Tax Refund Expectations and Financial Behavior

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Uncertainty and Financial Behavior

- Risk plays a central role in financial behavior
- However *complexity* can generate subjective uncertainty, even without risk
  - Personal income tax, financial product features, add-on pricing...
- This project: directly measure uncertainty about deterministic outcomes in a high-stakes setting: tax refunds for low income tax filers
  - 1.5 months of income for average EITC recipient
  - 25% of survey respondents are “not sure at all” what their tax refund will be *when filing*
- We characterize amount of, heterogeneity in, and effects/costs of this uncertainty
- We find uncertainty about tax-based transfer payments is **substantial** and **costly**

This Paper: Research Questions

1. How accurate and uncertain are low-income tax filers' refund expectations?

2. How are these expectations formed / what factors drive tax filers' uncertainty?

3. Does this have "real" consequences?

This Paper: Approach

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- Partner with a volunteer (VITA) tax-preparation site in Boston
- Survey tax filers on expectations about tax refund: point estimate & distribution
- Link responses to current/prior tax returns + credit reports / consumption data

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- Build a simple model of belief formation/Bayesian updating to interpret patterns
- Characterize noise in signals about year-to-year tax refund changes

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3. Does this have "real" consequences?

- Link to a panel of credit reports $\implies$ infer consumption changes
- Calculate welfare losses, given (a range of) assumptions on risk aversion, etc.

This Paper: Preview of Results

1. Expectations are accurate; uncertainty is substantial
   - Mean (med.) surprise is $-63 ($-81)
   - Mean *absolute* surprise is $899, and 29% of tax filers face a surprise of $\geq$ $1000
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2. Uncertainty is related to tax complexity, especially in the EITC
   - EITC-eligible filers have $>$2x higher uncertainty than non-eligibles on average
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3. Tax refund uncertainty has real consequences
   - Evidence for precautionary motives: uncertainty reduces smoothing of tax refund
   - Welfare cost of uncertainty is $\approx$ 10% of EITC for average recipient $\implies$ $7B nationally

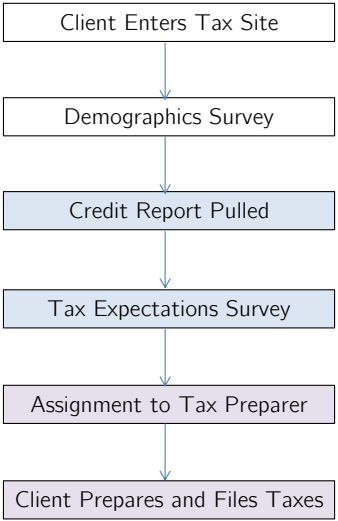
Relation to Other Work

- *Tax complexity / understanding of the tax code*: **Chetty et al.** (2013); Zwick (2018); Benzarti (2017); Chetty & Saez (2013); Rees-Jones & Taubinsky (2018); Bhargava & Manoli (2015); Fujii & Hawley (1988)
- *Effectiveness of the EITC*: Eissa & Hoynes (2004, 2006); Meyer & Rosenbaum (2001); Nichols & Rothstein (2015); Hoynes & Patel (2018); **Kleven (2019)**
- *Eliciting subjective expectations:* **Manski** (2004); Engelberg et al. (2009); Delavande & Rohwedder (2011); Armantier et al. (2013); Bruine de Bruin et al. (2010)
- *Tax refunds and financial behavior*: **Jones** (2010, 2012); Bertrand & Morse (2009); Souleles (1999); Smeeding et al. (2000); Romich & Weisner (2000)
- *Prudence and precautionary motives in consumption:* **Kimball** (1990); Deaton (1991); Carroll (1997); Carroll & Samwick (1998); Gourinchas & Parker (2001); Dynan (1993); Aguiar & Hurst (2013); Skinner (1988); Jappelli & Pistaferri (2000)

Outline

Our Setting

- Volunteer (VITA) tax preparation site in Boston
- Tax filers go to several stations:
  1. Intake: Demographic survey
  2. Financial Guide:
     - Financial advising & consumer credit report
     - Consent to participate in research
     - Complete expectations survey
  3. Tax Prep: File taxes
- We collect follow-up credit reports. (1, 2, & 6 months) for consenting filers
- Phone survey on consumption behavior after tax refund receipt

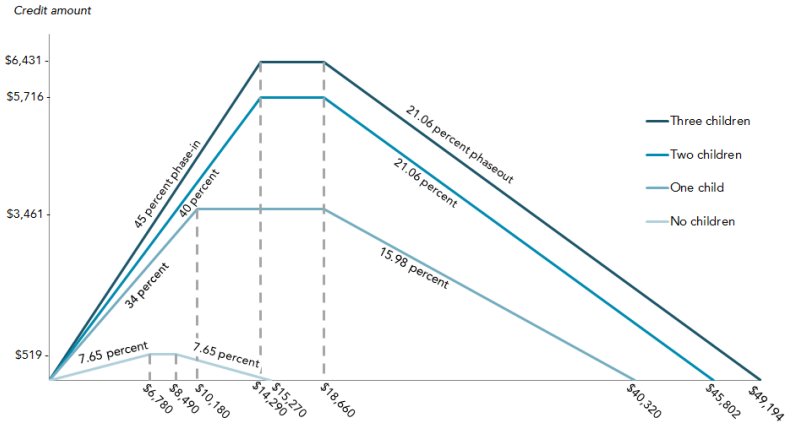


Background on the EITC

FIGURE 1

Earned Income Tax Credit

2018



Source: Urban-Brookings Tax Policy Center (2018). Internal Revenue Procedure 2018-18, Internal Revenue Service.
Notes: Assumes all income comes from earnings. Amounts are for taxpayers filing a single or head-of-household tax return. For married couples filing a joint tax return, the credit begins to phase out at income $5,690 higher than shown.

Summary Statistics: Economic and Tax Characteristics

	Tax Data & Expectations Data	Tax Data, Expectations Data, & Demographics	Tax Data, Expectations Data, & Prior Year Returns	Tax Data, Expectations Data, & Credit Card Data
	(1)	(2)	(3)	(4)
Economic and Tax Characteristics				
Adjusted Gross Income ($)	20,637	20,705	23,475	24,081
	15,930	15,752	16,228	16,356
Has Dependents	0.32	0.32	0.36	0.34
	0.47	0.47	0.48	0.47
Married	0.08	0.07	0.07	0.08
	0.27	0.26	0.25	0.28
Single Head of Household	0.27	0.27	0.31	0.29
	0.44	0.45	0.46	0.45
Filed Schedule C	0.08	0.07	0.07	0.07
	0.27	0.26	0.25	0.26
Lost Job	0.08	0.07	0.07	0.06
	0.27	0.26	0.25	0.24
Observations	618	548	337	359
with Demographics	548	548	303	319

Summary Statistics: Tax Refunds

	Tax Data & Expectations Data	Tax Data, Expectations Data, & Demographics	Tax Data, Expectations Data, & Prior Year Returns	Tax Data, Expectations Data, & Credit Card Data
	(1)	(2)	(3)	(4)
Tax Refund				
Refund Amount ($)	1,542	1,552	1,846	1,746
	2,207	2,194	2,385	2,311
Received EITC	0.35	0.35	0.35	0.31
	0.48	0.48	0.48	0.46
EITC Credit (If >0)	1,654	1,623	1,985	1,891
	1,661	1,664	1,796	1,713
EITC share	0.50	0.49	0.53	0.46
	0.43	0.38	0.43	0.40
Chose Direct Deposit	0.59	0.58	0.64	0.65
	0.49	0.49	0.48	0.48
Observations	618	548	337	359
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Summary Statistics: Demographics

	Tax Data & Expectations Data	Tax Data, Expectations Data, & Demographics	Tax Data, Expectations Data, & Prior Year Returns	Tax Data, Expectations Data, & Credit Card Data
	(1)	(2)	(3)	(4)
Demographic Characteristics				
Female	0.62	0.62	0.65	0.67
	0.49	0.49	0.48	0.47
Age	40.21	40.15	42.85	41.66
	15.92	15.82	15.70	15.87
High School or Above	0.82	0.82	0.85	0.86
	0.38	0.38	0.36	0.35
Some College or More	0.15	0.15	0.18	0.20
	0.36	0.36	0.38	0.40
Observations	618	548	337	359
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Summary Statistics: Savings and Credit

	Tax Data & Expectations Data	Tax Data, Expectations Data, & Demographics	Tax Data, Expectations Data, & Prior Year Returns	Tax Data, Expectations Data, & Credit Card Data
	(1)	(2)	(3)	(4)
Savings and Credit				
Estimated Savings Balance	523	523	546	634
	576	576	583	606
FICO Score	666	666	675	684
	87	88	89	80
Credit Card Balances ($)	1,686	1,780	2,005	2,630
	4,985	5,228	5,925	6,026
Non-Mortgage Installment	9,612	9,938	11,696	12,589
Balances ($)	23,488	24,319	26,886	27,036
Has Mortgage	0.04	0.05	0.06	0.06
	0.21	0.21	0.23	0.23
Observations	618	548	337	359
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Outline

Survey of Tax Refund Expectations

We elicited three versions of tax refund expectations:

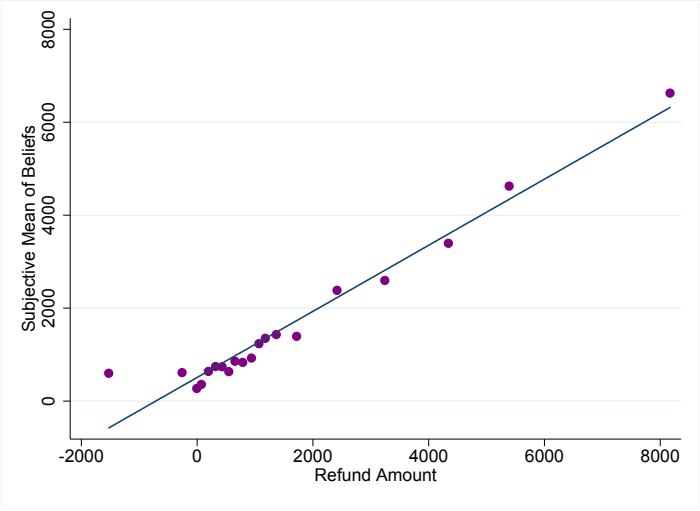
1. Point forecast: “If you get a tax refund this year, how much do you think it will be?”
2. Qualitative uncertainty: “How sure are you that your refund will be between $_____ and $_____?”
3. Quantitative uncertainty: “What is the “percent chance” that you think your refund could be...”
   - e.g. $0 to $500, $500 to $1000, etc.

We fit normal distributions to the reported distributions + use (subjective) std. to quantify uncertainty. ▸ Details ▸ Beta Distribution ▸ Normal vs. Beta ▸ Beliefs by Group

85% of respondents use two or more bins to report their expectations.

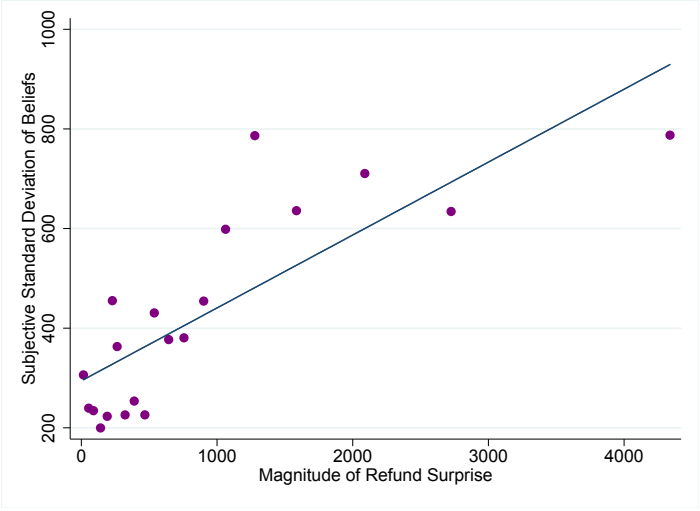
Accuracy of (Mean) Expectations

Tax refund expectations are approximately accurate on average



Uncertainty and Actual Surprises

Reported uncertainty is “accurate,” with more uncertain filers facing larger absolute surprises in refund size:



Outline

Tax Refund Variability and Uncertainty

- Which groups are most uncertain and make the greatest errors?
- Which groups face greatest tax refund variability?
- We estimate:

$$Y_i = \alpha_0 + X_1'\beta_1 + \Delta X_2'\beta_2 + \epsilon_i$$

- Y_i: change in refund, reported uncertainty (subjective std.), abs. surprise (error)
- X_1 and X_2: demographics and "tax determinants"

Contributors to Tax Refund Uncertainty

	Absolute Forecast Error (1)	S.D. of Elicited Beliefs (2)	Abs. Change in Refund Amount (3)	Abs. Change in MTR (4)
Age 25 or Younger	-112.1	-25.92	-331.4**	0.00295
	(98.24)	(42.85)	(156.2)	(0.0176)
Above Age 50	-196.4**	-139.6***	-338.8***	-0.0217
	(92.50)	(38.26)	(126.3)	(0.0164)
Any College	122.9	1.789	11.53	-0.000560
	(87.52)	(42.69)	(135.9)	(0.0163)
Female	-133.9	-38.92	35.51	-0.00378
	(83.64)	(38.68)	(133.6)	(0.0172)
Constant	672.2***	303.1***	374.5***	0.0310*
	(94.72)	(48.92)	(136.5)	(0.0177)
N	618	618	337	337
R-squared	0.221	0.255	0.442	0.231

Contributors to Tax Refund Uncertainty, ctd.

	Absolute Forecast Error (1)	S.D. of Elicited Beliefs (2)	Abs. Change in Refund Amount (3)	Abs. Change in MTR (4)
Absolute Change in AGI	-0.481	10.43**	48.05***	0.00462***
	(6.413)	(4.517)	(10.83)	(0.00156)
Has Dependents	829.6***	478.5***	554.7***	0.0754***
	(106.7)	(50.55)	(142.4)	(0.0208)
Change in No. Dependents	973.0***	-84.03	1660.1***	0.0586
	(338.4)	(106.7)	(373.7)	(0.0366)
Married	-41.38	176.8*	-143.2	-0.0446
	(158.1)	(90.30)	(244.8)	(0.0382)
Change in Filing Status	-537.2*	-46.52	-64.57	0.0350
	(301.1)	(111.1)	(415.3)	(0.0428)
Received UI during Past Year	72.14	-16.94	-38.53	0.0199
	(141.2)	(66.57)	(276.3)	(0.0367)
N	618	618	337	337
R-squared	0.221	0.255	0.442	0.231

Formation of Expectations and Uncertainty

- Framework to understand expectations formation: tax filer receives a noisy, unbiased *signal* about their tax refund size and forms a *posterior* belief
  - Define signal relative to a prior. Prior = past year's refund
- Decompose the signal into the actual change in refund plus noise:

$$\eta = \Delta y + \epsilon$$

- Which tax filers have "noisy tax understanding" (large ϵ) vs. frequent changes in circumstances (Δy)?

Estimating Expectation Formation

- Particular parameterization:
  - Normally distributed prior: $m_0 \sim \mathcal{N}(y_0, 1/h_0)$
  - Unbiased signal with normal noise: $\eta = \Delta y + \epsilon$ where $\epsilon \sim (0, 1/h_\epsilon)$
- Then mean of Bayesian posterior m_1 is:

$$m_1 = m_0 + \underbrace{\frac{h_\epsilon}{h_0 + h_\epsilon}}_{\equiv I}(\Delta y + \epsilon)$$

- We posit $I = I(x_i)$ and estimate $I(x)$ via OLS using observed year-over-year updating behavior,

$$(m_1 - m_0)_i = \sum_{x \in X} \beta_x \mathbf{1}_{x,i} \Delta y_i + \nu_i$$

Updating Model: Results

Dependent Variable:	Difference between Mean Expectation and Last Year's Refund			
	(1)	(2)	(3)	(4)
Change in Refund Amount over Last Year	0.598***	0.392***	0.284**	0.233
	(0.0719)	(0.137)	(0.144)	(0.149)
Interacted with Change in Refund Amount				
Absolute Change in AGI ($1,000)			0.0122**	0.0118**
			(0.00495)	(0.00491)
Absolute Change in MTR				0.457*
				(0.246)
Demographic Interactions with ΔRefund	NO	YES	YES	YES
N	337	337	337	337
R-sq	0.34	0.38	0.40	0.41
Error Variance Decomposition:				
Signal Noise	0.81	0.67	0.73	0.72
Incomplete Updating	0.19	0.33	0.27	0.28

Quantifying the Role of Signal Noise

- With our estimates of the updating model,

$$(m_1 - m_0)_i = \hat{l}_{x(i)} \Delta y_i + \hat{\nu}_i$$

we can quantify the role of noise,

$$\hat{\nu}_i = \hat{l}_{x_(i)} \epsilon_i$$

in an individual's surprise,

$$s_i \equiv \Delta y_i - (m_1 - m_0)_i$$

- We perform an error variance decomposition to quantify the role of such noise,

$$\frac{Var(\nu_i)}{Var(s_i)} = \frac{Var(\nu_i)}{Var(\nu_i) + Var((1 - l_{x_i})\Delta y_i)}$$

- Population average is .67-.73

Outline

Financial Behavior Before and After Tax Filing

- Do uncertainty and surprises in tax refund expectations matter for consumption?
  - How much borrowing to smooth refund over time?
- We study relationship between debt change ΔB_{it} at horizon t and expected refund μ_i and uncertainty σ_i,

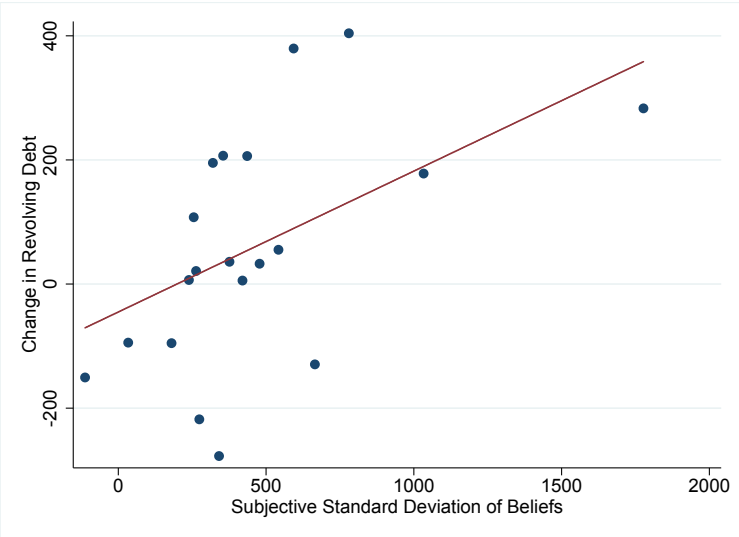
$$\Delta B_{it} = \alpha_0 + \beta_1 \mu_i + \beta_2 \sigma_i + Z_i' \gamma + \eta_i$$

  $Z_i =$ demographics and "tax determinants"
- Possible measurement error in uncertainty $\implies$ instrument for σ_i (Gillen et al. (2019))
  - Use qualitative responses: "very sure," "somewhat sure"...

Impacts on Consumption

	2-Month Change in Revolving Debt Balances					Subjective S.D. (First Stage)
	(1)	(2)	(3)	(4)	(5)	(6)
Expected Refund Amount	-39.94	-79.23**	-44.23	-40.38	-271.7*	0.178***
	(27.59)	(33.69)	(38.21)	(38.07)	(140.3)	(0.0121)
Subjective Standard Deviation		227.0*	237.2*	259.3**	1339.1*	
		(135.0)	(128.4)	(131.5)	(806.3)	
"Somewhat Sure" of Refund Amount						-0.154**
						(0.0598)
"Very Sure" of Refund Amount						-0.185***
						(0.0598)
Controls						
Demographics			X	X		
Tax Determinants				X		
Estimator	OLS	OLS	OLS	OLS	2SLS	2SLS
First-stage F-stat	--	--	--	--		4.89
N	359	359	359	359	359	359
R-sq	0.009	0.018	0.079	0.096	--	--

Impacts on Consumption



Note: binscatter controls for demographic controls and tax determinants.

Measuring the Welfare Costs of Uncertainty

A calibrated, simple model gives benchmark estimates of welfare cost of uncertainty

- Two periods, each with known take-home pay $c_0 = c_1$
- Uncertain tax refund y_1

Given beliefs $F_i(y)$, tax filer solves:

$$\max_b \int_y \left[u(c_{0,i} + b) + \beta u(c_{1,i} + y - Rb)\right] dF_i(y) \equiv V_i^u$$

We estimate the compensating variation for two reductions in uncertainty

- Eliminating uncertainty but not tax refund variability
- Eliminating both uncertainty and variability

Measuring the Welfare Costs of Uncertainty

Compensating variation (τ) for two reductions in uncertainty:

- Eliminating uncertainty but not tax refund variability

$$\int_y \left[\max_b u(c_{0,i} + b - \tau_i^{\text{nu}}) + \beta u(c_{1,i} + y - Rb - \tau_i^{\text{nu}}) \right] dF_i(y) = V_i^u$$

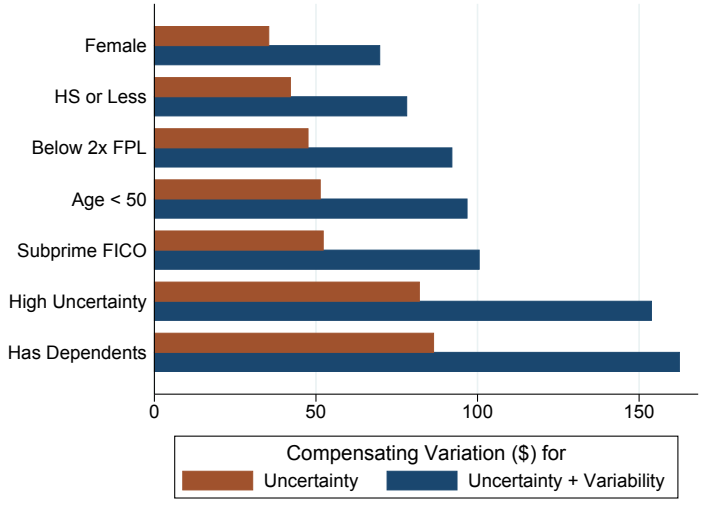
- Eliminating both uncertainty and variability

$$\max_b u(c_{0,i} + b - \tau_i^{\text{d}}) + \beta u(c_{1,i} + \int_y [y] dF_i(y) - Rb - \tau_i^{\text{d}}) = V_i^u$$

To implement in our data:

- CRRA utility with $\gamma = 1, 2, \ldots 5$
- c is quarterly take-home pay after tax withholding
- $F(y)$ is each individual's elicited belief distribution
- Fix $\beta = 1/R$ and $R = 1.05$ ($\approx$ credit card rates, quarterly)

Welfare Costs of Uncertainty



Conclusion

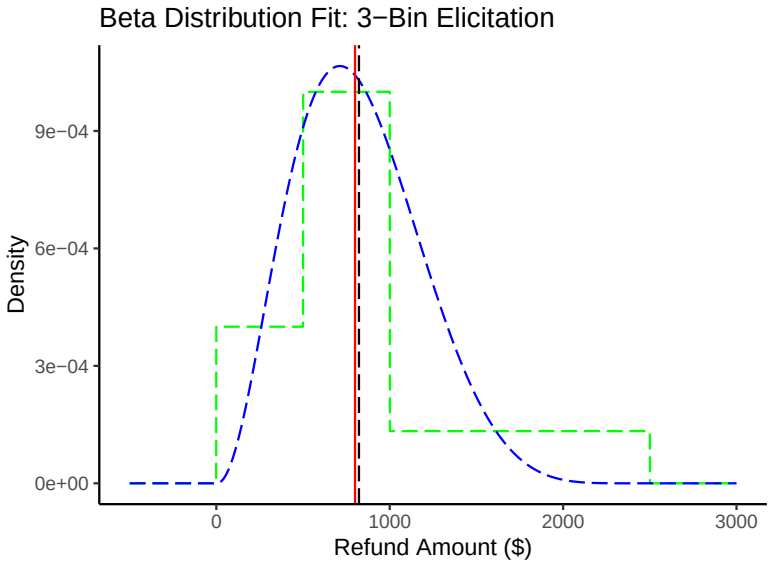
1. **Tax Refund Expectations and Uncertainty**
   - Tax refund expectations are mean-unbiased but uncertain
   - Uncertainty is “accurate”: larger surprises when uncertainty is higher
   - 29% of tax filers face a surprise of $\geq$ \$1000
2. **Belief Formation**
   - Tax complexity (e.g. ΔMTRs) drive $>$2x higher uncertainty for EITC-eligibles
   - Roughly 2/3 - 3/4 of of tax refund surprise is attributable to signal noise
3. **Effects and Costs of Uncertainty**
   - More uncertain tax filers appear to spend less of their refund before filing
   - Welfare costs maybe substantial: roughly 10% of value of EITC / \$7B nationally

Beliefs by Group

	Features of Probabilistic Survey Question Responses								
	Full Sample	Has Dependents		Marital Status		Adjusted Gross Income (AGI)		Education	
		Yes	No	Married	Single	Above $30,000	Below $20,000	Some College	No College
Number of Bins with Positive Probability									
1 Bin	15.2%	20.0%	13.2%	30.0%	13.9%	18.6%	12.4%	14.6%	15.7%
2 Bin	43.6%	46.2%	42.5%	32.5%	44.6%	39.1%	47.4%	42.2%	44.6%
3 Bin	23.0%	16.6%	25.8%	12.5%	24.0%	20.9%	24.8%	21.4%	24.3%
4 Bin	12.1%	11.0%	12.6%	12.5%	12.1%	14.1%	10.5%	15.0%	10.0%
5 Bin	4.5%	4.8%	4.4%	10.0%	4.0%	5.5%	3.8%	5.3%	3.9%
6 Bin	1.4%	1.4%	1.5%	2.5%	1.3%	1.8%	1.1%	1.5%	1.4%
Qualitative Uncertainty									
Very Sure	32.9%	29.7%	34.3%	50.0%	31.4%	27.7%	37.2%	31.1%	34.3%
Somewhat Sure	42.6%	48.3%	40.2%	30.0%	43.7%	45.5%	40.2%	39.8%	44.6%
Not Sure at All	23.5%	21.4%	24.3%	20.0%	23.8%	25.5%	21.8%	27.2%	20.7%
Quantitative Responses									
Point Estimate	1,623	3,308	906	2,238	1,568	2,124	1,208	1,519	1,699
Minimum	-555	928	-1,185	-250	-582	-348	-726	-752	-409
Maximum	5,493	9,621	3,738	7,238	5,336	6,966	4,274	5,684	5,352
Features of Parametric Distribution									
Mean	1,686	3,566	886	2,575	1,606	2,259	1,211	1,611	1,741
Median	1,766	3,586	992	2,460	1,703	2,334	1,296	1,706	1,810
Std. Dev.	611	1,102	402	900	585	783	468	610	612
Coefficient of Variation	0.51	0.29	0.61	0.34	0.53	0.36	0.64	0.59	0.45

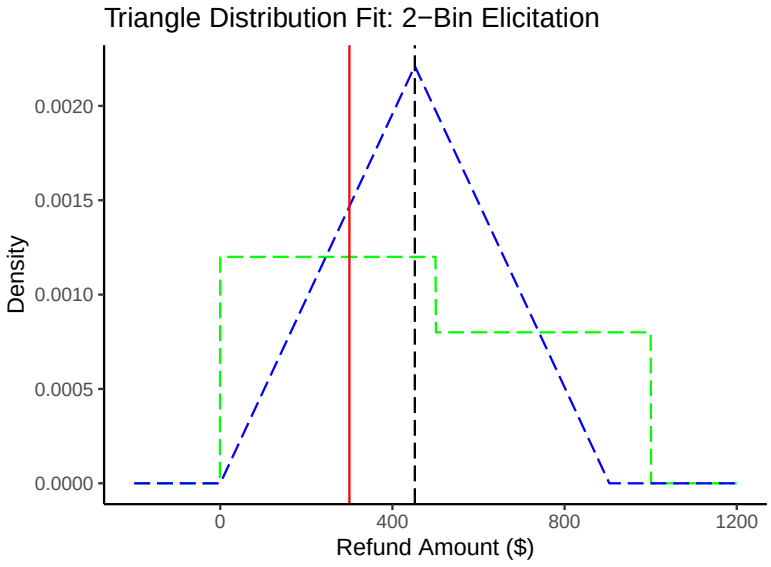
Back

Fitting Beta Distributions: 3 bins



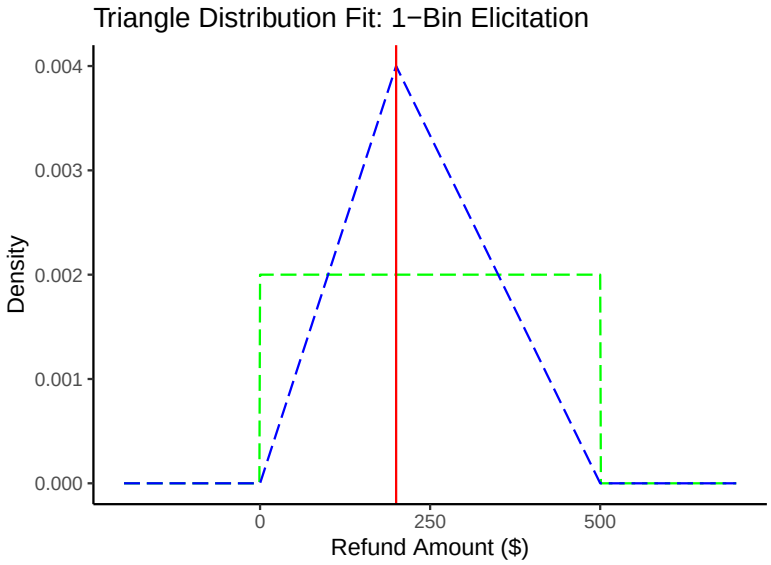
Back Normal Distribution

Fitting Beta Distributions: 2 bins



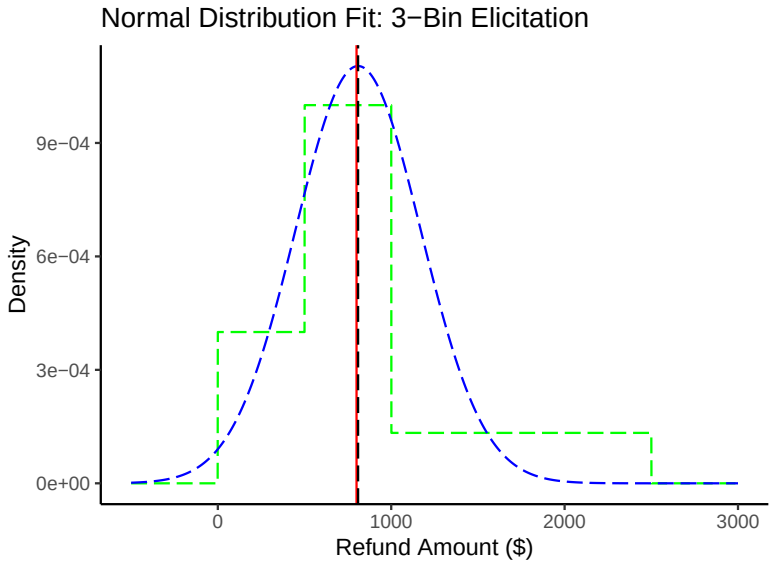
Back Normal Distribution

Fitting Beta Distributions: 1 bin



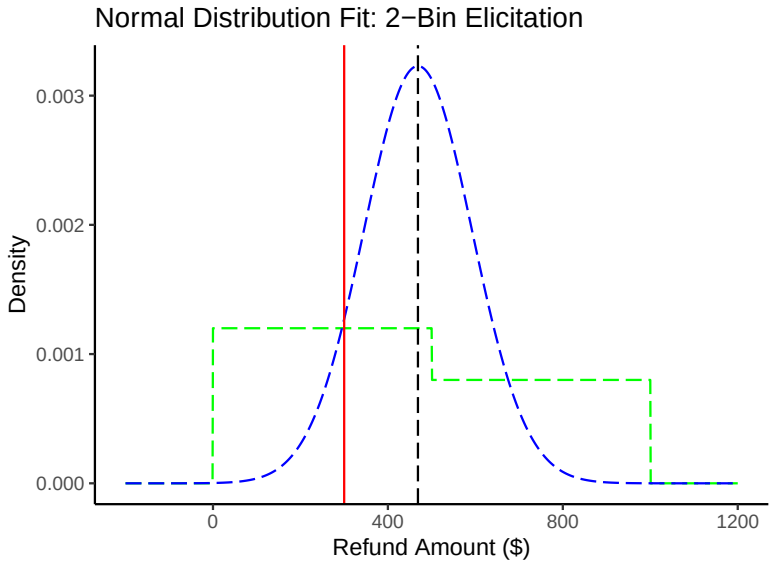
Back Normal Distribution

Fitting Normal Distributions: 3 bins



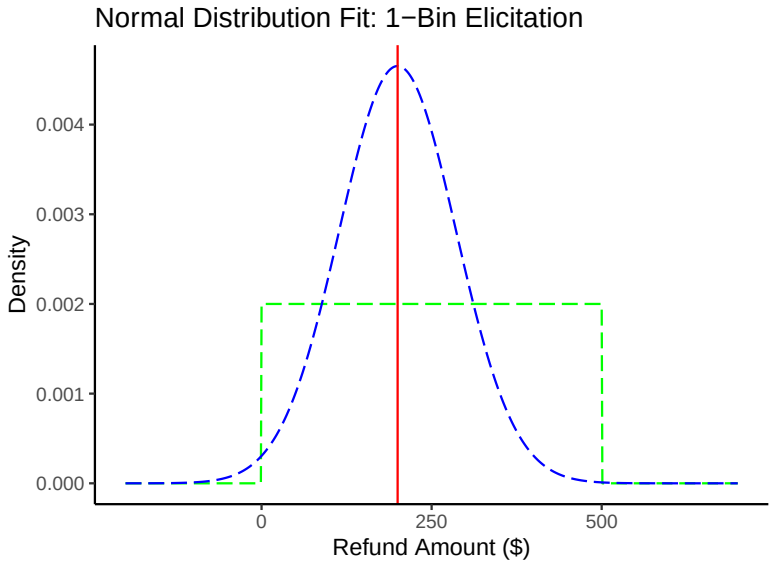
Back Beta Distribution

Fitting Normal Distributions: 2 bins



Back Beta Distribution

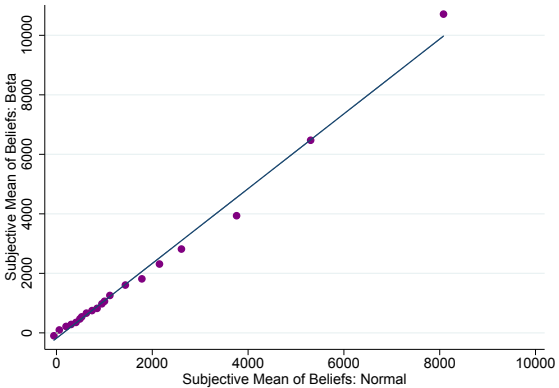
Fitting Normal Distributions: 1 bin

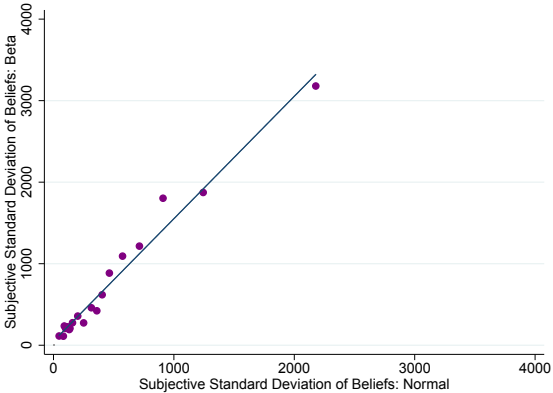


Back Beta Distribution

Comparing Distributional Assumptions: Normal vs. Beta

Back





Heterogeneity in Impacts on Consumption

	Core FICO Score Sample[1]			Low-Savings Sample[2]			Non-binding Credit Constraint Sample[3]		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Expected Refund Amount	-159.6***	-487.6**	-84.81	-77.45*	-341.9*	-26.07	-101.9**	-287.9*	-57.00
	(45.09)	(214.9)	(54.41)	(46.03)	(176.3)	(48.04)	(39.47)	(165.8)	(47.56)
Subjective Standard Deviation	641.7***	2697.1**	676.4***	320.4**	1669.5*	405.5**	243.9	1340.6	379.3*
	(195.0)	(1365.4)	(199.5)	(162.2)	(896.7)	(165.1)	(189.7)	(989.5)	(200.1)
Controls									
Demographics			X	142.5		X			X
Tax Determinants			X	-2.504		X			X
Estimator	OLS	2SLS	OLS	OLS	2SLS	OLS	OLS	2SLS	OLS
First-stage F-stat	--	2.72	--	--	3.44	--	--	3.99	--
N	174	174	174	195	195	195	193	193	193
R-sq	0.085	--	0.190	0.023	--	0.188	0.025	--	0.130

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