

Tax Enforcement

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GOALS OF THIS LECTURE

- 1) Theoretically model tax enforcement, tax evasion, and avoidance in simple ways.
- 2) Study empirical evidence on tax avoidance and evasion and effects of policies.

Tax Enforcement Problem

Most models of optimal taxation (income or commodity) assume away enforcement issues. In practice:

1) Enforcement is costly (eats up around 10% of taxes collected in the US) when combining costs for government (tax administration) and private agents (tax compliance costs)

2) Substantial tax evasion (15% of under-reported income in the US federal taxes). Tax evasion much worse in developing countries

Two widely used surveys:

Andreoni, Erard, Feinstein JEL 1998

Slemrod and Yitzhaki Handbook of PE, 2002

ALLINGHAM-SANDMO JPUBE'72 MODEL

Seminal in the theoretical tax evasion literature. Uses the Becker crime model

Individual taxpayer problem:

$$\max_{\bar{w}} (1 - p) \cdot u(w - \tau \cdot \bar{w}) + p \cdot u(w - \tau \cdot \bar{w} - \tau(w - \bar{w})(1 + \theta)),$$

where w is true income, \bar{w} reported income, τ tax rate, p audit probability, θ fine factor, $u(\cdot)$ concave.

Let $c^{No\ Audit} = w - \tau \cdot \bar{w}$ and $c^{Audit} = w - \tau \cdot \bar{w} - \tau(w - \bar{w})(1 + \theta)$

FOC in \bar{w} : $-\tau(1 - p)u'(c^{No\ Audit}) + p\theta\tau u'(c^{Audit}) = 0 \Rightarrow$

$$\frac{u'(c^{Audit})}{u'(c^{No\ Audit})} = \frac{1 - p}{p\theta}$$

SOC $\Rightarrow \tau^2(1 - p)u''(c^{No\ Audit}) + p\tau^2\theta^2u''(c^{Audit}) < 0$

ALLINGHAM-SANDMO JPUBE'72 MODEL

Result: Evasion $w - \bar{w} \downarrow$ with p and θ

Proof of $d\bar{w}/dp > 0$: Differentiate FOC with respect to p and \bar{w} :

$$-dp \cdot \tau u'(c^{No\ Audit}) - d\bar{w} \cdot \tau^2(1-p)u''(c^{No\ Audit}) = dp \cdot \theta \tau u'(c^{Audit}) + d\bar{w} \cdot p\theta^2 \tau^2 u''(c^{Audit})$$

$$\Rightarrow d\bar{w} \cdot [-\tau^2(1-p)u''(c^{No\ Audit}) - p\theta^2 \tau^2 u''(c^{Audit})] = dp \cdot [\theta \tau u'(c^{Audit}) + \tau u'(c^{No\ Audit})]$$

Similar proof for $d\bar{w}/d\theta > 0$

Huge literature built from the **A-S** model [including optimal auditing rules]

Why is tax evasion so low in OECD countries?

Key puzzle: US has low audit rates ($p = .01$) and low fines ($\theta \simeq .2$). With reasonable risk aversion (say CRRA $\gamma = 1$), tax evasion should be much higher than observed empirically

Two types of explanations for puzzle

1) **Unwilling to Cheat:** Social norms and morality [people dislike being dishonest and hence voluntarily pay taxes]

2) **Unable to Cheat:** Probability of being caught is much higher than observed audit rate because of **3rd party reporting:**

Employers double report wages to govt (W2 forms), companies and financial institutions double report capital income paid out to govt (US 1099 forms)

DETERMINANTS OF TAX EVASION

Large empirical literature studies tax evasion levels and the link between tax evasion and (a) tax rates, (b) penalties, (c) audit probabilities, (d) prior audit experiences, (e) socio-economic characteristics

Early literature relies on observational [non-experimental] data which creates serious identification and measurement issues:

(1) Evasion is difficult to measure

(2) Most independent variables [audits, penalties, etc.] are endogenous responses to evasion and also difficult to measure

⇒ Requires to use experimental data or to find good instruments: (a) IRS Tax Compliance Measurement Studies (TCMP), (b) lab experiments, (c) field experiments

TCMP: IMPACT OF THIRD PARTY REPORTING

IRS Tax Compliance Measurement Study (TCMP) is a thorough audit of stratified sample of tax returns done periodically. TCMP shows that:

- 1) Tax Gap is about 15%
- 2) Tax Gap concentrated among income items with no 3rd party reporting (such as self-employment income)
 - tax gap over 50% when little 3rd party reporting [consistent with Allingham-Sandmo]
 - Tax Gap very small (< 5%) with 3rd party reporting

Tax Gap "Map"

Tax Year 2006 (\$ billions)

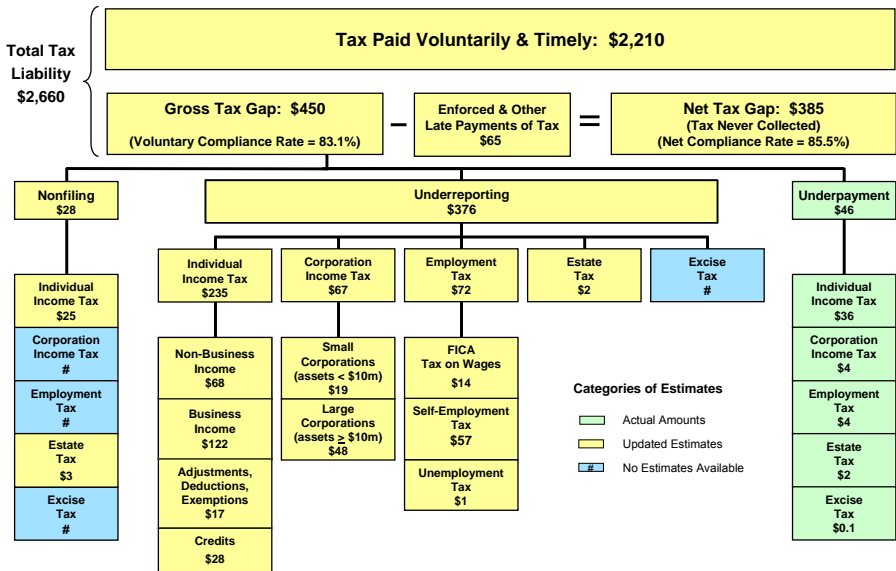
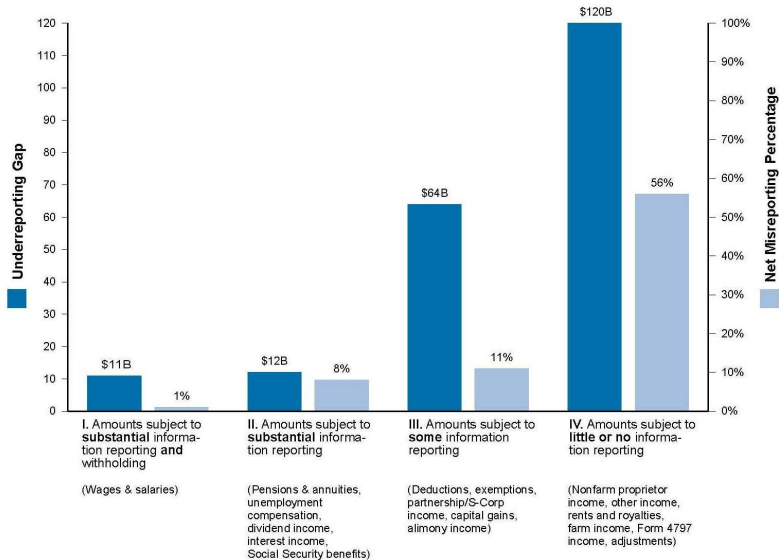


Chart 1: Effect of Information Reporting on Taxpayer Compliance

Tax Year 2006 Individual Income Tax Underreporting Gap and Net Misreporting Percentage, by "Visibility" Category



NOTE: Net Misreporting Percentage is defined as the net misreported amount of income as a ratio of the true amount. Source: IRS (2012) Internal Revenue Service, December 2011

TCMP: IMPACT OF TAX WITHHOLDING

3) Tax Withholding further reduces tax gap: liquidity constraint effect is most likely explanation: some taxpayers can never pay the tax due unless it is withheld at source

⇒ wage income withholding is critical for enforcement of broad based income tax and payroll taxes

Numbers from TCMP are rough estimates because audits cannot uncover all evasion [IRS blows up uncovered evasion by factor 3-4] ⇒ Thorough audits detect evasion of only about 4% of income

LAB EXPERIMENTS

Multi-period reporting games involving participants (mostly students) who receive and report income, pay taxes, and face risks of being audited and penalized

1) Lab experiments have consistently shown that penalties, audit probabilities, and prior audits increase compliance (e.g., Alm, Jackson, and McKee, 1992)

2) But when penalties and audit probabilities are set at realistic levels, their deterrent effect is quite small [Alm, Jackson, and McKee 1992] ⇒ Laboratory experiments tends to predict more evasion than we observe in practice

Issues: Lab environment is artificial, and therefore likely to miss important aspects of the real-world reporting environment [3rd party information and social norms]

FIELD EXPERIMENTS

1) Blumenthal, Christian, Slemrod NTJ'01 study the effects of normative appeals to comply: treatment group receives letter encouraging compliance on normative grounds "support valuable services" or "join the compliant majority", control group [no letter]

⇒ No (statistically significant) effect of normative appeals on compliance overall

2) Slemrod, Blumenthal, Christian JPubE'01 study the effects of "threat-of-audit" letters

⇒ Statistically significant effect on reported income increase, especially among the self-employed ["high opportunity group"] but very small sample size

Recently: (a) Hallsworth et al. (2014) show that normative appeals help in collecting overdue taxes [but small quantitatively], (b) Bott et al. 2014 for a randomized experiment in Norway on foreign income [threat of audit more effective than normative appeal], (c) see survey Luttmer-Singhal '14

	Either Letter					
	Federal Taxable Income			MN Tax Liability		
	Treated	Control	Treated-Control	Treated	Control	Treated-Control
1994	\$26,927	\$26,940	\$-14	\$1,946	\$1,954	\$-8
1993	\$26,346	\$26,449	\$-103	\$1,919	\$1,934	\$-15
1994-1993	\$580	\$491	\$89(270)	\$27	\$20	\$7(22)
% with 94-93 increase	54.3	53.9	0.4	52.8	52.3	0.5
n	31,149	15,624		31,149	15,624	

Notes:

Number in parentheses is the standard error.

The mean of "Treated-Control" may differ from the mean of "Treated" minus the mean of "Control" due to rounding error.

Table 4

Average reported federal taxable income: differences in differences for the whole sam

Whole sample (weighted)

	Treatment	Control	Difference
1994	23,781	23,202	579
1993	23,342	22,484	858
94-93	439	717	-278
S.E.			464
%w/increase	54.4%	51.9%	2.5%***
<i>n</i>	1537	20,831	

Low income

High opportunity

	Treatment	Control	Difference
1994	7473	3992	3481
1993	971	787	183
94-93	6502	3204	3298
S.E.			2718
%w/increase	65.4%	51.2%	14.2%*
<i>n</i>	52	123	

Source: Slemrod et al. (2001), p.466

TAX AUDIT EXPERIMENT FROM DENMARK

Kleven-Knudsen-Kreiner-Pedersen-Saez '11 analyze bigger Danish income tax auditing experiment [stratified sample 40,000]

Overall detected evasion [no adjustment] is around 2.5% but:

- 1) Evasion rate for self-reported items is almost 40%
- 2) Evasion rate for third party reported items is only 0.3%
- 3) Overall evasion rate is so low because 95% of income is third party reported in Denmark

Role of 3rd party reports [information structure] seem to trump social factors and economic factors:

$$Evade_i = \alpha + \beta \text{Self Reported Income}_i + \gamma \text{Social Factors}_i + \varepsilon_i$$

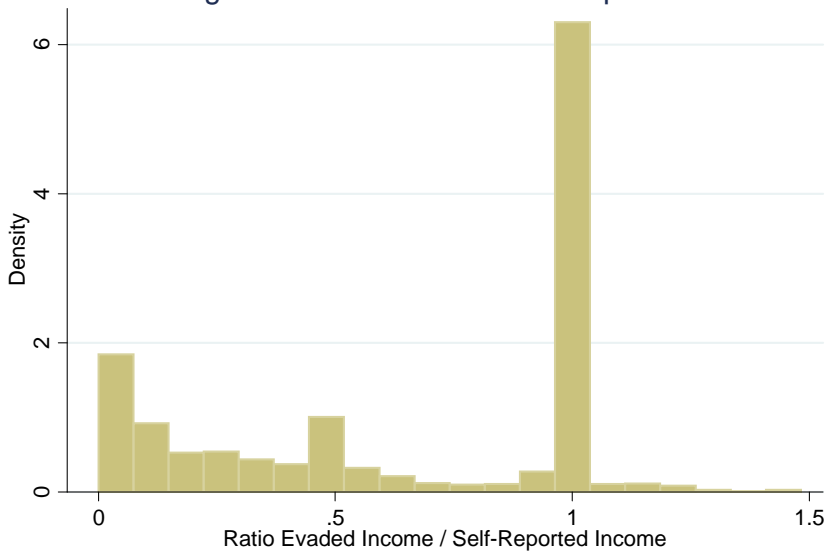
Self-Reported vs. Third-Party Reported Income

	Pre-audit net income			Under-reporting of income		
	Total	Third-party	Self-reported	Total	Third-party	Self-reported
Amount	206,038	195,969	10,069	4,255	536	3,719
	(2,159)	(1,798)	(1,380)	(424)	(80)	(416)
Percent	98.38	98.57	38.18	8.39	1.72	7.28
	(0.09)	(0.08)	(0.35)	(0.20)	(0.09)	(0.19)

Determinants of the Probability of Audit Adjustment: Social, Economic, and Information Factors

	Social factors		Socio-economic factors		Information factors		All factors	
Constant	14.42	(0.64)	11.92	(0.66)	1.44	(0.25)	3.98	(0.62)
Female	-5.76	(0.43)	-4.45	(0.45)			-2.05	(0.41)
Married	1.55	(0.46)	-0.36	(0.48)			-1.64	(0.44)
Member of church	-1.98	(0.59)	-2.67	(0.58)			-1.19	(0.54)
Copenhagen	-0.29	(0.67)	1.20	(0.67)			1.00	(0.62)
Age above 45	-0.37	(0.45)	-0.35	(0.45)			0.10	(0.42)
Home owner			5.96	(0.48)			-0.35	(0.46)
Firm size below 10			4.43	(0.82)			2.97	(0.76)
Informal sector			3.25	(0.86)			-0.99	(0.79)
Self-Reported Income					9.47	(0.53)	9.72	(0.54)
Self-Reported Income > 20K					17.46	(0.91)	17.08	(0.92)
Self-Reported < -10K					14.63	(0.72)	14.53	(0.72)
Audit Flag					15.48	(0.59)	15.32	(0.60)
R-square	1.1%		2.1%		17.1%		17.4%	
Adjusted R-square	1.0%		2.1%		17.1%		17.4%	

A. Histogram Evaded Income/Self-Reported Income



B. Evasion by Fraction Income Self-Reported

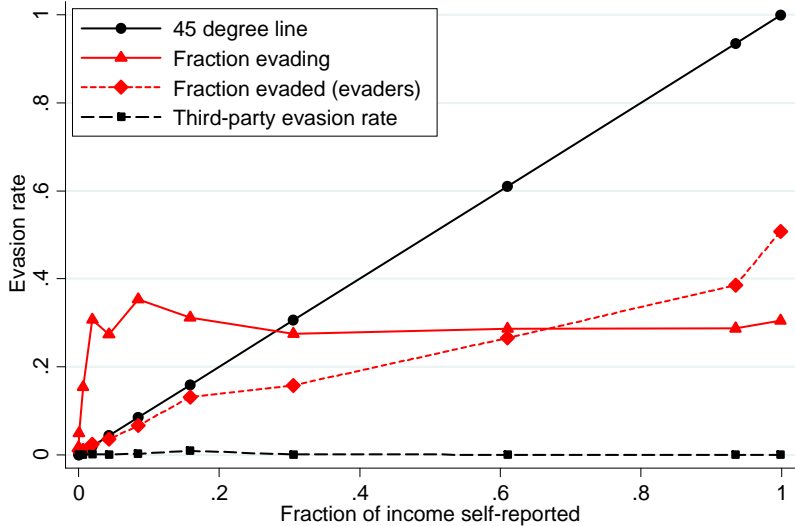


Figure 3. Anatomy of Tax Evasion

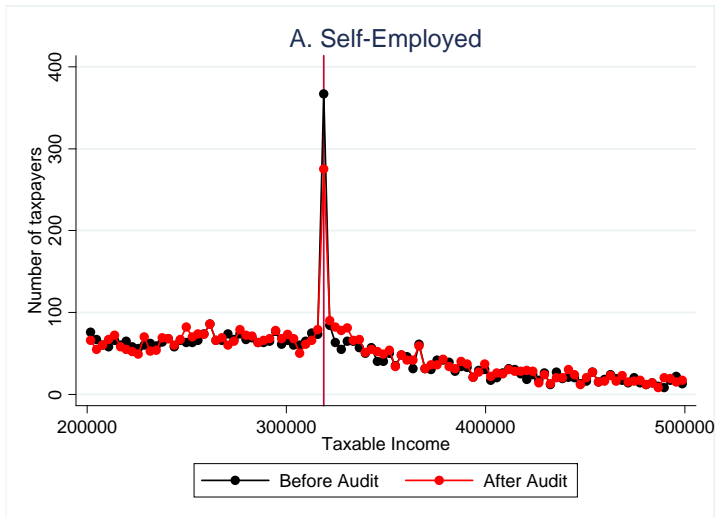
Panel A displays the density of the ratio of evaded income to self-reported income (after a

TAX AUDIT EXPERIMENT FROM DENMARK

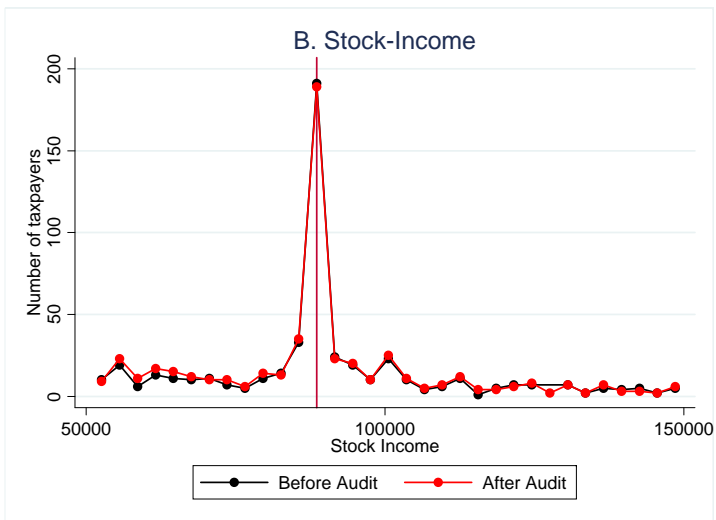
Kleven et al. '11 also provide experimental causal effects of:

- 1) Marginal tax rates: use bunching evidence before and after audit: Most bunching not due to evasion but avoidance \Rightarrow Effect of MTR on evasion is modest
- 2) Prior-audit effects: compare next year outcomes of 100% audit group and a 0% audit group [as audited tax filers may update upward beliefs on p]
 \Rightarrow Find significant effects on reported income increases, concentrated among self-reported items [nothing on 3rd party income]: Extra tax collected through this indirect effect is about 50% of extra taxes collected due to base year audits
- 3) Threat-of-audit letters: Find significant effects on self-reported income increases [as in Slemrod et al.] and letter prob matters

Bunching at the Top Kink in the Income Tax



Bunching at the Kink in the Stock Income Tax



Effect of Audits on Subsequent Reporting

Amount of income change from 2006 to 2007

	Baseline audit adjustment amount	Difference: 100% vs. 0% audit group		
	Total income	Total income	Self-reported income	Third-party income
Net income	5629	2554	2322	232
	(497)	(787)	(658)	(691)
Total tax	2510	1377		
	(165)	(464)		

Effect of Audit Threats on Subsequent Reporting

Probability of adjusting reported income (in percent)

	Both 0% and 100% audit groups			
	No-letter group	Difference: letter group vs. no-letter group		
	Baseline	Any adjustment	Upward adjustment	Downward adjustment
Net income	13.37	1.65	1.51	0.13
	(0.35)	(0.47)	(0.28)	(0.40)
Total tax	13.67	1.56	1.54	0.01
	(0.35)	(0.48)	(0.28)	(0.40)

Effect of Audit Threats on Subsequent Reporting

Probability of upward adjustment in reported income (in percent)

Both 0% and 100% audit groups

	Letter – No Letter	50% Letter – No Letter	100% Letter – 50% Letter
Net income	1.51	1.04	0.95
	(0.28)	(0.33)	(0.33)
Total tax	1.54	0.99	1.10
	(0.28)	(0.33)	(0.33)

ADDING THIRD PARTY REPORTING IN A-S MODEL: KLEVEN-KREINER-SAEZ '09

Income $w = w_t + w_s$ where w_t is third party reported (observed by govt at no cost) and w_s is self-reported (as in standard Allingham-Sandmo model). Individual reports \bar{w}_t and \bar{w}_s

1) $\bar{w}_t = w_t$ because audit rate is 100% for this income category

2) Government audits \bar{w}_s with probability $p < 1$ (costly):

$$\max_{\bar{w}_s} (1 - p)u(w - \tau w_t - \tau \bar{w}_s) + pu(w - \tau w_t - \tau \bar{w}_s - \tau(w_s - \bar{w}_s)(1 + \theta))$$

$$\Leftrightarrow \max_{\bar{w} = w_t + \bar{w}_s} (1 - p)u(w - \tau \bar{w}) + pu(w - \tau \bar{w} - \tau(w - \bar{w})(1 + \theta))$$

\Rightarrow **3rd Party Irrelevance:** If no constraints on \bar{w}_s , 3rd party reporting does not help enforcement

Note: irrelevance result remains true if $p(\bar{w})$

BREAKING THE IRRELEVANCE RESULT

Irrelevance result depends on 2 strong assumptions:

- (1) Self-reported losses are allowed
- (2) Audit rate does not depend on (sign of) \bar{w}_s

More realistic models where irrelevance breaks down:

- (1) Disallow self-reported losses
- (2) Audit rate p depends (negatively) on \bar{w}_s

⇒ 3rd party reporting helps government enforce taxes

EXPLAINING ACTUAL TAX POLICIES

Income $w = w_t + w_s$ where w_t is third party reported (observed by govt at no cost) and w_s is self-reported (as in standard Allingham-Sandmo model).

Incorporating 3rd party reporting solves puzzles of the **Allingham-Sandmo** model:

- 1) Evasion rates are high in s sector (consistent with **Allingham-Sandmo**) and low in t sector
- 2) IRS sets audit rate p higher when $\bar{w}_s < 0$ (small business losses, undocumented deductions, etc.) to protect w_t base
- 3) \bar{w}_s losses not allowed against w_t (example: US limits capital gain losses and passive business losses)
- 4) Use of schedular income taxes (tax separately various bases): Earliest income taxes (1800-1900) are **schedular**

SIMPLER MODEL OF TAX EVASION

$$u = (1 - p(\bar{w})) [w - \tau \bar{w}] + p(\bar{w}) [w(1 - \tau) - \theta \tau (w - \bar{w})]$$

$$\text{FOC } du/d\bar{w} = 0 \Rightarrow [p(\bar{w}) - p'(\bar{w})(w - \bar{w})](1 + \theta) = 1$$

Introduce the elasticity of the detection probability with respect to undeclared income: $\varepsilon = -(w - \bar{w})p'(\bar{w})/p(\bar{w}) > 0$

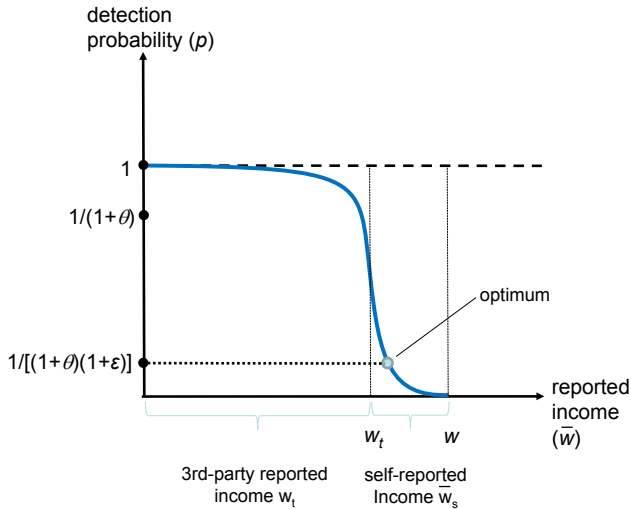
$$1 = p(\bar{w}) \cdot (1 + \theta) \cdot (1 + \varepsilon)$$

If $\varepsilon = 0$, then always evade if $1 > p \cdot (1 + \theta)$

If $\varepsilon > 0$, then evading more increases risk of being caught on all infra-marginal evaded taxes \Rightarrow Even with $\theta = 0$, full evasion is not always optimal

Shape of $p(\bar{w})$ depends crucially on 3rd party income

Figure 1: Probability of Detection under Third-Party Reporting



WHY DOES THIRD PARTY REPORTING WORK?

In theory, employer and employee could collude to evade taxes ⇒ third-party does not help (Yaniv 1992)

In practice, such collusion is fragile in modern companies because of combination of:

- 1) Accounting and payroll records that are widely used within the firm [records need to report true wages in order to be useful to run a complex business]
- 2) A single employee can denounce collusion between employer and employees. Likely to happen in a large business [disgruntled employee, honest newly hired employee, whistle blower seeking govt reward]

⇒ Taxes can be enforced even with low penalties and low audit rates [Kleven-Kreiner-Saez, 2016]

INCOME TAXATION IN DEVO COUNTRIES

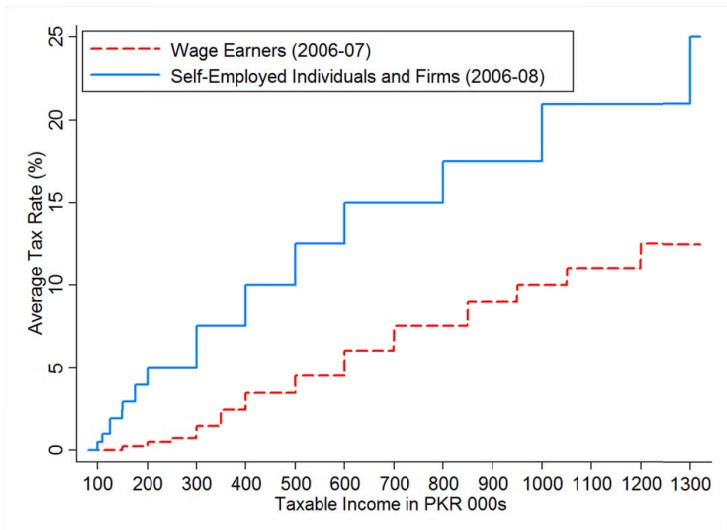
Progressive individual income taxes in devo countries are small and limited to a small fraction of upper income taxpayers (vast majority of the population are informal self-employed workers)

Kleven and Waseem QJE'13 study income tax in Pakistan

Tax creates notches because **average** tax rate jumps \Rightarrow Bunching below the notch and gap in density just above the notch

Empirically: Evidence of bunching (primarily among self-employed) but size of the response is quantitatively small

Large fraction of taxpayers are unresponsive to notch likely due to lack of information

FIGURE 3**Personal Income Tax Schedules in Pakistan**

Notes: the figure shows the statutory (average) tax rate as a function of annual taxable income in the personal income tax schedules for wage earners (red dashed line) and self-employed individuals and unincorporated firms (blue solid line), respectively. Taxable income is shown in thousands of Pakistani Rupees (PKR), and the PKR-USD exchange rate is around 85 as of April 2011. The schedule for the self-employed applies to the full period of this study (2006-08), while the schedule for wage earners applies only to 2006-07 and was changed by a tax reform in 2008. The tax system classifies individuals as either wage

FIGURE 1
Effect of Notch on Taxpayer Behavior

Panel A: Bunching at the Notch

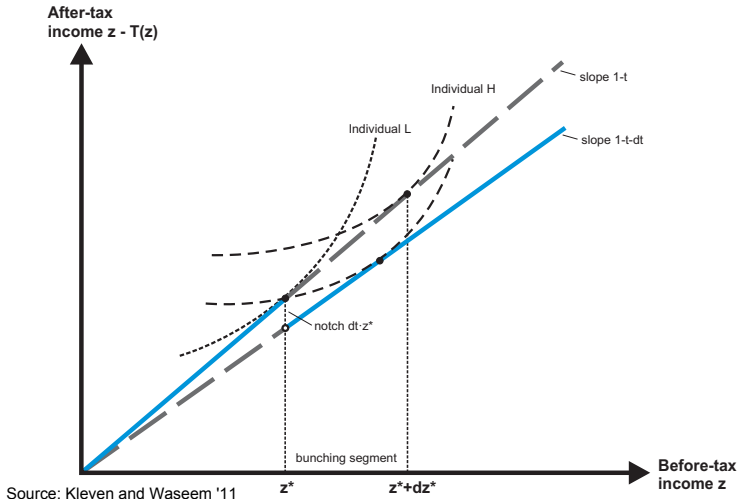
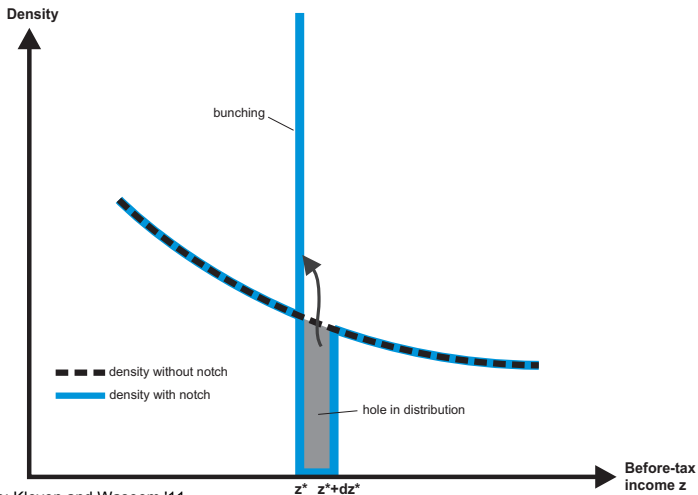


FIGURE 2
Effect of Notch on Density Distribution

Panel A: Theoretical Density Distributions

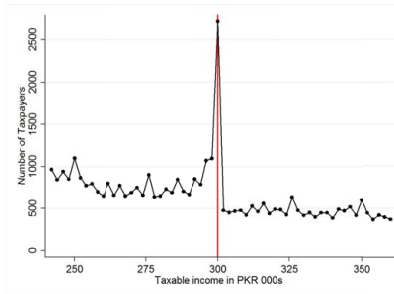


Source: Kleven and Waseem '11

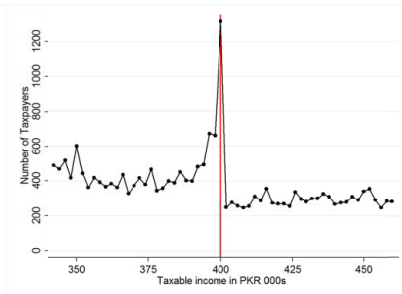
FIGURE 5

Density Distribution around Middle Notches:
Self-Employed Individuals and Firms (Sophisticated Filers)

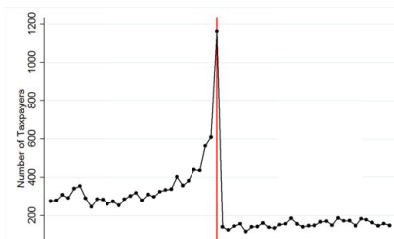
Panel A: Notch at 300k



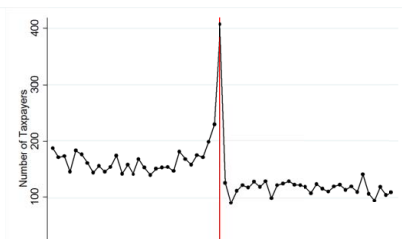
Panel B: Notch at 400k



Panel C: Notch at 500k



Panel D: Notch at 600k



Kleven and Waseem QJE'13 notch analysis

With optimization frictions (lack of information, costs of adjustment), a fraction of individuals fail to respond to notch

Kleven-Waseem use density above notch to measure the fraction of unresponsive individuals

This allows them to back up the frictionless elasticity (i.e. the elasticity among responsive individuals)

The frictionless elasticity is much higher than the reduced form elasticity but remains still relatively modest

HISTORY OF TAX COLLECTION

Interesting to understand why taxes develop the way they do
[Webber-Wildavsky '86 book, Ardant '71 book in French]

During most of history, governments were under the tax enforcement constraint: they were collecting as much taxes as possible given the economic / informational conditions

Many developing countries today still face such tax enforcement constraints

Earliest taxes are tributes: conquerors / rulers realize that it is more lucrative to raise periodic tributes than outright stealing

Taxation as the Origin of States

States first arise through warfare and conquest in productive areas (e.g. Nile Valley) to extract taxes (see Carneiro, 1970)

Modern test of this theory: Sanchez (2015) surveys Eastern Congo villages in war areas

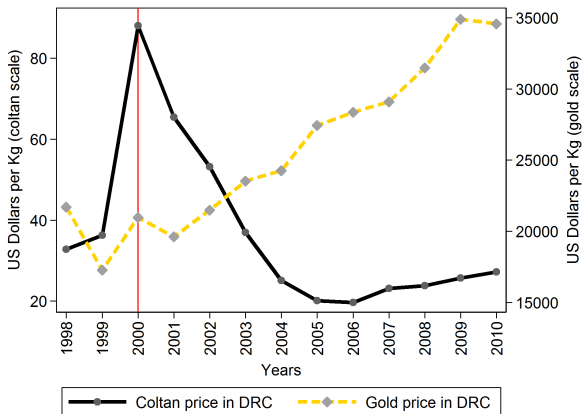
Bandits establish “local states” (=order and taxes) when village tax potential is high

(a) villages with coltan mineral have tax potential particularly when coltan price is high

(b) villages with gold mineral do not have tax potential (bc gold can be easily hidden)

Likelihood of taxation of coltan mining sites follows coltan price

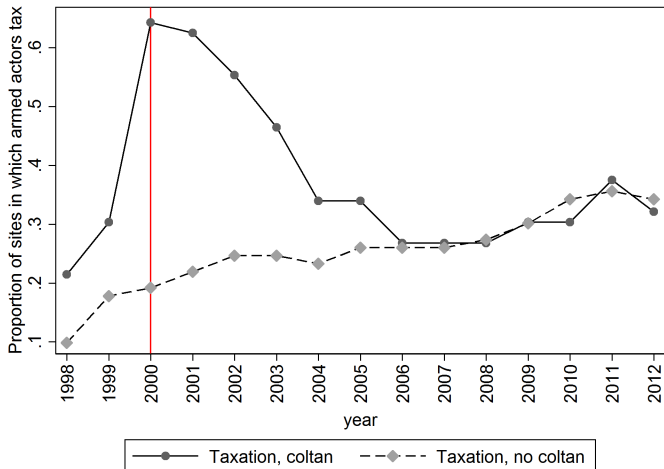
Figure 2: Local prices of coltan and gold



Notes: This figure plots the yearly average price of gold and coltan in Sud Kivu, in USD per kilogram, as measured in the survey. The price of coltan is scaled on the left vertical axis and the price of gold in the right axis. Source: United States Geological Survey (2010).

Source: Sanchez (2015)

Figure 9: Demand shock for coltan and presence of taxation



Notes: This figure plots the average number of sites where an armed actor collects taxes regularly on years. I take this variable from the site survey, in which the specialists are asked to list past taxes in the site. Taxes by an armed actor are defined in the survey as a mandatory payment on mining activity which is regular (sporadic expropriation is excluded), stable (rates of expropriation are stable) and anticipated (villagers make investment decisions with knowledge of these expropriation rates and that these will be respected). The solid line graphs the average number of mining sites where an armed actor collects regular taxes for mining sites that are endowed with available coltan deposits, and the dashed line reports the same quantity for mining sites that are not endowed with coltan deposits.

ARCHAIC TAXES

Governments try to extract revenue through rules without destroying economic activity and without generating tax revolts

Colbert (17th century France) famous expression: “plucking the goose while minimizing hissing”

Direct taxes: taxes on property, businesses, or people

Indirect taxes: taxes on transactions and exchanges

Classification is no longer very meaningful: [estate tax is direct, inheritance tax is indirect but economically equivalent]

ARCHAIC DIRECT TAXES

Poll tax (fixed amount per person). Cannot raise much revenue as poor cannot pay much [people flee or rebel, serfdom is a way to prevent fleeing behavioral response]. Later differentiated by class (nobility, peasants, professions).

Land tax (amount per lot), later differentiated by quality. Cannot raise much unless carefully differentiated with expensive land registry [otherwise marginal lands abandoned]

Product taxes (such as tithe = fraction of gross agricultural product): Tax requires monitoring production. Tax on gross product can be overwhelming for marginal lands

⇒ Archaic direct taxes can hardly raise more than 5% of total product in primitive economies. Hard to collect in barter economies. Only minimal govt can be supported.

ARCHAIC INDIRECT TAXES

Indirect taxes require exchange economies

Tolls for use of roads, rivers, entering towns, crossing borders, harbors, mountain pass. Initially based on people, later based on goods transported [overused when no coordination across jurisdictions]

Excise and Sales Taxes on exchanged goods. In early economies, only few goods are traded: salt, metal, alcohol beverages. Fairs where exchanges are concentrated also allow governments to impose sales taxes

Govt Monopoly Some economic activities require use of heavy equipment (grinding wheat, pressing grapes) ⇒ Can be controlled/monitored by govt

⇒ Archaic indirect taxes can raise substantial additional revenue in jurisdictions with substantial trading activity

MODERN TAXES

Modern taxes exploit **accounting information** that is required in large/complex business activities and **withholding at source**

Shift from differentiated capitation and presumptive taxes (on businesses and individuals) toward modern income taxation

Shift from excise taxes toward general sales taxes and VAT

Modern taxes can collect 50% of GDP without harming growth

Modern taxes in rich countries today are threatened primarily by (a) tax havens [enforcement difficult], (b) international tax competition [requires international coordination], (c) marginally the informal sector

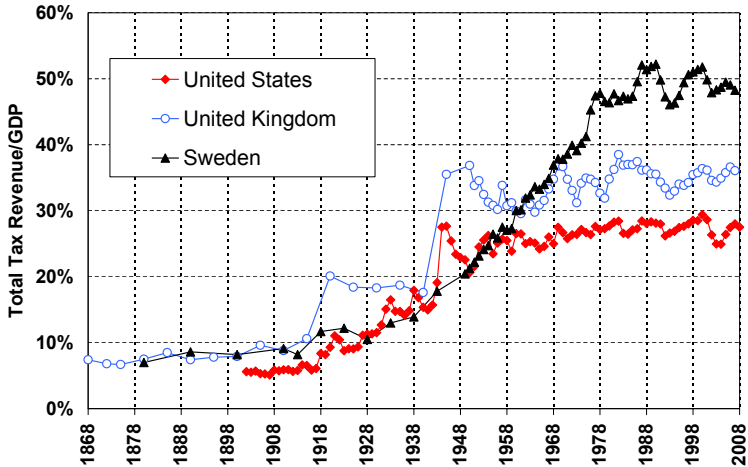
IMF recommendations for poor countries to switch from archaic tariffs to modern VAT reduced tax revenue bc VAT enforcement failed [Cage-Gadenne 13]

EMPIRICAL PATH OF GOVERNMENT GROWTH

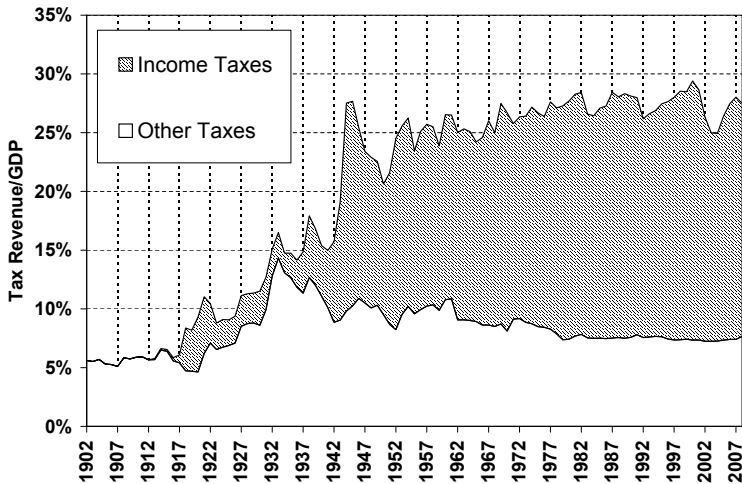
- 1) Govt size is small (typically $< 10\%$ of GDP) in Western countries before industrialization (Flora '83). Use **archaic** taxes: [poll taxes, land-property taxes, product taxes, excise taxes, tolls, tariffs]
- 2) Govt size increases sharply in all advanced economies during 20th century. Increase corresponds to the development of **modern** taxes enforced using business records [income taxes, payroll taxes, value added taxes]
- 3) Govt growth has slowed or stopped in most advanced economies over last 3 decades

This general historical pattern applies to almost all rich countries although timing and final govt size varies across countries

2A. Tax revenue/GDP in the US, UK, and Sweden



2B. US Tax Composition, 1902-2008



Source: statistics computed by the author

ALTERNATIVE THEORIES OF GOVT GROWTH

- 1) Demand elasticity for public goods has income elasticity above one [**Wagner's law** ~ 1900] (can't explain stability since 1980)
- 2) Supply side: Stagnating productivity in the government sector [Baumol's '67 **Cost Disease Theory**] (can't explain stability since 1980)
- 3) **Ratchet effect theory**: temporary shocks (e.g., wars) raise government expenditures, which do not fall back after the shock because of changed social norms [Peacock-Wiseman '61, Besley-Persson '08] (can't explain Sweden and pre-20th century wars)
- 4) **Political economy** theories based on voting and democratization, etc.

VARIOUS SALES TAXES

Turnover taxes used to tax all sales: business to consumer (B-C) and business to business (B-B):

Creates multiple layers of taxes along a production chain ⇒ Higher total tax when B-B-C than B-C

Retail Sales Tax is imposed on B-C sales only [B-B exempt]: difficult to distinguish B-B and B-C (shifting), strong evasion incentive for B-C [sales tax does not work well with small retailers]

Value-Added-Tax (VAT) taxes only value added [sales minus purchases] in all transactions (B-B and B-C): equivalent to retail sales economically but easier to enforce [automatic upstream enforcement]

VAT first introduced in France in 1950s, has spread to most countries [US only rich country without VAT] yet little research

NO EVASION: VAT \Leftrightarrow RETAIL SALES TAX

(1) Supplier S produces material using only labor inputs and sells it for s , pays VAT $\tau \cdot s$

(2) Manufacturer M buys material for s and sells product for m , pays VAT $\tau \cdot (m - s)$

(3) Retailer R buys product for m and sells good to consumers for r , pays VAT $\tau \cdot (r - m)$

Total VAT is $\tau \cdot r$

Retail sales tax paid only by R : $\tau \cdot r$

VAT \Leftrightarrow Retail sales tax

INTRODUCING EVASION

Government matches the purchases and sales VAT reports: need to be consistent: \bar{s} , \bar{m} , \bar{r}

If M and R truthfully report $\bar{m} = m$, $\bar{r} = r$: if S decides to evade $\bar{s} < s$, M has to pay $\tau \cdot (m - \bar{s})$, M will only purchase at lower price \Rightarrow No gain for S to evade

Similarly, if R truthfully reports $\bar{r} = r$, then M (and hence S) cannot evade

VAT compliance down the chain forces compliance upstream [even if upstream businesses are informal]

If R is big and uses business records (Walmart) then R cannot misreport \bar{r}
 \Rightarrow VAT will work well [but retail sales tax would also work]

WHY VAT WORKS BETTER?

If R is small / informal, it can evade but needs to report at least $\bar{r} = \bar{m}$
[otherwise VAT credit would attract tax audit]

If M is small / informal and if R evades and sets $\bar{r} = \bar{m}$, then M can evade VAT by colluding with R : both R and M can decide to lower both \bar{r} and \bar{m} equally

... S can also evade if M and R evade

If all firms are small / informal, VAT enforcement is impossible

If bottom firm R is small / informal \Rightarrow Retail sales tax breaks down entirely but VAT does not:

If bottom firm R is small / informal but M is large / formal, VAT enforcement will work from M and upstream

ENFORCEMENT OF VAT VS RETAIL SALES TAX

- 1) Sales tax enforcement depends critically on retailers. Sales tax can be enforced with large retailers but much harder with small retailers
- 2) VAT: when there is a large/formal firm in the production chain, then enforcement upstream takes place automatically. Imports often play this role as they are easy to observe and tax [Keen '07]
- 3) VAT Issues: (a) VAT evasion easier with international transactions [carousel fraud], (b) VAT cannot tax easily financial services.

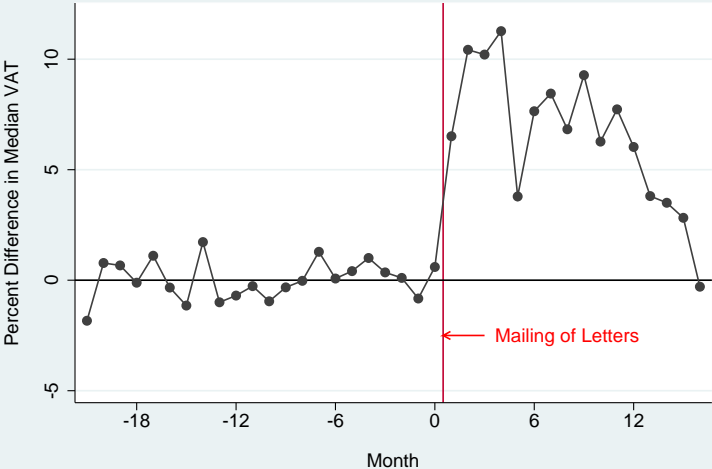
POMERANZ AER'15 VAT EXPERIMENT

Randomized experiment with 445,000 firms in Chile: sent threat of VAT audit letters to sub-sample of businesses

Key Results:

- 1) Significant effect of letters on VAT collection (+10% over 12 months)
- 2) Smaller impact on reported transactions that already have a paper trail (intermediate sales) than on those which don't (final sales)
- 3) Effect of random audit announcement is transmitted up the VAT chain, increasing compliance by firms' suppliers

Deterrence vs. Control (Median)



Source: Pomeranz AER'14

Panel A

Table 4: Letter Message Experiment: Intent-to-Treat Effects on VAT Payments by Type of Letter

	(1)	(2)	(3)	(4)	(5)
	Mean VAT	Median VAT	Percent VAT > Previous Year	Percent VAT > Predicted	Percent VAT > Zero
Deterrence letter X post	-1,114 (2,804)	1,326*** (316)	1.40*** (0.12)	1.42*** (0.10)	0.53*** (0.09)
Tax morale letter X post	-1,840 (6,082)	262 (666)	0.40 (0.25)	0.30 (0.22)	0.44** (0.20)
Placebo letter X post	835 (6,243)	383 (687)	-0.11 (0.26)	-0.19 (0.23)	-0.14 (0.20)
Constant	268,810*** (1,799)	17,518*** (112)	47.50*** (0.07)	48.27*** (0.07)	67.30*** (0.06)
Month fixed effects	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	No	Yes	Yes	Yes
Treatment Assignment	No	Yes	No	No	No
Number of observations	7,892,076	1,221,828	7,892,076	7,892,076	7,892,076
Number of firms	445,734	445,734	445,734	445,734	445,734
Adjusted R^2	0.40		0.14	0.28	0.47

Notes: Column (1) shows a regression of the mean declared VAT on treatment dummies, winsorized at the top and bottom 0.1% to deal with extreme outliers. Column (2) shows a median regression of average VAT before treatment and in 4 months after each treatment wave. Columns (3)-(5) show linear probability regressions of the probability of an increase in declared VAT compared to the same month in the previous year, the probability of declaring more than predicted and the probability of declaring any positive amount. Observations are monthly in Columns (1) and (3)-(5) for ten months prior to treatment and four months after each wave of mailing. The four months after the second wave excludes firms treated in the first. Coefficients and standard errors of the linear probability regressions are multiplied by 100 to express effects in percent. Monetary amounts are in Chilean pesos, with 500 Chilean pesos approximately equivalent to 1 USD. Standard errors in parentheses, robust and clustered at the firm level for Columns (1) and (3)-(5). *** p<0.01, ** p<0.05, * p<0.1.

Source: Pomeranz AER'15

Table 5: Impact of Deterrence Letter on Different Types of Transactions

	(1) Percent Sales > Previous Year	(2) Percent Input Costs > Previous Year	(3) Percent Intermediary Sales > Previous Year	(4) Percent Final Sales > Previous Year
Deterrence letter X post	1.17*** (0.22)	0.16 (0.21)	0.12 (0.19)	1.33*** (0.21)
Constant	55.39*** (0.13)	53.25*** (0.13)	38.37*** (0.12)	45.04*** (0.12)
Month fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Number of observations	2,392,529	2,392,529	2,392,529	2,392,529
Number of firms	133,156	133,156	133,156	133,156
Adjusted R^2	0.25	0.22	0.30	0.32

Notes: Regressions of the probability of the line item (total sales, total input costs, intermediary sales, and final sales) being higher than in the same month the previous year. Sample of firms that have both final and intermediary sales in the year prior to treatment. The four months after the second wave excludes firms treated in the first wave. Coefficients and standard errors are multiplied by 100 to express effects in percent. Robust standard errors in parentheses, clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 6: Interaction of Firm Size and Share of Sales to Final Consumers

Panel A:	Percent VAT > Previous Year				
	(1)	(2)	(3)	(4)	(5)
Deterrence letter X final sales share	1.61*** (0.26)			1.48*** (0.27)	1.43*** (0.26)
Deterrence letter X size category		-0.17*** (0.04)		-0.10*** (0.04)	
Deterrence letter X log employees			-0.45*** (0.11)		-0.29** (0.12)
Deterrence letter	0.68*** (0.16)	2.63*** (0.29)	1.66*** (0.13)	1.49*** (0.35)	0.92*** (0.19)
Constant	47.53*** (0.08)	48.87*** (0.08)	47.50*** (0.08)	48.89*** (0.08)	47.53*** (0.08)
Final sales share X post	Yes	No	No	Yes	Yes
Size measure X post	No	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes	Yes
Observations	7,308,631	7,116,590	7,340,994	7,084,823	7,308,631
Number of firms	406,834	396,135	408,636	394,367	406,834
Adjusted R^2	0.14	0.14	0.14	0.14	0.14

Source: Pomeranz AER, 15

Table 7: Spillover Effects on Trading Partners' VAT Payments

	(1)	(2)	(3)	(4)	(5)	(6)
	Percent VAT > Previous Year	Percent VAT > Predicted	Percent VAT > Previous Year	Percent VAT > Predicted	Percent VAT > Previous Year	Percent VAT > Predicted
Audit announcement X post	2.41** (1.14)	2.03* (1.11)				
Audit announcement X supplier X post			4.28*** (1.54)	3.92*** (1.50)	4.14*** (1.52)	3.83*** (1.52)
Audit announcement X client X post			-0.26 (1.64)	-0.28 (1.51)	-0.14 (1.67)	-0.28 (1.55)
Supplier X post			-0.64 (1.62)	0.34 (1.59)	-1.11 (1.67)	0.60 (1.64)
Constant	52.07*** (0.95)	49.06*** (0.94)	52.07*** (0.95)	49.06*** (0.94)	52.75*** (0.96)	50.11*** (0.96)
Controls X post	No	No	No	No	Yes	Yes
Controls X audit announcement X post	No	No	No	No	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	45,264	45,264	45,264	45,264	44,288	44,288
Number of firms	2,829	2,829	2,829	2,829	2,768	2,768
Adjusted R^2	0.05	0.11	0.05	0.11	0.05	0.10

Notes: Regressions for trading partners of audited firms. Column (1), (3) and (5) shows the probability of an increase in declared VAT since the previous year, Column (2), (4) and (6) shows the probability of declaring more than predicted. The controls in Columns (5) and (6) are firm sales, sales/input-ratio, share of sales going to final consumers, and industry categorized as "hard-to-monitor." Observations are monthly for ten months prior to treatment and six months after the audit announcements were mailed. Coefficients and standard errors are multiplied by 100 to express effects in percent. Robust standard errors in parentheses, clustered at the level of the audited firm. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

WEALTH IN TAX HEAVENS ZUCMAN QJE'13

Official statistics substantially underestimate the net foreign asset positions of rich countries bc they do not capture most of the assets held by households in off-shore tax havens

Example: Wealthy US individual opens a Cayman Islands account and buys mutual fund shares (composed of US corporate stock): Cayman Islands record a liability but US do not record an asset (because this is not reported in the US)

⇒ Total world liabilities are larger than world total assets

Zucman compiles all financial stats and estimates that around 8% of the global financial wealth of households is held in tax havens (three-quarters of which goes unrecorded = 6%)

If top 1% hold about 50% of total financial wealth, then about 12% of financial wealth of the rich is hidden in tax heavens

CURBING OFF-SHORE TAX EVASION

Off-shore tax evasion possible because of bank secrecy: US cannot get a list of US individuals owning Swiss bank accounts from Switzerland

⇒ No 3rd party reporting makes tax enforcement very difficult

In principle, problem could be solved with exchange of information across countries BUT need all countries to cooperate

Johannesen-Zucman AEJ-EP'14 analyze tax haven crackdown: G20 countries forced number of tax havens to sign bilateral treaties on bank information sharing

Key result: Instead of repatriating funds, tax evaders shifted deposits to havens not covered by treaty with home country.

CURBING OFF-SHORE TAX EVASION

FATCA'13 US regulations try to impose info exchange for all entities dealing with US:

If foreign bank B does not provide list of all its US account holders, any financial transaction between B and US will carry 30% tax withholding ⇒ Interesting to see what it will do

Long-term solution will require:

a) Systematic registration of assets to ultimate owners [already exists within countries for domestic tax enforcement]

b) Systematic information exchange between tax countries with no exceptions for tax heavens

⇒ Could be enforced with tariffs threats on tax heavens [Zucman JEP'14 and book '15]

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