

Tax Refund Uncertainty: Evidence and Welfare Implications

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Redistributing Income Through the Tax Code

- ▶ Tax refunds are a significant source of income for many low-income households
 - ▶ \approx 1.5 months of income for average EITC recipient
 - ▶ Refunds are often large because credits typically cannot be claimed in advance
- ▶ Rules determining transfers and refunds are complex
 - ▶ May lead to uncertainty even after income-related uncertainty is resolved
 - ▶ Example: EITC includes multiple schedules (# dependents), phase-in and phase-out regions
- ▶ Relatively little is known about the nature of this uncertainty among low-income filers
 - ▶ Uncertainty may affect the efficiency of redistributing income through tax refunds

We Study the Magnitude and Consequences of Refund Uncertainty

1. How uncertain are low-income tax filers about annual tax refunds?
2. What are the costs of this uncertainty?

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1. **How uncertain are low-income tax filers about annual tax refunds?**
 - ▶ Partner with a volunteer (VITA) tax-preparation site
 - ▶ Survey tax filers on expectations about tax refund: point estimate & distribution
 - ▶ Link responses to current/prior tax returns

2. **What are the costs of this uncertainty?**

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- 2. What are the costs of this uncertainty?**
 - ▶ Link to a panel of credit reports \implies infer borrowing changes
 - ▶ Calculate welfare losses, given (a range of) assumptions on risk aversion, etc.

Preview of Results

1. Uncertainty is large in both absolute and relative terms

- ▶ 1/4 of Filers "Not Sure At All" their refund will fall within \$1000 of their guess.
- ▶ Roughly 4.5 times larger than prior estimates of transitory income uncertainty
- ▶ Uncertainty is "accurate": more uncertain filers have larger surprises

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2. Uncertainty has “real” consequences

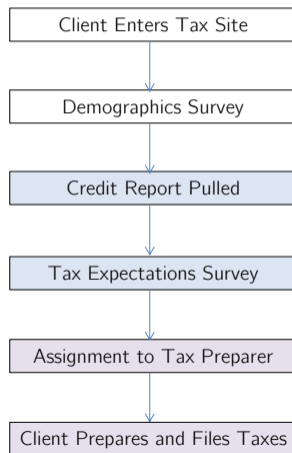
- ▶ Evidence for precautionary motives: uncertainty reduces smoothing of tax refund
- ▶ Welfare cost of uncertainty is $\approx 9\%$ of EITC for average recipient \implies \$6B nationally

Related Literature

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

Our Setting: a VITA Site in Boston

- ▶ Volunteer (VITA) tax preparation site in Boston
- ▶ Tax filers go to several stations:
 1. Intake (white): Demographic Survey
 2. Financial Guide (blue):
 - ▶ Financial advising & consumer credit reports
 - ▶ Consent to participate in research
 - ▶ Complete expectations survey
 3. Tax Prep (purple): File Taxes
- ▶ We collect follow-up credit reports (1, 2, & 6 months) for consenting filers



Our Sample

	Tax Data & Expectations Data (1)	Tax Data, Expectations Data, & Demographics (2)	Current and Prior Tax Data & Expectations Data (3)	Tax Data, Expectations Data, & Credit Data (4)
Female	0.62 (0.49)	0.62 (0.49)	0.65 (0.48)	0.67 (0.47)
Age	40.21 (15.92)	40.15 (15.82)	42.85 (15.70)	41.66 (15.87)
BA Degree	0.15 (0.36)	0.15 (0.36)	0.18 (0.38)	0.20 (0.40)
Adjusted Gross Income (\$)	20,636.93 (15930.39)	20,704.68 (15751.66)	23,474.88 (16228.46)	24,081.49 (16355.96)
Has Dependents	0.32 (0.47)	0.32 (0.47)	0.36 (0.48)	0.34 (0.47)
Married	0.08 (0.27)	0.07 (0.26)	0.07 (0.25)	0.08 (0.28)
Lost Job	0.08 (0.27)	0.07 (0.26)	0.07 (0.25)	0.06 (0.24)
Observations	618	548	337	359
with Demographics	548	548	303	319

Our Sample

	Tax Data & Expectations Data (1)	Tax Data, Expectations Data, & Demographics (2)	Current and Prior Tax Data & Expectations Data (3)	Tax Data, Expectations Data, & Credit Data (4)
Refund Amount (\$)	1,542.33 (2207.11)	1,552.27 (2194.48)	1,845.97 (2384.90)	1,745.95 (2311.50)
Received EITC	0.35 (0.48)	0.35 (0.48)	0.35 (0.48)	0.31 (0.46)
EITC Credit (If >0)	1,654.16 (1661.35)	1,622.52 (1664.33)	1,985.20 (1795.86)	1,891.45 (1713.43)
EITC share	0.50 (0.43)	0.49 (0.38)	0.53 (0.43)	0.46 (0.40)
Estimated Savings Balance	523.36 (576.15)	523.36 (576.15)	545.97 (583.24)	633.82 (606.28)
FICO Score	666 (87)	666 (88)	675 (89)	684 (80)
Credit Card Balances (\$)	1,686 (4,985)	1,780 (5,228)	2,005 (5,925)	2,630 (6,026)
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Survey of Tax Refund Expectations

We elicited three versions of tax refund expectations: [▶ Survey Questions](#)

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...”
 - ▶ Negative, \$0-500, \$500-1000, \$1000-2500, \$2500-5000, >\$5000

Fitting Beliefs to Normal Distributions

We fit beliefs to normal distributions + use (subjective) std. to quantify uncertainty

$$\min_{\mu, \sigma} \sum_{x \in \mathcal{X}_i} \left[p_{x,i} - \Phi \left(\frac{x - \mu_i}{\sigma_i} \right) \right]^2 + \left(\max \left\{ 0, 1 + \Phi \left(\frac{\underline{x} - \mu_i}{\sigma_i} \right) - \Phi \left(\frac{\bar{x} - \mu_i}{\sigma_i} \right) - \alpha \right\} \right)^2$$

- ▶ p_x : cumulative probability at each interior point x
 - ▶ \bar{x} and \underline{x} are the minimum and maximum support points
 - ▶ $\alpha = .01$: precision error

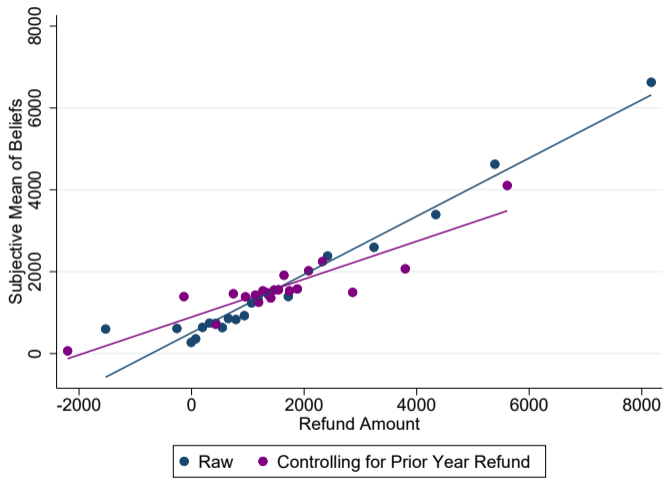
78% of respondents use two or more bins to report their expectations.

▶ Graphical Example

▶ Beta Distribution

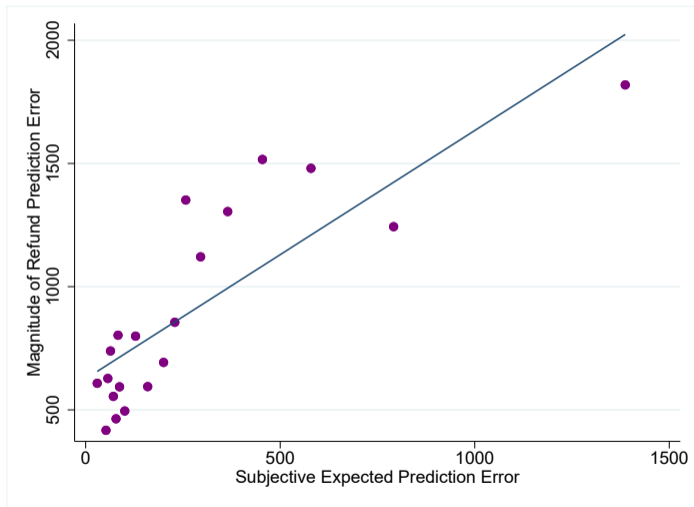
▶ Normal vs. Beta

Accuracy of (Mean) Expectations

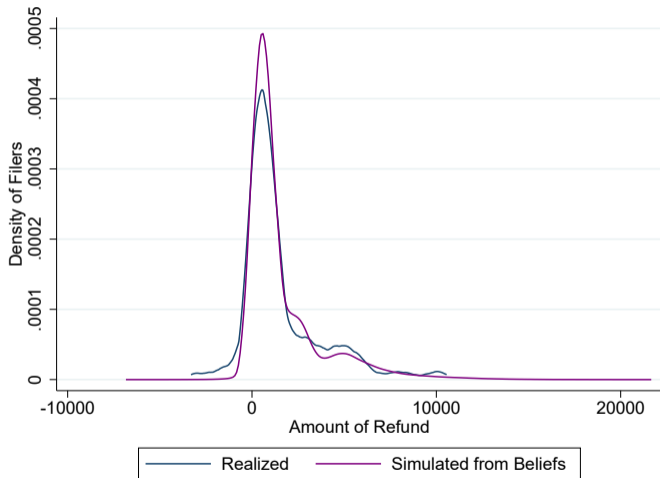


R-squared: .334

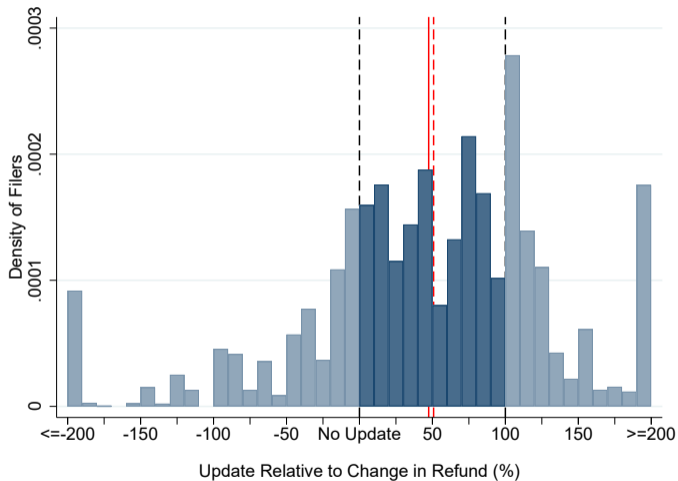
More Uncertain Filers See Larger (Absolute) Surprises



The Distribution of Refund Expectations



Individuals “Update” in the Right Direction



76% update in the “right” direction

Uncertainty is Substantial in Absolute and Relative Terms

	Core Sample	Has Dependents		Marital Status		Any College		Relative to 2x Federal Poverty Line	
		Yes	No	Married	Not Married	Yes	No	Below	Above
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Qualitative Uncertainty									
Very Certain	34.0%	30.3%	35.7%	44.9%	33.0%	32.5%	37.3%	38.5%	31.5%
Somewhat Certain	41.7%	48.2%	38.8%	36.7%	42.2%	38.9%	42.7%	39.9%	42.8%
Not Certain At All	23.5%	21.0%	24.6%	18.4%	23.9%	27.0%	19.7%	21.1%	24.8%
Quantitative Responses									
Point Estimate	1682.1	3520.3	837.0	2468.6	1614.1	1656.4	1725.5	2799.5	1078.7
Features of Parametric Distribution									
Mean	1605.4	3364.6	794.3	2377.6	1538.8	1614.5	1618.1	2635.5	1043.9
Std. Dev	425.9	769.4	267.5	647.5	406.8	448.3	412.6	589.6	336.6
Observations	618	195	423	49	569	252	279	218	400

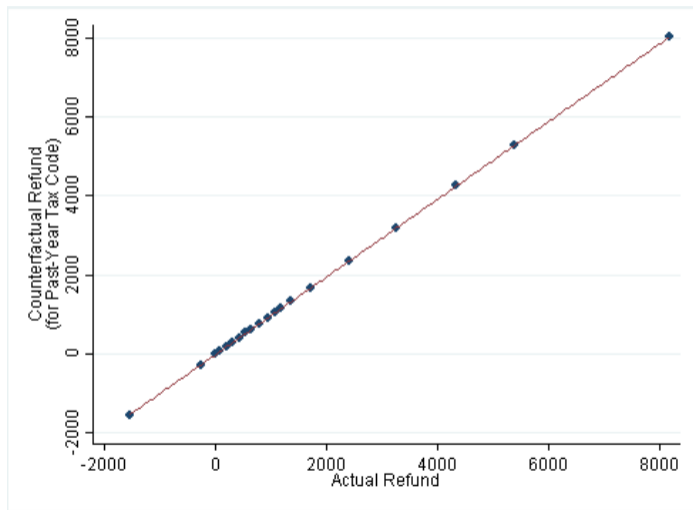
- ▶ S.d. of transitory income shocks for avg hh is 6% of income (Guvenen et al. 2019)
- ▶ Median filer sees refund as having a s.d. that is 27% the size of refund, or 2% of pre-tax income

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Tax Environment



Suggestive Evidence Uncertainty is Due to the Tax Code

1. Timing of Survey

- ▶ Elicited beliefs after actual uncertainty was resolved
- ▶ Filers had already collected their documentations for filing

2. Uncertainty is higher among groups that potentially face **more tax complexity** (and have larger changes in MTRs):

- ▶ Filers with dependents
- ▶ Married filers
- ▶ Filers with large past-year changes in income

Consequences of Refund Uncertainty

Financial Behavior Before and After Tax Filing

- ▶ We study relationship between the reduction in non-installment debt ΔD_i and
 - ▶ expected refund $m_{1,i}$
 - ▶ uncertainty σ_i :

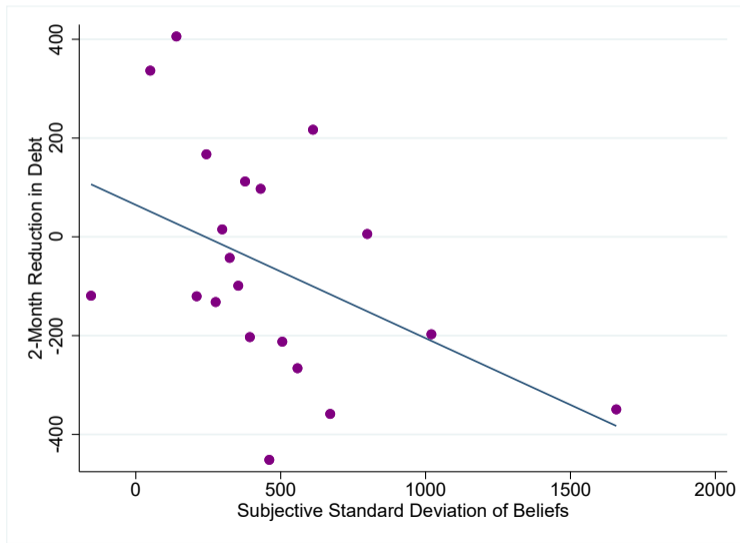
$$\Delta D_i = \omega m_{1,i} + \gamma \sigma_i + X_i \beta + \epsilon_i$$

- ▶ γ (key parameter): signed so negative estimates consistent with precautionary behavior
- ▶ Include controls for $X_i =$ demographics and “tax determinants”
- ▶ Possible measurement error in $\Delta D_{it} \implies$ winsorize (and probe robustness)




Impacts on Borrowing

	Baseline Model (OLS)				2SLS Estimates		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent Variable: 2-Month Reduction in Debt						
Expected Refund Amount	39.94 (27.59)	79.23** (33.69)	44.23 (38.21)	40.38 (38.07)	271.7* (140.3)	199.4 (131.0)	199.3 (146.0)
Subjective Standard Deviation		-227.0* (135.0)	-237.2* (128.4)	-259.3** (131.5)	-1339.1* (806.3)	-1194.6 (769.9)	-1243.0 (866.9)
"Somewhat Sure" of Refund Amount					First Stage		
					-0.154** (0.0598)	-0.154** (0.0613)	-0.140** (0.0604)
"Very Sure" of Refund Amount					-0.185*** (0.0598)	-0.181*** (0.0596)	-0.156*** (0.0586)
<i>Controls</i>							
		Demographics	X	X		X	X
		Tax Determinants		X			X
First-stage F-stat	--	--	--	--	4.89	4.73	3.67
Observations	359	359	359	359	359	359	359
R-squared	0.009	0.018	0.079	0.096	--	--	--

Impacts on Borrowing



Robustness of Borrowing Results

- ▶ Mis-measurement of Uncertainty
 - ▶ Instrument using qualitative measures
 - ▶ Estimate specifications using beliefs fit to beta (rather than normal) distributions 
- ▶ ΔD_i is a proxy for borrowing: what if individuals self-insure through other channels? 
 - ▶ Savings: filers that did not choose direct deposit, or that had no/little savings
 - ▶ Labor supply: filers who said they could not change their hours when desired
- ▶ Omitted Variables Bias 
 - ▶ Flexible controls for realized refund and for income

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:

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

We estimate the compensating variation for eliminating uncertainty

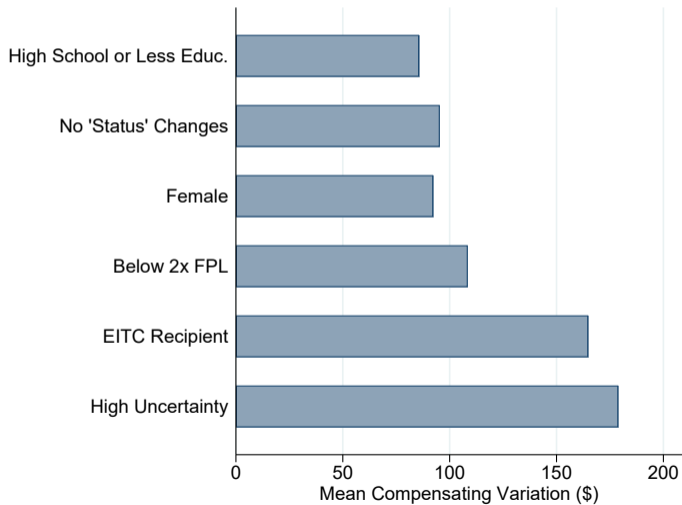
Measuring the Welfare Costs of Uncertainty

Compensating variation (τ) for reducing uncertainty:

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

To implement in our data:

- ▶ CRRA utility with $\gamma = 1, 2, \dots, 5$
- ▶ 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: $\gamma = 3$ 

Welfare Costs of Uncertainty

	Percent of Sample	Compensating Variation for No Uncertainty						Allowing Savings
		Baseline Specification	Beta/Triangle Beliefs	Qualitative Uncertainty	CRRA, Gamma=1	CRRA, Gamma=5	CRRA, Heterogeneity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
All Taxfilers	100%	92.51 [11.75] (272.56)	95.26 [21.74] (180.80)	88.55 [9.96] (294.63)	23.63 [3.82] (60.09)	125.21 [20.05] (309.14)	83.27 [11.84] (228.82)	90.41 [10.89] (271.84)
High School or Less	45%	85.71 [12.48] (240.53)	96.95 [21.60] (186.75)	81.12 [9.88] (273.76)	24.31 [4.02] (64.52)	119.49 [21.26] (287.61)	77.26 [11.90] (204.22)	83.88 [11.69] (241.49)
No Status Changes	47%	95.40 [10.90] (326.91)	101.95 [18.30] (211.54)	91.43 [8.49] (366.04)	21.88 [3.54] (58.02)	129.60 [18.36] (356.94)	85.25 [10.64] (267.69)	93.09 [9.78] (324.58)
Female	52%	92.31 [15.27] (248.74)	101.22 [25.45] (173.53)	86.21 [12.30] (268.93)	26.26 [4.95] (65.78)	126.14 [26.16] (296.86)	90.26 [14.80] (247.75)	90.22 [13.82] (246.83)
Below 200% Federal Poverty Line	64%	108.48 [12.62] (308.52)	88.89 [23.40] (175.67)	105.53 [10.92] (339.31)	27.12 [4.04] (68.09)	130.44 [21.93] (295.59)	93.77 [13.38] (238.36)	105.95 [11.19] (308.42)
EITC Filer	35%	164.83 [33.18] (368.15)	184.51 [59.05] (256.67)	150.48 [25.02] (391.21)	42.31 [10.43] (85.00)	216.72 [57.79] (417.49)	143.77 [32.24] (294.08)	162.18 [33.08] (367.69)
High Uncertainty Filer	50%	178.89 [46.49] (365.73)	176.22 [82.82] (228.04)	171.48 [38.39] (400.00)	45.27 [14.25] (79.26)	239.30 [72.49] (406.16)	160.47 [44.92] (304.69)	175.19 [42.12] (365.43)

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. Effects and Costs of Uncertainty

- ▶ More uncertain tax filers appear to borrow less of their refund before filing
- ▶ Welfare costs maybe substantial: roughly 9% of value of EITC / \$6B nationally

Survey: Point Estimate and Qualitative Uncertainty

- 1) If you get a tax refund this year, how much do you think it will be? Please choose an amount:

\$ _____

(Financial Guide volunteer: please write \$500 above this number, and \$500 below this number, in the two blank lines in the question below)

- 2) How sure are you that your refund will be between \$ _____ and \$ _____? Please circle one:

NOT SURE AT ALL

SOMEWHAT SURE

VERY SURE

Survey: Labor Supply Question

3) Suppose you want to make some extra money by working more hours next week. Do you think you could get your manager/supervisor to schedule you for more hours?

YES

NO

I AM NOT WORKING RIGHT NOW

I AM NOT PAID HOURLY

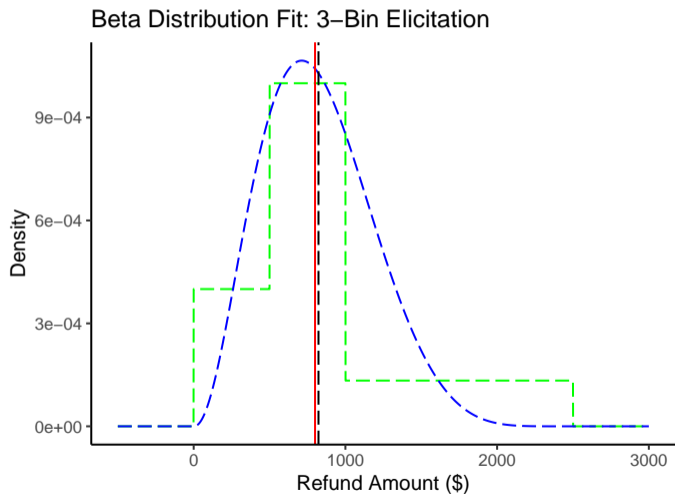
Survey:

- 4) We have one final question about your tax refund. Below we show six possible amounts that your refund could be (for example, “between \$1000 and \$2500”). For each of the six possibilities, please say what is the “percent chance” that you think your refund could be that amount:

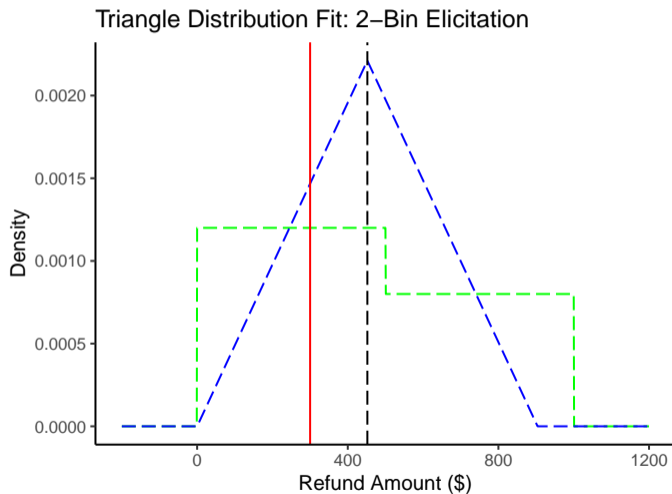
Could my refund be... (Please Enter % Chance for Each)

Over \$5000	%
Between \$2500 and \$5000	%
Between \$1000 and \$2500	%
Between \$500 and \$1000	%
Between \$0 and \$500	%
Negative: I will owe taxes	%

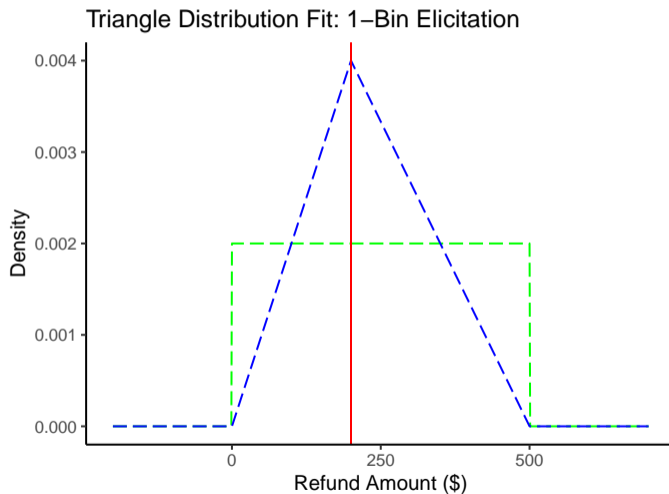
Fitting Beta Distributions: 3 bins



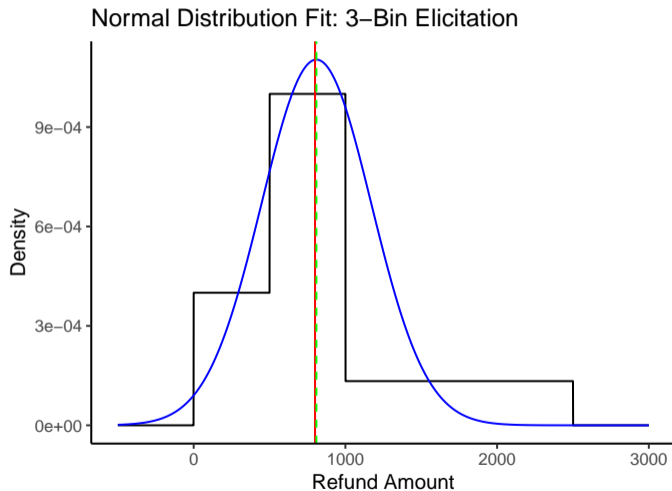
Fitting Beta Distributions: 2 bins



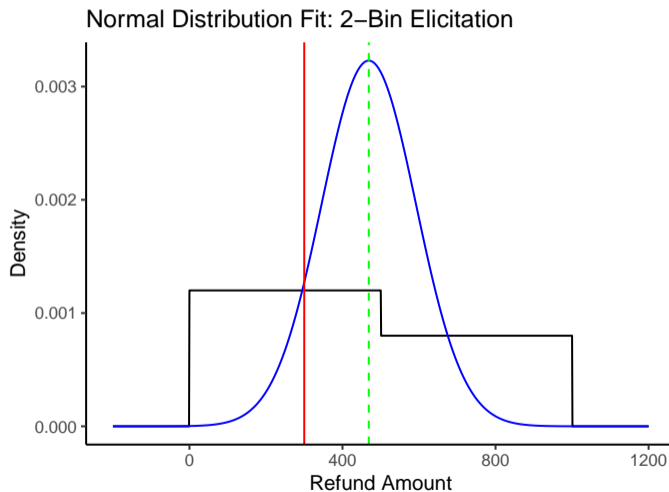
Fitting Beta Distributions: 1 Bin



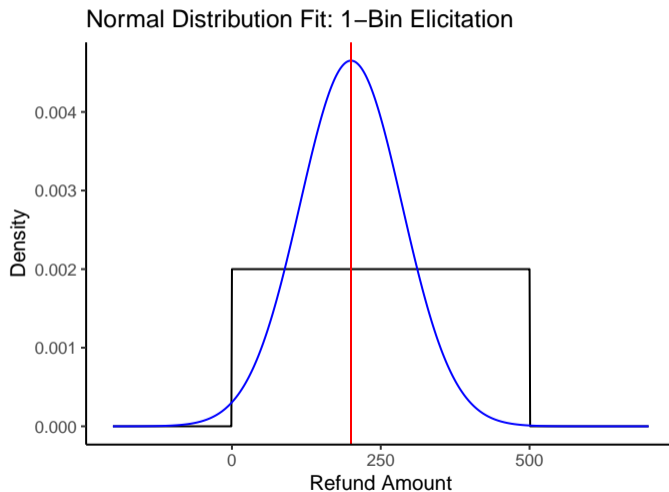
Fitting Normal Distributions: 3 Bins



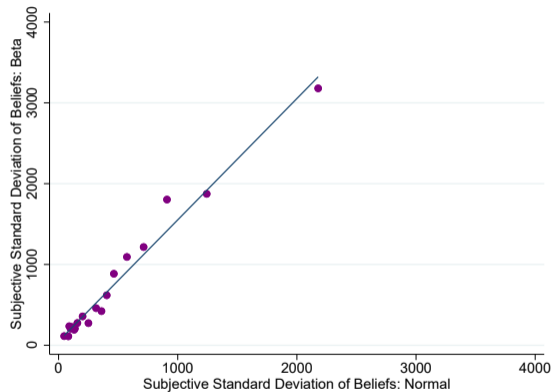
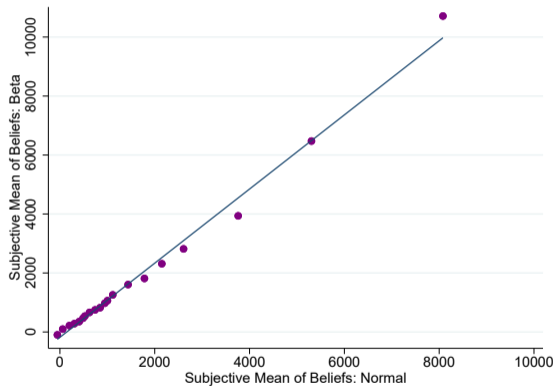
Fitting Normal Distributions: 2 Bins



Fitting Normal Distributions: 1 Bin



Comparing Distributional Assumptions: Normal vs. Beta



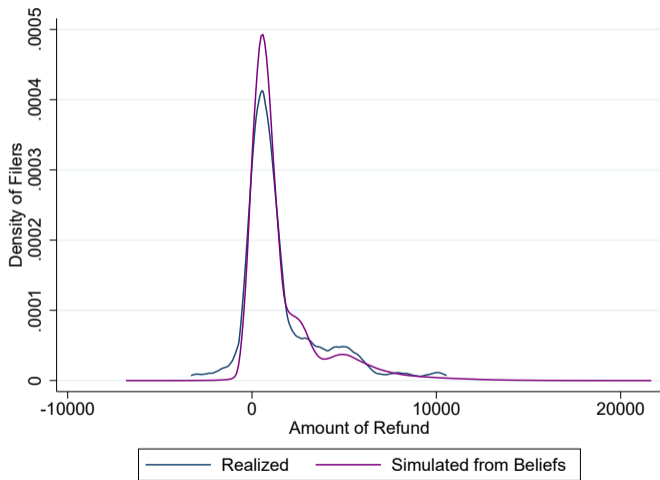
Comparing Distributional Assumptions: Normal vs. Beta

	Normal Distribution				Beta Distribution			
	Baseline	Exclude 50/50	Exclude Single Bins	All	Baseline	Exclude 50/50	Exclude Single Bins	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mean	1,605 (2000)	1,641 (2061)	1,322 (1407)	1,678 (2187)	1,837 (2584)	1,905 (2698)	1,435 (1705)	1,932 (2796)
Median	1,605 (2000)	1,641 (2061)	1,322 (1407)	1,678 (2187)	1,943 (3138)	2,026 (3299)	1,582 (2626)	2,068 (3407)
Std. Dev.	426 (510)	457 (535)	385 (456)	454 (599)	690 (895)	739 (941)	578 (725)	733 (1005)
Observations	618	541	584	647	618	541	584	647

Subjective Belief Distribution

	Core Sample	Has Dependents		Marital Status		Any College		Relative to 2x Federal Poverty Line	
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Savings	523.4	467.8	548.1	526.4	523.1	578.7	477.1	387.9	589.9
Refund	1542.3	3766.2	517.2	1998.9	1503.0	1589.0	1525.8	2959.3	770.1
Revolving Debt	2584.9	2948.1	2399.8	4424.2	2415.3	2537.4	2699.1	1965.9	2875.8
Observations	618	195	423	49	569	252	279	218	400

Distribution of Beliefs and Refunds



Sample Selection Criteria

- ▶ Exclude outlier observations
 - ▶ Individuals with subjective uncertainty in the top/bottom 1% of respondents
 - ▶ Individuals with expectation errors in the top/bottom 1% of respondents
 - ▶ Individuals with AGI below 0
- ▶ Exclude individuals with point forecasts that did not fall within the support of bins used to report subjective probabilities
- ▶ Exclude individuals whose point forecasts did not sum to 100%

▶ Core Sample

Robustness of Borrowing: Alternate Samples

	Baseline	Alternate Samples				Additional Specifications			
		No Direct Deposit	No Savings	Can't Change Income	No Dependents	Refund Controls	Income Controls	Refund & Income	Winsorize at 1%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Expected Refund Amount	40.38 (38.07)	6.266 (47.30)	35.28 (79.27)	0.487 (41.61)	70.50 (68.33)	-17.86 (39.15)	41.14 (38.11)	-5.019 (36.01)	9.558 (76.60)
Subjective Standard Deviation	-259.3** (131.5)	-196.4 (143.1)	-486.0** (203.5)	-370.7** (144.6)	-576.4** (250.1)	-283.3** (132.1)	-253.0* (131.7)	-252.4* (133.8)	-552.4** (256.5)
<i>Controls</i>									
Demographics	X	X	X	X	X	X	X	X	X
Tax Determinants	X	X	X	X	X	X	X	X	X
Refund Income						Linear	Linear	Cubic	Cubic
Observations	359	234	91	211	237	359	359	359	359
R-squared	0.096	0.103	0.273	0.130	0.107	0.112	0.097	0.120	0.073

Robustness of Borrowing Results: Beta Distribution

	Alternate Belief Distribution: Beta Distribution						
	Baseline	Full Sample	No Direct Deposit	No Savings	Can't Change Income	No Dependents	LIML
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Expected Refund Amount	40.38 (38.07)	54.92 (44.14)	10.04 (48.67)	68.22 (93.92)	33.69 (49.81)	116.5 (78.39)	208.5 (155.2)
Subjective Standard Deviation	-259.3** (131.5)	-154.0 (120.6)	-48.57 (116.0)	-329.0* (193.8)	-224.6* (135.7)	-510.1** (206.1)	-1300.1 (924.9)
<i>Controls</i>							
Demographics	X	X	X	X	X	X	X
Tax Determinants	X	X	X	X	X	X	X
Observations	359	359	234	91	211	237	359
R-squared	0.096	0.096	0.103	0.273	0.130	0.107	---