



Measuring the fiscal and equity impact of tax evasion: evidence from Denmark and Estonia

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Motivation

- Tax non-compliance has various impacts (fiscal, efficiency, equity, distributional)
- Challenging measurement issues
- Comparative angle even more lacking
- Combining various (micro-)data sources may offer new angles and opportunities



Research aim

- Comparative estimates of distributional and fiscal effects of tax non-compliance
- 2 countries (of initially 4): EE and DK
- Micro-level (individual) estimates
- Exploit combined survey & register data

- Focus on employment incomes



Methodology – overall

- Extend the EU tax-benefit model with estimates for income underreporting
- Simulate household taxes and net incomes under various compliance assumptions (full vs partial)
- Methods for obtaining & incorporating tax non-compliance estimates depend on micro-data available:
 - EE: SILC (survey-based incomes)
 - DK: SILC (register-based incomes)



Data – Estonia

- National SILC 2008 linked with tax records
- No respondents' consent required
 - Cf. Sakshaug and Kreuter (2012)
- Based on personal IDs, achieved for 99.5% of original sample (incl. non-respondents)
- Tax records contain filed annual personal tax report or aggregated employers' monthly reports (used for pre-populating tax forms)
- Income reference period: 2007



Estimation - Estonia

- Draw on Paulus (2015)
- A structural model relating survey and register earnings to (latent) true earnings:

$$\begin{aligned} & \textit{survey earnings } (y^s) - \textit{measurement error} \\ & = \textit{true earnings } (y^T) \\ & = \textit{reported (register) earnings } (y^r) + \textit{non-reported earnings} \end{aligned}$$

- Sample: employees with positive survey earnings
- Identification: assume public employees cannot underreport their wages/salaries



Formal model (Paulus 2015)

- True earnings

$$\ln y_i^T = x_i \beta^T + \varepsilon_i^T \quad (\text{with probability } p)$$

$$y_i^T = 0 \quad (\text{with probability } 1-p)$$

- Register earnings

$$y_i^r = \begin{cases} 0 & \text{if } y_i^T = 0 & (\text{no earnings}) \\ 0 & \text{if } y_i^T > 0 \text{ and } r_i^* \leq 0 & (\text{full non-compliance}) \\ r_i^* \cdot y_i^T & \text{if } y_i^T > 0 \text{ and } 0 < r_i^* < 1 & (\text{partial compliance}) \\ y_i^T & \text{if } y_i^T > 0 \text{ and } r_i^* \geq 1 & (\text{full compliance}) \end{cases}$$

$$r_i^* = \theta^r y_i^T + x_i \beta^r + \varepsilon_i^r$$

- Survey earnings

$$\ln y_i^S = \theta^S \ln y_i^T \cdot 1(y_i^T > 0) + \theta_0^S \cdot 1(y_i^T = 0) + x_i \beta^S + \varepsilon_i^S$$



Data - Denmark

- SILC incomes drawn from tax records ($y^s = y^r$)
- Draw on models for participation, weekly hours and hourly wage of “hidden” activities, estimated by Economic Council (2011)
- Based on a survey of hidden economy by the Rockwool Foundation (Hvidtfeldt et al. 2010)
 - Pooled cross-sections, 1994-2009
 - Individuals aged 18-74
 - Direct questions on hidden economic activities
 - Socio-demographic, labour market and income information



Predictions – Denmark

Predict undeclared earnings into SILC 2011:

- Logit for the likelihood of undeclared activities
- Calibrate using the aggregate estimate of Skov (2014): 23.9% in 2011
- Assign average hours per week by gender/age
- Conditional OLS for hourly wage rate

Annual non-reported income =
Pr(evader | characteristics) x
average hours per week (sex, age | evader) x
hourly wage rate (characteristics | evader) x 52



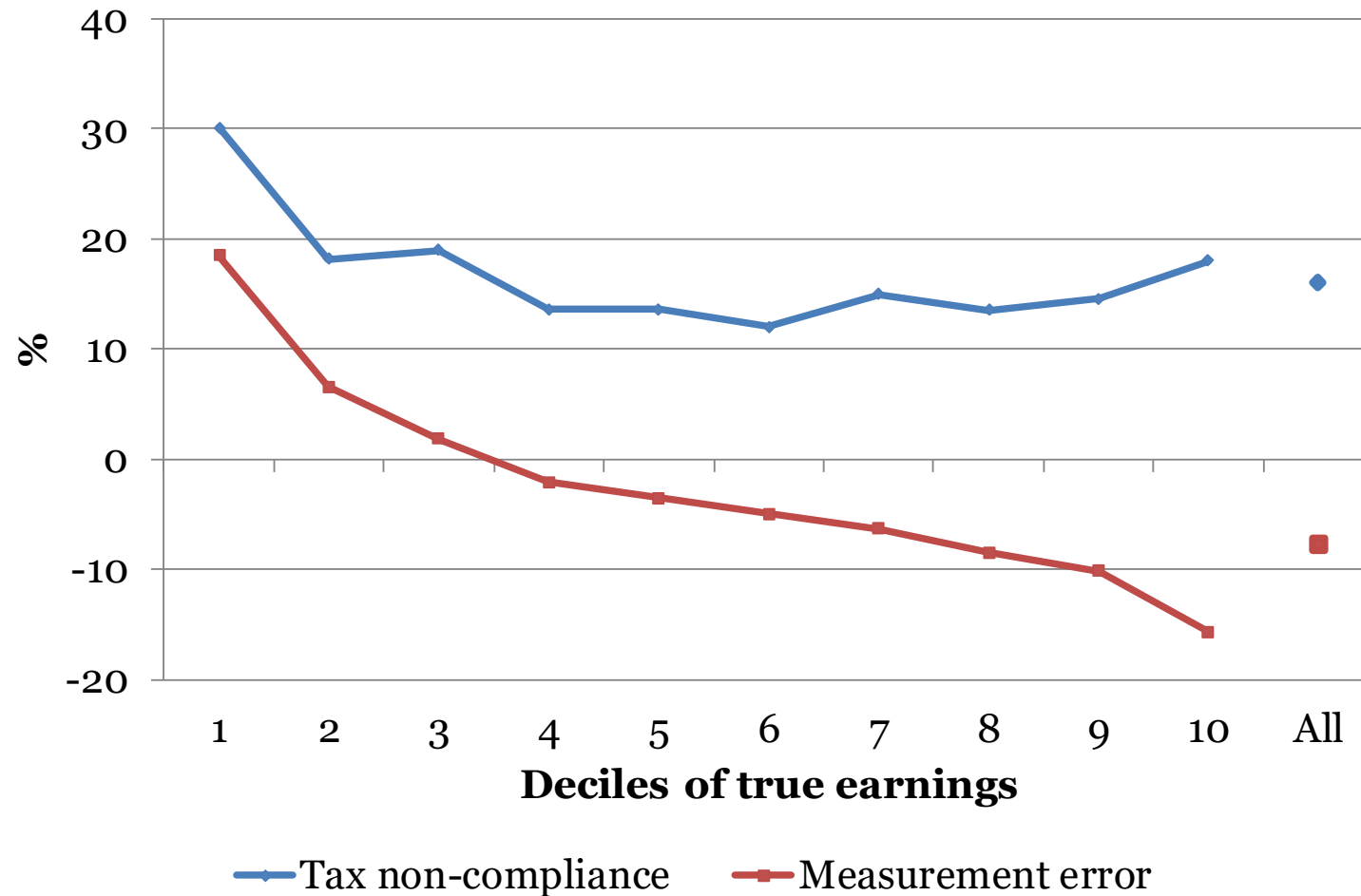
Estimated tax compliance

	Estonia		Denmark	
	Private employees	All employees	Employees	Whole population
No earnings	0.8%	1.0%	n/a	n/a
Fully non-compliant	3.9%	3.1%	n/a	6.2%
Partly compliant	29.0%	22.8%	23.5%	16.7%
Fully compliant	66.3%	73.2%	76.5%	77.1%

Notes: employees = positive earnings in SILC; DK figures refer to individuals aged 18-74.

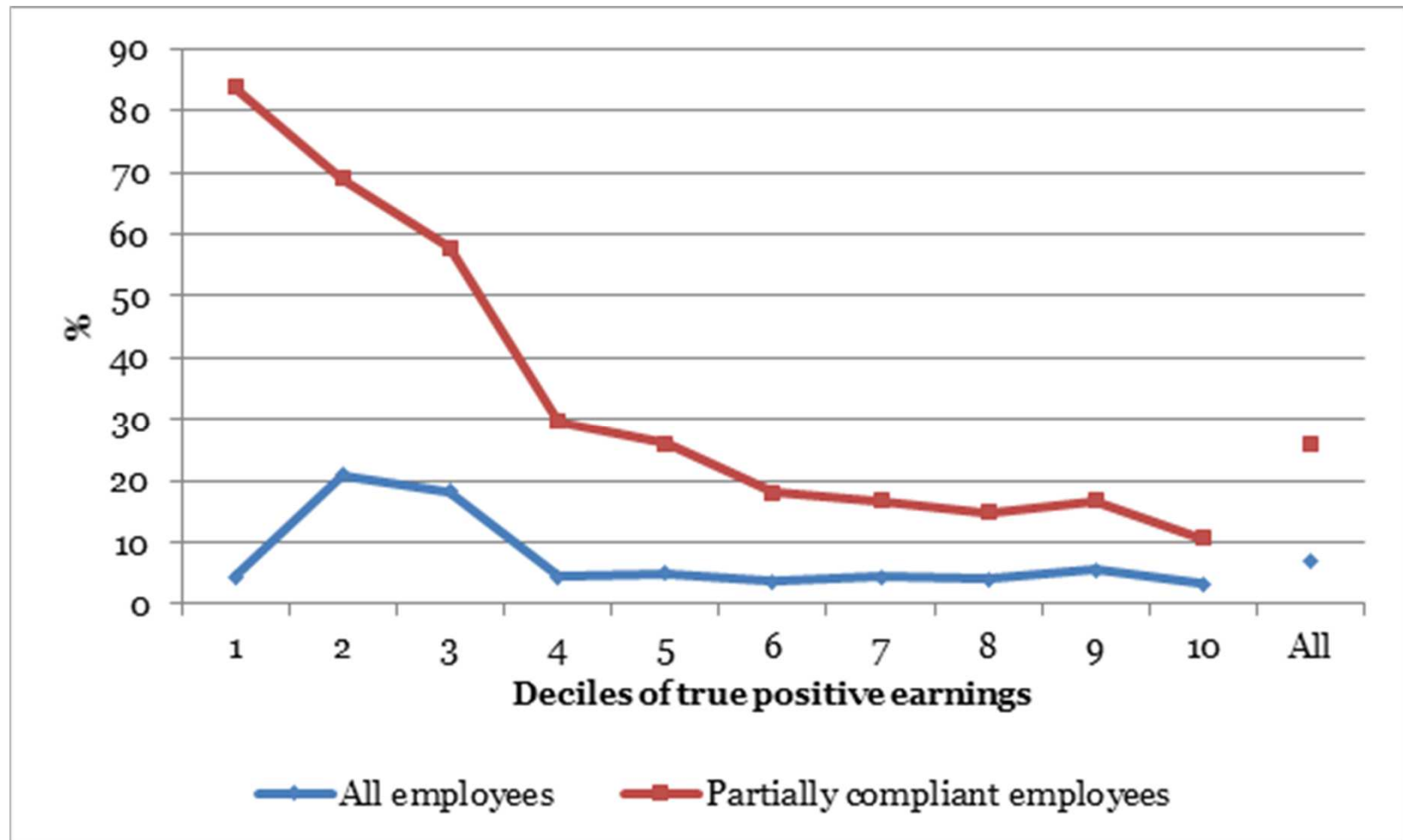


Estimated misreporting: EE (% of true earnings)





Estimated misreporting: DK (% of true earnings)





Simulations in EUROMOD

- o EU tax-benefit microsimulation model (Sutherland and Figari, 2013)



Scenario	Employment income	Tax and benefits
Tax evasion	True	Based on declared income
No tax evasion	True	Based on true income

- o Static calculations (first-order effects)



Fiscal and distributional effects of “no tax evasion”

	Estonia	Denmark
Original income	0.0%	0.0%
Taxes	+13.9%	+6.0%
Workers SIC	+8.9%	+6.3%
Benefits	-0.8%	-1.4%
Disposable income	-2.3%	-3.5%
Gini	-0.2pp (-0.6%)	0.02pp (+0.1%) n/s



Survey measurement error vs tax non-compliance: EE

Indicator	(1) survey earnings (baseline)	(2) register earnings	(3) estimated true earnings	(4) estimated true earnings (no evasion)
Population totals (baseline=100)				
Earnings	100.0	95.1	110.3	110.3
Direct taxes and SIC	100.0	94.7	94.5	110.5
Equivalised household disposable income (monthly EEK)				
Mean value	525.6	505.9	584.8	565.2
Poverty line (60% of median)	275.6	255.7	302.0	293.2
Poverty and inequality indicators based on equivalised household disposable income				
Poverty rate (FGT0)	0.195	0.225	0.224	0.219
Poverty gap (FGT1)	0.049	0.064	0.059	0.058
Gini coefficient	0.308	0.343	0.328	0.326
Poverty indicators with a fixed poverty line (275.6 EEK)				
Poverty rate (FGT0)		0.259	0.183	0.189
Poverty gap (FGT1)		0.077	0.045	0.049



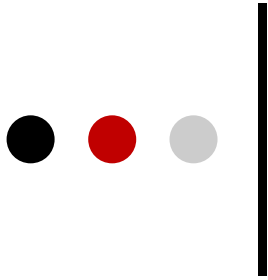
Conclusions

- Substantial part of employment income not reported for taxes (EE 12%, DK 7%)
- Loss of income tax/SIC revenue of similar magnitude
- EE and DK more similar than expected
- Non-compliance has little effect on inequality (increasing in EE, n/s in DK)
 - Similar to US (Bishop et al. 2000, Johns & Slemrod 2010), IT (Fiorio & D'Amuri 2005), HU (Benedek & Lelkes 2011), EL (Leventi et al. 2013) – different data and methods



Conclusions (cont.)

- Measurement error more crucial for the distribution (survey incomes more equal)
- Registers provide only a partial picture – survey-based incomes provide valuable additional information (even if noisy)
- Comparing mean survey and register incomes alone can be highly misleading
 - Reflect non-compliance as well as ME
 - Problematic to achieve consistent samples, re-ranking etc



Thank you!

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