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64TH WORLD STATISTICS CONGRESS

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bea
Bureau of Economic Analysis
U.S. DEPARTMENT OF COMMERCE

IPS 422: Measuring Inequality in Income, Consumption and Wealth

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

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Monday July 17, 2:00PM-3:40PM

Outline

- Defining Income and Consumption

- Constructing Independent Distributions

- Joint distribution

  - Methodology

  - Results

  - Comparison to other results

Research Question

- Can we relate income and consumption of households with aggregate economic growth?

- Construct a household-level joint distribution of income and consumption, such that the values sum to national accounts totals

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

- Demographic disaggregation helps explain concentration in the tails (Garner 1993, Fisher et al. 2022)

- 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: 2017

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**) (2018 survey)

67,859 households: detailed income questions about the previous calendar year

Consumption: Consumer Expenditure Survey (**CE**)

8,238 consumer units with ≥2 interviews: expenditures 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

Independent Distributions: A Comparison

- Income distribution is significantly less equal than consumption
- Median income and consumption are comparable
- The largest difference between the distributions is in top quintile (esp. top 5%)

| Inequality Metric	DPI ($2017)	PCE ($2017)
Mean	$115,931	$101,932
Median	$83,551	$82,500
0-20% Share	5.8%	8.6%
20-40% Share	10.6%	12.9%
40-60% Share	14.8%	16.4%
60-80% Share	20.9%	21.1%
80-100% Share	47.9%	40.9%
Top 1% Share	12.4%	8.9%
Top 5% Share	23.7%	19.2%
Gini Index	0.42	0.33
90/10 Ratio	4.89	3.63

Joint Methodology Overview

1. Adopt (and/or modify) current distrib of PI ([BEA)](BEA) and PCE ([BLS)](BLS)

2. Create a "comparable" income measure between CE & CPS

3. Assigning CU-Level PCE to CPS Households: Multiple Imputation

4. Computing Distributional Estimates: All shares based on equivalized income and consumption (see next slide)

Prototype year: 2017

Distribution of "Comparable" Income is Similar
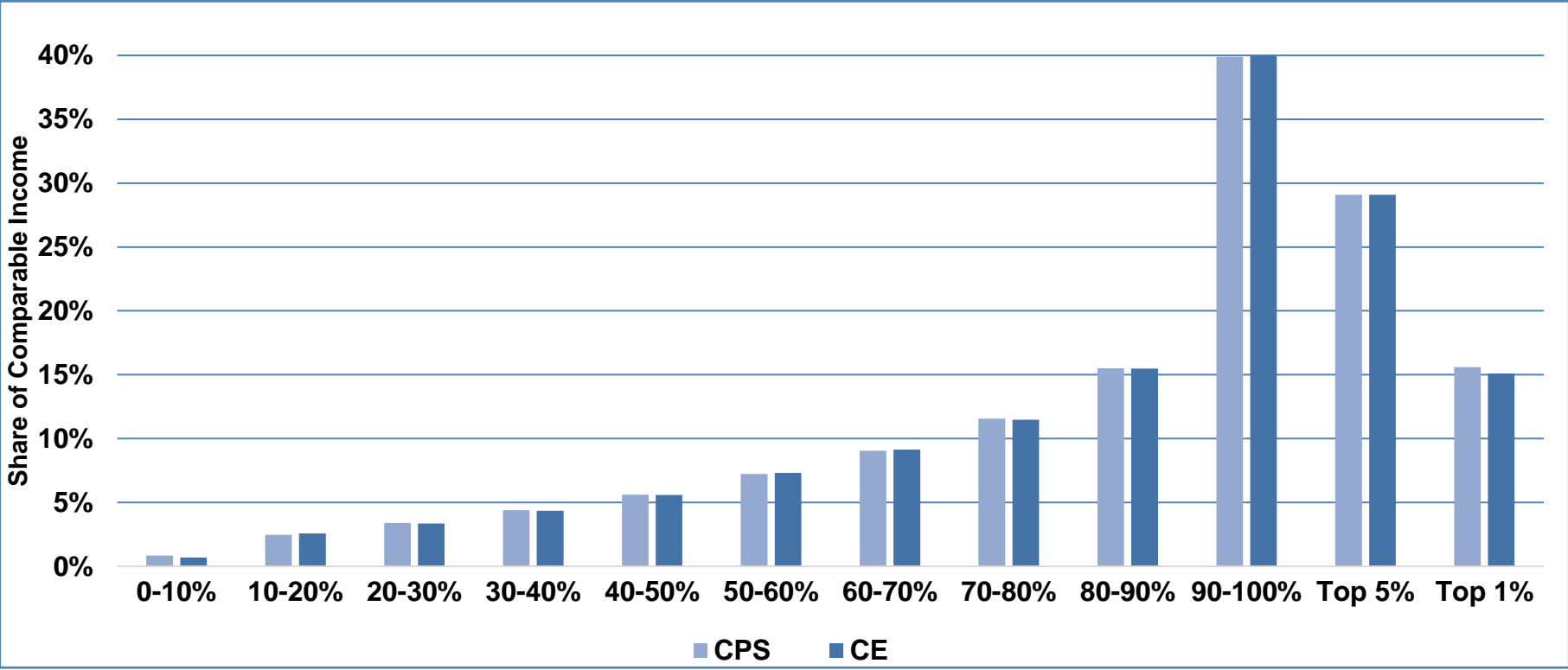
# Multiple Imputation with Predictive Mean Matching

- Rank CE and CPS on equivalized comparable income and create deciles

- Estimate separate models **for each decile** 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
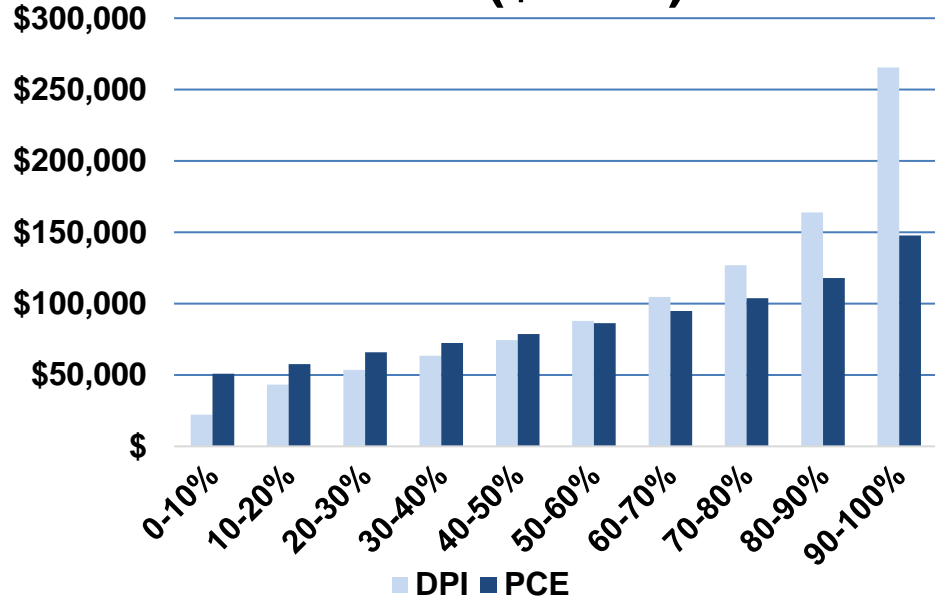
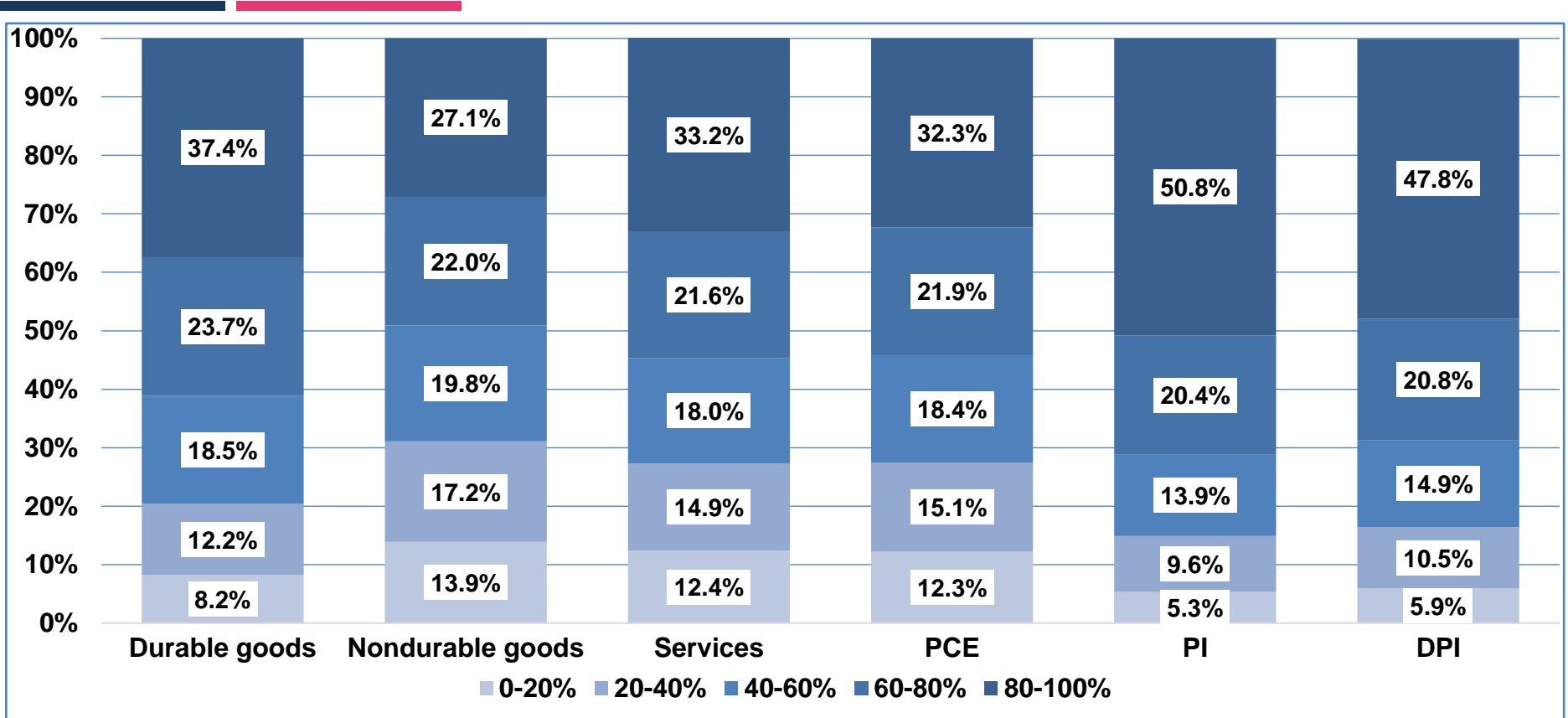# Comparing Means and Medians (ranked on eq. DPI)

Means ($2017)
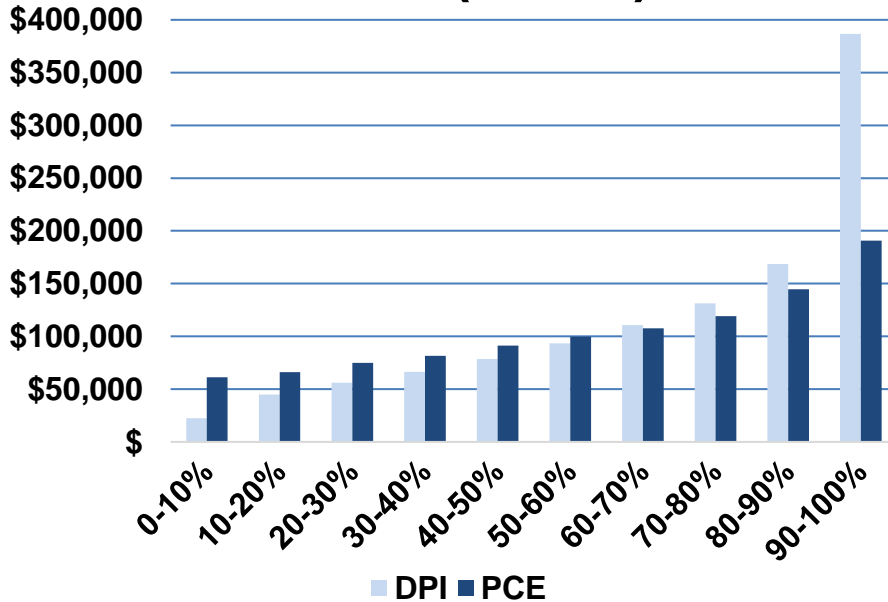
Medians ($2017)

Income Share	Mean DPI	Mean PCE
Top 5%	$548,554	$197,353
Top 1%	$1,431,805	$204,077

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

Quintile Breakout (ranked on equivalized DPI)

Stacked bar chart showing quintile breakout by category:

	Durable goods	Nondurable goods	Services	PCE	PI	DPI
80-100%	37.4%	27.1%	33.2%	32.3%	50.8%	47.8%
60-80%	23.7%	22.0%	21.6%	21.9%	20.4%	20.8%
40-60%	18.5%	19.8%	18.0%	18.4%	13.9%	14.9%
20-40%	12.2%	17.2%	14.9%	15.1%	9.6%	10.5%
0-20%	8.2%	13.9%	12.4%	12.3%	5.3%	5.9%

Legend: 0-20% | 20-40% | 40-60% | 60-80% | 80-100%

Joint Distribution Results: Cross Shares

- Income-consumption cross-shares [similar to Fisher et al. (2022)]
- Table A shows the share of income held by those in each joint income-consumption quantile (i.e., the top joint quintile has 25% of total DPI)
- Table B shows the share of consumption held by those in each joint income-consumption quantile (i.e., the top joint quintile has 23% of total PCE)
- The row (column) totals show the total for each DPI (PCE) quantile

		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%	11%
	40-60%	3%	4%	3%	3%	2%	0%	15%
	60-80%	2%	4%	5%	6%	4%	1%	21%
	80-100%	1%	3%	6%	12%	25%	9%	48%
	Top 5%	1%	1%	2%	5%	15%	6%	24%
	Total	12%	15%	18%	23%	32%	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%	1%	13%
	20-40%	3%	3%	3%	3%	3%	1%	15%
	40-60%	2%	3%	4%	4%	5%	2%	18%
	60-80%	1%	2%	5%	6%	8%	3%	22%
	80-100%	0%	1%	3%	6%	23%	12%	32%
	Top 5%	0%	0%	1%	1%	8%	5%	10%
	Total	9%	13%	17%	21%	40%	19%	100%

Comparison with Fisher et al. (2022) Results

- Similar results, but less concentration at the tails in our analysis

- Different income definitions
  - Gindelsky and Martin (2023) includes many more transfers
  - Fisher et al. (2022) includes capital gains
  - Fisher et al. (2022) doesn't scale to national accounts

- Different base datasets
  - Gindelsky and Martin (2023) uses CPS; Fisher et al. (2022) uses SCF
  - Fisher et al. (2022) uses some CE data, while Gindelsky and Martin (2023) uses only CE

Gindelsky and Martin (2023)

		Personal Consumption Expenditure Quintiles				
		0-20%	20-40%	40-60%	60-80%	80-100%
Personal Income Quintiles	0-20%	8%	5%	3%	2%	1%
	20-40%	6%	5%	4%	3%	2%
	40-60%	4%	5%	5%	4%	3%
	60-80%	2%	3%	5%	6%	4%
	80-100%	1%	2%	3%	5%	10%

Fisher et al. (2022)

		Consumption Expenditure Quintiles				
		0-20%	20-40%	40-60%	60-80%	80-100%
Income Quintiles	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%

Measurement Challenges: Independent Dist

- **Scope:** CPS and CE are only non-institutional households → Add NPISH imputation

- **Definitional alliance:** Some macro concepts don't match survey questions well. Others have no micro equivalent → Imputations may increase measurement error

- **Survey Design (CE):** CE has two independent samples, both <u>on rolling basis</u> (e.g., not CY). This analysis is based on interview (some diary items imputed)
  - Diary: more frequent purchases (2-week period)
  - Interview: big-ticket items (quarterly)

- **Underrepresented at the top:** CPS and CE are known to underrepresent high income households → Tail Adjustment

Measurement Challenges: Joint

All aforementioned challenges of independent distributions

+

- **Coverage of concepts:** one survey does not have all info

- **Misalignment of Surveys:** income dist. of CPS lies to the right of CE (more skewed)

- **Sample size:** imputing consumption items from a relatively small sample

- **Tail adjustment:** have some tax record info on tail of income distribution, no analog for consumption tail

- **Disconnect between micro and macro concepts due to imputations:** 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

Conclusions

- Confirm consumption is distributed significantly **more equally** than income

- **Significant heterogeneity depending on the sources** of consumption and income

- The top quintile (when ranked on equivalized DPI) **has 32% of PCE (compared to 48% of DPI),** while the bottom quintile has 12% of PCE (compared to 6% of DPI)

- **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?

- **Black, young, and lower educated reference persons** **are overrep. at bottom** of the joint dist, compared to indep dist: greater representation across multiple dimensions

- **Joint distribution of upper decile looks like average** of independent distributions

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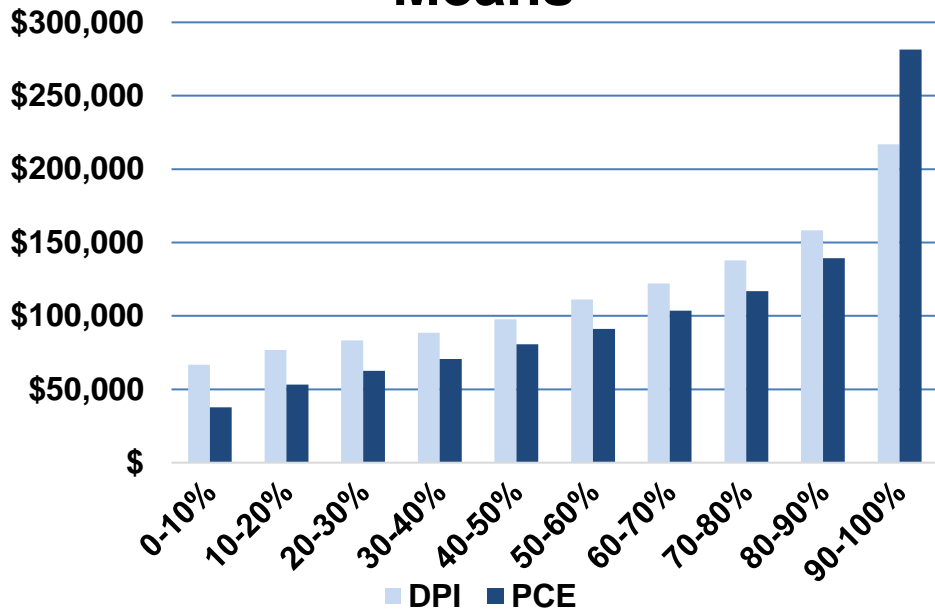64TH WORLD STATISTICS CONGRESS

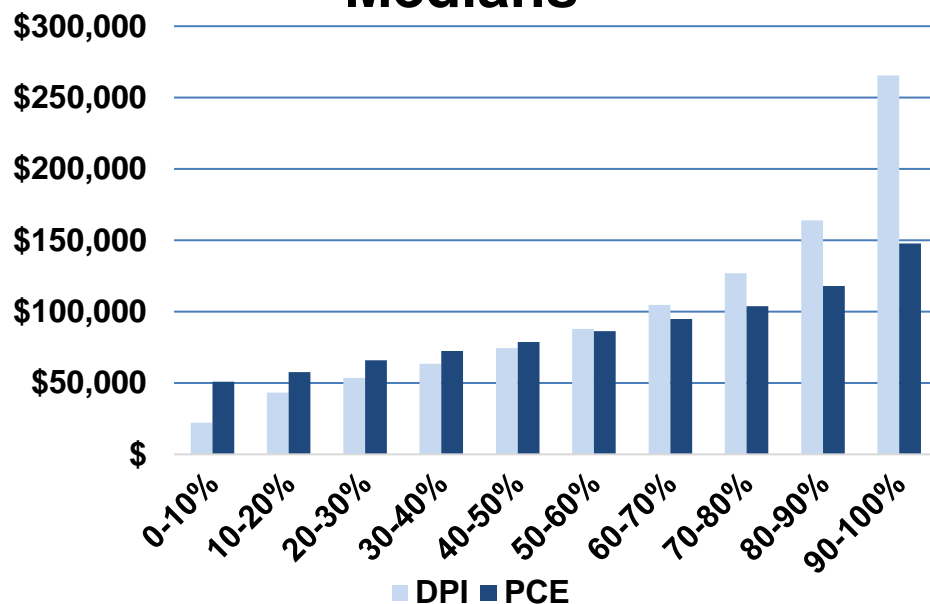# THANK YOU.

Shares of PCE (with different rankings)
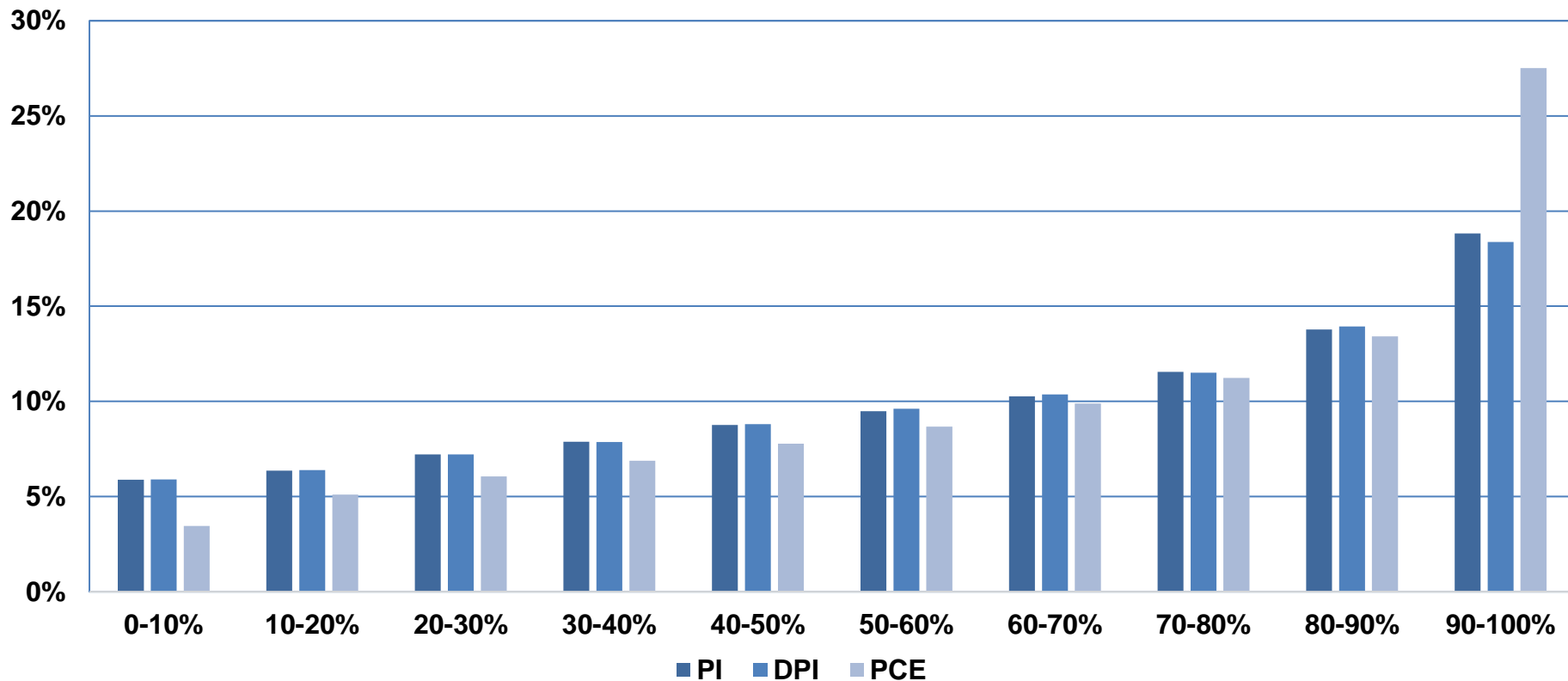
# Comparing Means and Medians (ranked on eq. PCE)

Means

(Bar chart comparing DPI and PCE across income deciles from 0-10% to 90-100%, y-axis from $0 to $300,000)

Medians

(Bar chart comparing DPI and PCE across income deciles from 0-10% to 90-100%, y-axis from $0 to $300,000)

| Income Share	Mean DPI	Mean PCE
Top 5%	$243,021	$389,115
Top 1%	$239,625	$854,754

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

# Demographic Disaggregation: Race of Reference Person
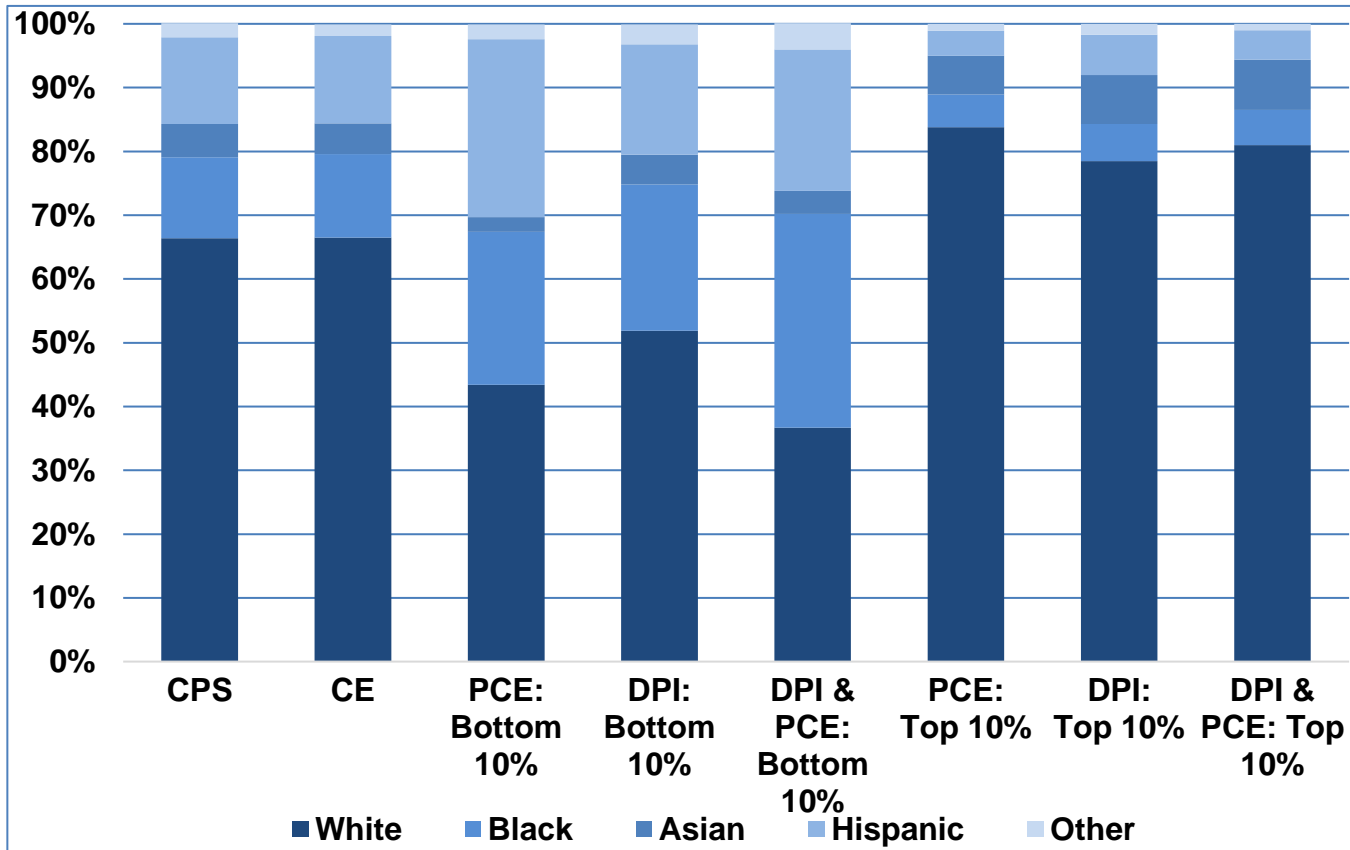
- CE & CPS have similar distributions
- Whites are significantly overrep. in top 10% and underrep. in bottom 10%
- Relative to indep. dist, Blacks are overrep. in bottom decile of joint dist.
- Joint dist. in top 10% reflects the average of the indep. dist

Demographic Disaggregation: Age
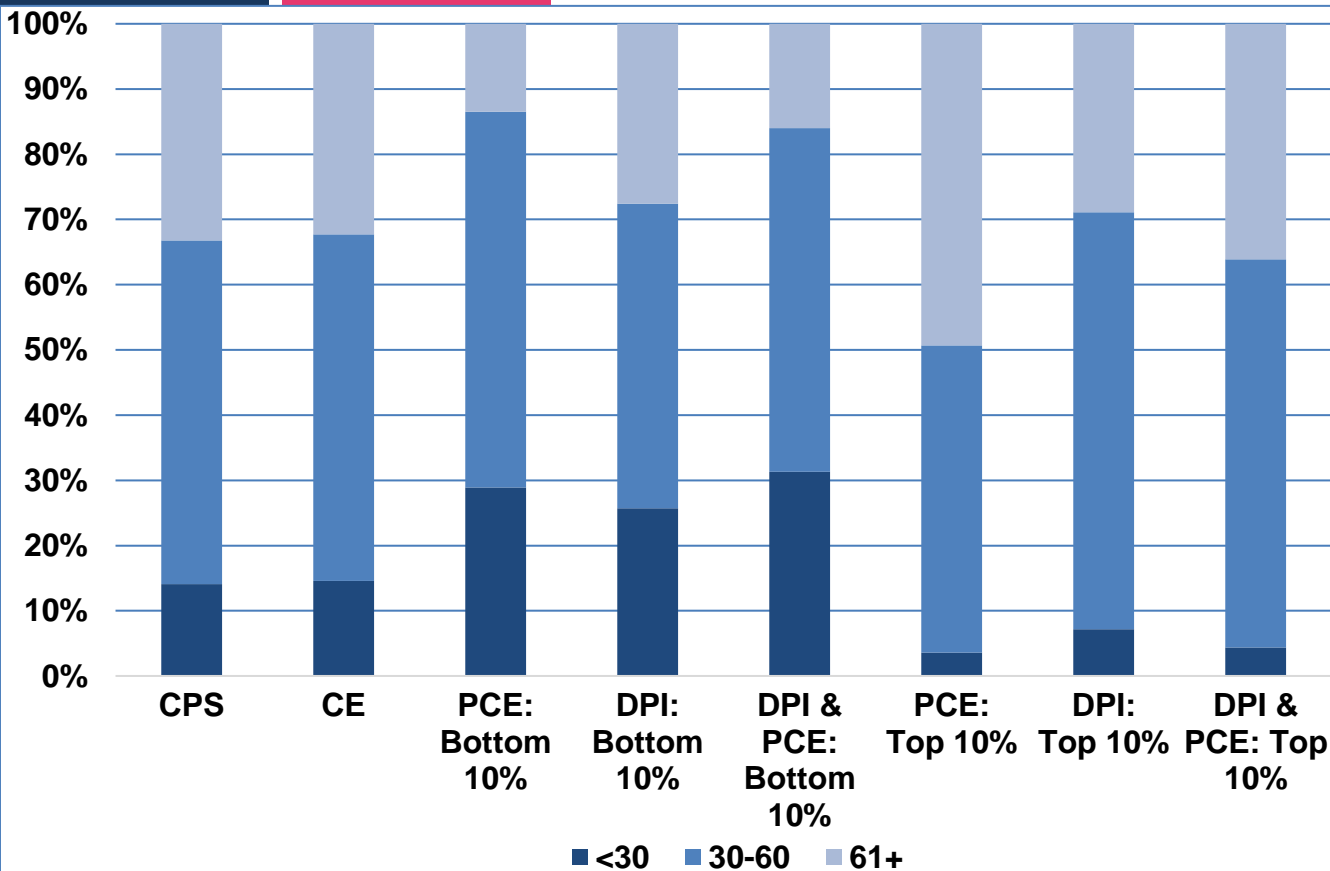
- CE & CPS have similar distributions
- Younger hh significantly underrep. in top 10% & overrep. in bottom 10%
- Relative to indep. dist, younger hh overrep. in bottom decile of joint dist.
- Joint dist. in top 10% reflects the average of the indep. dist

Demographic Disaggregation: Educational Attainment
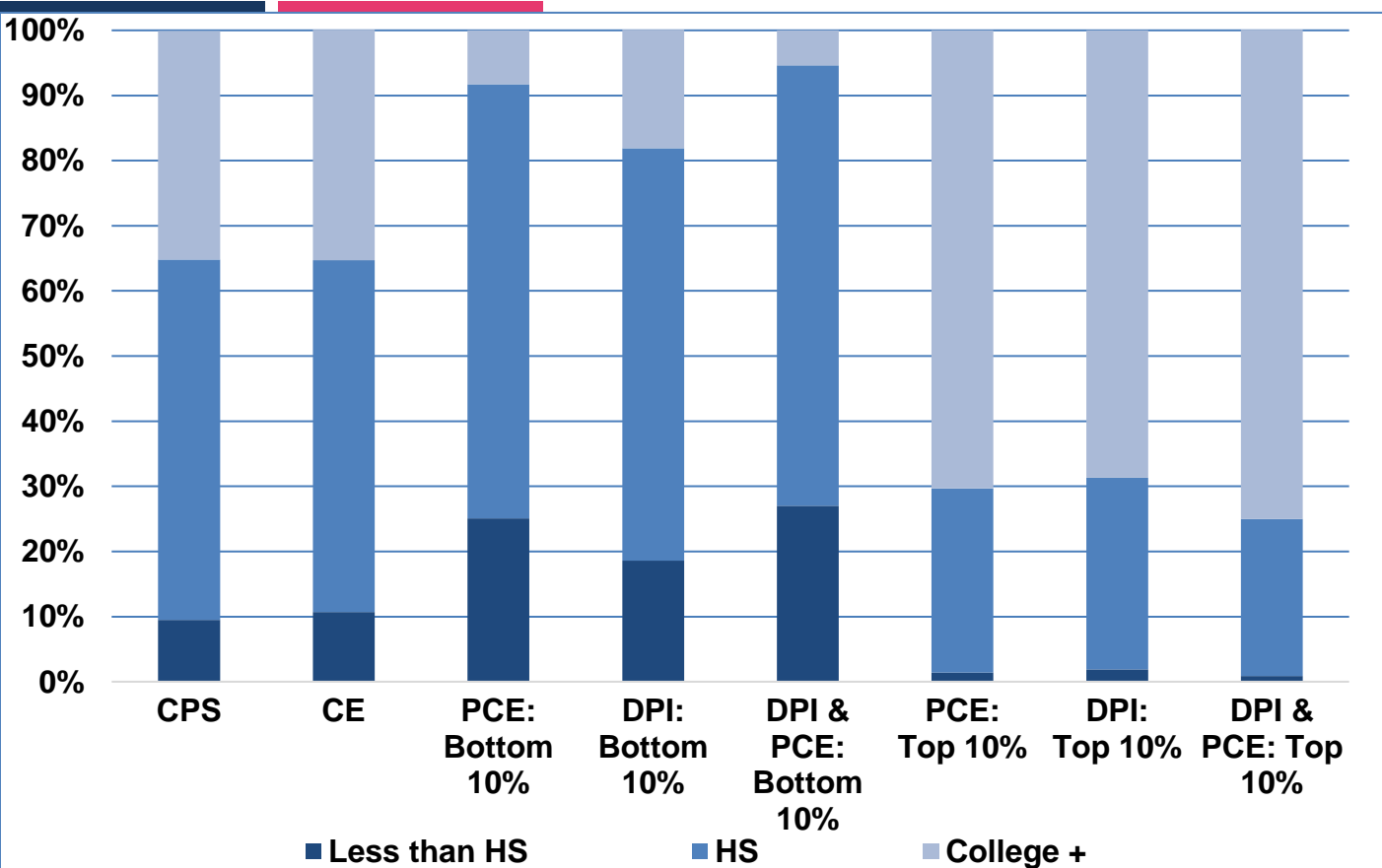
- CE & CPS have similar dist.
- <High School hh are significantly overrep. in bottom 10% and underrep. in top 10%
- Relative to indep. dist, <HS hh are overrep. in bottom decile of the joint dist.
- Joint dist. in top 10% reflects the average of the indep. dist