather than the longer 1955–2026 figures shown above, so that the residual reflects a common period throughout; the 1987–2026 and 1995–2026 columns are already on a common footing and require no such adjustment.

4 A Broader Inflation Measure and the Cost of Living

It has been shown that both the fiscal cost of publicly provided goods and services, proxied by federal tax receipts, and asset prices have risen persistently faster than conventional consumer prices. This section combines these two categories with the CPI into a single broader measure of inflation for the United States, following the construction developed for Germany in Israel and Schnabl (2024). Section 4.1 builds three variants of this broader measure and compares them with the CPI and PCE; Section 4.2 tests how sensitive the results are to the underlying weights; and Section 4.3 uses the resulting measures to reassess the growth of US real wages.

4.1 Alternative Inflation Measures

Combining several price series into a single index requires a weighting scheme, and how the weights are applied matters as much as their values. A weighted average of the already-rebased index *levels* is biased: because the fastest-growing component compounds away from the others over time, its implicit contribution to the index drifts upward long after the nominal weights were set, so that a series assigned, say, 30 percent in the base period can come to dominate the index decades later purely as an artifact of compounding. The three alternative measures constructed below instead apply the weights to each component's period-to-period *growth rate*—equivalent to a continuously rebalanced portfolio rather than a buy-and-hold one—and chain the weighted growth rates back into an index, which keeps the weights genuinely constant over time.⁵

Three variants of an alternative index are constructed. AI-1 combines the CPI (70 percent) with two asset-price series—stocks and real estate—weighted 18 and 12 percent, respectively. The 18/12 split matches, in ratio, the composition of household net worth held in equities versus real estate reported in the Federal Reserve's Financial Accounts of the United

⁵In our case, a level-weighted construction of these same indices would overstate the role of stock prices as they happen to compound fastest. The growth-rate-weighted construction used throughout this paper avoids that bias.

States.⁶ Because it depends on Case-Shiller house-price data, AI-1 begins in 1987. AI-2 adds tax receipts to AI-1 at a further 30 percent weight, matching an OECD estimate of the average tax wedge facing a representative US household under its *Taxing Wages* methodology; algebraically this is equivalent to a single, flat weighting of 49 percent CPI, 12.6 percent equities, 8.4 percent real estate, and 30 percent tax receipts, and it inherits AI-1’s 1987 start date. AI-3 combines the CPI with federal tax receipts, weighted 70 and 30 percent. It leaves asset prices out and is an index of private and public consumption. Because it does not depend on the Case-Shiller series, it spans the full 1955–2026 range. Figure 4 plots all three measures against the CPI.

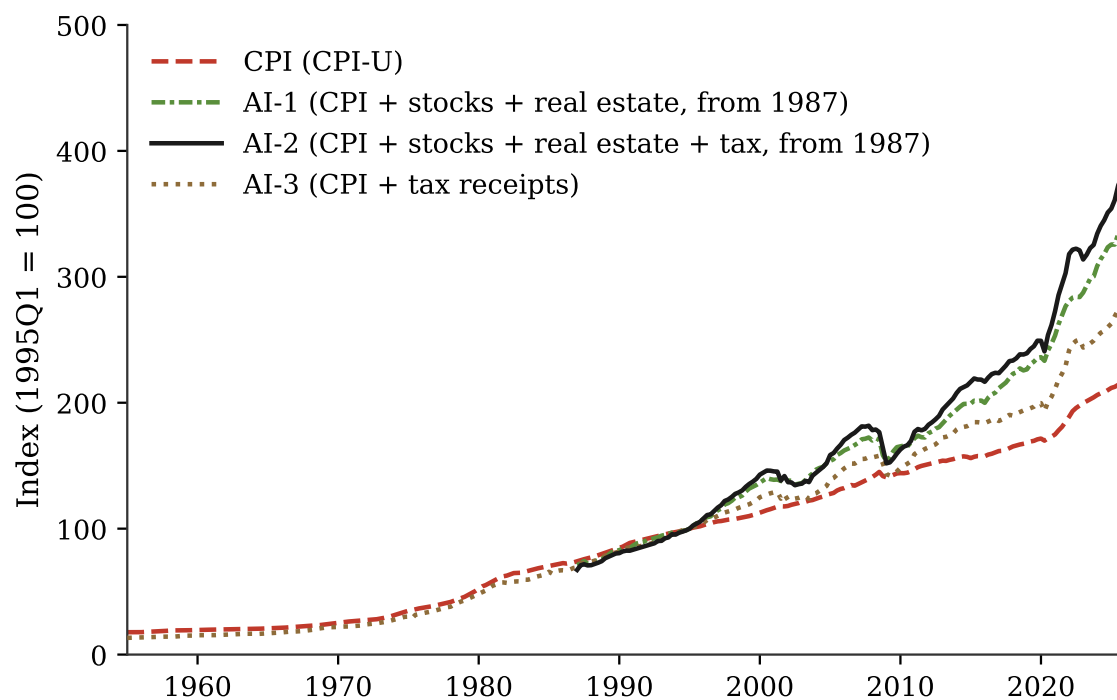
Table 4 reports the average annual growth of all three alternative measures. AI-3, which adds only tax receipts to the CPI, already grows faster than either conventional measure over every horizon: 4.37 percent per year since 1955, 3.62 percent since 1987, and 3.35 percent since 1995, against 3.59, 2.80, and 2.54 percent for the CPI and 3.25, 2.37, and 2.14 percent for the PCE. For the base period since 1995, AI-3 thus increased 0.81 percentage points more than the CPI, and 1.21 percentage points more than the PCE annually on average. Interestingly, AI-3 already ran noticeably ahead of both conventional measures—about 0.76 percentage points per year faster than the CPI, and roughly 0.96 points faster than the PCE (though the PCE comparison starts four years later, in 1959, instead of 1955). They were not tracking closely. Tax receipts were already growing distinctly faster than either price index during the pre-1995 period, largely reflecting the high-inflation 1970s and early 1980s pulling all three series up together in level but with tax receipts consistently outpacing.⁷

So, the AI-3–CPI gap is fairly stable across the two eras (0.76pp before, 0.81pp after 1995), while the AI-3–PCE gap widens somewhat (0.96pp before, 1.21pp after)—consistent

⁶One might instead be tempted to anchor the real-estate weight to the relative importance of owners’ equivalent rent (OER) in the CPI-U, currently around 26 percent. This could be considered a category error as OER’s consumption-flow weight is used for what is meant to be an asset-price weight. On the other hand, it seems to be reasonable to assume that households buying a home spend around as much on mortgage payments as other households pay in rent, if not more. So a higher weight for real estate might be defensible at least in certain circumstances. We will explore a range of different weights in Section 4.2.

⁷These pre-1995 figures are computed the same way as the columns in Table 4, but over 1955Q1–1995Q1 for CPI and AI-3, and 1959Q1–1995Q1 for the PCE; they are not shown as a separate table column.

Figure 4: CPI vs. Alternative Broader Inflation Measures, 1955–2026



Notes: CPI and AI-3 (CPI + tax receipts, 70/30 weights) span the full 1955–2026 range; AI-1 (CPI + stocks + real estate, 70/18/12 weights) and AI-2 (AI-1 + tax receipts, adding a 30% tax weight) begin in 1987, limited by the availability of the Case-Shiller series. All indices are constructed as continuously-rebalanced (growth-rate-chained) weighted averages of the underlying component series and rebased to 1995Q1 = 100.

with the paper’s broader point that the divergence, while not brand new, has if anything gotten somewhat more pronounced since the base year rather than easing off.

Adding the asset-price components widens the gap further: AI-1 grows at 4.11 percent since 1987 and 4.04 percent since 1995, and AI-2, which combines both blind spots, at 4.54 and 4.39 percent, respectively. The ranking—CPI and PCE slowest, AI-3 faster, AI-1 and AI-2 faster still when data is available—holds across the considered time horizons.

Table 4: Average Annual Inflation by Measure (Geometric Mean)

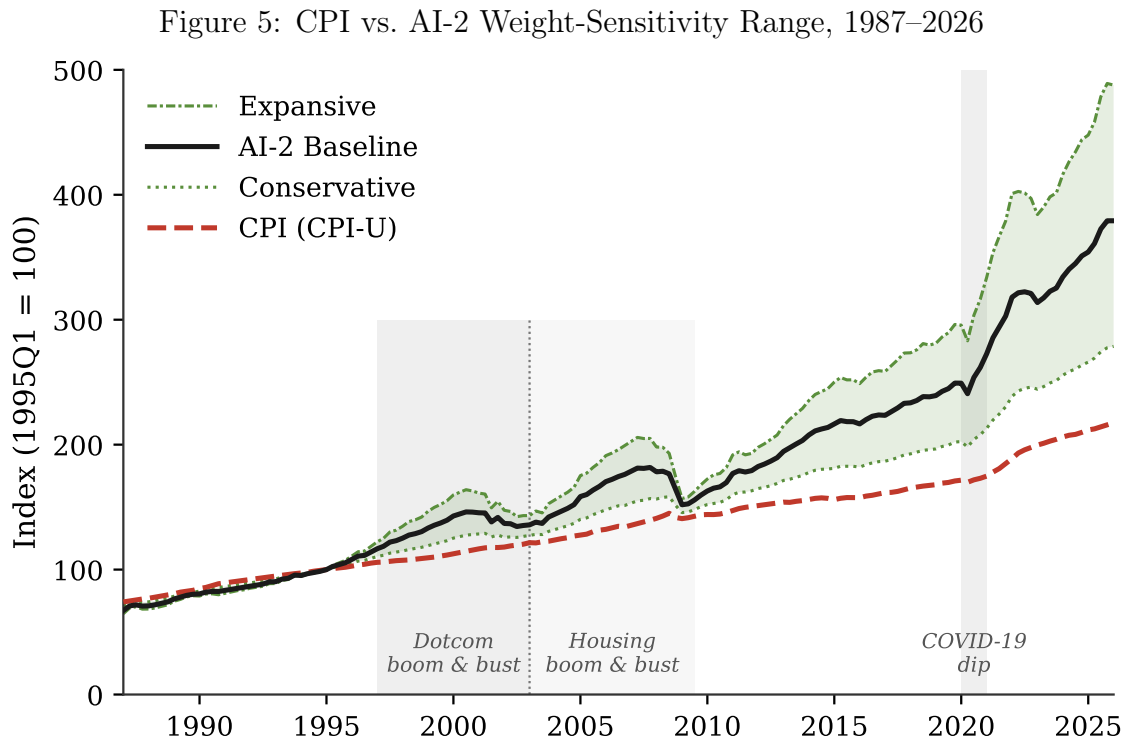
Measure	Period	Full Range	1987–2026	1995–2026
CPI (CPI-U)	1955–2026	3.59%	2.80%	2.54%
PCE Price Index	1959–2026	3.25%	2.37%	2.14%
AI-1 (CPI + stocks + real estate)	1987–2026		4.11%	4.04%
AI-2 (CPI + stocks + real estate + tax)	1987–2026		4.54%	4.39%
AI-3 (CPI + tax receipts)	1955–2026	4.37%	3.62%	3.35%

Notes: Average annual growth is the geometric mean of the period-to-period growth rates, i.e. $(\text{End Index} / \text{Start Index})^{1/\text{years}} - 1$, over each series’ full available history, over the 1987–2026 window, and over 1995–2026, the base period to which all series in this paper are rebased. AI-1 and AI-2 are available only from 1987, so their Full-Range and 1987–2026 figures coincide. Weighting scheme for AI-1: 70% CPI, 18% S&P 500 and 12% Case-Shiller Index; AI-2: 70% AI-1 and 30% tax receipts; AI-3: 70% CPI and 30% tax receipts.

4.2 A Range of Scenarios

AI-2 is the broadest alternative inflation measure constructed above. The weights adopted represent a single, defensible baseline, but they are discretionary choices, not empirical measurements, and the paper’s conclusions should not hinge on their exact values. This section therefore constructs a *Conservative* and an *Expansive* variant of AI-2 around the same baseline, using the identical growth-rate-weighted methodology but with independently anchored, lower and higher weights for the tax and asset components. The conservative scenario lowers the tax weight to 15 percent, informed by federal tax receipts alone as a share of GDP (~ 18 percent), and lowers the combined stock-and-real-estate weight to 8 percent, close to the flow of new household saving out of income. The expansive scenario raises the tax weight to 40 percent, matching total government spending as a share of GDP, including deficit-financed

spending ($\sim 40\text{--}43$ percent), and raises the combined asset weight to 33 percent, matching the Federal Reserve’s reported share of household net worth held in equities. Figure 5 plots the resulting corridor against the CPI.



Notes: The shaded corridor spans the Conservative (15% tax; 5%/3% stocks/real estate) to Expansive (40% tax; 20%/13% stocks/real estate) weighting scenarios for AI-2; the solid black line is the AI-2 Baseline (30% tax; 12.6%/8.4% stocks/real estate); CPI-U is shown for reference. The shaded bands mark the dotcom boom and bust (1997–2002), the housing boom and bust (2003–mid-2009), and the COVID-19 dip (2020).

Table 5 shows that the paper’s central conclusion does not depend on the particular baseline weights chosen. Even under the *conservative* weighting, AI-2 grows at 3.36 percent since 1995, still well above the CPI’s 2.54 percent over the same windows. This corresponds to an AI-2-CPI gap for the baseline period of 0.82 percentage points. The *expansive* weighting pushes average annual growth to 5.24 percent, more than twice the CPI’s rate. The gap widens to 2.7 percentage points. Figure 5 shows the same result graphically: the shaded corridor spanning the conservative-to-expansive range sits above the CPI for the entire period from 1995 onward, dipping toward the CPI’s level only briefly in the years of the dotcom crash and the housing crash. The Covid-19 pandemic reveals a mild dip in the alternative

inflation indices, but does not mark as clear a correction as the previous cyclical downturns.

Table 5: Average Annual Inflation Under Alternative Weighting Scenarios

Measure	Period	1987–2026	1995–2026
CPI (CPI-U)	1955–2026	2.80%	2.54%
AI-2 Conservative	1987–2026	3.58%	3.36%
AI-2 Baseline	1987–2026	4.54%	4.39%
AI-2 Expansive	1987–2026	5.32%	5.24%

Notes: Average annual growth is the geometric mean of the period-to-period growth rates, over the 1987–2026 and the 1995–2026 windows. The Period column reports each series’ full data availability; the three weighting scenarios are available only from 1987, so no separate full-history column is shown for them. Over its own full available history (1955–2026), the CPI grows at 3.59 percent per year. Conservative and Expansive weights anchor the tax component to federal tax receipts/GDP (~18%) and total government spending/GDP (~40–43%) respectively; the combined stock-and-real-estate weight is anchored, at the conservative end, to the flow of new household saving (split 5%/3% between stocks and real estate), and at the expansive end, to the Federal Reserve’s reported share of household net worth held in equities (~33%, split 20%/13% between stocks and real estate, roughly the same ratio as the AI-1/AI-2 baseline weights in Section 4.1).

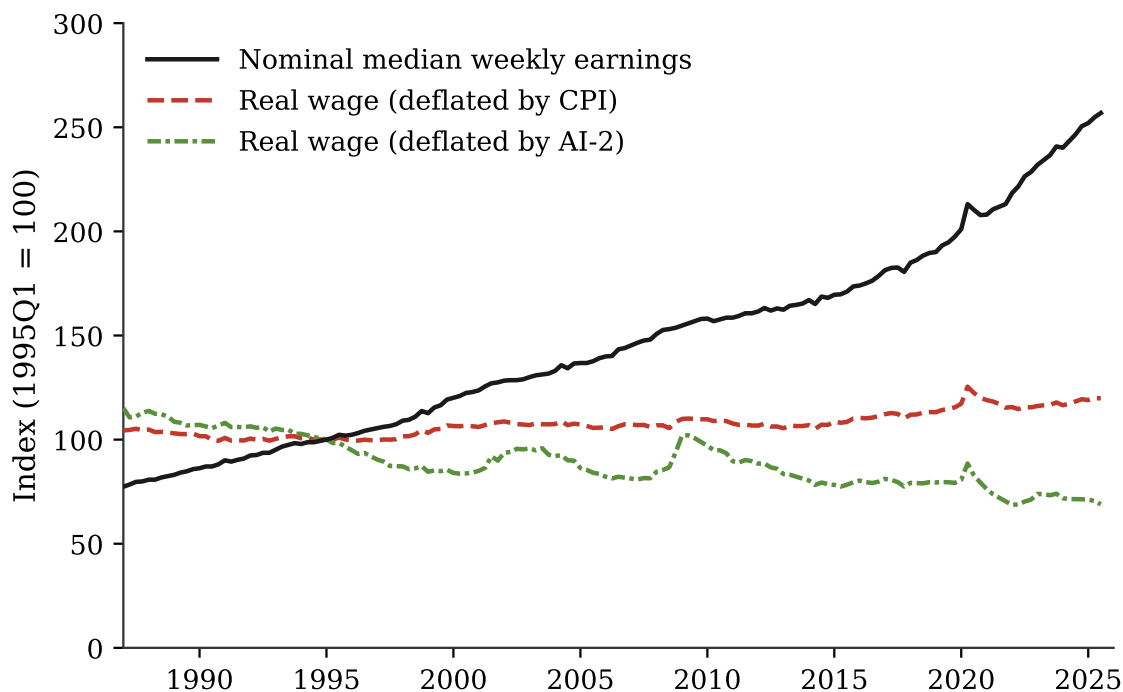
4.3 Real Earnings and the Cost of Living

Whether households’ true cost of living has kept pace with their earnings depends on which price index is used to deflate nominal wages. Figure 6 compares median usual gross weekly earnings for full-time workers, deflated by the CPI, to the same nominal series deflated instead by the baseline AI-2, over the 1987–2026 window common to both. Because AI-2 rises faster than the CPI, as shown in Sections 4.1 and 4.2, deflating by it mechanically produces a slower-growing, or more sharply declining, real wage series; the question is how large the difference is in practice.

Table 6 reports the difference in both average annual and cumulative terms. Nominal wages grew at 3.16 percent per year from 1987 to 2026 (3.14 percent since 1995), a cumulative increase of 237 percent. Deflating by the CPI, the most commonly used inflation measure, leaves little of this nominal gain intact: real wages only grew at 0.35 percent per year (0.59 percent since 1995), a cumulative gain of 15 percent over the full period. Deflating by AI-2 reverses the picture entirely: real wages *fell* at 1.31 percent per year since 1987 and 1.20 percent per year since 1995, a cumulative loss of 40 percent. On the official CPI-deflated

measure, in other words, workers’ purchasing power has been roughly flat, if modestly improving; once the broader measure developed in this paper is used instead, the same nominal earnings translate into a purchasing power that has fallen by nearly two-fifths over the same four decades. The two accounts of how US households have fared are not simply different in degree, but point in opposite directions.

Figure 6: Nominal and Real Median Weekly Earnings, 1987–2026



Notes: Nominal series is median usual gross weekly earnings of full-time wage and salary workers, 16 years and over. Real wage series are computed by dividing the nominal wage index by the CPI or AI-2 index at the same date; both deflators are already rebased to 1995Q1 = 100, so each real wage series is automatically 100 at that base quarter. Sources: BLS via FRED (LES1252881500Q); own construction (AI-2).

These divergent accounts of real wage growth are not simply a matter of measurement; they describe two different economic experiences. Depending on the concrete situation a household finds itself in one or the other could be closer to the truth. A household whose income consists entirely of wages around the median level, with little or no holding of financial or real assets, may face the cost-of-living path implied by AI-2 without the offsetting capital gains that AI-2’s own asset-price components register. Only households with meaningful asset holdings capture the appreciation that drives the wedge between the two measures.

Table 6: Nominal and Real Wage Growth

Measure	1987–2026		1995–2026	
	Avg. Growth	Cum. Growth	Avg. Growth	Cum. Growth
Nominal median gross weekly earnings	3.16%	+236.9%	3.14%	+160.7%
Real wage (deflated by CPI)	0.35%	+14.8%	0.59%	+19.9%
Real wage (deflated by AI-2)	−1.31%	−40.3%	−1.20%	−31.3%

Notes: Average annual growth is the geometric mean of the period-to-period growth rates; cumulative growth is the total percentage change over the window, $(\text{End}/\text{Start}) - 1$. The comparison is restricted to 1987–2026 and 1995–2026 to match AI-2’s availability and its rebasing period, respectively.

This asymmetry is consistent with a growing empirical literature finding that inflationary monetary policy redistributes wealth toward those already holding financial and real assets rather than toward wage earners (Domanski et al., 2016; Jakurti, 2025), and with the Austrian account of monetary non-neutrality, in which newly created money raises asset and financial-claim prices before, and more than, the prices of everyday consumption goods, redistributing real income away from later recipients of the new money—disproportionately wage-dependent households—toward earlier recipients (Sieroń, 2019). The scale of the gap documented here, a nearly forty percent difference in cumulative purchasing power between the CPI- and AI-2-deflated measures, is large enough to bear on debates about the economic exclusion of non-college-educated, wage-dependent Americans that Case and Deaton link to rising mortality from suicide, drug overdose, and alcohol-related disease (Case and Deaton, 2015, 2020). Whether conventional price statistics have understated the true cost of living for exactly this group is, on this evidence, a question that deserves further attention.

5 Conclusion

This paper began from a simple observation: Haberler’s 1927 vindication of the Laspeyres and Paasche indices as bounds on the true subjective price level rested on two assumptions—that the relevant economic subject is a pure consumer who spends the whole of income on present consumption, and that all goods entering the comparison are bought and sold on

free markets—that are still built, largely without comment, into the CPI and PCE a century later. Each assumption opens a blind spot: the pure-consumer assumption excludes the prices of assets through which real households save and transfer purchasing power into the future; the free-market assumption excludes the fiscal cost of goods and services provided by government, for which there is no market price and no revealed preference. The empirical evidence for the United States in Sections 3 and 4 shows that both blind spots cover areas of the economy in which prices have risen substantially faster than the CPI or PCE. A broader measure of inflation that incorporates both blind spots transforms the last four decades of US wage history: on the CPI-deflated measure, real median weekly earnings have been roughly flat since 1987; on the broader measure developed here, the same nominal earnings imply a decline in purchasing power of nearly forty percent.

The year 2027 marks the centennial of both of Haberler's *Der Sinn der Indexzahlen* and the Austrian Institute for Business Cycle Research. Both were products of 1927 Vienna—of the same circle of economists around Mises and Hayek. Haberler's simplifying assumptions were reasonable choices for the analytical purpose he set himself—to give index numbers a rigorous economic interpretation rather than treating them as statistical objects with formal properties, but no economic meaning. A century later, those same assumptions have hardened into unexamined defaults, even as central banks have elevated CPI-type measures to the status of an explicit numerical policy target. What began as a tractable simplification for a theoretical argument has become, without anyone quite deciding it should, the operational definition of price stability itself.

If the argument of this paper is correct, that operational definition is a mistake with real consequences. A central bank that succeeds in holding a biased, too-narrow price index to some target—2 percent, in the case of the Federal Reserve's PCE objective—is not thereby holding the broader cost of living, let alone the growth of the money stock, to anything resembling stability; Section 3 showed that the growth of M2 has outpaced real GDP and the CPI combined by a widening margin since the mid-1990s, most dramatically after 2008

and 2020. On the logic of Austrian business cycle theory, money created in excess of what a growing, largely saturated consumption economy can naturally absorb does not simply vanish: it flows into the very asset markets and public-sector spending that this paper highlights, financing speculative bubbles, accelerating the financialization of the economy, and sowing the cluster of malinvestment that periodically ends in crisis. An inflation-targeting regime built on Haberler’s century-old simplifications may therefore be constraining a far narrower slice of the price system than its architects intend, while leaving asset markets and the public sector comparatively free to inflate—and, on Austrian premises, free to set up the next bust.

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A Appendix: Robustness Checks

This appendix reports four robustness checks that are not directly addressed in the main text. Section A.1 asks to what extent the decline in broadly-deflated real wages documented in Section 4.3 survives an adjustment for changes in hours worked. Section A.2 explores federal total expenditures as an alternative proxy for the aggregate price of government-provided goods and services. Section A.3 uses alternative price series for both real estate and stocks. Section A.4 asks whether the monetary picture drawn in Section 3.3 is specific to the choice of M2 as the money-stock measure, or holds for the narrower M1 aggregate as well.

A.1 Adjusting for Average Hours Worked

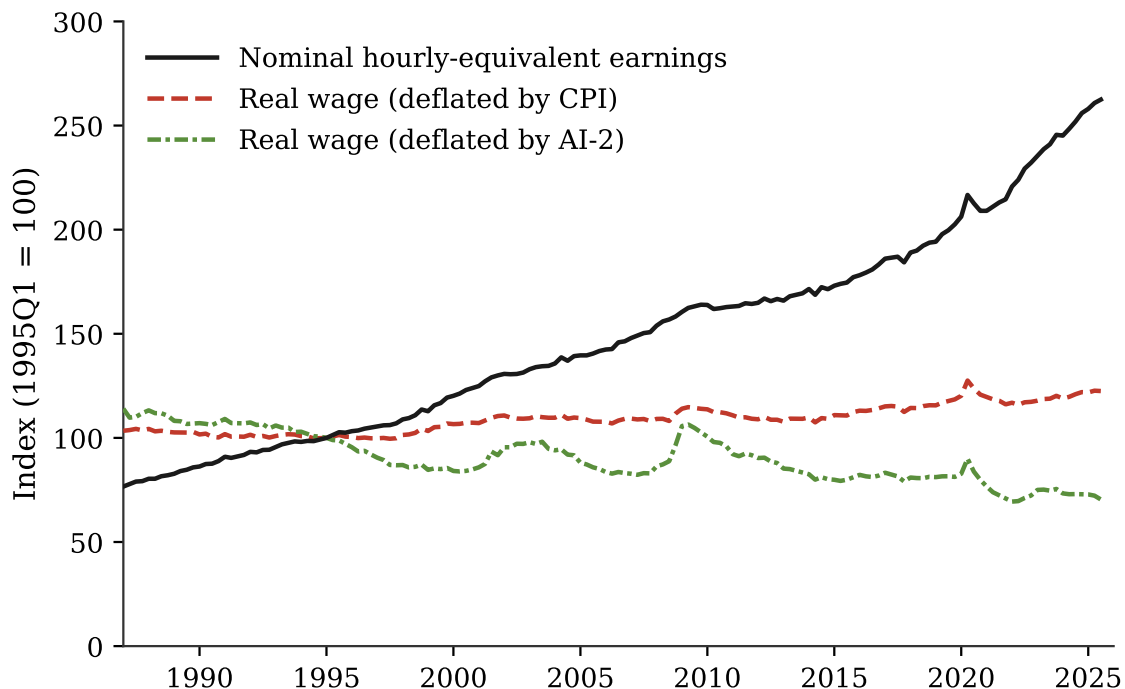
The wage series used throughout Section 4.3 is median usual gross *weekly* earnings for full-time workers. If average hours worked per week have changed systematically over the sample period, weekly earnings growth need not track hourly earnings growth, and the paper’s real-wage conclusions could in principle be an artifact of that gap rather than of the choice of deflator. To check this, average weekly hours of production and nonsupervisory employees in the private sector (BLS series AWHNONAG, seasonally adjusted, monthly) are used to convert the nominal weekly earnings index into an hourly-equivalent earnings index, which is then deflated by the CPI and by AI-2 exactly as in Table 6.⁸ Average weekly hours in the AWHNONAG series fell only modestly over the sample: from 34.7 hours in 1987Q1 to 33.8 hours in 2026Q2, a cumulative decline of about 2.6 percent (roughly 2.0 percent since 1995).

Figure 7 recasts Figure 6 entirely on this hourly-equivalent basis: nominal hourly-equivalent earnings, and the same series deflated by the CPI and by AI-2, over 1987–2026. The picture is qualitatively the same as on the weekly-earnings basis—a modest CPI-deflated gain

⁸As an independent corroboration, using a different methodology and source, the Penn World Table’s average annual hours worked per person engaged for the United States (Feenstra et al., 2015, release 11.0) shows the same qualitative pattern: a decline from 1828.6 hours in 1987 to 1788.9 hours in 2023 (a cumulative fall of 2.2 percent), and from 1860.4 hours in 1995 to the same 2023 endpoint (a cumulative fall of 3.8 percent).

against a substantial AI-2-deflated decline—confirming that the deflator, not the choice between weekly and hourly earnings, drives the paper’s central result. Table 7 reports the same average annual and cumulative growth rates for this hourly-equivalent basis as Table 6 reports for the weekly-earnings basis. Hourly-equivalent nominal earnings grew at 3.27 percent per year since 1987 (3.24 percent since 1995), a cumulative gain of 253.5 percent (170.9 percent since 1995)—both slightly ahead of the corresponding weekly-earnings figures of 3.16 and 3.14 percent, reflecting the modest decline in average hours worked documented above.

Figure 7: Nominal and Real Hourly-Equivalent Earnings, 1987–2026



Notes: Hourly-equivalent basis: nominal median weekly earnings for full-time workers divided by average weekly hours (BLS AWHNONAG, seasonally adjusted, resampled to quarterly), rebased to 1995Q1 = 100. Real wage series divide this hourly-equivalent nominal index by the CPI or by AI-2, each already rebased to 1995Q1 = 100. Compare directly to Figure 6, the weekly-earnings-basis version. Sources: BLS via FRED (LES1252881500Q, AWHNONAG); own construction (AI-2).

Table 7: Nominal and Real Hourly-Equivalent Wage Growth

Measure	1987–2026		1995–2026	
	Avg. Growth	Cum. Growth	Avg. Growth	Cum. Growth
Nominal hourly-equivalent earnings	3.27%	+253.5%	3.24%	+170.9%
Real wage (deflated by CPI)	0.43%	+18.1%	0.65%	+22.1%
Real wage (deflated by AI-2)	−1.24%	−38.6%	−1.14%	−30.0%

Notes: Average annual growth is the geometric mean of the period-to-period growth rates; cumulative growth is the total percentage change over the window, $(\text{End}/\text{Start}) - 1$. Constructed exactly as Table 6, but from the hourly-equivalent nominal earnings index underlying Figure 7 rather than nominal weekly earnings directly. Real wage rows are identical to the hourly-basis rows of Table 8.

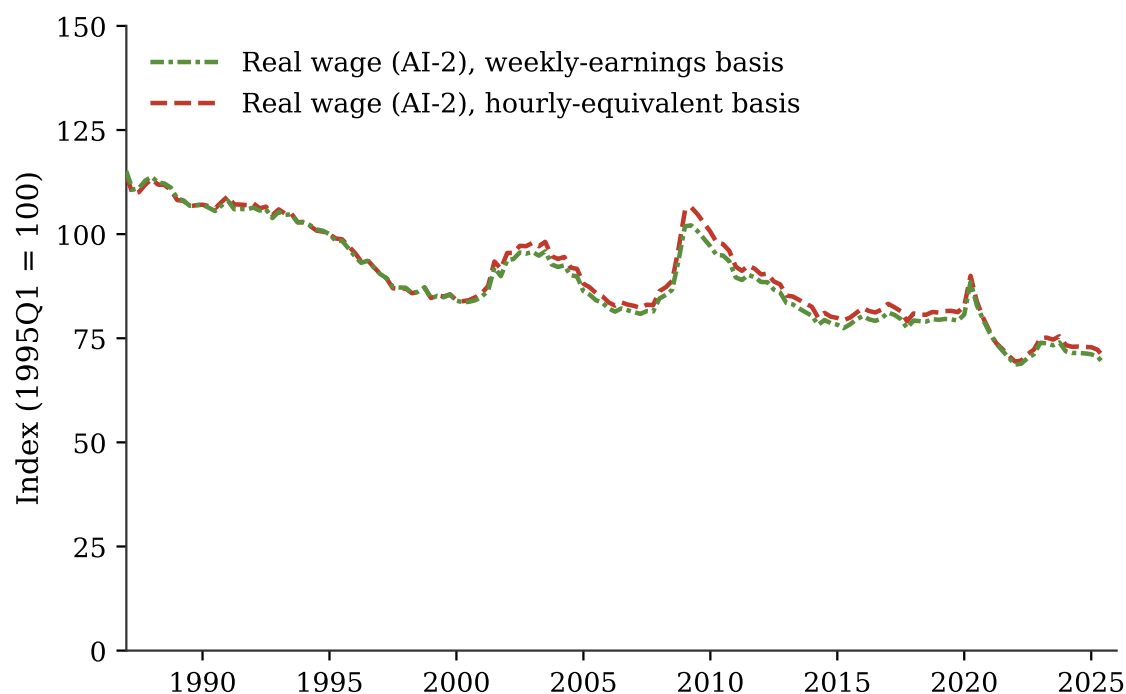
Table 8 and Figure 8 isolate the AI-2-deflated real wage line from Figure 7 and Table 7 for a direct comparison against the original weekly-earnings-based series. Because hours worked declined only slightly, the adjustment moves the results only at the margin, and always in the direction of a somewhat more favorable outcome for workers: on the hourly basis, the CPI-deflated real wage grew a little faster (0.43 percent per year since 1987, versus 0.35 percent on the weekly basis), and the AI-2-deflated real wage fell a little more slowly (−1.24 percent per year since 1987, versus −1.31 percent). The same pattern holds since 1995. In no case does the adjustment change the sign or the order of magnitude of the result: real hourly-equivalent earnings deflated by AI-2 still fell by roughly two-fifths since 1987 and by nearly a third since 1995, confirming that the paper’s central finding on real wages is not an artifact of unadjusted hours.

Table 8: Real Wage Growth: Weekly-Earnings vs. Hourly-Equivalent Basis

Measure	1987–2026		1995–2026	
	Avg. Growth	Cum. Growth	Avg. Growth	Cum. Growth
Real wage (CPI), weekly basis	0.35%	+14.8%	0.59%	+19.9%
Real wage (CPI), hourly basis	0.43%	+18.1%	0.65%	+22.1%
Real wage (AI-2), weekly basis	−1.31%	−40.3%	−1.20%	−31.3%
Real wage (AI-2), hourly basis	−1.24%	−38.6%	−1.14%	−30.0%

Notes: Average annual growth is the geometric mean of the period-to-period growth rates; cumulative growth is the total percentage change over the window, $(\text{End}/\text{Start}) - 1$. Weekly-basis rows reproduce the corresponding rows of Table 6; hourly-basis rows apply the hours adjustment described in the text.

Figure 8: Real Median Earnings Deflated by AI-2: Weekly-Earnings vs. Hourly-Equivalent Basis, 1987–2026



Notes: The weekly-earnings basis divides the nominal median weekly earnings index by AI-2, as in Figure 6. The hourly-equivalent basis first divides nominal weekly earnings by average weekly hours (BLS AWHNONAG, seasonally adjusted, resampled to quarterly), rebases the resulting hourly earnings index to 1995Q1 = 100, and then divides by AI-2. Sources: BLS via FRED (LES1252881500Q, AWHNONAG); own construction (AI-2).

A.2 Government Spending as an Alternative Public-Goods Proxy

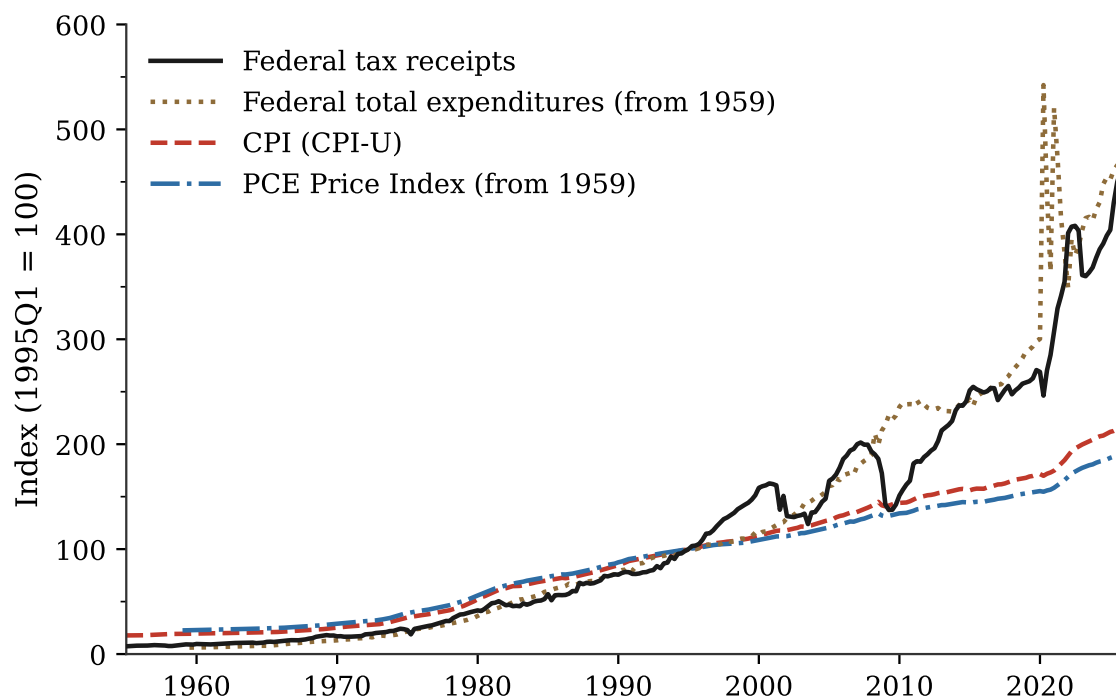
Section 3.1 proxies the price of government-provided goods and services by federal tax receipts. Receipts, however, are a revenue-side measure: they reflect statutory tax rates, bracket structure, and capital-gains realizations as much as the volume of goods and services government actually provides, and they can diverge from spending whenever the federal government runs a deficit or surplus. This check shows how findings change when tax receipts are replaced with federal government total expenditures (BEA/FRED series W019RCQ027SBEA). Figure 9 plots both series, together with the CPI and PCE, rebased to 1995Q1 = 100.

Tax receipts and total expenditures track one another closely over most of the sample, and both rise far faster than either price index throughout. Expenditures are visibly more volatile than receipts, however, reflecting the lumpiness of transfer payments and emergency outlays: the clearest example is the 2020–21 pandemic response, when federal spending briefly spiked to nearly double its pre-pandemic level before receding, a swing with no counterpart in the smoother tax-receipts series.⁹ By the end of the sample, tax receipts stand at roughly 454 and total expenditures at roughly 511 (1995Q1 = 100), compared with 217 for the CPI and 193 for the PCE.

Table 9 reports average annual growth rates computed with the same geometric-mean formula and the same window conventions as Table 1. Federal total expenditures compounded at 6.87 percent per year over their full available history (1959–2026Q1), against tax receipts’ 5.97 percent over their longer 1955–2026Q1 history; over the 1987–2026Q1 and 1995–2026Q1 windows common to both series, expenditures grew at 5.38 and 5.41 percent, essentially matching tax receipts’ 5.33 and 5.00 percent. The two public-sector measures are closest exactly where the comparison matters most for the paper’s argument: over both win-

⁹Expenditures also spike sharply in 2026Q1 (to an index value of roughly 511, up from about 466 the previous quarter); as of this writing it is not yet clear whether this reflects a genuine one-off outlay, a timing effect in a lumpy transfer-payment category, or a data revision, and the figure should be interpreted with that caveat in mind pending BEA’s next update.

Figure 9: Federal Tax Receipts vs. Federal Total Expenditures, CPI, and PCE Price Index, 1955–2026



Notes: Federal current tax receipts and federal total expenditures (both seasonally adjusted at an annual rate, nominal, quarterly) plotted against the CPI-U and the PCE Price Index, all re-based to 1995Q1 = 100. All series truncated to tax receipts' latest available quarter (2026Q1) to match Table 9. Sources: Bureau of Economic Analysis via FRED (W006RC1Q027SBEA, W019RCQ027SBEA); Bureau of Labor Statistics via FRED (CPIAUCSL); Bureau of Economic Analysis via FRED (PCEPI).

dows, spending growth is within half a percentage point of receipts growth, and both remain roughly twice the CPI’s 2.80 and 2.54 percent and the PCE’s 2.37 and 2.14 percent over the same windows. The findings of Section 3.1 are accordingly not artifacts of using the revenue side rather than the expenditure side of the federal government’s accounts. Focusing on the spending side rather than the revenue side would emphasize the inflationary tendencies even more.

Table 9: Average Annual Growth: Federal Tax Receipts vs. Federal Total Expenditures

Measure	Period	Full Range	1987–2026Q1	1995–2026Q1
CPI (CPI-U)	1955–2026Q1	3.59%	2.80%	2.54%
PCE Price Index	1959–2026Q1	3.26%	2.37%	2.14%
Federal tax receipts	1955–2026Q1	5.97%	5.33%	5.00%
Federal total expenditures	1959–2026Q1	6.87%	5.38%	5.41%

Notes: Average annual growth is the geometric mean of the period-to-period growth rates, computed from the quarterly series underlying Figure 9. CPI and tax receipts figures reproduce the corresponding rows of Table 1 exactly; all windows are truncated to tax receipts’ latest available quarter (2026Q1) for comparability across rows. PCE’s Full Range figure is 0.01pp lower in Table 1, which runs through 2026Q2 rather than the 2026Q1 truncation used throughout this table. Federal total expenditures are available only from 1959Q3, so its Full Range column is not on a fully common footing with CPI and tax receipts (available since 1955); the 1987–2026Q1 and 1995–2026Q1 columns are unaffected by this. See the note in the text on a spending spike in 2026Q1 of uncertain provenance.

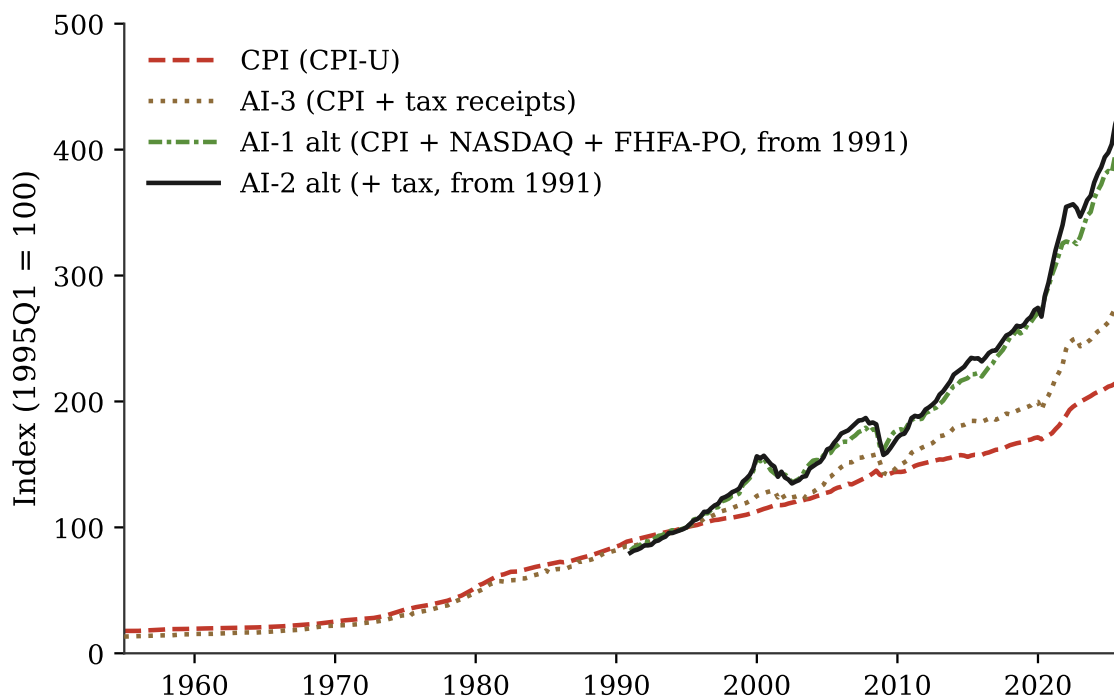
A.3 Alternative Asset Price Indices

Sections 4.1–4.2 build AI-1 and AI-2 from the Shiller S&P Composite (equities) and the Case-Shiller U.S. National Home Price Index (real estate). Both are defensible choices, but not unique ones: the S&P Composite is a large-cap, broad-market benchmark, whereas the technology-heavy NASDAQ Composite has grown at a markedly different pace over the past three decades; and Case-Shiller’s repeat-sales methodology is only one of several ways of constructing a national house-price index. This check replaces both inputs—the NASDAQ Composite (FRED: NASDAQCOM) in place of the S&P Composite, and the FHFA Purchase-Only House Price Index (FRED: HPIPONM226S) in place of Case-Shiller—while leaving the CPI, tax receipts, and the growth-rate-weighting methodology exactly as

in Sections 4.1–4.2. NASDAQCOM is a daily series; consistent with how the Shiller series is treated elsewhere in this paper, it is averaged to monthly and then to quarterly frequency before entering the weighted alternative indices. The FHFA Purchase-Only index is available only from January 1991, four years later than Case-Shiller, so every series in this check begins in 1991Q1 rather than 1987Q1 and is separately rebased to 1995Q1 = 100.

Figure 10 reproduces Figure 4 with these two substitutions, plotting CPI and AI-3 (unaffected by the swap, shown for reference) alongside the alternative versions of AI-1 and AI-2.

Figure 10: CPI vs. Alternative Broader Inflation Measures, NASDAQ/FHFA-PO Basis, 1955–2026



Notes: Reproduces Figure 4 with the NASDAQ Composite in place of the Shiller S&P Composite and the FHFA Purchase-Only House Price Index in place of Case-Shiller; weights are unchanged (AI-1 alt: 70/18/12 CPI/NASDAQ/FHFA-PO; AI-2 alt: 49/12.6/8.4/30 CPI/NASDAQ/FHFA-PO/tax). Available only from 1991Q1, limited by FHFA-PO’s start date. Sources: Nasdaq, Inc. via FRED (NASDAQCOM); FHFA via FRED (HPIPONM226S); BLS/FRED (CPIAUCSL); BEA/FRED (W006RC1Q027SBEA).

Table 10 reports average annual growth over the 1991–2026 window common to the alternative series and over 1995–2026. The alternative AI-1 grows at 4.69 percent per year since 1991 (4.62 percent since 1995) and the alternative AI-2 at 4.92 and 4.81 percent—if

anything faster than the 4.11/4.04 and 4.54/4.39 percent reported for the S&P/Case-Shiller basis in Table 4, reflecting the NASDAQ Composite’s larger cumulative gains over this more recent, technology-heavy window. The ranking established in Section 4.1—CPI and AI-3 slowest, the asset-inclusive measures fastest—is unchanged.

Table 10: Average Annual Inflation by Measure, NASDAQ/FHFA-PO Basis

Measure	Period	1991–2026	1995–2026
CPI (CPI-U)	1955–2026	2.57%	2.54%
AI-3 (CPI + tax receipts)	1955–2026	3.43%	3.35%
AI-1 alt (CPI + NASDAQ + FHFA-PO)	1991–2026	4.69%	4.62%
AI-2 alt (+ tax)	1991–2026	4.92%	4.81%

Notes: Average annual growth is the geometric mean of the period-to-period growth rates, computed from the quarterly series underlying Figure 10, over the 1991–2026 window common to the alternative AI-1/AI-2 and over 1995–2026. CPI and AI-3 rows reproduce Table 4 over these same windows.

Figure 11 and Table 11 repeat this substitution for the weight-sensitivity range of Section 4.2, using the same Conservative (15% tax; 5%/3% NASDAQ/FHFA-PO), Baseline (30% tax; 18%/12%), and Expansive (40% tax; 20%/13%) weights as Table 5.

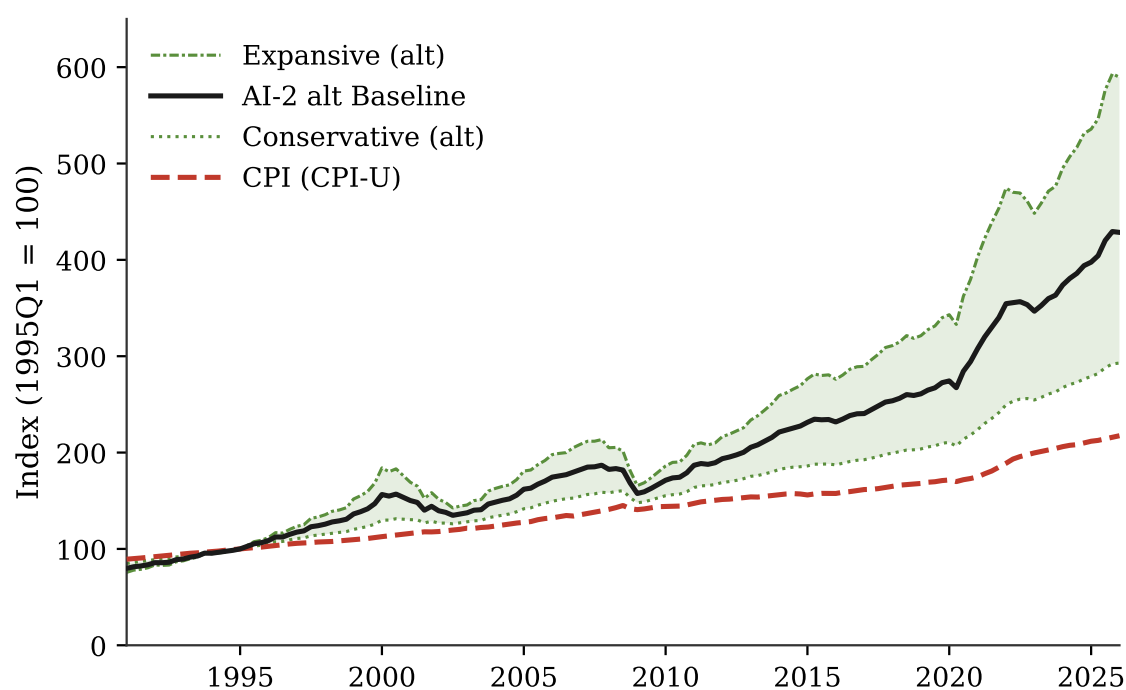
Table 11: Average Annual Inflation Under Alternative Weighting Scenarios, NASDAQ/FHFA-PO Basis

Measure	Period	1991–2026	1995–2026
CPI (CPI-U)	1955–2026	2.57%	2.54%
AI-2 alt Conservative	1991–2026	3.60%	3.53%
AI-2 alt Baseline	1991–2026	4.92%	4.81%
AI-2 alt Expansive	1991–2026	6.04%	5.89%

Notes: Average annual growth is the geometric mean of the period-to-period growth rates, over the 1991–2026 window common to all three scenarios and over 1995–2026. Constructed exactly as Table 5, but from the NASDAQ Composite and FHFA Purchase-Only series underlying Figure 11 rather than the Shiller S&P Composite and Case-Shiller.

Even under the conservative weighting, and even measured against a more volatile equity benchmark over a shorter and more recent window, AI-2’s growth rate on the NASDAQ/FHFA-PO basis (3.60 percent since 1991) is well above the CPI’s (2.57 percent). The Baseline and Expansive alternatives run further ahead still. The central finding of Sections 4.1–4.2—that asset prices, however proxied, have grown substantially faster than the CPI—is accordingly

Figure 11: CPI vs. AI-2 Weight-Sensitivity Range, NASDAQ/FHFA-PO Basis, 1991–2026



Notes: Reproduces Figure 5 with the NASDAQ Composite in place of the Shiller S&P Composite and the FHFA Purchase-Only House Price Index in place of Case-Shiller; weighting scenarios are otherwise identical to Table 5. Available only from 1991Q1, limited by FHFA-PO's start date. Sources as in Figure 10.

not an artifact of the particular equity and real-estate series chosen there. The alternative asset price series presented in the appendix emphasize the inflationary tendencies even more.

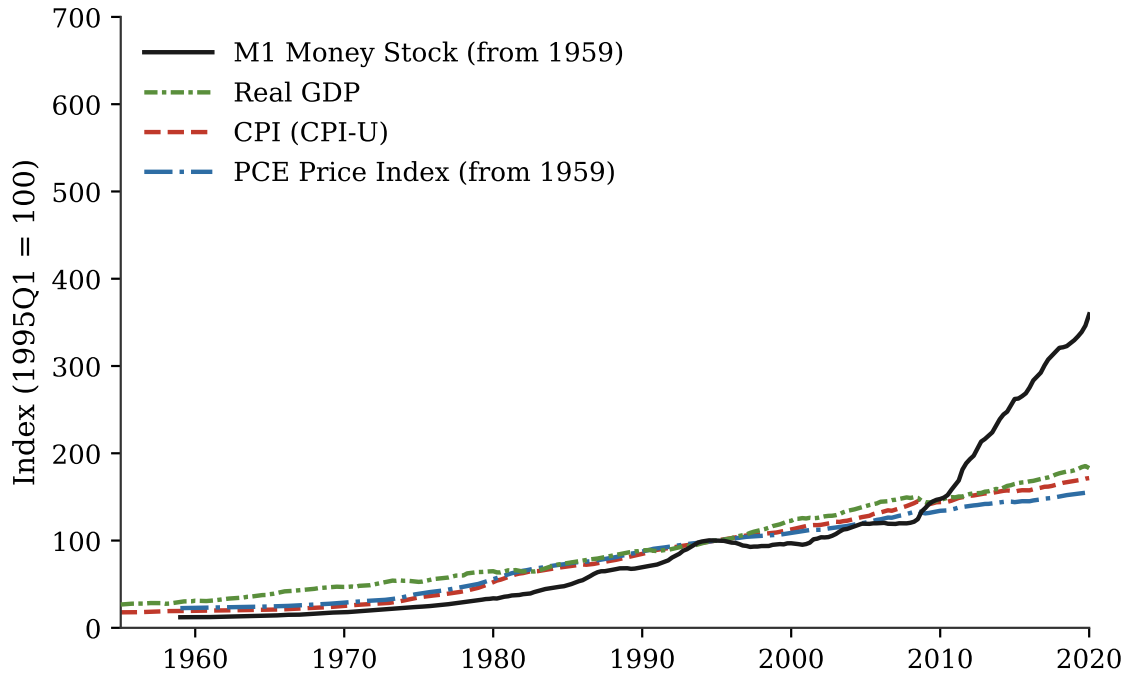
A.4 A Narrower Money Aggregate

Section 3.3 (Figure 3, Table 3) uses M2, the broader aggregate that includes savings deposits, small time deposits, and retail money market funds alongside currency and checkable deposits. This check asks whether the same picture holds for M1, the narrower aggregate consisting of currency and its close substitutes. M1 cannot be tracked over the same window as M2, however: in May 2020 the Federal Reserve redefined M1 to fold in “other liquid deposits” (essentially savings deposits, previously classified under M2), producing a purely definitional level jump of roughly 3.4-fold in a single month (from \$4,856.4 billion in April 2020 to \$16,312.5 billion in May 2020) that does not reflect actual money creation. Figure 12 therefore reproduces Figure 3 with M1 in place of M2, cut off at 2020Q1, the last full quarter unaffected by the redefinition.

Table 12 reports the corresponding growth rates, computed over the same full-history, 1987–, and 1995–windows as Table 3, but ending in 2020Q1 rather than 2026Q2 for all four series. Over its full available history (1959–2020Q1), M1 compounded at 5.71 percent per year; over 1987–2020Q1 and 1995–2020Q1, M1 growth was 5.38 and 5.25 percent. To compare like with like, M2 growth must be recomputed over these same truncated windows rather than taken from Table 3, which runs through 2026Q2: over 1959–2020Q1, 1987–2020Q1, and 1995–2020Q1, M2 compounded at 6.77, 5.41, and 6.19 percent—in every window faster than M1.

The bottom row of Table 12 makes the resulting difference in monetary “excess” with respect to M1 explicit: over the same three truncated windows, M1 growth yields a residual, against the combined growth of real GDP and the CPI, of -0.97 , $+0.24$, and $+0.62$ percentage points, while M2’s residual over the identical windows is $+0.09$, $+0.27$, and $+1.56$ percentage points—consistently larger than M1’s. This shows that the broader aggregate

Figure 12: M1 Money Stock vs. Real GDP and CPI/PCE Price Index, 1955–2020Q1



Notes: M1 money stock, real GDP, CPI-U, and the PCE Price Index, all rebased to 1995Q1 = 100. M1 and CPI/PCE are quarterly averages of seasonally adjusted monthly series; real GDP is quarterly, seasonally adjusted at an annual rate, chained 2017 dollars. M1 begins in 1959 and is truncated at 2020Q1 to exclude the May 2020 redefinition of M1 (inclusion of other liquid deposits, previously part of M2), which produced a purely definitional jump in the series. Sources: Federal Reserve via FRED (M1SL); Bureau of Economic Analysis via FRED (GDPC1); BLS/FRED (CPI-AUCSL); BEA/FRED (PCEPI).

was already registering a substantially larger monetary “excess” than the narrower one well before the pandemic. As reported in Table 3, M2’s residual is +1.19 percentage points since 1995 once the 2020–26 window is included. This intensifying pattern—a rising residual across the three progressively shorter, more recent windows—is visible in both aggregates. The difference between the two aggregates is consistent with the mechanics described in Section 3.3: the excess money creation documented there shows up disproportionately in the broader, interest-bearing components of M2—savings deposits, time deposits, and retail money funds—rather than in the transactions balances captured by M1.

Table 12: Average Annual Growth: M1, Real GDP, and CPI/PCE (through 2020Q1)

Measure	Period	Full Range	1987–2020Q1	1995–2020Q1
M1 Money Stock	1959–2020Q1	5.71%	5.38%	5.25%
CPI (CPI-U)	1955–2020Q1	3.55%	2.58%	2.18%
PCE Price Index	1959–2020Q1	3.21%	2.13%	1.78%
Real GDP	1955–2020Q1	3.01%	2.56%	2.45%
M1 less Real GDP and CPI growth	—	−0.97 pp	+0.24 pp	+0.62 pp

Notes: Average annual growth is the geometric mean of the period-to-period growth rates, computed from the quarterly series underlying Figure 12. All windows end in 2020Q1, the last full quarter before M1’s redefinition, so these figures are not directly comparable to the 2026-endpoint windows in Table 3. The bottom row reports the simple difference, in percentage points, between M1’s average annual growth and the sum of real GDP’s and the CPI’s average annual growth over the same window (M1 – real GDP – CPI). As in Table 3, the Full Range residual uses CPI and real GDP growth recomputed over M1’s own 1959–2020Q1 window (3.65% and 3.03%, respectively) rather than the longer 1955–2020Q1 figures shown above, so that the residual reflects a common period throughout. Sources as in Figure 12.