What Money Can Buy: A Joint Distribution of Personal Income and Personal Consumption Expenditures

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Outline

- Defining Income and Consumption
- Constructing Independent Distributions
- Joint distribution
  - Methodology
  - Results
  - Comparison to other results
- Distribution of Personal Saving

Research Question

- Can we relate income and consumption of households to aggregate economic growth?
- Construct a household-level joint distribution of income and consumption, such that the values sum to national accounts totals
- Will return to more specific methodological questions after presentation of method and results

Why do we **want** a joint distribution?

- Income and consumption are **both** key determinants of well-being: need to go beyond single-dimension inequality (Garner and Short 2013, Fisher et al. 2022)
- Gain insights into how tax and transfers will impact their relative rankings and spending patterns (estimate marginal propensity to consume) (Fisher et al. 2020, Kaplan and Violante 2014).
- Household-level effects will then add up to economy-wide impacts
- Understanding the causes of limited intergenerational mobility
- Significant volume of literature on both income and consumption distributions using various datasets (see paper)

Why a national accounts framework?

- Understand how macroeconomic growth is experienced by households (micro)
- Tax and transfer policy are done at the macro level, but have micro implications
- Stiglitz et al. (2009) report: push to go “Beyond GDP” and emphasize well-being
- OECD Groups
  - Expert Group on Disparities in National Accounts (EGDNA): Distribute national accounts totals to households
  - Expert Group on Income, Consumption, and Wealth (EGICW): Create a joint distribution of income, consumption, and wealth
- Combining work of two OECD groups

Data: Main analysis for 2017 – subsequently extended to 2004-2022

- Macro aggregates: National Income and Product Accounts (**NIPA**) by BEA
  - **Income:** Personal Income (**PI**) and Disposable Personal Income (**DPI**) [NIPA table 2.9]
  - **Consumption:** Personal Consumption Expenditures (**PCE**)[1]

- Microdata
  - **Income:** Annual Social and Economic Supplement of the Current Population Survey (**CPS**)
    - 2017: 67,859 households: detailed income questions (2018 survey year)
  - **Consumption:** Consumer Expenditure Survey (**CE**)
    - 2017: 8,238 consumer units with ≥2 interviews: expend. occurring Nov. 2016 –Feb. 2018

- [1]As in other distributional exercises (see below), here the term "consumption" is used as shorthand to mean "consumption expenditure". However, these two concepts are not quite equal. For instance, as measured in the national accounts and microdata, consumption expenditures do not include inter-household transfers of goods or services.

PI Methodology Overview

- **PI** is the income received by persons from participation in production, government and business transfers, service flows from homeownership, and holding interest-bearing securities and corporate stock
- **DPI (PI – taxes)** is closest to the measure of economic resources available to households to purchase goods and services
- Strategy (see Technical document and working paper for details)
    1. Identify a NIPA total to be distributed (over 70 components of PI)
    2. Identify CPS variable (s) (+ outside data) to allocate component
    3. Sum all household components (wages, business income, interest, dividends, imputed interest, Medicare, Medicaid, Social Security, WIC, SNAP, etc.) to Hh Inc

- Personal Income = Household Income - *Household Current Transfer Receipts from Nonprofits - Nonprofit Institution Transfer Receipts from Households + Nonprofit Institution Income*

    4. Equivalize (divide by $\sqrt{household\ size}$) and rank households to compare households of different sizes to each other

PCE Distributional Methodology

PCE is a measure of the goods (durable and nondurable) and services purchased by, or on behalf, of U.S. residents.

1. Identify PCE product type (NIPA Table 2.4.5) to distribute
2. Identify CE variable(s) for PCE component – perform allocations and imputations (see BLS method, updated since Dec 2022 release).
3. Augment CE health expenditures with administrative & survey data
4. Scale up CE to PCE major product aggregates using proportional allocation for remaining gap
5. Divide CU expenditures by $\sqrt{cu\ size}$ to derive equivalized PCE

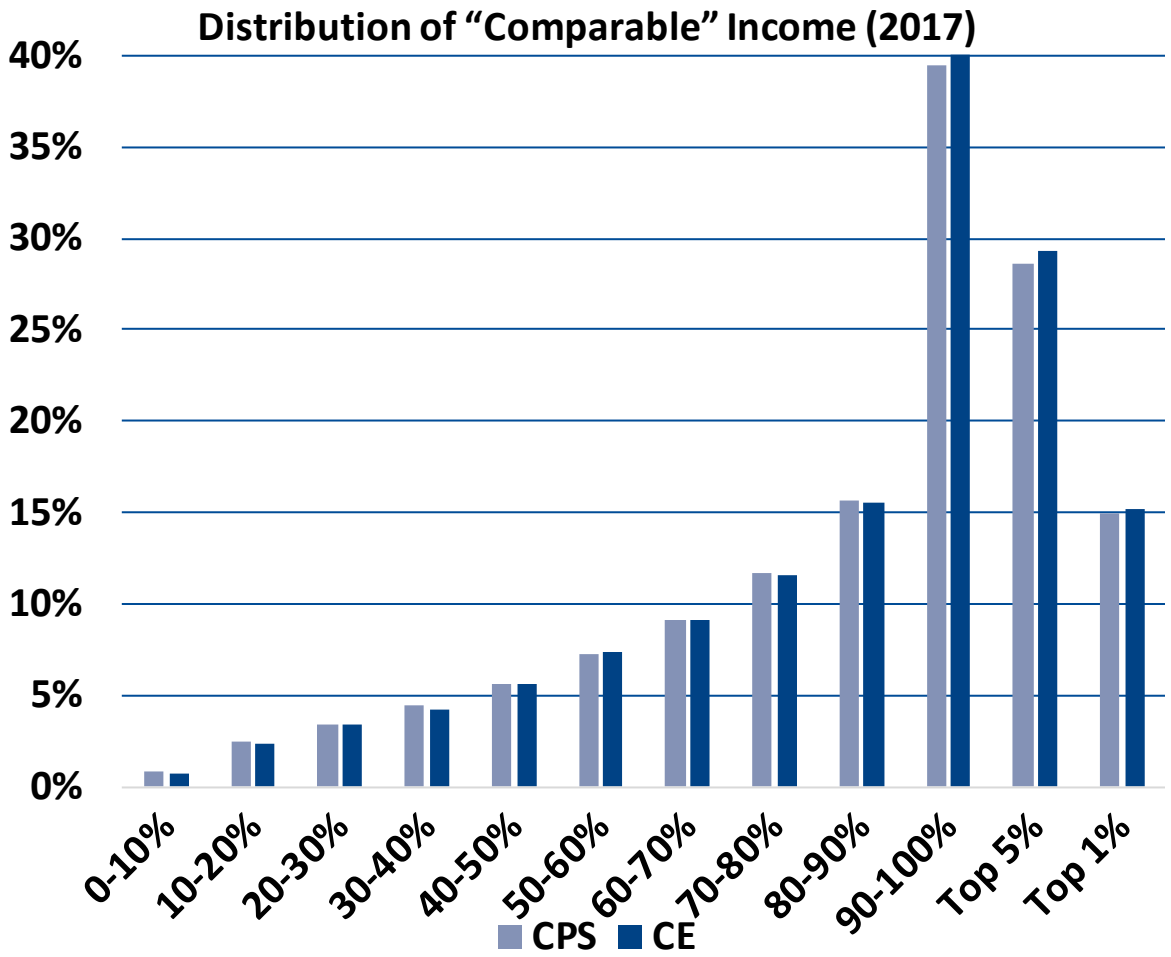
Main Measurement Challenges

- Survey Challenges
  - One survey does not have all info
  - CPS and CE exclude institutional households → Add NPISH imputation
  - Imputing consumption items from a relatively small sample
  - Underrepresented at the top: CPS and CE are known to underrepresent high income households → tail adjustment for both surveys; tax info for income, but no target for consumption tail (do pareto adjustment)
- Misalignment
  - Some macro concepts don't match survey questions well (e.g., see Passero et al. 2014 for CE-PCE differences). Others have no micro equivalent
  - Income dist. of CPS lies to the right of CE (more skewed)
  - Harder to match income to consumption when both contain large amounts of imputations (i.e., items not in bank accounts), but imputations must be allocated

Joint Methodology Overview: Prototype Year 2017, Extended 2004-2022

1	Create a "comparable" income measure between CPS & CE	Labor income, interest, dividends, social security, unemployment, and other transfers
2	Assigning CU-level PCE to CPS Households	Multiple Imputation with Predictive Mean Matching by decile of equivalized comparable income
3	Harmonize overlapping components of PI/DPI & PCE	Allocate concepts in both PCE and PI (implicit rental inc. of owner-occ. & health ins. + employer contrib.) using the same survey such that personal saving is unimpacted.
4	Computing Distributional Estimates based on equivalized DPI	Create a joint distribution of PI & PCE, and subsequently PS by decile of equivalized DPI

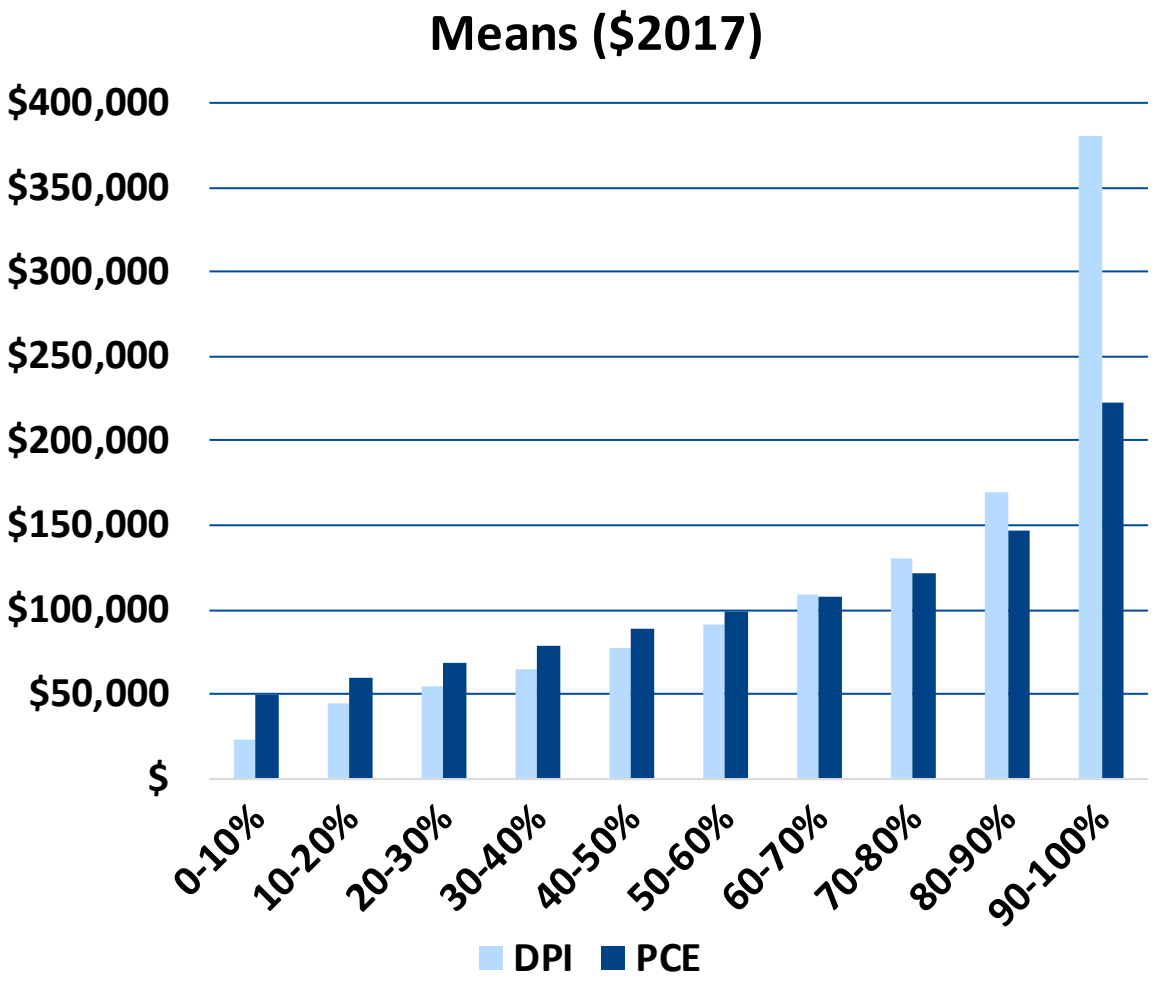
Comparable Income and Independent Distributions

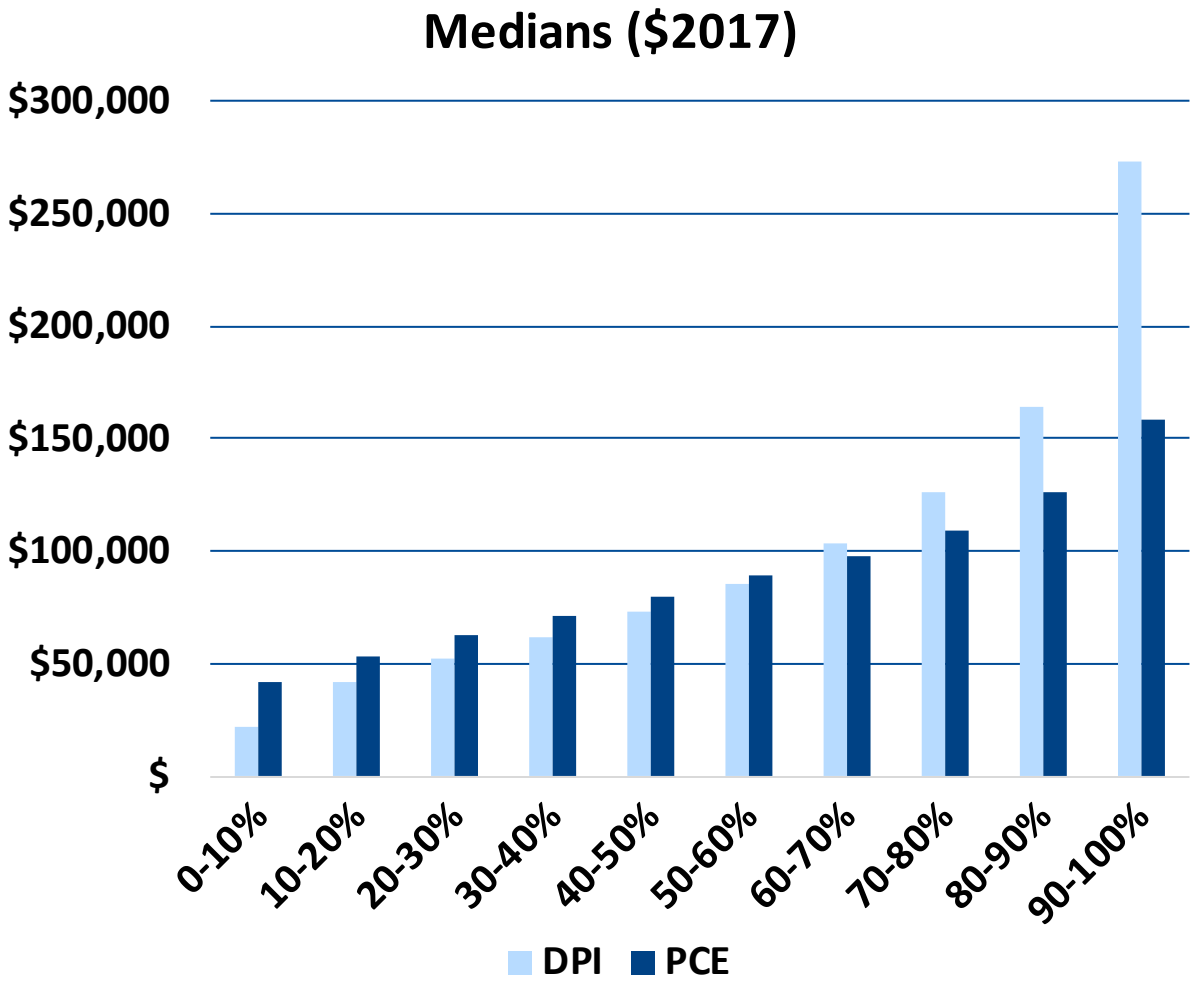


Inequality Metric	DPI ($2017)	PCE ($2017)
Mean	$114,542	$102,371
Median	$82,370	$82,940
0-20% Share	5.9%	8.6%
20-40% Share	10.6%	13.0%
40-60% Share	14.8%	16.4%
60-80% Share	21.0%	21.2%
80-100% Share	47.8%	40.9%
Top 1% Share	11.5%	8.7%
Top 5% Share	23.2%	19.1%
Gini Index	0.411	0.331
90/10 Ratio	4.90	3.62

- Comparable income is similarly distributed in CPS & CE
- Income distribution is significantly less equal than consumption (biggest difference is in top 5%)
- Median income and consumption are roughly equal

Joint Distribution: Real Means and Medians (ranked on eq. DPI)





Income Share	Mean DPI	Mean PCE
Top 5%	$531,989	$245,219
Top 1%	$1,302,517	$222,249

Mean (or median) consumption is higher than income at the bottom, about parity in the middle, and much lower at the top

Joint Distribution Results: Cross Shares (2017)

- Table A: share of income held by those in each joint income-consumption quantile (i.e., the top joint quintile has 26% of DPI)
- Table B: share of consumption held by those in each joint income-consumption quantile (i.e., the top joint quintile has 25% of PCE)
- The row (column) totals show the total for each DPI (PCE) quantile
- Very similar results to Fisher et al. 2022, despite different definitions and concepts (e.g., we scale to NIPAs, include health insurance and exclude capital gains)

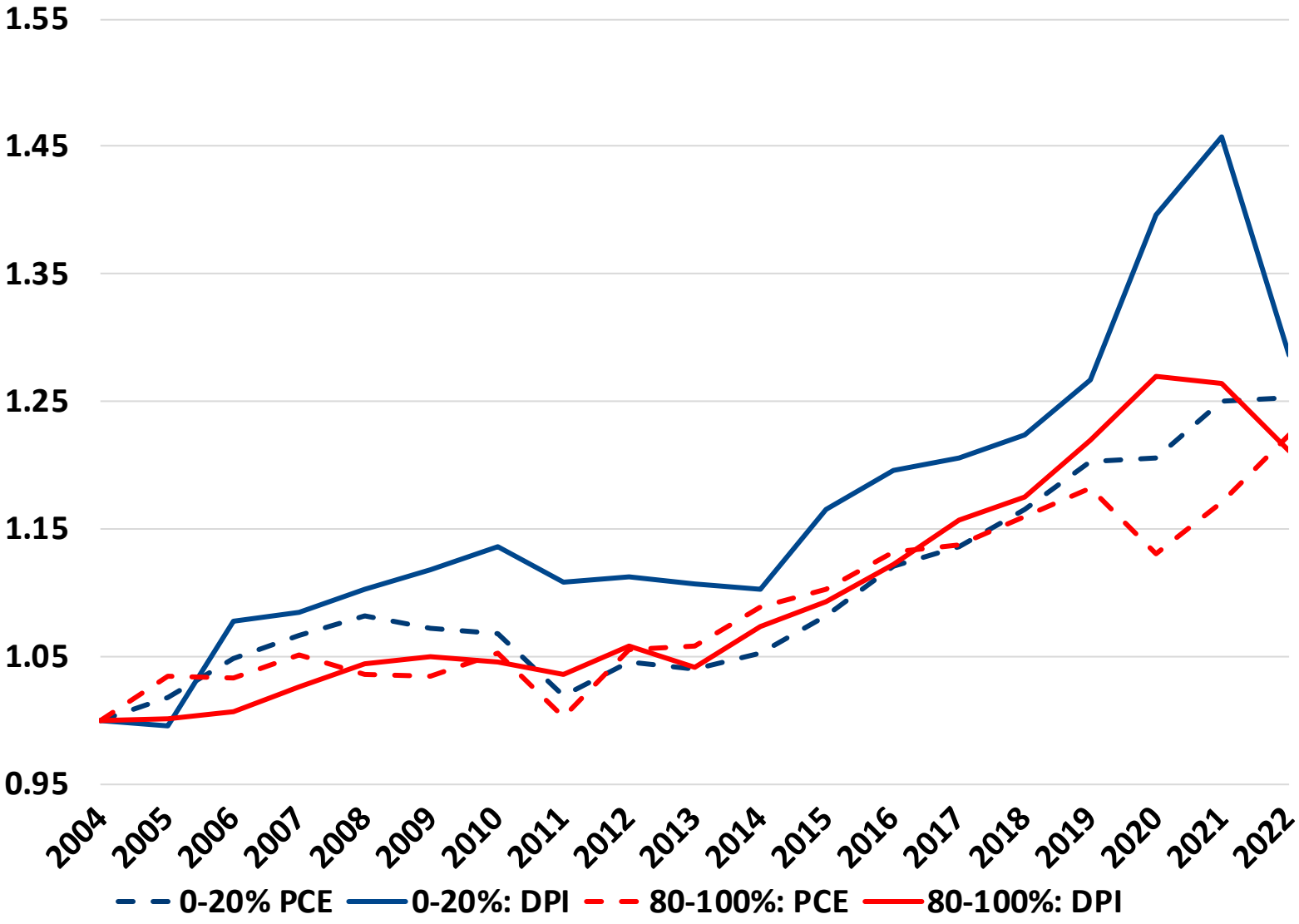
A: Share of DPI

		PCE Quantiles						
		0-20%	20-40%	40-60%	60-80%	80-100%	Top 5%	**Total**
DPI Quantiles	0-20%	3%	2%	1%	1%	0%	0%	**6%**
	20-40%	3%	3%	2%	2%	1%	0%	**10%**
	40-60%	3%	4%	4%	3%	2%	0%	**15%**
	60-80%	2%	4%	5%	6%	4%	1%	**21%**
	80-100%	1%	3%	6%	12%	26%	9%	**48%**
	Top 5%	0%	1%	3%	5%	15%	7%	**23%**
	Total	**12%**	**15%**	**18%**	**23%**	**33%**	**10%**	**100%**

B: Share of PCE

		PCE Quantiles						
		0-20%	20-40%	40-60%	60-80%	80-100%	Top 5%	**Total**
DPI Quantiles	0-20%	3%	3%	2%	2%	2%	0%	**12%**
	20-40%	3%	3%	3%	3%	3%	1%	**15%**
	40-60%	2%	3%	4%	4%	5%	1%	**18%**
	60-80%	1%	2%	4%	6%	8%	3%	**23%**
	80-100%	0%	1%	2%	6%	25%	14%	**33%**
	Top 5%	0%	0%	0%	1%	9%	8%	**10%**
	Total	**9%**	**13%**	**16%**	**21%**	**41%**	**20%**	**100%**

Growth in Real Median Income for Top & Bottom 20% (by eq. DPI)



- Growth in real median income outpaces growth in expenditure, within quantile
- Greater influence of COVID-era transfers on bottom quintile of income
- Different patterns of PI & PCE during COVID

Distribution of Personal Saving (PS)

- PS is defined as:
  - Personal Saving (Line 34) on Table 2.1 = DPI (Line 27) – PCE (Line 28) – Other Personal Outlays (Lines 29:31)

Example:

Table 2.1. Personal Income and Its Disposition

[Billions of dollars]

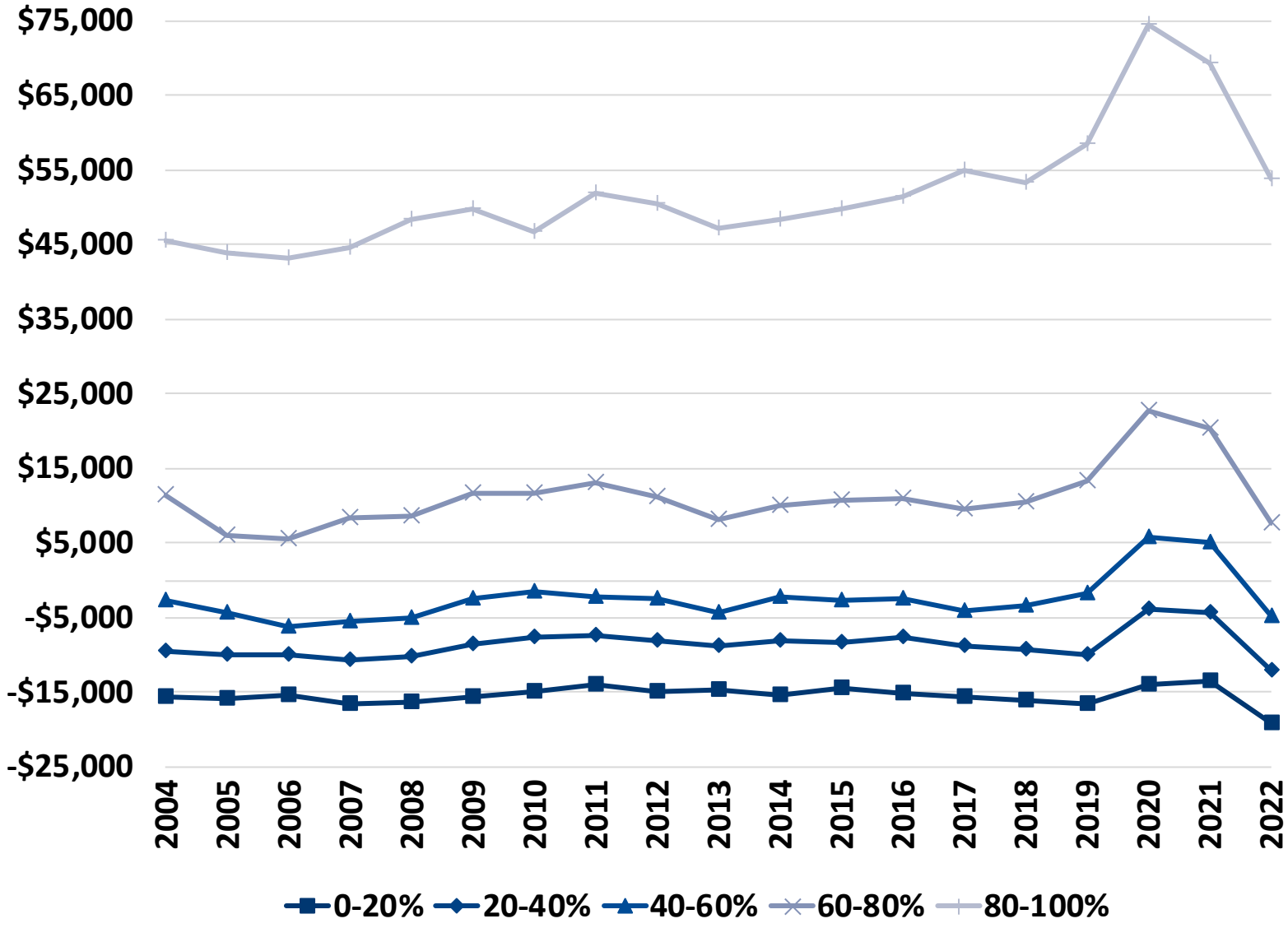
Last Revised on: March 28, 2024 - Next Release Date April 25, 2024

Line		2017	2018	2019	2020	2021	2022	2023
27	**Equals: Disposable personal income**	**14,613.9**	**15,454.0**	**16,157.0**	**17,372.5**	**18,664.4**	**18,702.5**	**20,218.9**
28	**Less: Personal outlays**	**13,772.3**	**14,457.4**	**14,966.1**	**14,694.0**	**16,543.9**	**18,079.7**	**19,305.1**
29	Personal consumption expenditures	13,290.6	13,934.4	14,417.6	14,206.2	16,043.0	17,511.7	18,570.6
30	Personal interest payments[4]	290.4	321.3	340.8	285.8	273.6	326.1	489.2
31	Personal current transfer payments	191.3	201.6	207.6	202.0	227.3	241.8	245.2
32	To government	104.6	111.3	114.6	108.6	120.2	127.7	130.8
33	To the rest of the world (net)	86.7	90.3	93.0	93.3	107.1	114.1	114.4
34	**Equals: Personal saving**	**841.6**	**996.7**	**1,190.9**	**2,678.6**	**2,120.5**	**622.8**	**913.8**

Savings Distribution Methodology

- PI and PCE distributed (modified) as previously discussed, other items as follows:
  - **Personal interest payments:** interest payments as reported by respondents in CE
  - **Personal current transfer payments:** partially distributed using payment info in CE (including license/registration fees) where available. Remainder allocated to be distributionally neutral
- Households ranked on eq. DPI, and then PS is presented by eq. DPI decile

Real Median PS by Quintile (ranked by eq. DPI) ($2017)



Expenditure is higher than income throughout for the bottom 40%

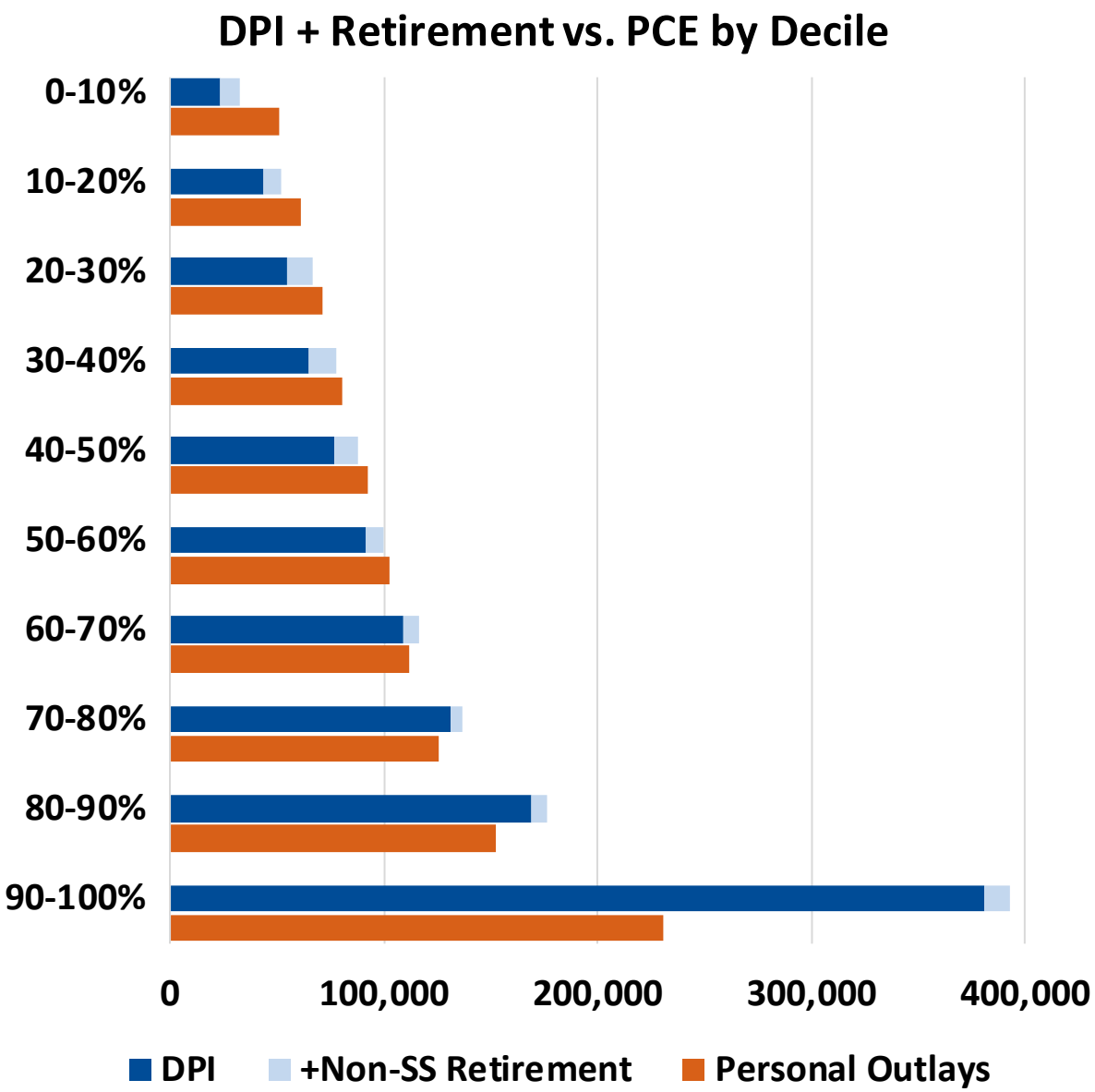
The most significant increases in income-expenditure are for the top quintile, especially during COVID (27% increase from 2019-2020)

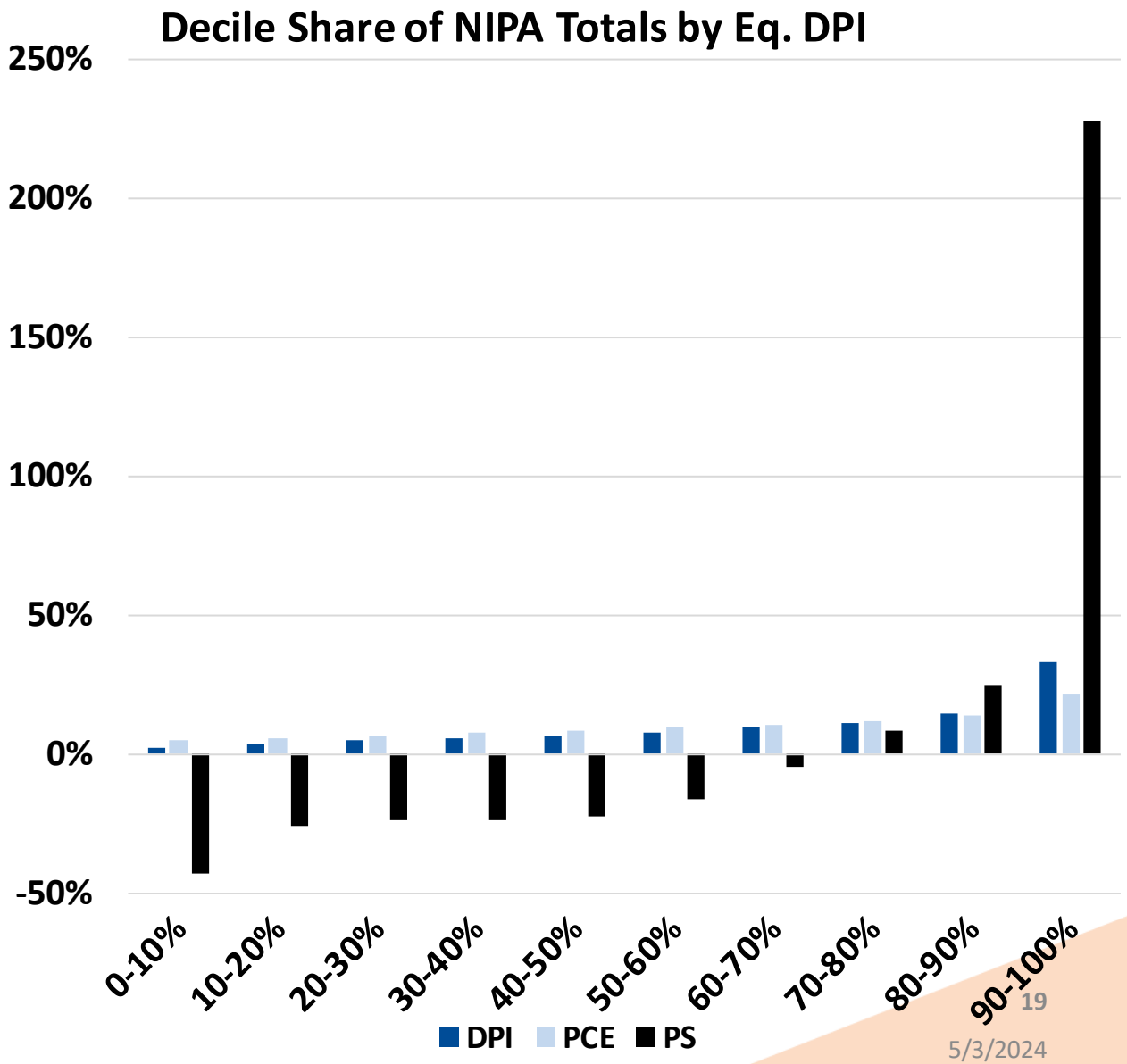
- Garner et al. (2024) find big changes in consumption at the top of the distribution (e.g., reduced consumption of food away from home + entertainment)

Why is PS negative for lower quintiles?

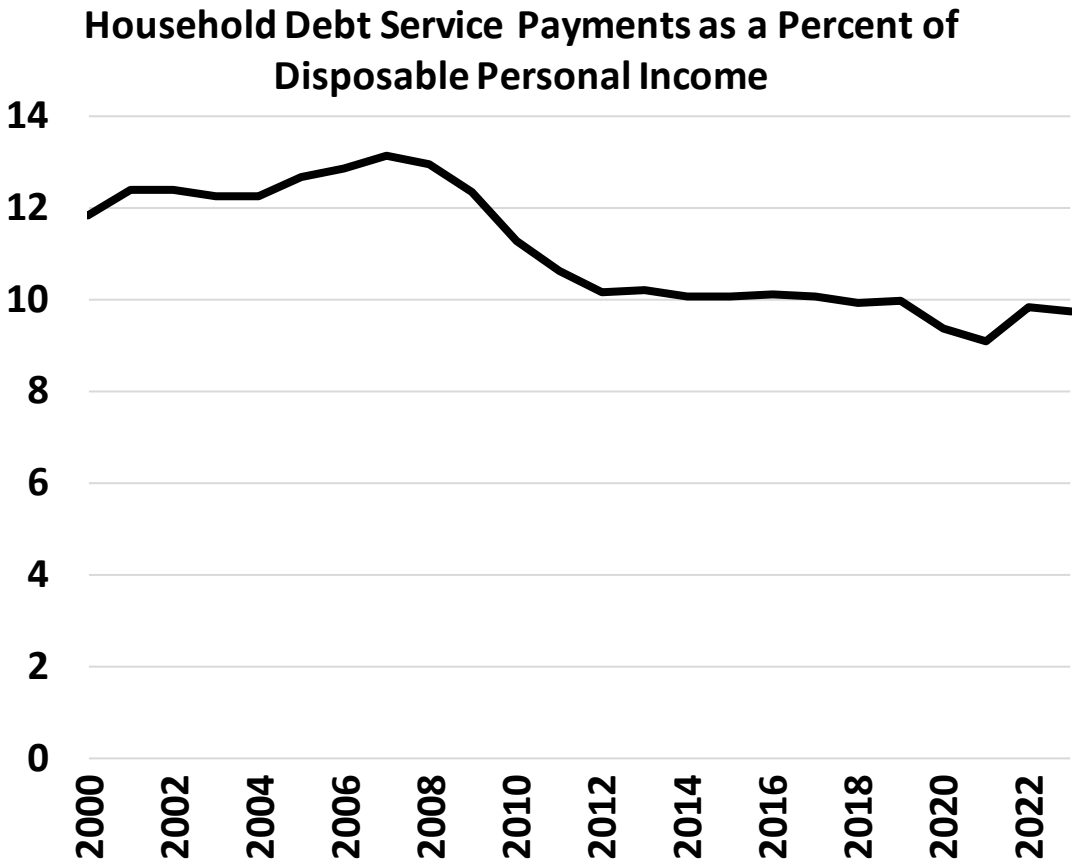
- PCE allocated values for large **financed** purchases (e.g., vehicles) may be significantly higher than cash outlays
  - E.g., 80% of new car and truck purchases are financed (NADA)
  - 2023Q2: avg. amount financed = $40k, avg. down payment = $7k, avg. monthly payment = $733 (Edmonds)
- PI does not include retirement income disbursements, other than social security
  - Can be a significant source of income for retired households
  - Difficult to estimate potential distributional impact of exclusion
    - Bee and Mitchell 2017 show admin reports are about double CPS survey estimates pre-2018 CPS redesign (2012 data)
    - CPS redesign results in significantly higher retirement disbursement values (Semega and Welniak 2015) closer to admin totals, but underreporting is still likely to vary across the distribution
- Other microdata explanations may include
  - Other sources of income definitionally not included in PI
  - Underreporting and misreporting of income in surveys, including item non-response
- **Consumption may be financed by debt/other assets. Do not observe household balance sheet**

PS by Deciles of DPI (2017)

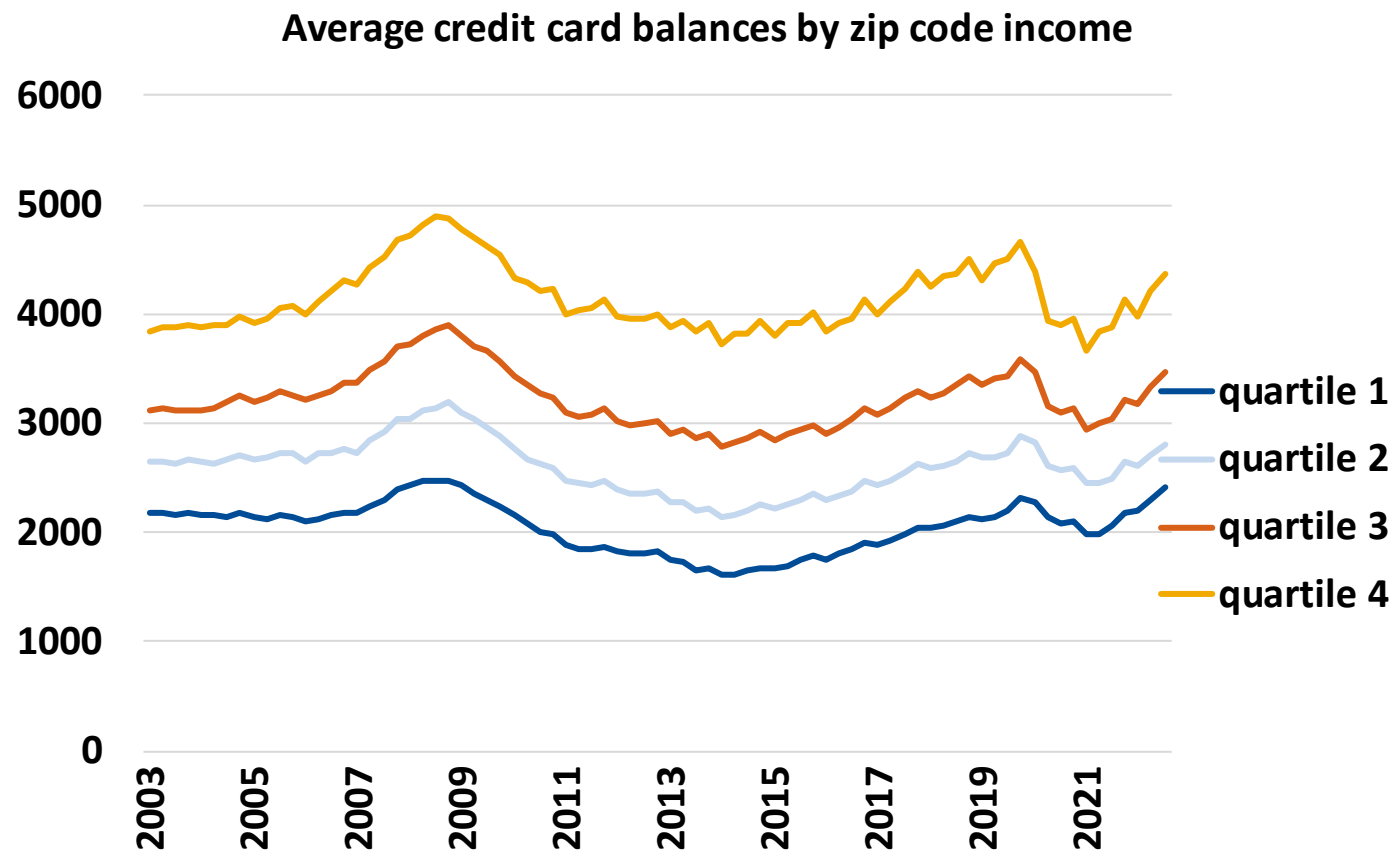




Debt



Source: FRED (Series=TDSP)



Source: NYFED, LSE

	All	0-20%	20-40%	40-60%	60-80%	80-90%	90-100%
Credit Card balance as a share of household inc by inc quantile	5.7%	2.1%	3.8%	4.4%	6.8%	8.7%	12.5%

Source: FED SCF tables for 2019

Other Saving Estimates

- Micro saving estimates based on household data: Balestra and Oehler (2023)
  - U.S. estimates prepared for OECD ICW group, using SCF (2016)
  - Saving by income quintile

Inc Quintile	Mean Savings	Median Savings	Ratio: Inc/Cons	Share of hh with savings>0
0-20%	-10,806	-8,727	0.58	16%
20-40%	-2,654	-549	0.87	48%
40-60%	8,719	10,073	1.17	71%
60-80%	26,144	28,466	1.50	88%
80-100%	161,522	73,269	1.82	97%

- Federal reserve banks have produced estimates of “excess savings” – a separate concept covering deviation from the long-run savings rate
  - A number of academic studies also look at this concept
  - Where income distributions are mentioned, find that vast majority of excess savings held by top, and very little by bottom quintiles
- Some work on MPC & MPS – explore estimating these coefficients for future work

Conclusions

- Confirm consumption is distributed significantly **more equally** than income
  - COVID-era transfers led to an increase inequality of PCE from 2019-2021 and decrease in inequality of DPI – jointly the distribution became less concentrated in the tails
  - **Considerable agreement** between deciles of income and consumption (50% within a decile), but 25% more than one quintile – is this due to national accounts framework?

- **Personal Saving is negative for bottom half of the distribution,** but mostly stable over the period, largely due to out-of-pocket health expenditures, housing expenditures, and excluded income sources. Not due solely to macro scaling.

- The top quintile (when ranked on equivalized DPI) **has 33% of PCE (compared to 48% of DPI),** while the bottom quintile has 12% of PCE (compared to 6% of DPI) in 2017

Questions for the Committee

1. Is the comparable income concept appropriate for linking the dataset? Can it be improved?
2. Are there any methodological improvements in household allocation that can be made?
3. What are some additional contributing factors to negative personal saving at the bottom of the distribution to consider?

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Thank you!

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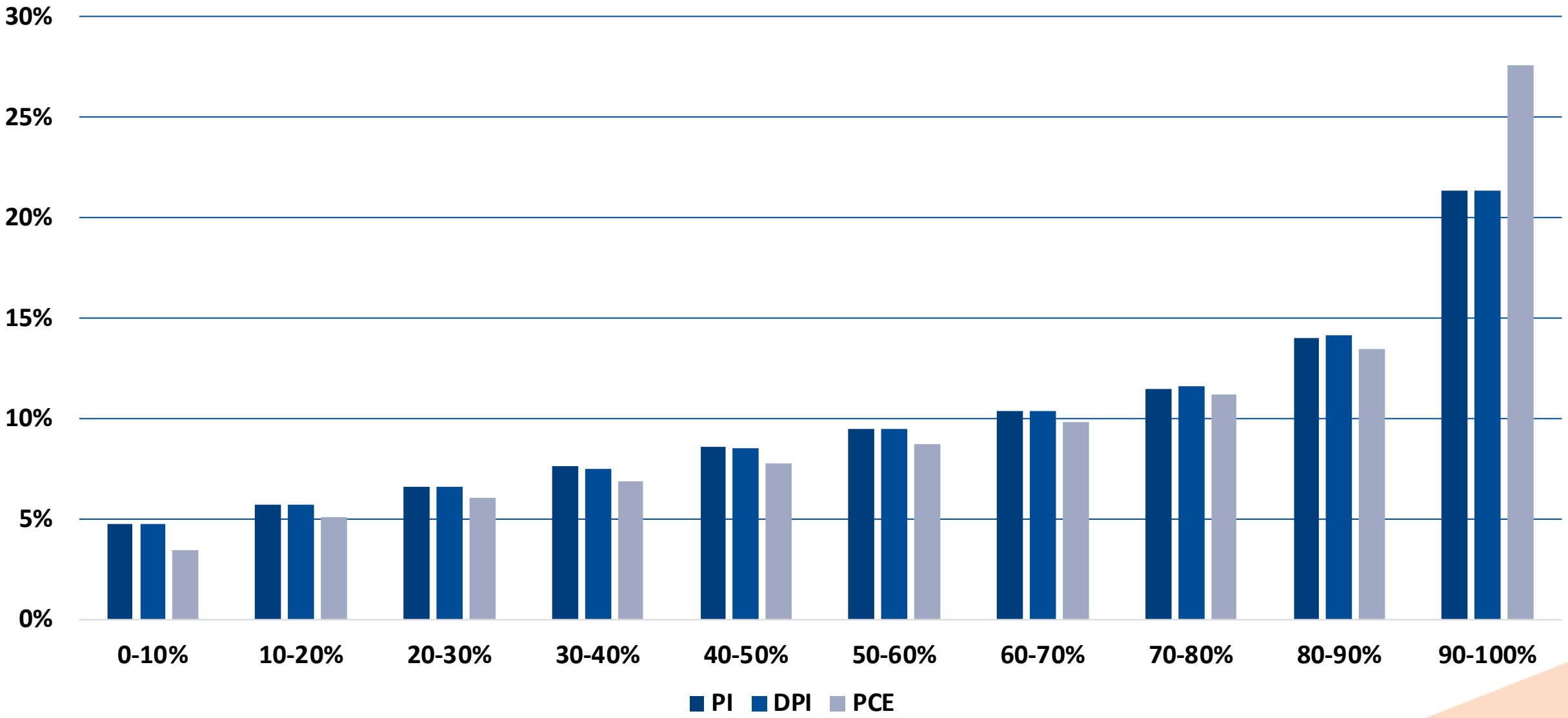
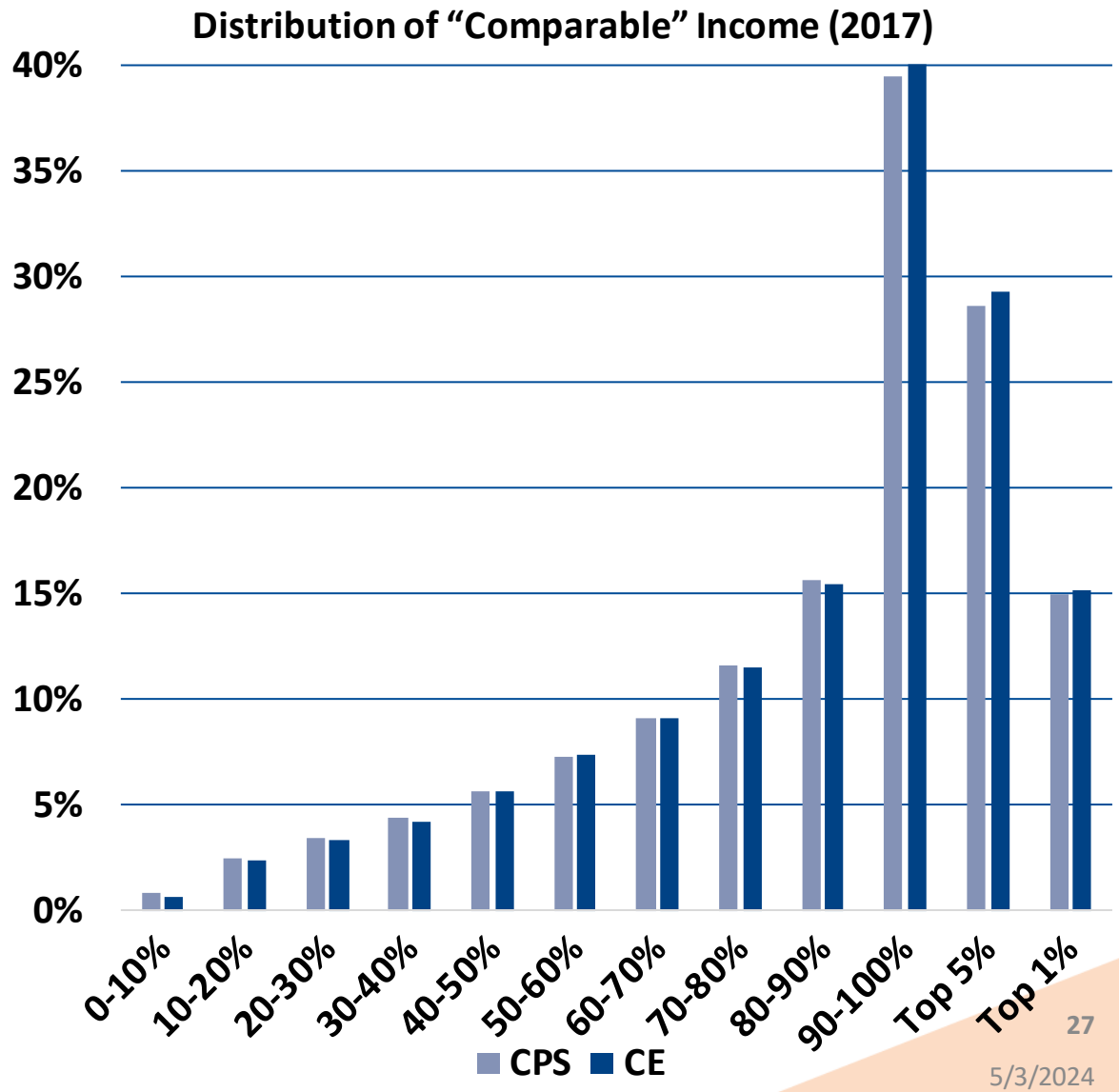
Shares of PCE for 2017 (with different rankings)



What is Comparable Income?

Comparable income is constructed from

1. Wages and Salaries
2. Self-employment
3. Net Rental Income
4. Interest and Dividends
5. Social Security
6. Supplemental Security Income
7. Unemployment Insurance
8. Veteran's Benefits
9. Earned Income Tax Credit
10. Child Tax Credit
11. Welfare + WIC + Food Stamps



Variables for Comparable Income Imputation

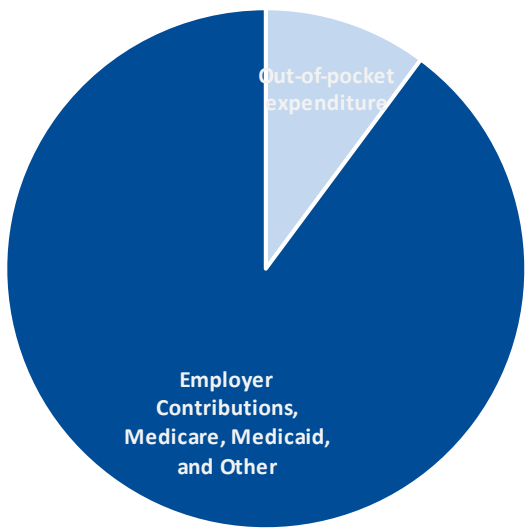
Comparable income consists of:

NIPA Table and Line	NIPA Categories	CPS ASEC Variables	CE Variables
Table 2.1, line 3	Wages and Salaries	hwsval	fsalarym
Table 2.1, line 10 + 11	Self-employment	hseval, hfrval	fsmpfrxm
Table 7.9, line 2	Net Rental Income	hrntval	Netrentm
Table 2.9, line 27:28	Interest and Dividends	hintval, hdivval	intrdvxm
Table 3.12, line 5	Social Security	hssval	frretirm
Table 3.12, line 23 + 36	Supplemental Security Income	hssival	fssixm
Table 3.12, line 7 + 14 +17	Unemployment Ins + Veteran's Benefits	hucval, hvetval	othregxm
Internal table	Earned Income Tax Credit	eit_cred	from TAXSIM (TTX2 file)
Internal table	Child Tax Credit	ctc_crd + actc_crd	from TAXSIM (TTX2 file)
Internal table	Welfare + WIC + Food Stamps	hpawval, hfdval, hrnumwic	jfs_amtm, welfarem, fam_size

Methods to Harmonize Overlapping PI & PCE Components

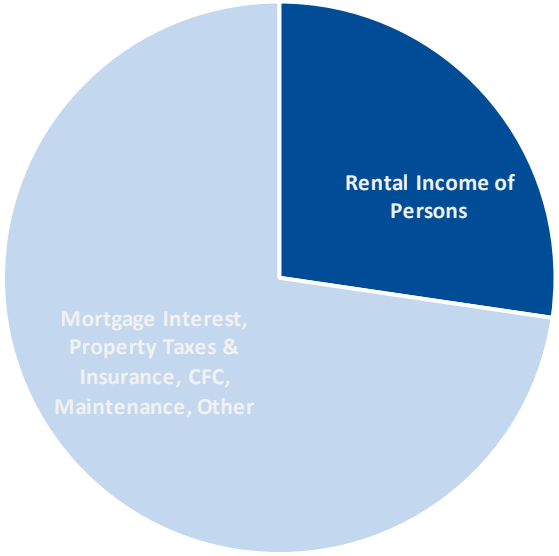
- Health
  - Some components of PCE health care are also contained in PI → Those components are imputed using CPS data to be the same for both the distribution of DPI & PCE
  - PI = dark blue, PCE = full circle

PCE Health Care



- Housing
  - Some components of PCE housing are also contained in PI → The owner-occupier components are imputed using CE rental equivalence so they are consistent for both the distribution of DPI & PCE
  - PI = dark blue, PCE = full circle

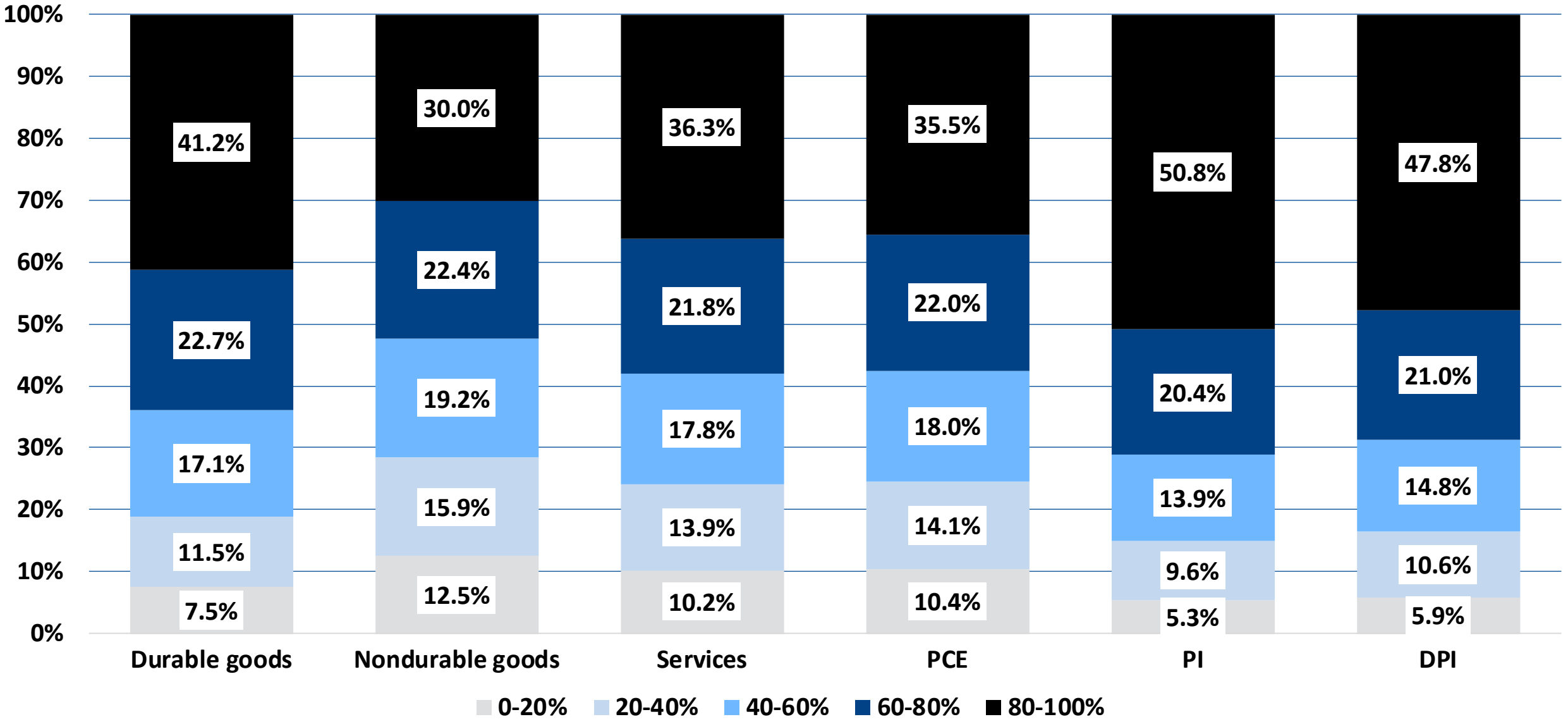
PCE Housing



Multiple Imputation with Predictive Mean Matching

- Rank CE and CPS on equivalized comparable income and create deciles
- Estimate separate models **for each decile and tenure group (owner or renter)** in CE
- Total PCE is modeled as a function of demographics & income source indicators
- Predicted values form measures of distance between obs in CE & CPS
- Match is chosen from the 5 “closest” CE obs to each CPS obs
- The chosen CE obs vector of PCE values is assigned to the CPS obs
- Distributional statistics are computed 5 times using the CPS (one for each of the multiple imputations). Our results are the averages

Quintile Breakout: ranked on equivalized DPI (2017)



Comparison of 2017 Results with Fisher et al. (2022) Results

- Similar results, but less concentration at the tails in our analysis
- Different definitions and concepts
  - Gindelsky and Martin (2024) includes many more transfers (incl. Medicare/Medicaid)
  - Fisher et al. (2022) includes realized capital gains
  - Fisher et al. (2022) doesn't scale to national accounts
- Different base datasets
  - Gindelsky and Martin (2024) uses CPS; Fisher et al. (2022) uses SCF
  - Fisher et al. (2022) uses some CE data, while Gindelsky and Martin (2024) uses only CE

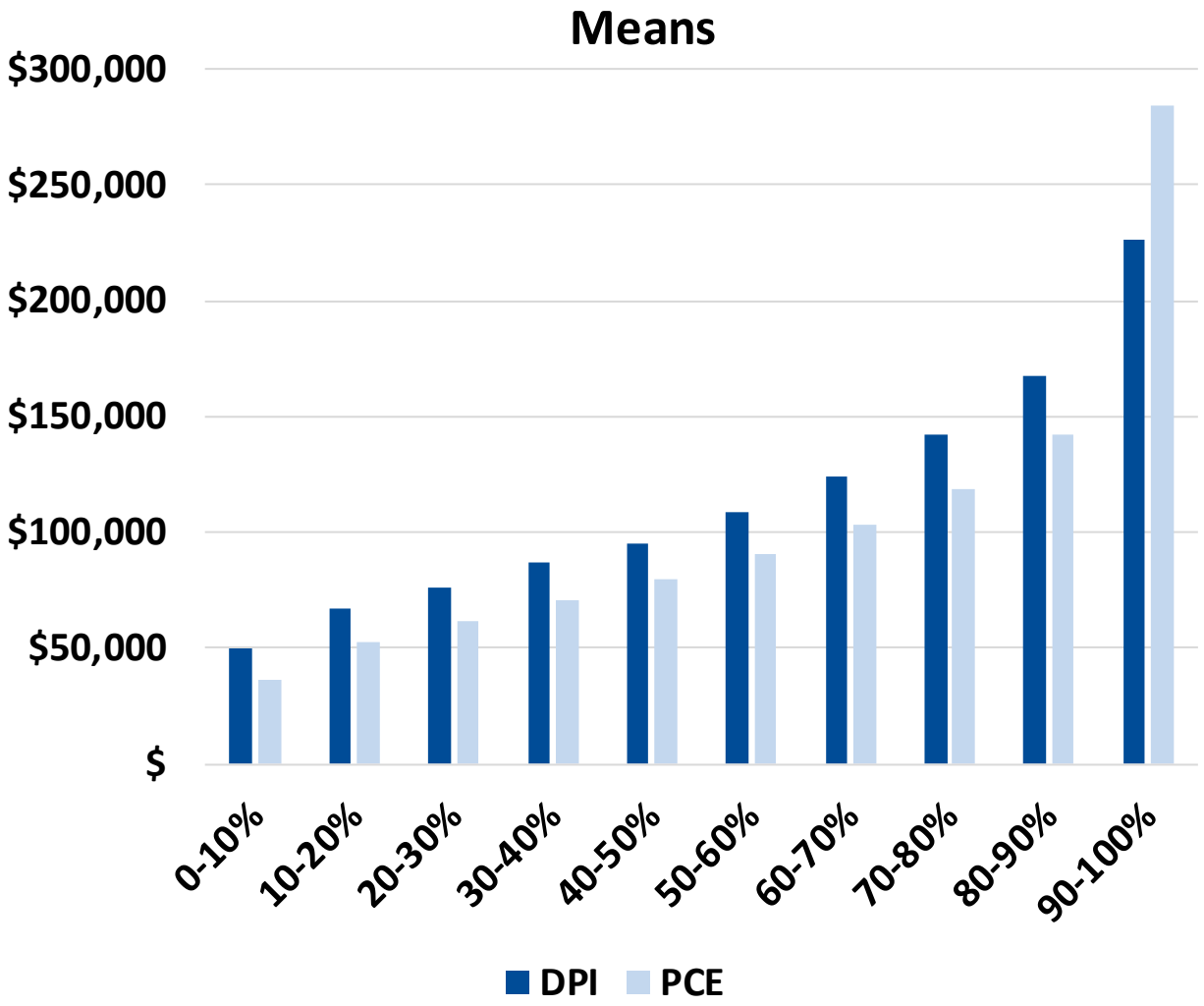
Gindelsky and Martin (2023)

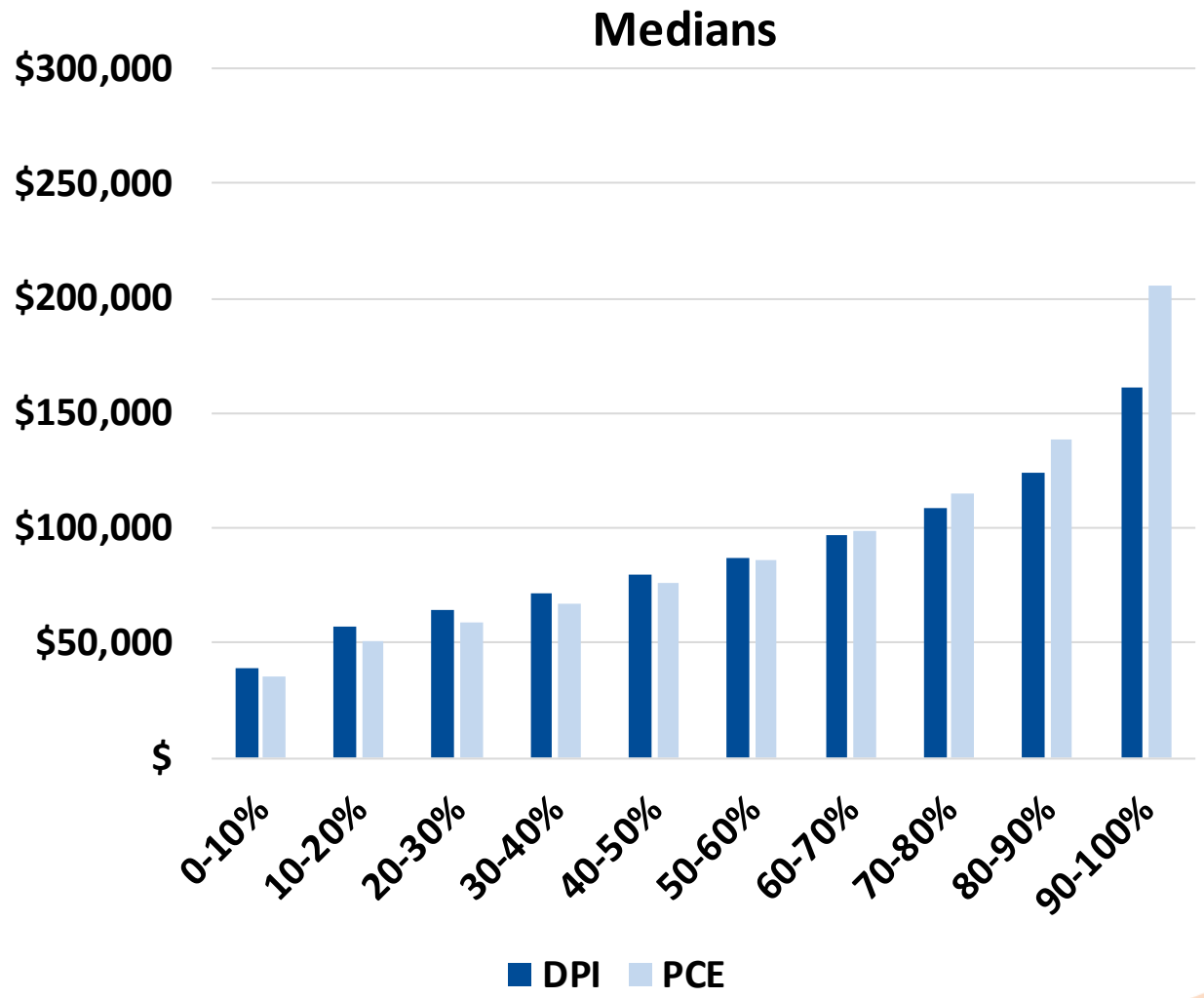
Personal Income Quintiles	Personal Consumption Expenditure Quintiles					
		0-20%	20-40%	40-60%	60-80%	80-100%
	0-20%	11%	5%	2%	1%	1%
	20-40%	5%	6%	5%	3%	1%
	40-60%	2%	5%	6%	5%	2%
	60-80%	2%	4%	6%	6%	3%
	80-100%	0%	1%	2%	5%	11%

Fisher et al. (2022)

Income Quintiles	Consumption Expenditure Quintiles					
		0-20%	20-40%	40-60%	60-80%	80-100%
	0-20%	10%	5%	3%	1%	0%
	20-40%	6%	5%	5%	3%	1%
	40-60%	3%	5%	5%	5%	2%
	60-80%	1%	3%	5%	6%	5%
	80-100%	0%	1%	2%	5%	12%

Comparing Means and Medians (ranked on eq. PCE)





Income Share	Mean DPI	Mean PCE
Top 5%	$256,549	$392,175
Top 1%	$300,638	$871,545

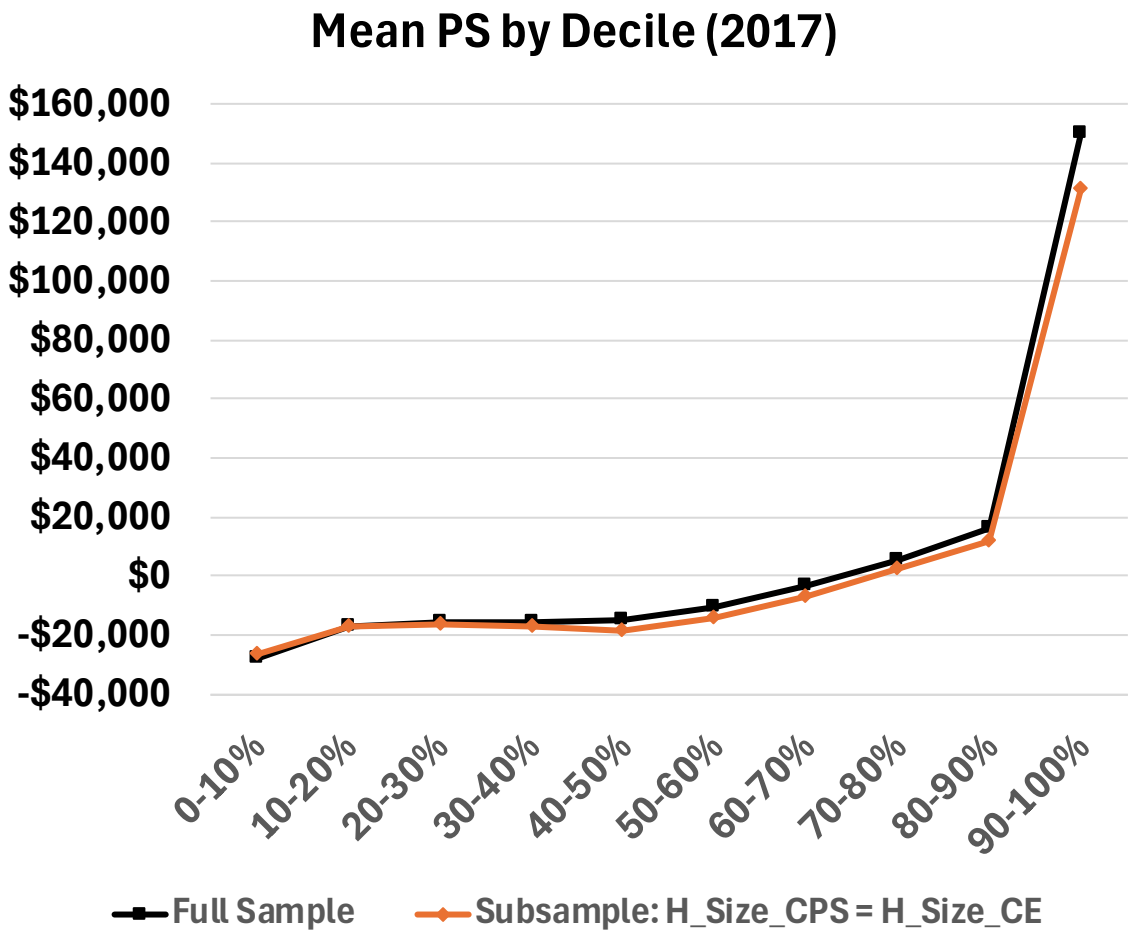
Impact of (Excluded) Retirement Income

- Non-social security retirement disbursements increase median household money income in the CPS by 10% in 2017 (~$5k)
- Including retirement income for households shifts 11% of those in Q1 to a higher quintile
- However, retirement income is underreported in the CPS ASEC
- From Bee and Mitchell (2017 for 2012 data), can see a very big increase in income for those over 65+, throughout the distribution, from replacing survey values with retirement with administrative values

Quantile of Over-65 Households	% Increase in retirement Income from ADREC
5	13.26%
10	11.64%
25	18.21%
50	24.54%
75	21.46%
90	15.29%
95	15.39%
Mean	20.88%

Source: Bee and Mitchell (2017), Table 4B

Impact of Household Size Mismatch on Estimated Savings



- The CE-CPS matching is done by decile of equivalized comparable income
- Household size indicators (1,2,3,4,5,6 7+) are included in the distance function, with agreement between the CE and CPS variable occurring 53% of the time
  - In 80% of matches, household size agrees to within one person
- Mismatch between household size, while potentially related to imputation error, is not driving the relationship between PS and DPI