Background

Economic theory often models economic agents as profit-maximizing individuals.

Theft and crime are, from a purely utilitarian point of view, wealth transfers from one individual to another.

Background

This raises the important question:

Why are we honest at all?

- We could be following particular group norms (Akerlof and Kranton, 2000)
- We may care about reputation
- Lying may give us disutility (Kartik et al. 2007)

Background

How do we distinguish between these different explanations?

We'll review how laboratory experiments can tease out different motivations.

Lying – Fischbacher and Heusi (2013)

Subjects sat a cubicle and had to roll a die. The outcome of the roll of the die would determine their payoff. In the baseline case:

- $1 =$ CHF 3
- $2 =$ CHF 6
- $3 =$ CHF 9
- $4 =$ CHF 12
- $5 =$ CHF 15
- $6 =$ CHF 0

Lying – Fischbacher and Heusi (2013)

The experimenter could not verify the outcome of the die roll.

- To control for guilt, in a separate treatment subjects were given CHF 15 to start with;
- Subjects could return whatever money they wanted into an envelope and put it into a ballot box.
- Hence the profit-maximising statement is 5.

Lying could only be observed on aggregate by testing whether the distribution of reported dice rolls is uniform or not.

Lying – Fischbacher and Heusi (2013)

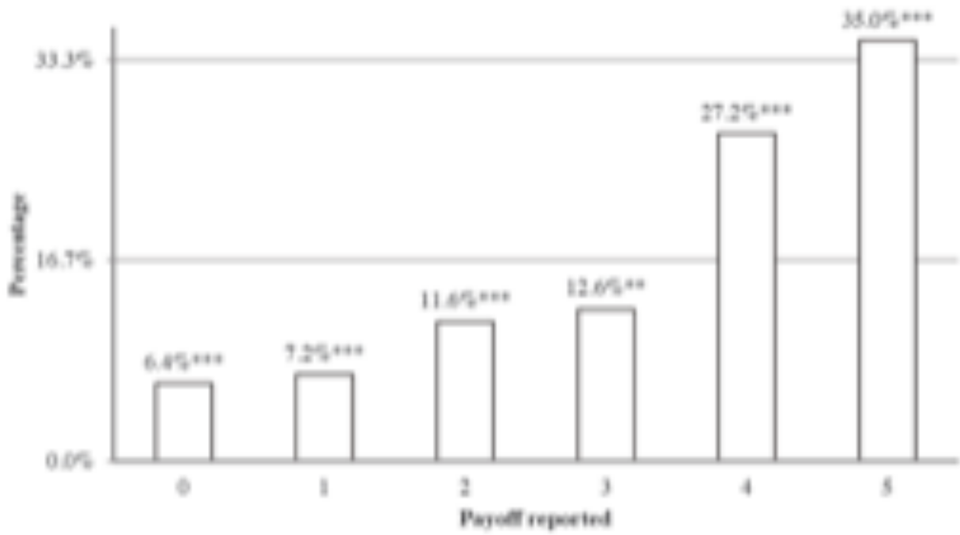


Figure 1. Percentage of reported number of subjects in baseline experiment; first participation only (stars display the significance of two-sided binomial test that the observed percentage differs from 16.7% (*=10%-level, **=5%-level, ***=1%-level)).

Lying – Fischbacher and Heusi (2013)

TABLE 1. Summary of all treatments.

	Fisher exact test (FE)[a] or signed rank test (WSR)[b]	Share of subjects (in percent) who reported corresponding payoff; one-sided binomial tests that it is smaller (larger) that 100%/6. *(+) = 10%-level, ** (++) = 5%-level, *** (+++) = 1%-level					
		0	1	2	3	4	5
(a) Baseline							
baseline ($n = 389$)		6.43***	7.20***	11.57***	12.60**	27.25+++	34.96+++
(b) High-stake sessions	FE 0.100						
baseline ($n = 79$)		2.53***	10.13*	15.19	15.19	17.72	39.24+++
high stake ($n = 80$)		11.25	5.00***	15.00	8.75**	27.50+++	32.50+++
(c) 4.9 sessions	FE 0.518						
baseline ($n = 128$)		7.03***	4.69***	9.38**	12.50	24.22++	42.19+++
4.9 ($n = 125$)		8.00***	5.60***	14.40	10.40**	29.60+++	32.00+++
(d) Externality sessions	FE 0.344						
baseline ($n = 80$)		8.75**	7.50**	7.50**	8.75**	40.00+++	27.50++
externality ($n = 78$)		8.97**	12.82	8.97**	16.67	25.64++	26.92++
(e) Double anonymous sessions	FE 0.969						
baseline ($n = 140$)		5.71***	8.57***	10.71**	17.14	28.57+++	29.29+++
double anonymous ($n = 137$)		6.57***	8.76***	10.22**	17.52	24.09++	32.85+++
(f) No die session							
no die ($n = 34$)		0.00***	2.94**	0.00***	0.00***	11.76	85.29+++
(g) Repetition	WSR 0.000						
first participation ($n = 111$)		11.71*	9.91**	13.51	12.61	20.72	31.53+++
second participation ($n = 111$)		4.50***	3.60***	5.41***	9.01**	25.23++	52.25+++
(h) Repetition: report in second participation	FE 0.171						
first report 0–3 ($n = 53$)		3.77***	5.66**	9.43	15.09	28.30+++	37.74+++
first report 4 ($n = 23$)		4.35*	4.35*	0.00**	4.35*	21.74	65.22+++
first report 5 ($n = 35$)		5.71*	0.00***	2.86**	2.86**	22.86	65.71+++
(i) Repetition: report in first participation	FE 0.075						
second report 0—3 ($n = 25$)		12.00	20.00	28.00	12.00	12.00	16.00
second report 4 ($n = 28$)		14.29	3.57**	14.29	21.43	17.86	28.57+++
second report 5 ($n = 57$)		10.34	8.62*	6.90**	8.62*	25.86+++	39.66+++

Lying – Fischbacher and Heusi (2013)

TABLE 1. Continued

	Average belief (in percent) about reporting corresponding payoff; signed rank test that belief differs from 100%/6 *10%-level, **5%-level, ***1%-level					
(j) Belief treatment						
inexperienced ($n = 41$)	9.34***	13.88***	14.78	17.00	16.80	28.20
experienced ($n = 19$)	3.84***	5.74***	8.21**	12.05**	22.58**	47.58***

[a]Reports the p-value of a Fisher exact test comparing the distributions of payoffs reported in the two treatment groups.
[b]Reports the p-value of a Wilcoxon signed rank test that in both participations the same number is reported.

Lying – Abeler et al. (2014)

The researchers randomly called landlines in Germany and asked respondents one of the following two questions:

"Please flip a coin once. Please let us know the outcome. If Tails comes up, we'll pay you 15 Euro. If Heads comes up, we'll pay you nothing."

"Please flip a coin four times. Please let us know the outcome. We'll pay you 5 Euro for each Tails that comes up and nothing otherwise."

Lying – Abeler et al. (2014)

Notice that it is impossible to verify whether the responders were lying or not.

As such, the profit-maximising response to the first question is: Tails!

And the profit-maximising response to the second question is: 4 Tails!

Lying – Abeler et al. (2014)

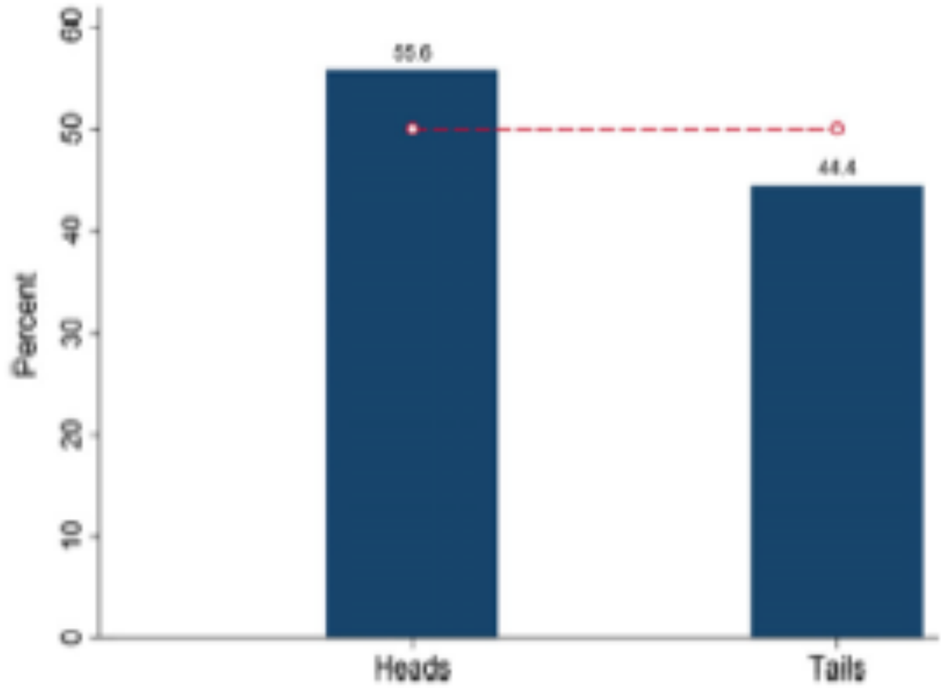


Fig. 1. Aggregate behavior in 1-Coin-Telephone. Reporting heads yielded no payoff; reporting tails yielded a payoff of 15 euros. The dashed line corresponds to the expected distribution if every participant reported the true outcome of their coin toss.

Lying – Abeler et al. (2014)

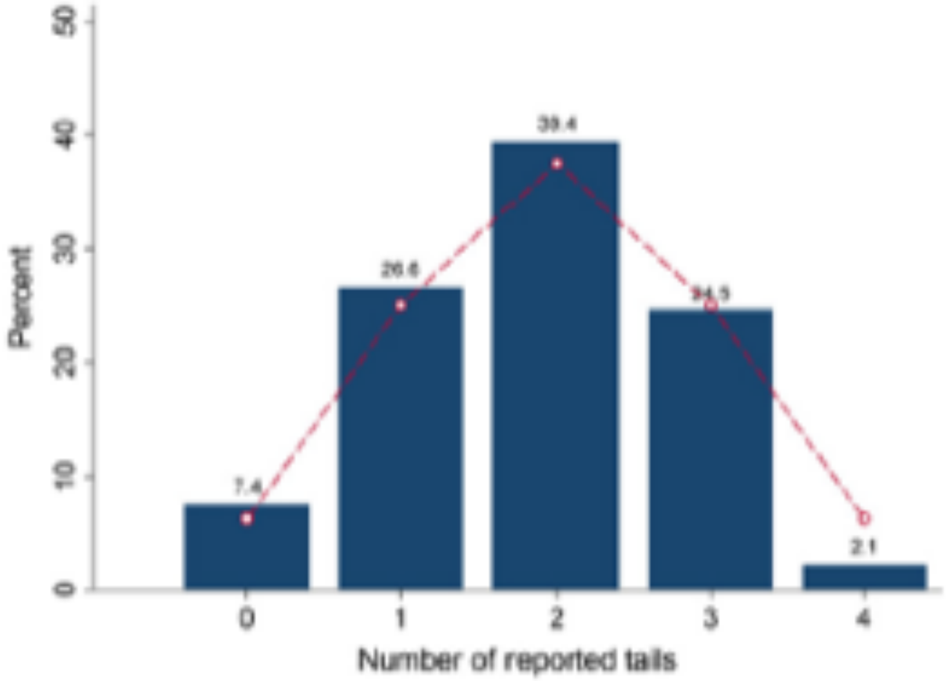
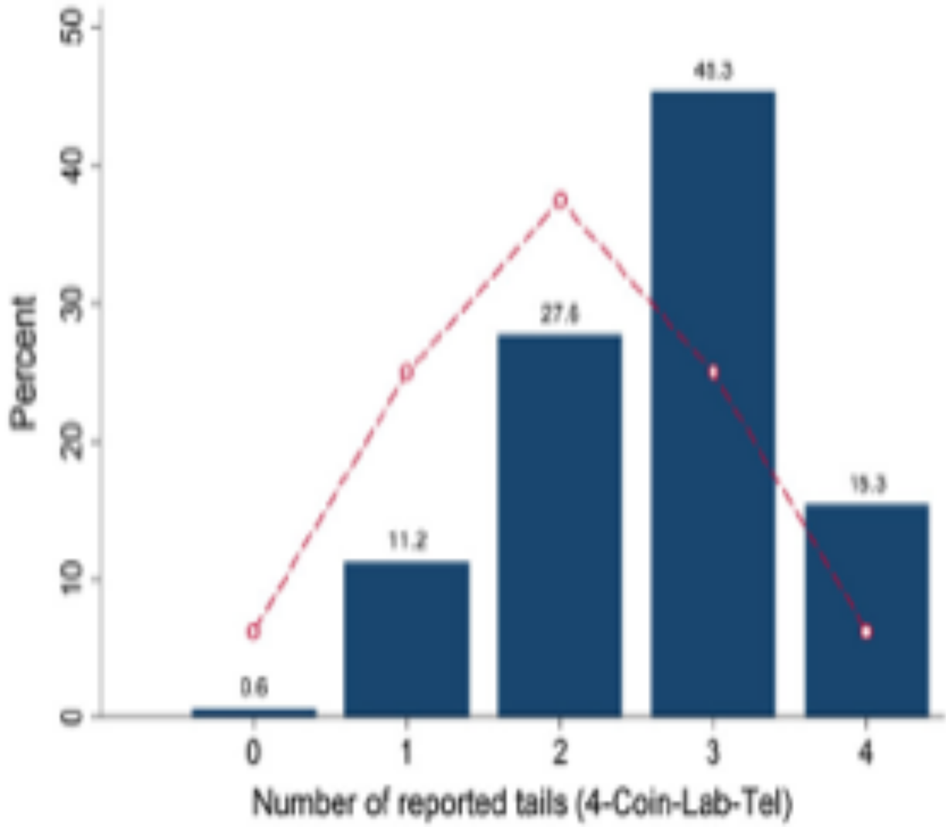
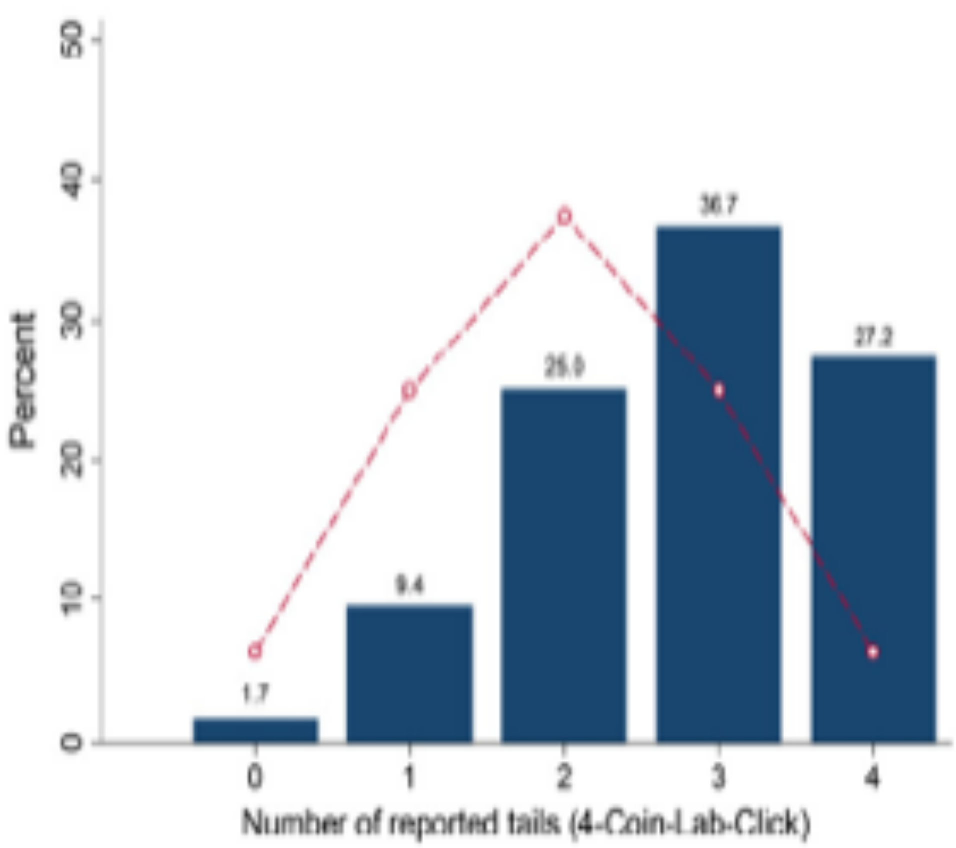


Fig. 2 Aggregate behavior in 4-Coin-Telephone. The payoff was 5 euros times the number of tails reported. The dashed line corresponds to the expected distribution if every participant reported the true outcomes of their coin tosses.

Lying – Abeler et al. (2014)



Lying – Abeler et al. (2014)



Lying – Abeler et al. (2014)

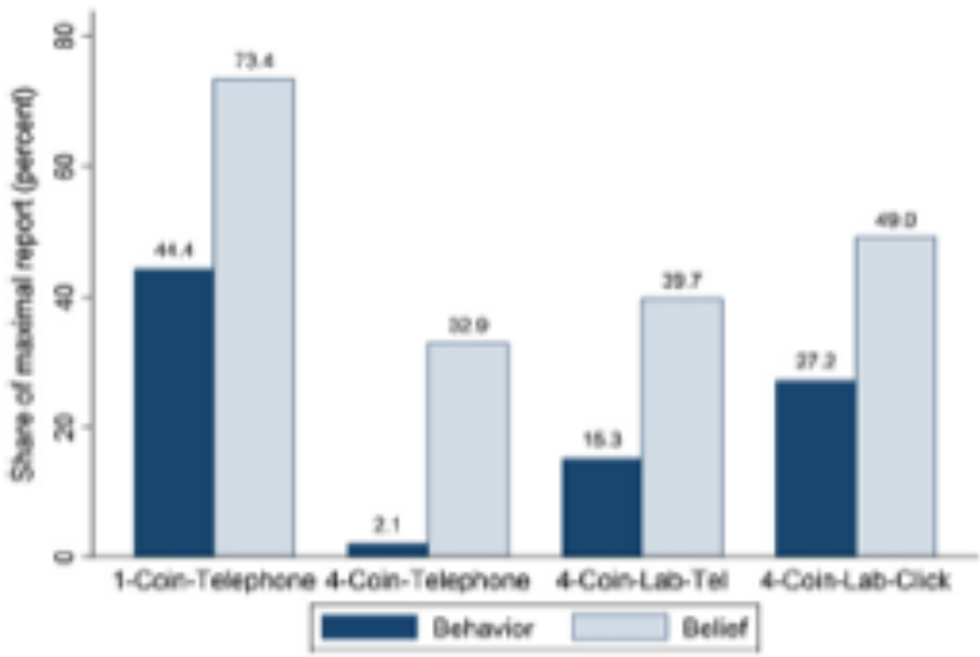


Fig. 4. Share of maximal reports across treatments. The maximal report is 4 in the 4-Coin Treatments and 1 in 1-Coin-Telephone. The dark bars depict actual behavior. The light-colored bars depict the average belief of participants in each treatment about the behavior of the other participants in their treatment.

Behavioural Models of Lying

It is still an open question as to why people (partially) lie.

- Let S be the set of possible states of the world.
- Let $s \in S$ be the actual state of the world.
- Let $m \in S$ be a message that the player i sends about the state of the world.
- Let $u_i(s, m)$ be the utility function for player i

What is the functional form of $u_i(s, m)$ that can explain the behavior we saw earlier?

Fixed Cost of Lying

One possibility is that lying gives you a fixed disutility:

- $u_i = v(m)$ if $s = m$
- $u_i = v(m) - c$ if $s \neq m$
- Assume that: $\frac{\partial v(m)}{\partial m} > 0$

A fixed cost of lying model cannot explain the observed results, particularly partial lying.

- If $v(m) - c > v(s), m > s$, then m should be the largest element of S.
- In other words, if the financial benefit of lying exceeds the psychological cost, one should tell the biggest possible lie.

Other rationales for lying aversion

People may choose not to lie because this may damage their reputation (Akerlof, 1983)

Although honesty is an *injunctive* norm, *descriptive* social norms may dictate whether or not lying is prevalent

- An honest individual in a society full of dishonest people may be less reluctant to lie or cheat.
- i.e. When in Rome, do as Romans do.

Still an open question in behavioural economics.

Lying - Abeler et al, 2016

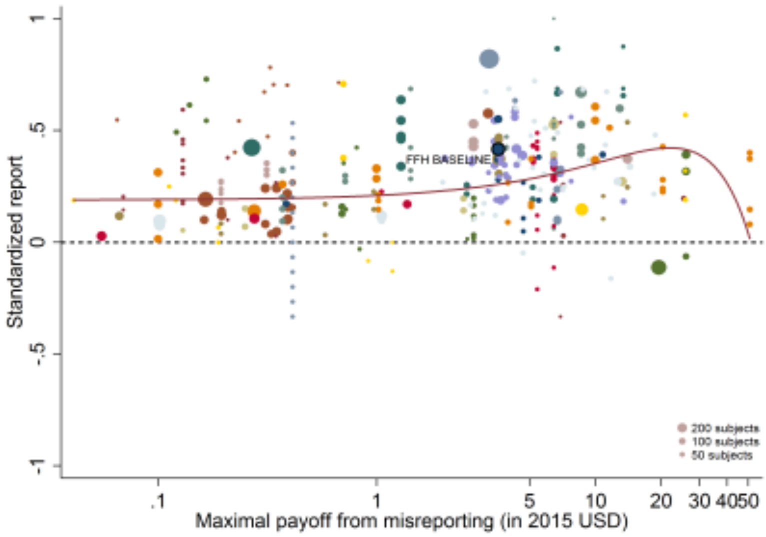
Meta-analysis of 72 experiments (over 32,000 subjects in 43 countries)

Standardized report across lottery types, from payoff minimising (-1) to payoff maximising (+1), with the expected payoff from truth telling at 0

- $r_{standardized} = \frac{\pi - \pi^{truth}}{\pi^{truth} - \pi^{min}}$, $\pi < \pi^{truth}$
- $r_{standardized} = \frac{\pi - \pi^{truth}}{\pi^{max} - \pi^{truth}}$, $\pi \geq \pi^{truth}$

Lying - Abeler et al, 2016

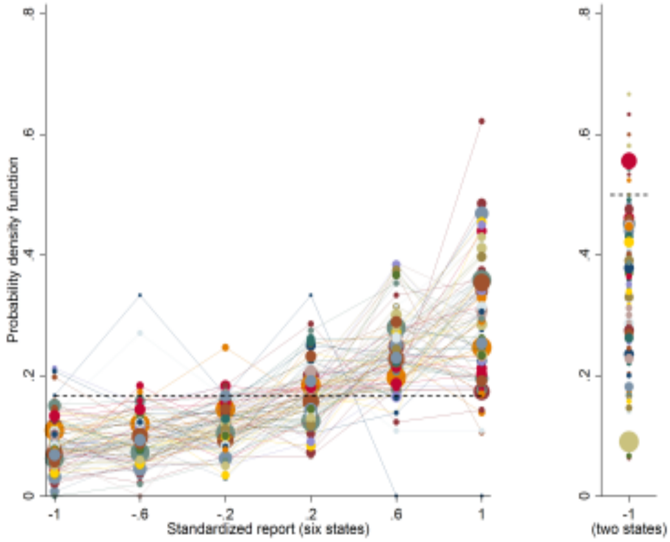
Figure 1: Average standardized report by incentive level



Notes: The figure plots standardized report against maximal payoff from misreporting. Standardized report is on the y-axis. A value of 0 means that subjects realize as much payoff as a group of subjects who all tell the truth. A value of 1 means that subjects all report the state that yields the highest payoff. The maximal payoff from misreporting (converted by PPP to 2015 USD), i.e., the difference between the highest and lowest possible payoff from reporting, is on the x-axis (log scale). Each bubble represents the average standardized report of one treatment and the size of a bubble is proportional to the number of subjects in that treatment. "FFH BASELINE" marks the result of the baseline treatment of Fischbacher and Föllmi-Heusi (2013). The line is the fitted regression line of a quadratic regression.

Lying - Abeler et al, 2016

Figure 2: Distribution of reports (uniform distributions with six and two outcomes))



Notes: The figure depicts the distribution of reports by treatment. The left panel shows treatments that use a uniform distribution with six states and linear payoff increases. The right panel shows treatments that use a uniform distribution with two states. The right panel only depicts the likelihood that the low-payoff state is reported. The likelihood of the high-payoff state is 1 minus the depicted likelihood. The size of a bubble is proportional to the total number of subjects in that treatment. Only treatments with at least 10 observations are included. The dashed line indicates the truthful distribution at 1/6 and 1/2.

Variable Cost of Lying

Another possibility is that disutility increases in the size of the lie:

- $u_i = v(m) - c(m - s)$
- $c(m - s)$ is a convex cost with minimum at $m = s$ (truth)
- Assume that: $\frac{\partial v(m)}{\partial m} > 0$

Variable cost allows partial lying, but not in the form observed as does not explain partial lies in large samples

Abeler et al (2016) describe and discuss a wide variety of potential models and detail further experiments to test which of the models are most applicable

Economics of Crime (& What Punishment)

Having established that some people are honest, while others are not, what type of policies can governments use to incentivize good behavior?

Gary Becker pioneered the use of economic theory to tackle individual and collective choice in non-market settings.

Economics of Crime: Tax Evasion

Allingham and Sandmo (1972) and Yitzhaki (1974) applied the economics of crime approach to tax evasion (one of the most common forms of white collar crime)

They model the decision to evade taxes as a decision under risk:

- There is a (known) probability that the government may audit their tax return
- If audited, a fine is levied which is proportional to the amount evaded (Yitzhaki)
- If not audited, taxpayer gets away with not paying full amount owed.

Economics of Crime: A Model of Tax Evasion

Taxpayer has income Y, and must report $X \leq Y$ to tax authority.

- If there is an audit, true Y is revealed with certainty

After tax declaration takes place, one out of two potential states of the world occurs:

1. There is no audit, in which case the taxpayer's income is:
   - $Y^n = Y - tX$
2. There is an audit, in which case the taxpayer's income is:
   - $Y^c = Y - tX - ft(Y - X)$

Economics of Crime: A Model of Tax Evasion

Allingham, Sandmo and Yitzhaki assume taxpayers know the probability of being audited.

- Taxpayers may not know what that probability is.
- Therefore, they are making a decision under ambiguity.
- emember the Ellsberg urn problem in week 1?

We are going to present a more general form of preferences for ambiguity, proposed by Chateauneuf et al. (2007).

- Ambiguity causes individuals to be responsive to the best and worst possible outcomes.

Economics of Crime: A Model of Tax Evasion

Let $p \in \Omega$ be a state of nature, corresponding to the (possibly unknown) probability with which a taxpayer is audited.

The decision-maker has a utility function defined as follows:

$$V(f) = \delta\left[(1-\alpha)M_i + \alpha m_i\right] + (1-\delta)E\left[u_i(Y,X)\right] \qquad (1)$$

- $E\left[u_i(Y,X)\right]$ is the expected utility of decision-maker i with respect to the probability distribution p on Ω,
- $M_i = \max_{p\in\Omega} u_i(Y,X)$ (i.e. the best possible outcome)
- $m_i = \min_{p\in\Omega} u_i(Y,X)$ (i.e. the worst possible outcome)
- $0 \leq \alpha, \delta \leq 1$ are weights

Economics of Crime: A Model of Tax Evasion

The decision-maker will select X to maximise her utility function, where:

- $m_i = Y^c$,
- $M_i = Y^n$,
- $E[u_i(Y, X)] = pu_i\left(Y - tX - ft(Y - X)\right) + (1 - p)u_i\left(Y - tX\right)$.

Collecting terms and rearranging, this gives the following maximisation problem:

$$\max_{\{X\}} u_i\left(Y - tX - ft(Y - X)\right)\left[\delta\alpha + (1 - \delta)p\right] + u_i\left(Y - tX\right)\left[\delta(1 - \alpha) + (1 - \delta)(1 - p)\right] \quad (2)$$

Economics of Crime: A Model of Tax Evasion

$$\max_{\{X\}} u_i\left(Y - tX - ft(Y - X)\right)\left[\delta\alpha + (1-\delta)p\right] \\ + u_i\left(Y - tX\right)\left[\delta(1-\alpha) + (1-\delta)(1-p)\right]$$

For there to be non-compliance, the marginal utility of income declaration must be negative when the decision-maker declares his income truthfully:

$$\left.\frac{\partial V(X)}{\partial X}\right|_{X=W} = u_i'\left(Y(1-t)\right)\left[(ft-t)(\alpha\delta + (1-\delta)p) \\ - t\left(\delta(1-\alpha) + (1-\delta)(1-p)\right)\right] < 0 \quad (3)$$

Collecting terms and rearranging gives:

$$f < \frac{1}{\delta(\alpha - p) + p} \tag{4}$$

Collecting terms and rearranging gives:

$$f < \frac{1}{\delta(\alpha - p) + p} \tag{5}$$

In the absence of ambiguity ($\delta = 0$), an increase in the audit probability always leads to lower levels of non-compliance

In the presence of ambiguity ($\delta > 0$), the effect of raising the probability of audit on behaviour is weakened.

Economics of Crime: A Model of Tax Evasion

Fixing *p*, the effect of changing the weight in ambiguity preferences will depend on how the decision-maker views ambiguity.

If $\alpha > p$, then the decision-maker is *pessimistic*.

- The more sensitive a pessimistic decision-maker is to ambiguity (i.e. a higher δ), the higher the level of compliance for a given level of audit probability.

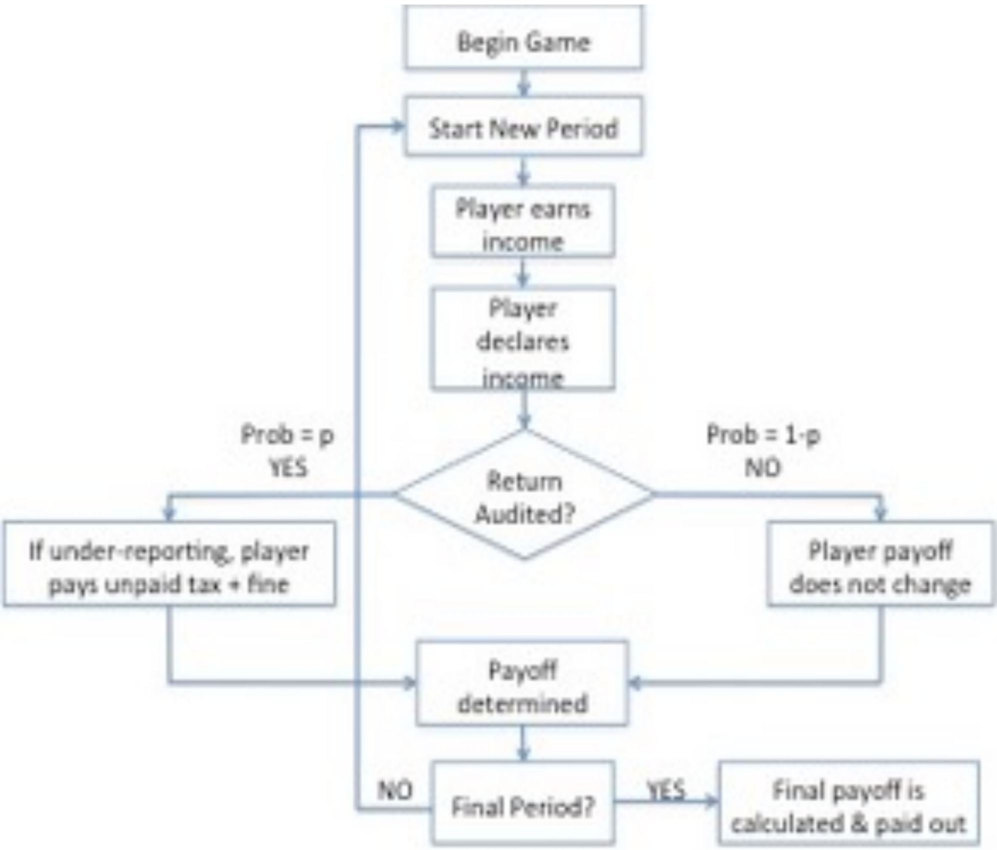
Economics of Crime: A Model of Tax Evasion

Conversely, if $\alpha < p$, then the decision-maker is *optimistic*, and a higher δ leads to lower compliance.

Survey evidence (Andreoni et al., 1998) suggests that taxpayers believe the audit probability is higher than its actual value.

- People may be ambiguity averse in the context of a tax compliance decision.

An Experiment on Tax Evasion



An Experiment on Tax Evasion

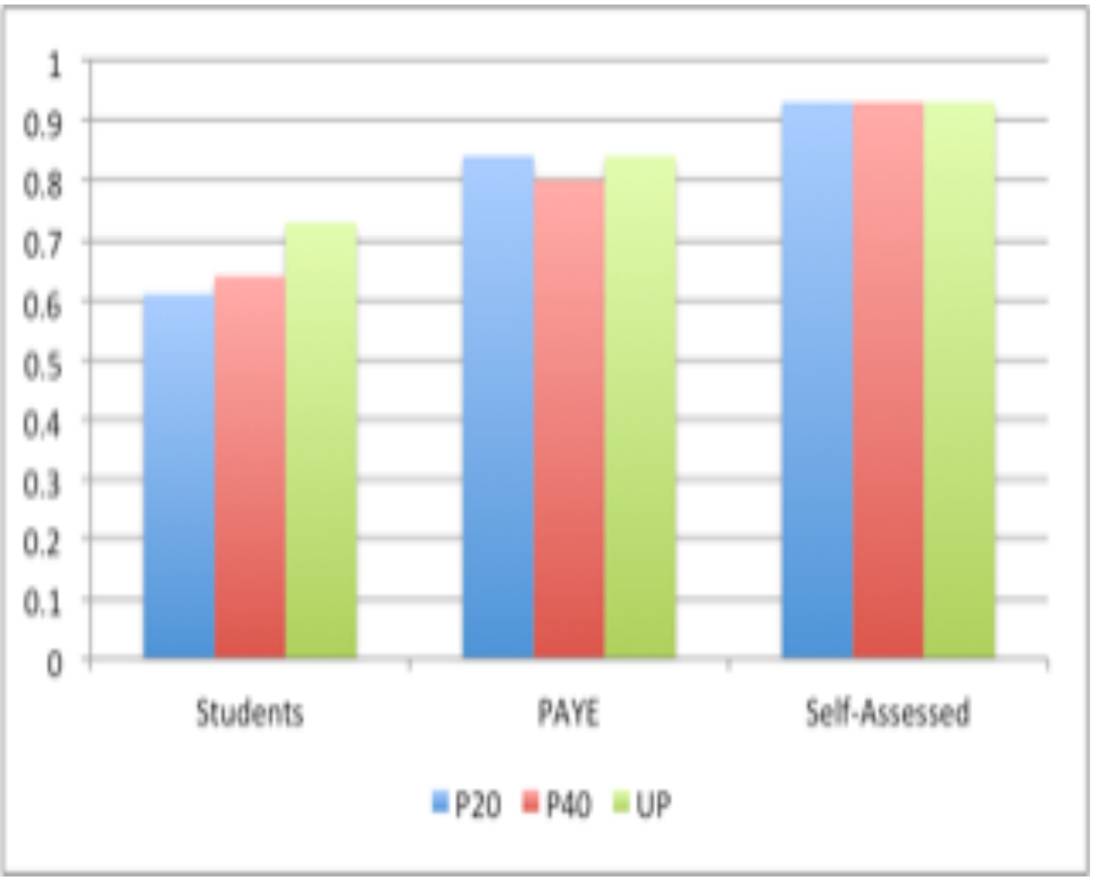
An Experiment on Tax Evasion

		Audit Rate			
		P20N	P20	P40	UP
Fine level	F100	30, 29, 27	35, 36, 31	35, 35, 30	30, 30, 32
	F200		35, 35	35, 35	

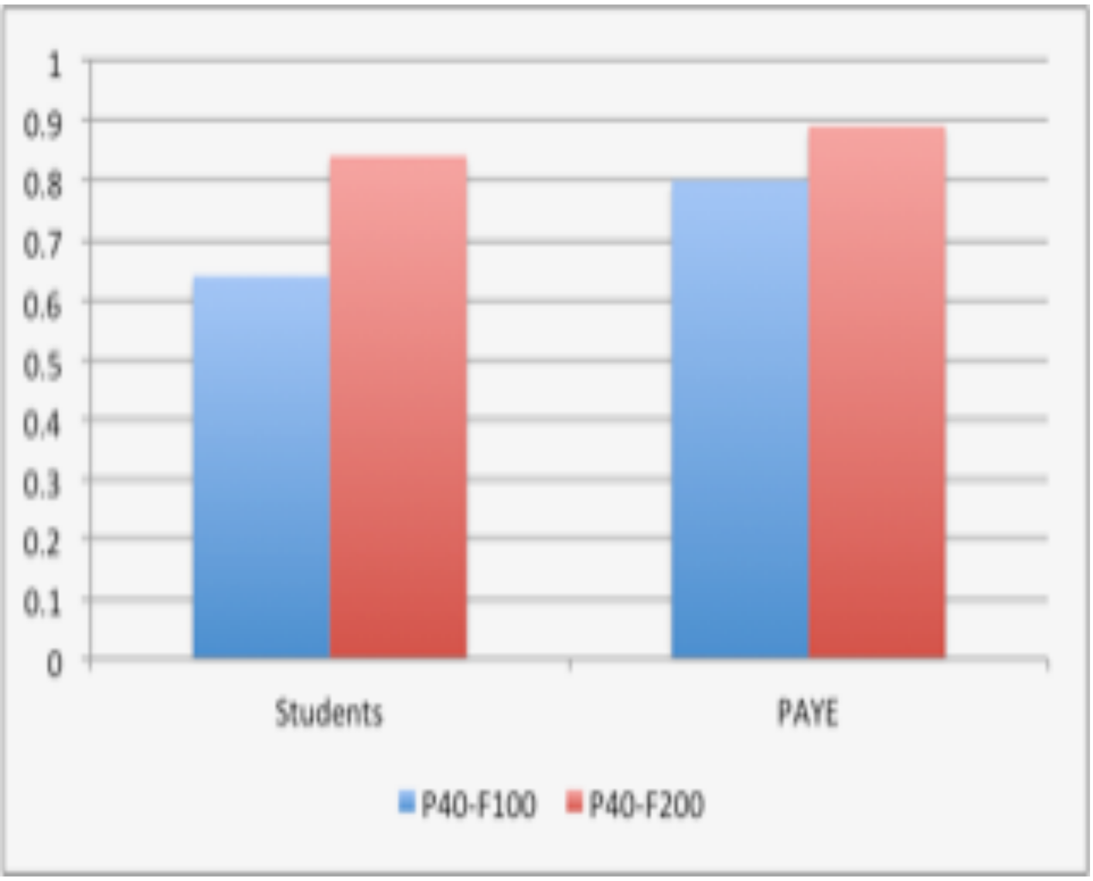
Numbers are sample size for Student, PAYE and Self-Assessed subject pools.

Table: Experimental Design.

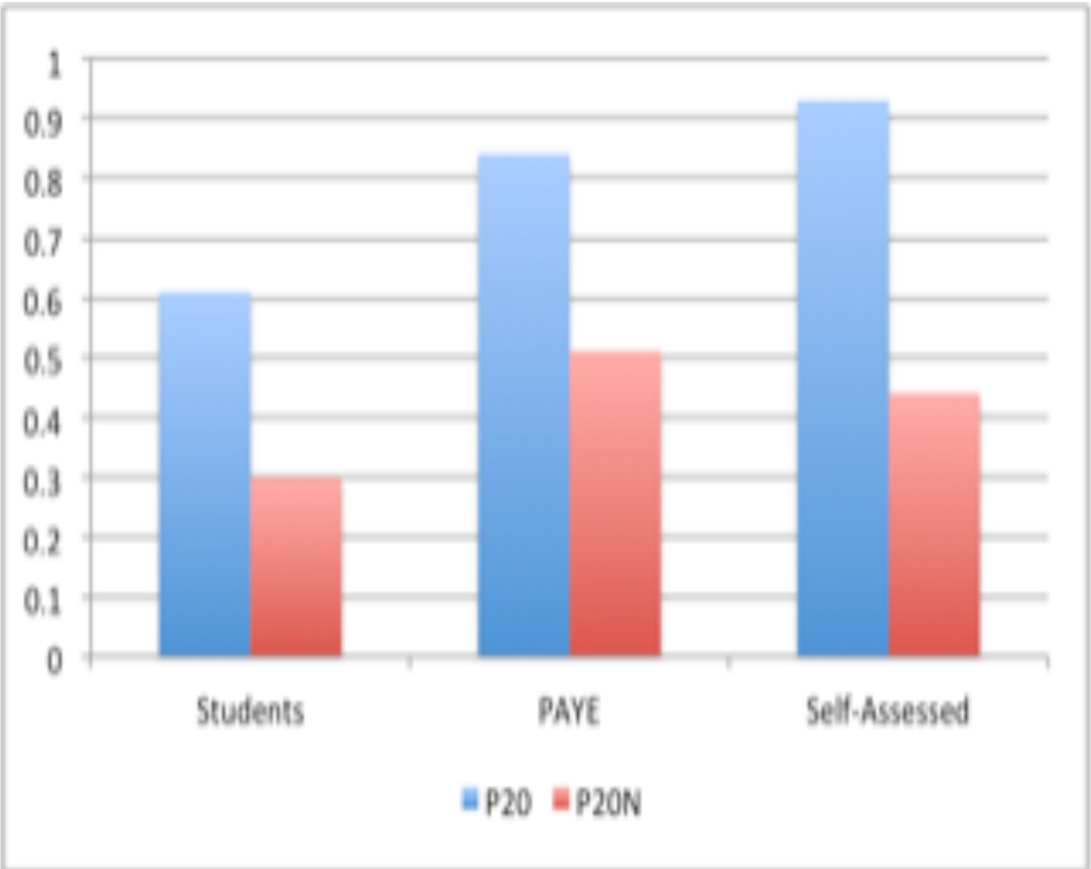
An Experiment on Tax Evasion: The effect of changing p



An Experiment on Tax Evasion: The effect of changing f



An Experiment on Tax Evasion: The effect of changing tax framing



An Experiment on Tax Evasion: The 'bomb-crater' effect

	(1)		(2)	
DV	$c_{it} \in [0,1]$		$c_{it} \in [0,1]$	
Income_{it}	0.010***	(0.002)	0.011***	(0.002)
$\text{Total Income}_{it-1}$	-0.001***	(0.0001)	-0.001***	(0.0001)
$(\text{Not Evade} \times \text{Audited})_{it-1}$	-0.337***	(0.031)		
$(\text{Evade} \times \text{Audited})_{it-1}$	-0.522***	(0.035)		
$(\text{Evade} \times \text{Not Audited})_{it-1}$	-0.226***	(0.035)		
$\text{Student} \times \text{Audited}_{it-1}$			-0.386***	(0.032)
$\text{PAYE} \times \text{Audited}_{it-1}$			-0.077**	(0.034)
Experience_{t}	0.011*	(0.006)	0.013*	(0.007)

An Experiment on Tax Evasion: in summary

1. Workers more compliant and more responsive to tax framing than students
2. Doubling the the audit rate does not lead to increased compliance in any of the three subject pools.
3. Ambiguous audit rates lead to higher compliance in students, but not in workers.
4. Negative relationship between accumulated income and compliance
5. Audited student subjects more likely to evade in the next period; weaker effect for PAYE, no effect on self-assessed.