

Experience Effects in Consumption

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Motivation

The crisis has left deep scars, which will affect both supply and demand for many years to come. – Olivier Blanchard (2012)

- What are the long-run implications of financial crises and macroeconomic shocks?
 - ▶ Secular stagnation: Hansen (1939), Summers (2014a), Summers (2014b)
 - ▶ Hysteresis effects: Blanchard and Summers (1986) and Delong and Summers (2012)
- We focus on micro-level evidence as a source of aggregate fluctuations:
 - ▶ Do experiences of economic downturn over an individual's life (so far) induce more cautious consumption, even when times have become better?
 - ▶ Does exposures to prosperous times have the opposite effect?

Overview

- **Psychological underpinning:** availability and recency bias (Kahneman and Tversky (1974) and Tversky and Kahneman (1974))
 - ▶ Experience effects: personal experiences leave an imprint on agents and affect their future decision-making and behavior.
- **Conjecture:**
 - ▶ Individuals who have lived through difficult economic times spend less and exhibit more expenditure switching in response to a downturn, entailing more usage of coupons and purchases of on-sale and lower quality items.
 - ▶ The opposite holds for positive economic experiences during one's lifetime so far.
- **Implication:** Consumption behavior is heterogeneous across cohorts, in normal times and in response to shocks.

Consumption Expenditure by Age Group

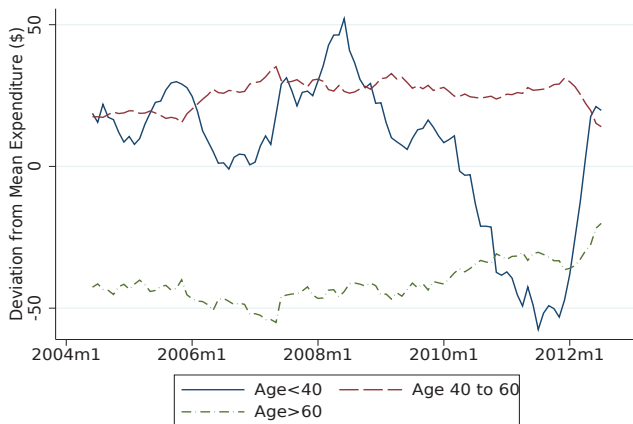


Figure 1: Six-month moving averages of monthly consumption expenditure of the young (below 40), mid-aged (between 40 and 60), and old individuals (above 60), expressed as deviations from the cross-sectional mean expenditure of all individuals. Expenditure deflated by personal consumption expenditure (PCE) price index from the U.S. Bureau of Economic Analysis (BEA). Observations are weighted with Nielsen sample weights. Source: Nielsen Homescan Panel.

Formal Testing

- **Question:** Do households that have lived through more economic downturns spend less on average and exhibit more expenditure switching to lower quality goods, controlling for income and other household characteristics? Does the opposite hold for households that have lived through more prosperous economic times?
- **Methodology**
 - ▶ Measure households' exposure to rougher (or milder) economic times using the rate of unemployment that have occurred in an individual's lifetime so far, as in Coibion, Gorodnichenko, and Hong (2015)
 - ▶ Link unemployment experience to spending decisions, as measured by
 - ★ total expenditure
 - ★ expenditure switching toward using coupons and purchasing on-sale items, generic store brand items, and lower-end products
- **Data**
 - ▶ Nielsen Homescan Panel
 - ▶ Extensions: Consumer Expenditure Survey (CEX) and Panel Study of Income Dynamics (PSID)

Related Literature

- Consumption

- ▶ Seminal works on life cycle-permanent income model: Modigliani and Brumberg (1954) and Friedman (1957)
- ▶ Subsequent developments: Caballero (1990), Carroll (1994), Deaton (1991), Gourinchas and Parker (2002)
- ▶ Models with intertemporal non-separability: Meghir and Weber (1996), Dynan (2000), Fuhrer (2000)
- ▶ Consumption expenditure switching: Nevo and Wong (2014), Coibion, Gorodnichenko, and Hong (2014)

- Experience effects and belief formation

- ▶ Macro-finance: Malmendier and Nagel (2009), Malmendier and Nagel (2013)
- ▶ Other contexts: Giuliano and Spilimbergo (2013), Oreopoulos, von Wachter, and Heisz (2012)

Data

- Nielsen household panel dataset (2004-2012)
 - ▶ Transaction data: 3.5 million household purchase transactions
 - ★ Scanned Universal Product Code (UPC) level data:
Trip specific: Date, store, quantity, price, deals,
Product specific: Brand, type, volume, packaging
 - ▶ Product data
 - ★ Non-food departments:
Alcohol, General merchandise, Health, Non-food grocery
 - ★ Food departments:
Dairy, Deli, Dry grocery, Fresh produce, Frozen food, Packaged meat
 - ▶ Demographic data: 98,547 households.
 - ★ Yearly self-reported household-level data:
Age, sex, race, education, occupation, region of residency, employment status, family composition and household size
- Historical national unemployment data
 - ▶ 1890-1930 (Romer 1986), 1930-1939 (Coen 1973), 1940-present (Bureau of Labor Statistics)

Measures of Consumption

- Total expenditure (\$): total expenditure reported, net of coupon use.
- Consumption expenditure switching
 - ▶ Coupon use (\$): An item is defined as involving coupon usage if the household recorded that item purchased involved using coupon.
 - ▶ Purchase of generic store brand (\$): An item is identified as a store brand product based on the brand code associated with the UPC.
 - ▶ Ranking of purchased products: The ranking is constructed based on unit price of goods in specific product modules, markets and month. The ranking is normalized between 0 and 1, where lower value represents lower-priced goods.
 - ▶ Purchase of on-sale products (quantity): An item is defined as being on sale if the household recorded that the item purchased involved a deal.

Experience Measure

- Lifetime weighted unemployment rate of household i at t :

$$UE_{it}(\lambda) = \sum_{k=1}^{age_{it}-1} w_{it}(k, \lambda) U_{t-k} \quad \text{where} \quad w_{it}(k, \lambda) = \frac{(age_{it}-k)^\lambda}{\sum_{k=1}^{age_{it}-1} (age_{it}-k)^\lambda}$$

- Weighting scheme

- ▶ If $\lambda > 0$, decreasing weights in time lag \Rightarrow more recent experience receive higher weights; if $\lambda < 0$, increasing weights in time lag
- ▶ Apply the linearly declining ($\lambda = 1$) weighting scheme, as estimated in previous work (Malmendier and Nagel 2011, 2013)
- ▶ Underscore all macroeconomic experiences accumulated during an individual's lifetime relative earlier historical data while allow for the possibility for experience effects to decay over time

Weighted Unemployment Experience by Age Group

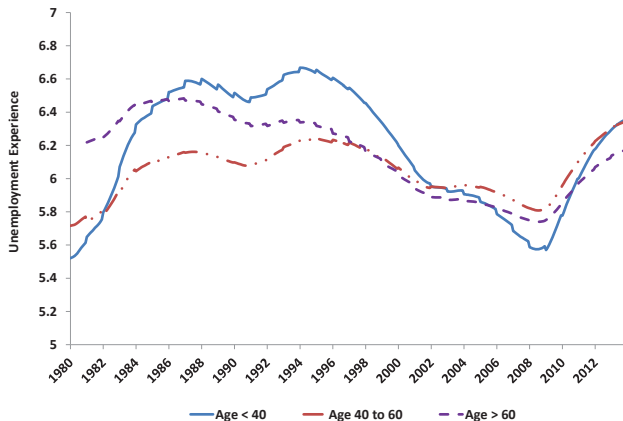


Figure 3: Weighted lifetime unemployment experience of the young (below 40), mid-aged (between 40 and 60), and old individuals (above 60), constructed based on the linearly-declining weighting function.

Summary Statistics

Table 1: Summary Statistics

variable	mean	sd	p10	p50	p90	N
Age of male head of households	50	12	33	49	67	3,913,933
Income	\$50k-\$59k		\$20k-\$25k	\$50k-\$60k	\$100k+	3,913,933
Household size	2.8	1.5	1	2	5	3,913,933
Consumption expenditure	713	534	206	586	1361	3,913,933
Coupon use	.029	.052	0	0	.083	3,903,053
Store brand purchase	.054	.14	0	.23	.52	3,889,055
Product ranking	.47	.11	.34	.47	.61	3,889,168
Sale item purchase	.24	.24	0	.17	.61	3,913,933
Unemployment experience	5.9	0.17	5.8	5.9	6.2	3,913,933

Coupon use is value of coupon use/total expenditure. Store brand purchase is value of store brand items bought/value of all items bought. Product ranking is a ranking of goods that continuously ranges from 0 to 1 based on unit price of goods in specific product modules and markets, where lower value represents lower-priced goods. Sale item purchase is quantity of sale items bought/total number of items bought. The sample period runs monthly from 2004 to 2012.

Estimation

$$C_{imt} = \alpha + \beta UE_{it}(\lambda) + \delta U_t + \kappa(U_{mt} - U_t) + \gamma' x_{it} + \eta_t + \varsigma_m + v_i + \varepsilon_{it}$$

- C_{imt} : measures of consumption of household i in local area m at time t
- $UE_{it}(\lambda)$: lifetime weighted unemployment, given weighting parameter λ
- U_t : current national unemployment condition
- U_{mt} : current county-level unemployment condition
- x_{it} : age controls, income controls, household characteristics (unemployment status, household size, education, and race)
- η_t : time dummies
- ς_m : local area dummies
- v_i : household dummies

Total Consumption Expenditure

	Pooled		FE	
	(1)	(2)	(3)	(4)
Experienced unemployment	-108.2*** (13.93)	-108.7*** (13.94)	-73.44*** (10.29)	-74.81*** (10.32)
National unemployment	-10.51*** (0.495)	-10.55*** (0.497)	-10.55*** (0.472)	-10.60*** (0.474)
Local - National unemployment		-0.850 (0.638)		-1.249*** (0.387)
Age controls	Yes	Yes	Yes	Yes
Income control	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Market area dummies	Yes	Yes	Yes	Yes
Household dummies	No	No	Yes	Yes
N	3771876	3771284	3771876	3771284
R-sq	0.119	0.119	0.011	0.011

Pooled OLS and fixed effects regression with total consumption expenditure in dollars as the dependent variable. Experienced unemployment is a lifetime linearly-declining weighted national unemployment rate experienced by households. Age controls are age and age squared of the male household heads. Household characteristics include unemployment status, household size, education, and race. Regressions are weighted by household sampling weights from Nielsen. The sample period runs from 2004 to 2012. Robust standard errors in parentheses are clustered by household. ***, **, * denote significance at 0.01, 0.05, and 0.1 levels, respectively.

Illustrative Example

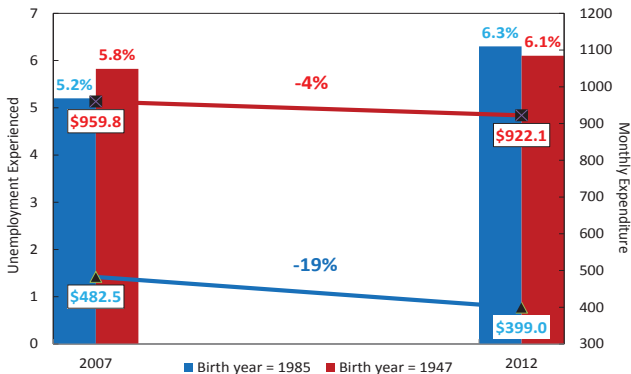


Figure 1: Example of the impact of the Great Recession on weighted lifetime unemployment rate and monthly consumption expenditure of a 22-year-old vs. 60-year-old (as of 2007) from December 2007 to December 2012. The bars show the weighted lifetime unemployment rate based on a linearly-declining weighting scheme. The lines show the monthly expenditure: the values for 2007 are from actual data, and the values for 2012 are calculated based on model estimates.

Age Heterogeneity

	(1) Expenditure	(2) Expenditure	(3) Expenditure
National unemployment positive change	0.615*** (0.135)	0.659*** (0.135)	
Age * National unemployment positive change	-0.0067** (0.0023)	-0.0067** (0.0023)	
National unemployment negative change	-1.238*** (0.270)	-1.197*** (0.271)	
Age * National unemployment negative change	0.0251*** (0.0049)	0.0252*** (0.0049)	
Local unemployment change		-0.0424*** (0.0116)	
Local unemployment positive change			0.471*** (0.0587)
Age * Local unemployment positive change			-0.0083*** (0.0011)
Local unemployment negative change			-0.187** (0.0689)
Age * Local unemployment negative change			0.0019 (0.0012)
Age controls	Yes	Yes	Yes
Income control	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes
Market area dummies	Yes	Yes	Yes
N	3614340	3613719	3613719
R-sq	0.005	0.005	0.005

Use of Coupon

	(1)	(2)	(3)	(4)
Experienced unemployment	0.0216*** (0.00332)	0.0217*** (0.00339)	0.00465*** (0.00139)	0.00462*** (0.00139)
National unemployment	0.00103*** (0.0000810)	0.00103*** (0.0000811)	0.00105*** (0.0000478)	0.00105*** (0.0000478)
Local - National unemployment		0.000469*** (0.000105)		0.0000271*** (0.0000430)
Age controls	Yes	Yes	Yes	Yes
Income control	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Market area dummies	Yes	Yes	No	No
Household dummies	No	No	Yes	Yes
N	3761544	3762136	3762136	3761544
R-sq	0.039	0.019	0.005	0.005

OLS regression with the dependent variable being the ratio of value of coupon usage/total expenditure. Experienced unemployment is a lifetime linearly-declining weighted national unemployment rate experienced by households. Age controls are age and age squared of the male household heads. Household characteristics include unemployment status, household size, education, and race. The sample period runs monthly from 2004 to 2012. Regressions are weighted by household sampling weights from Nielsen. Robust standard errors in parentheses are clustered by household. ***, **, * denote significance at 0.001, 0.01 and 0.05 levels, respectively.

Purchase of Generic Items

	(1)	(2)	(3)	(4)
Experienced unemployment	0.0171*** (0.00461)	0.0171*** (0.00481)	0.00905*** (0.00282)	0.00902*** (0.00282)
National unemployment	0.000405 (0.000274)	0.000392 (0.000275)	0.000348 (0.000172)	0.000347 (0.000172)
Local - National unemployment		0.0000371 (0.000156)		0.00000239 (0.0000978)
Age controls	Yes	Yes	Yes	Yes
Income control	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Market area dummies	Yes	Yes	No	No
Household dummies	No	No	Yes	Yes
N	3731874	3731285	3731874	3731285
R-sq	0.026	0.014	0.005	0.005

OLS regression with the dependent variable being the ratio of value of generic store brand items/value of all items bought. Experienced unemployment is a lifetime linearly-declining weighted national unemployment rate experienced by households. Age controls are age and age squared of the male household heads. Household characteristics include unemployment status, household size, education, and race. The sample period runs monthly from 2004 to 2012. Regressions are weighted by household sampling weights from Nielsen. Robust standard errors in parentheses are clustered by household. ***, **, * denote significance at 0.001, 0.01 and 0.05 levels, respectively.

Purchase of Higher-end Products

	(1)	(2)	(3)	(4)
Experienced unemployment	-0.0551** (0.0258)	-0.0642** (0.0263)	-0.04133*** (0.01449)	-0.0425*** (0.0145)
National unemployment	-0.0028*** (0.0009)	-0.0026*** (0.00130)	-0.00300*** (0.0007)	-0.00296*** (0.0007)
Local - National unemployment		-0.0023** (0.0009)		-0.00086 (0.00062)
Age controls	Yes	Yes	Yes	Yes
Income control	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Market area dummies	Yes	Yes	No	No
Household dummies	No	No	Yes	Yes
N	2994923	2994434	2994923	2994434
R-sq	0.087	0.078	0.05	0.05

OLS regression with the dependent variable being a transformed ranking of goods constructed based on the unit prices of goods in specific product modules, markets and month, where lower value represents lower-priced goods. The original dependent variable continuously ranges from 0 to 1, and the transformation $\ln(y/(1-y))$ maps the original variable to the real line. Experienced unemployment is a lifetime linearly-declining weighted national unemployment rate experienced by households. Age controls are age and age squared of the male household heads. Household characteristics include unemployment status, household size, education, and race. The sample period runs from 2004 to 2012. Regressions are weighted by household sampling weights from Nielsen. Robust standard errors in parentheses are clustered by household. ***, **, * denote significance at 0.001, 0.01 and 0.05 levels, respectively.

Purchase of On-sale Items

	(1)	(2)	(3)	(4)
Experienced unemployment	0.119*** (0.0165)	0.115*** (0.0156)	0.00978*** (0.00466)	0.0107*** (0.00468)
National unemployment	0.00275*** (0.000306)	0.00294*** (0.000310)	0.00276*** (0.00016)	0.00279*** (0.000161)
Local - National unemployment		0.00157** (0.000601)		0.000548*** (0.00018)
Age controls	Yes	Yes	Yes	Yes
Income control	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Market area dummies	Yes	Yes	No	No
Household dummies	No	No	Yes	Yes
N	3771876	3771284	3771876	3771284
R-sq	0.073	0.017	0.005	0.005

OLS regression with the dependent variable being the ratio of quantity of on-sale items purchased/total number of items purchased. Experienced unemployment is a lifetime linearly-declining weighted national unemployment rate experienced by households. Age controls are age and age squared of the male household heads. Household characteristics include unemployment status, household size, education, and race. The sample period runs monthly from 2004 to 2012. Regressions are weighted by household sampling weights from Nielsen. Robust standard errors in parentheses are clustered by household. ***, **, * denote significance at 0.001, 0.01 and 0.05 levels, respectively.

Extensions

- Limitations with the Nielsen data
 - ▶ Limit on the scope of products: non-durable goods
 - ▶ Limit on the time series dimension: 2004-2012

- Address limitation 1: CEX
 - ▶ A repeated cross-sectional survey (1980-2012) that contains household spending data across a comprehensive list of product categories
 - ▶ Construct a nearest-neighbor matching estimator to match onto Nielsen data based on common observables, following Rosenbaum and Rubin (1983) and Abadie and Imbens (2011)
 - ▶ Common observables include age, income, marital status, household size, education, race, region of residency, employment status, as well as their consumption of non-durable items

Nielsen and CEX Matched Sample

Table 5: Summary Statistics on Matched Nielsen-CEX Data, quarterly

variable	mean	sd	p10	p50	p90	N
Total consumption expenditure	4369	4681	1712	3246	7020	1,160,028
Durable consumption	1080	4350	0	111	1480	1,160,028
Non-durable consumption	2515	1196	1359	2276	3966	1,160,028
Non-durable consumption (Nielsen)	2139	1602	618	1757	4083	3,913,933

Nielsen and CEX Matched Sample

	Pooled			FE		
	Total	Durables	Non-durable	Total	Durables	Non-durable
Experienced unemployment	-1505.6*** (155.3)	-938.6*** (140.5)	-501.9*** (45.99)	-500.8** (228.3)	-252.6 (214.5)	-233.1*** (47.96)
National unemployment	-40.50** (14.38)	17.56 (13.07)	-50.77*** (3.343)	-59.01*** (13.14)	3.042 (12.08)	-54.57*** (2.790)
Age controls	Yes	Yes	Yes	Yes	Yes	Yes
Income control	Yes	Yes	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Market area dummies	Yes	Yes	Yes	Yes	Yes	Yes
Household dummies	No	No	No	Yes	Yes	Yes
N	1320903	1320903	1320903	1320903	1320903	1320903
R-sq	0.063	0.015	0.178	0.007	0.003	0.042

Pooled OLS and FE regressions with total consumption expenditure in dollars as the dependent variable. Experienced unemployment is a lifetime linearly-declining weighted national unemployment rate experienced by households. Age controls are age and age squared of the male household heads. Household characteristics include unemployment status, household size, education, and race. Regressions are weighted by household sampling weights from Nielsen. The sample period runs from 2004 to 2012. Robust standard errors in parentheses are clustered by household. ***, **, * denote significance at 0.01, 0.05, and 0.1 levels, respectively.

Address limitation 2: PSID

- Panel data on food consumption for a set of households that has been surveyed on a consistent basis since 1968
- Construct unemployment experience measures state-to-state migration information to introduce heterogeneity in experience within cohorts
- However, official state-level unemployment rates from the BLS are available only from 1976 onwards.
- Local unemployment experience measures
 - ▶ Measure 1: uses only 5 most recent state rates. Individual needs to be in the sample for the 6th year to compute. Weights are dependent on the age of individual.
 - ▶ Measure 2: Measure 1 and national unemployment experience as separate variables.
 - ▶ Measure 3: Uses both national and state rates. Rather than only using the 5 most recent state rates, it also uses the national rates for the years from birth to current age minus 6.

Table 9: Summary Statistics on PSID, annual

Variable	Mean	SD	Min	Max	N
Age of Family Head	43.5	16.3	16	102	214,358
Total Family Income (\$)	34,667	54,810	-122355	6,317,099	214,336
Total People in Family	2.89	1.69	1	19	214,366
Head Years of Education	12.7	3.16	0	17	210,172
Home-Food Expenditures (\$)	3,042	2,324.5	0	67,600	211,614
Restaurant Expenditures (\$)	1,002	1,449	0	52,000	206,811
State unemployment rate	6.50	1.73	2.58	14.33	214,366

Note: Total Family Income is defined as the sum of (1) Taxable Income of Head and Wife, (2) Total Transfer Income of Head and Wife, (3) Taxable Income of Others in FU, and (4) Total Transfer Income of Others in FU. Because Taxable Income is defined to include income from such things as assets, the values can be negative due to losses. Sample period runs from 1968-2011.

Table 10: Expenditure and Lifetime Unemployment Experienced, PSID

	Measure 1			Measure 2			Measure 3		
	All	Home	Rest	All	Home	Rest	All	Home	Rest
Exp state unemp	-52.30*** (15.46)	-38.93*** (10.89)	-13.37 (9.783)	-52.43*** (15.45)	-38.99*** (10.89)	-13.44 (9.783)			
Exp national unemp				-288.5 (182.2)	-126.3 (132.1)	-162.3 (109.0)			
Exp combined unemp							-179.2** (59.27)	-129.9** (42.50)	-49.35 (36.87)
National-state unemp	-1.226 (12.23)	-11.09 (9.468)	9.863 (7.028)	-1.280 (12.23)	-11.11 (9.468)	9.833 (7.025)	1.655 (12.48)	-8.463 (9.622)	10.12 (7.277)
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Income control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	108150	108150	108150	108150	108150	108150	108150	108150	108150
R-sq	0.296	0.276	0.135	0.296	0.276	0.135	0.296	0.276	0.135

Fixed effects regressions with expenditure on food at home (“home”), food away from home (“Rest”), and all food (“All”) in dollars as the dependent variable. “Exp state unemp” is a linearly-declining weighted state unemployment rate experienced by households from year $t - 5$ to $t - 1$, with weights dependent on the age of individual. “Exp national unemp” is a lifetime linearly-declining weighted national unemployment rate experienced by households. “Exp combined unemp” is a lifetime linearly-declining unemployment rate experienced by households based on state rates from year $t - 5$ to $t - 1$ and national rates from birth to $t - 6$. Age controls are age and age squared of the male household heads. Household characteristics include unemployment status, household size, education, and race.

Next Steps and Conclusion

- Findings so far
 - ▶ Households who have lived through periods of higher unemployment spend significantly less, after controlling for income, employment status, and other HH characteristics. Vice versa for good experiences.
 - ▶ They use more coupons and allocate expenditure toward on-sale items, generic store brand items, and lower-end products.
 - ▶ Macroeconomic shocks have stronger effects on the young cohorts with shorter lifetime histories, both positive and negative.
 - ★ Note: Positive direction ameliorates unobserved wealth confounds.
- Next step: Is it more about the local experience or national (unemployment) experience?
 - ▶ Construct synthetic state-level unemployment experience for each household in the Nielsen data, using state-level unemployment rates and migration data from the IRS. Interaction with own UE status?
- New perspectives from experience effects in consumption
 - ▶ A novel link between consumption, life-cycle and state of the economy.
 - ▶ A novel micro-foundation for aggregate demand fluctuations and long-run effects of macroeconomic shocks.