Inflation and Inequality

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November 4, 2022
Introduction

What are the distributional effects of inflation?

- Cost-of-living inequality
- Assets and liabilities
- Earnings (indexation, bargaining)
- Markups

In this talk, focus on:

1. the measurement of cost-of-living inequality
2. the implications for monetary and fiscal policy according to benchmark economic models
Roadmap

1 Measurement
   ▶ Real-time inflation inequality: new estimates
   ▶ Long run trends

2 Policy implications
Real-Time Inflation Inequality: New Estimates

- Constructs high-frequency and timely inflation distributions for the United States from public data sources
  - In the spirit of distributional national accounts (e.g., Saez-Zucman 2022 for nominal income)

- Simple methodology to estimate monthly inflation by income groups, race, age, etc., consistent with monthly releases of CPI
  - Use only publicly-available statistics: CPI price series (monthly), CEX expenditure microdata
  - Follow exact same price index construction steps as BLS: CEX used to update product weights in December of every other year
  - Add one disaggregation step to obtain expenditure shares and price indices by socio-demographic groups

- This approach also delivers monthly household-level price indices
Inflation Inequality: Baseline

Price Index (May 2020 = 1)

Overall CPI

Excluding gas & new/used vehicles

01 jul 2020
01 jan 2021
01 jul 2021
01 jan 2022
01 jul 2022
Inflation Inequality by Income Percentile

Cumulative CPI Inflation, May 2020 - May 2022, %

Household Income Percentile

Cumulative CPI Inflation, May 2020 - May 2022, %

Household Income Percentile
Inflation Inequality by Income Percentile: Excluding Gas & Vehicles

Cumulative CPI Inflation, May 2020 - May 2020, %

Household Income Percentile

Cumulative CPI Inflation, May 2020 - May 2020, %
Inflation Inequality: Rural vs. Urban

[Graph showing the comparison of price indices for rural and urban areas from May 2020 to July 2022, with the price index for May 2020 set as 1.]
Inflation Inequality: Age

![Inflation Inequality: Age chart](chart.png)
Inflation Inequality: Race

![Graph showing inflation inequality by race over time](image-url)
Household-Level Inflation Inequality (with HP filter)
Inflation inequality in the United States in the Long-Run

- Using scanner data for consumer packaged goods (Nielsen) and linked CEX-CPI data, Jaravel (QJE 2019) estimates a long-run trend of inflation inequality in the United States
  - Lower inflation for the rich: inflation is about 30-40 basis point lower on average per year for top income quintile vs. bottom quintile
  - Large magnitude of aggregation bias: important to get micro data for each sector of the economy to accurately measure expenditure shares, effective prices paid, and product variety across sociodemographic groups
- Using internal BLS datasets, Klick and Stockburger (BLS working paper, 2021) confirm these findings
- Sizable implications for the measurement of real income growth across the income distribution
Implications for Real Income Growth

(Collyer, Jaravel, Wimer 2019)
Roadmap

1 Measurement

2 Policy implications
   1 Monetary policy
   2 Taxes & transfers
Monetary Policy & Inflation Inequality: Heterogeneous Price Rigidities and Consumer/Worker MPC

- Need to think about how the transmission mechanisms of monetary policy interact with inflation inequality
  - Are consumers / workers exposed differently to disinflationary policies?
  - Benchmark New Keynesian model: price rigidities, which are heterogeneous across sectors (e.g., Nakamura & Steinsson 2009)

- Clayton, Jaravel and Schaab (2022) study the covariance between price rigidities and consumer/worker MPCs across sectors
  - Stylized fact 1: prices are more rigid in product categories selling to more educated/richer households
  - Stylized fact 2: prices are more rigid in product categories employing more educated/richer households
Implications for Monetary Policy: Intuition

- Due to both earnings and expenditure channel, exposure to monetary policy across households (i.e., to rigidities) covaries with households’ marginal propensities to consume.

- Consider a contractionary monetary policy shock: increase in nominal rate, demand falls, output & prices today fall.

- Expenditure channel: because of differences in price rigidities, prices fall more for the consumption basket of the poor → distributional effects via price indices are “pro-poor”:
  - the monetary policy shock reduces “real income” more for richer households, who have a lower MPC.
  - this leads to a smaller fall in aggregate demand in general equilibrium—that is, this channel dampens the aggregate effect of monetary policy.
Implications for Monetary Policy: Intuition

- Earnings channel: prices fall more in sectors employing the poor, which increases relative labor demand for the poor through changes in consumer demand → distributional effect via nominal earnings are “pro-poor”

  ▶ the monetary policy shock reduces labor earnings more for richer workers, who have a lower MPC

  ▶ this leads to a smaller fall in aggregate demand in general equilibrium—that is, this channel also dampens the aggregate effect of monetary policy

- Thus, accounting for heterogeneous price rigidities and their covariance with MPCs suggests that:

  ▶ monetary policy tightening has better distributional properties (pro-poor) than commonly thought

  ▶ compared with a model with homogeneous price indices and households, stronger tightening is required to achieve the same aggregate outcome
In contrast, the common view emphasizes differences between savers and debtors, implying that household heterogeneity amplifies the effectiveness of monetary policy, because changes in interest rates have a larger direct effect on high-MPC agents (e.g., Auclert 2019)

- an increase in the nominal interest rate reduces consumption more for debtors, who have a higher MPC; this channel *amplifies* the intended fall in aggregate demand in equilibrium

- moreover, monetary policy tightening has *pro-rich* distributional effects through the debtor-savor channel

Quantifying the relative importance of the two channels (savor-debtor vs. heterogeneous price rigidities) is work in progress...
Fiscal Policy with Inflation Inequality

- Taxes & transfers:
  - Indexation of social benefits and the poverty line
  - Optimal taxation
Optimal Taxation

- Jaravel and Olivi (2022) study optimal taxation in a Mirrlees model with non-homotheticities.

- Consider heterogeneous inflation shocks across product categories:
  - Heterogeneity in consumption baskets affects the value of redistribution at different points of the income distribution.

- If inflation is higher at the bottom of the income distribution, how does the equity-efficiency tradeoff change?
  - Main force: the social marginal utility of redistributing an additional dollar to low-income groups decreases.
    (other forces: substitution/income effects on labor supply)
  - Bottom line: in a utilitarian framework, observed heterogeneous inflation rates, which are lower for luxuries relative to necessities in the United States, generate a regressive optimal tax response.
Optimal Taxation: Result

Figure 1: The Response of the Optimal Tax Schedule to Observed Price Shocks (2004-2015), CEX-CPI data

(i) $\sigma = 0.6$

(ii) $\sigma = 2$

Notes: the IRS parameter is set to $\alpha = 0.3$ and the labor supply elasticity to $\varepsilon = 0.21$; the CEX-CPI dataset is used in both panels and the initial tax schedule is taken from Hendren (2020). See Section 5.2.1 for a description of the quantitative model and counterfactuals.
Conclusion
Conclusion

Recent evidence suggests that inflation inequality can be first-order, and that taking into account the distributional consequences of price changes is essential in several areas of policy making, from redistributive taxation to monetary policy.

Much remains to be learned:

- Getting access to granular price and expenditure data for all sectors of the economy
- Accounting for inflation inequality for optimal monetary + fiscal policy in a unified framework, including political economy considerations / reference dependence

More detail in Annual Review of Economics survey article (Jaravel 2021)
Appendix
Monthly CPI

![Graph of monthly CPI from 01 Jul 2020 to 01 Jul 2022, showing seasonally-adjusted monthly CPI with annualized rate in %.]
Inflation Inequality – CEX (Jaravel 2019)

A: Törnqvist, All Spending

- Törnqvist Annual Inflation Rate, Avg. 2004-2015, %
- Household Income Quintile

The chart shows the Törnqvist annual inflation rate across different household income quintiles. The rate decreases as the quintile increases, indicating a higher inflation rate for lower income households compared to higher income households.
### Aggregation Bias – Nielsen (Jaravel 2019)

<table>
<thead>
<tr>
<th>Aggregation Level</th>
<th>Δ Inflation rates, continuing products</th>
<th>Δ Log Feenstra variety adj.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>pp (1)</td>
<td>% Explained (2)</td>
</tr>
<tr>
<td>Barcodes</td>
<td>0.541</td>
<td>100</td>
</tr>
<tr>
<td>N = 2,240,278</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product Modules by price deciles</td>
<td>0.479</td>
<td>88.6</td>
</tr>
<tr>
<td>N = 10,371</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product Modules</td>
<td>0.358</td>
<td>66.2</td>
</tr>
<tr>
<td>N = 1,042</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product groups</td>
<td>0.291</td>
<td>53.9</td>
</tr>
<tr>
<td>N = 112</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Departments</td>
<td>0.071</td>
<td>13</td>
</tr>
<tr>
<td>N = 10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 6: Laspeyres index annualized percent changes from December 2003 to December 2018

<table>
<thead>
<tr>
<th>Item Category</th>
<th>All urban households (U)</th>
<th>62 years or older (E)</th>
<th>Wage earner (W)</th>
<th>Lowest income quartile</th>
<th>Highest income quartile</th>
</tr>
</thead>
<tbody>
<tr>
<td>All items</td>
<td>2.07</td>
<td>2.17</td>
<td>2.06</td>
<td>2.25</td>
<td>1.97</td>
</tr>
<tr>
<td>Apparel</td>
<td>0.14</td>
<td>0.05</td>
<td>0.10</td>
<td>-0.09</td>
<td>0.23</td>
</tr>
<tr>
<td>Education and communication</td>
<td>1.39</td>
<td>0.69</td>
<td>0.86</td>
<td>1.84</td>
<td>1.77</td>
</tr>
<tr>
<td>Food and beverages</td>
<td>2.19</td>
<td>2.14</td>
<td>2.18</td>
<td>2.13</td>
<td>2.23</td>
</tr>
<tr>
<td>Other goods and services</td>
<td>2.65</td>
<td>2.52</td>
<td>3.07</td>
<td>3.03</td>
<td>2.25</td>
</tr>
<tr>
<td>Housing</td>
<td>2.31</td>
<td>2.32</td>
<td>2.36</td>
<td>2.45</td>
<td>2.17</td>
</tr>
<tr>
<td>Medical care</td>
<td>3.21</td>
<td>3.08</td>
<td>3.29</td>
<td>3.11</td>
<td>3.29</td>
</tr>
<tr>
<td>Recreation</td>
<td>0.70</td>
<td>1.17</td>
<td>0.54</td>
<td>0.92</td>
<td>0.63</td>
</tr>
<tr>
<td>Transportation</td>
<td>1.85</td>
<td>1.92</td>
<td>1.93</td>
<td>2.11</td>
<td>1.68</td>
</tr>
</tbody>
</table>
Monetary Policy: Theory

**Proposition:** In response to our proposed aggregate perturbation, the change in aggregate demand can be decomposed as

\[
dY_1 = \left[ \text{Cov}_I \left( \mu \text{MPC}_{i,1}, b_{i,2} \right) - \frac{1}{\gamma} \mathbb{E}_I (\mu \text{MPS}_{i,1} c_{i,1}) \right] \frac{dR}{R} - \text{Cov}_I \left( \mu \text{MPC}_{i,1}, \frac{b_{i,1}}{\pi^A} \right) \frac{dP^A}{P^A} \\
+ \sum_s \frac{P_t^s}{P_t^A} \left( \mathbb{E}_I (\text{MPC}_{i,1}) + \text{Cov}_I (\mu \text{MPC}_{i,1}, \gamma_i^s) \right) dY_1^s
\]

Heterogeneous earnings effect

\[
+ \sum_t \frac{1}{R_{t-1}} \mathbb{E}_I (\text{MPC}_{i,1}) + \text{Cov}_I (\mu \text{MPC}_{i,1}, \gamma_i^B) \right) Y_t^B \frac{dp}{p}
\]

Relative price effect on earnings

\[
- \sum_t \frac{1}{R_{t-1}} \mathbb{E}_I (\mu \text{MPC}_{i,1} \alpha^i p^{\alpha^i} c_{i,t}) \frac{dp}{p}.
\]

Relative price effect on expenditures