

How Do Entrepreneurial Portfolios Respond to Income Taxation?

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Linnaeus University, Nov 23, 2017

Motivation

Entrepreneurs hold a **large share** of aggregate wealth:

- ▶ On average, the net worth of entrepreneurs is more than 5 (7) times that of non-entrepreneurs in Germany (in the US)
- ▶ 8% (9%) of the population own private business equity in Germany (in the US)

Entrepreneurs hold **undiversified** portfolios:

- ▶ On average, they invest 40% (42%) of their private wealth in their own firm in Germany (in the US; Gentry and Hubbard, 2004)

Tax effects on entrepreneurial portfolio investment are very important:

- ▶ Entrepreneurs may dominate tax effects on aggregate capital
- ▶ Entrepreneurial risk-taking is important for innovation, growth and job creation

Our contributions

We extend the standard theoretical portfolio choice model by allowing for tax sheltering of entrepreneurial income

- ▶ Kleven et al. (ECTA 2011): Almost half of Danish entrepreneurs underreport their income

We test the empirical implications of our theoretical model:

- ▶ Estimation of asset demand system for 6 assets using household panel data
- ▶ Tax effects on extensive and intensive margins of entrepreneurial portfolio choice

Main results:

- ▶ **Positive** effect of lower MTR on conditional portfolio share
- ▶ **Negative** effect on ownership probability of business equity

Portfolio choice model setup

Choice between

- ▶ a safe asset with return r and
- ▶ a risky asset (entrepreneurship) with return \tilde{e}
- ▶ Amount k is invested in the risky asset
- ▶ t is proportional tax rate on both returns

Pre-tax end of period wealth is

$$\tilde{W} = (1 + \tilde{e})k + (1 + r)(W_0 - k) = (1 + r)W_0 + (\tilde{e} - r)k \quad (1)$$

We introduce concealed income $\tilde{c} = \gamma(k, \tilde{e})$. Then *reported* taxable income is

$$\tilde{y}_R = \tilde{W} - W_0 - \tilde{c} \quad (2)$$

Thus the entrepreneur's true after tax income is

$$\tilde{y}_T = (1 - t)(\tilde{W} - W_0) + t\tilde{c} = (1 - t)[rW_0 + (\tilde{e} - r)k] + t\gamma(k, \tilde{e}) \quad (3)$$

Given a cdf $F(\tilde{e})$ the entrepreneur solves:

$$\max_k \bar{U} = E[u(W_0 + \tilde{y}_T)] \quad (4)$$

subject to $k \geq 0$

Standard Model

Two types of entrepreneurs:

- ▶ If $E(\tilde{e} - r) > 0$
will always choose interior solution $k^* > 0$ regardless of tax rate
- ▶ What happens if $E(\tilde{e} - r) \leq 0$?

1. Corner solution ($k^* = 0$)

FOC unaffected by tax

$$(1 - t)E(\tilde{e} - r) \leq 0. \quad (5)$$

2. Interior solution ($0 < k^*$)

$$\left. \frac{\partial \bar{U}}{\partial k} \right|_{k^* > 0} = E \left[u'(\tilde{W}_T) [(1 - t)(\tilde{e} - r)] \right] = 0 \quad (6)$$

$$-\frac{\rho u'(\tilde{W}_H)}{(1 - \rho)u'(\tilde{W}_L)} = \frac{\tilde{e}_L - r}{\tilde{e}_H - r}$$

In the standard model without tax sheltering, if we have $k^* > 0$, we cannot have k^* falling to zero when t falls.

Extended Model

1. Corner solution ($k^* = 0$)

FOC unaffected by tax

$$(1-t)E(\tilde{e}-r) \leq 0. \quad (7)$$

2. Interior solution ($0 < k^*$)

$$\left. \frac{\partial \bar{U}}{\partial k} \right|_{k^* > 0} = E \left[u'(\tilde{W}_T) [(1-t)(\tilde{e}-r) + t\gamma_k(k^*, \tilde{e})] \right] = 0 \quad (8)$$

$$-\frac{pu'(\tilde{W}_H)}{(1-p)u'(\tilde{W}_L)} = \frac{(1-t)(\tilde{e}_L-r) + t\gamma_k(k^*, \tilde{e}_L)}{(1-t)(\tilde{e}_H-r) + t\gamma_k(k^*, \tilde{e}_H)}$$

With income concealment \tilde{c} , there is **no longer a contradiction** between having $k^* > 0$ at some t and $k^* = \tilde{c}^* = 0$ at a lower value of t .

Empirical implications

Some entrepreneurs with $E(\tilde{e} - r) > 0$
will always choose interior solution $k^* > 0$ regardless of tax rate
→ These entrepreneurs will expand investment when tax rate falls

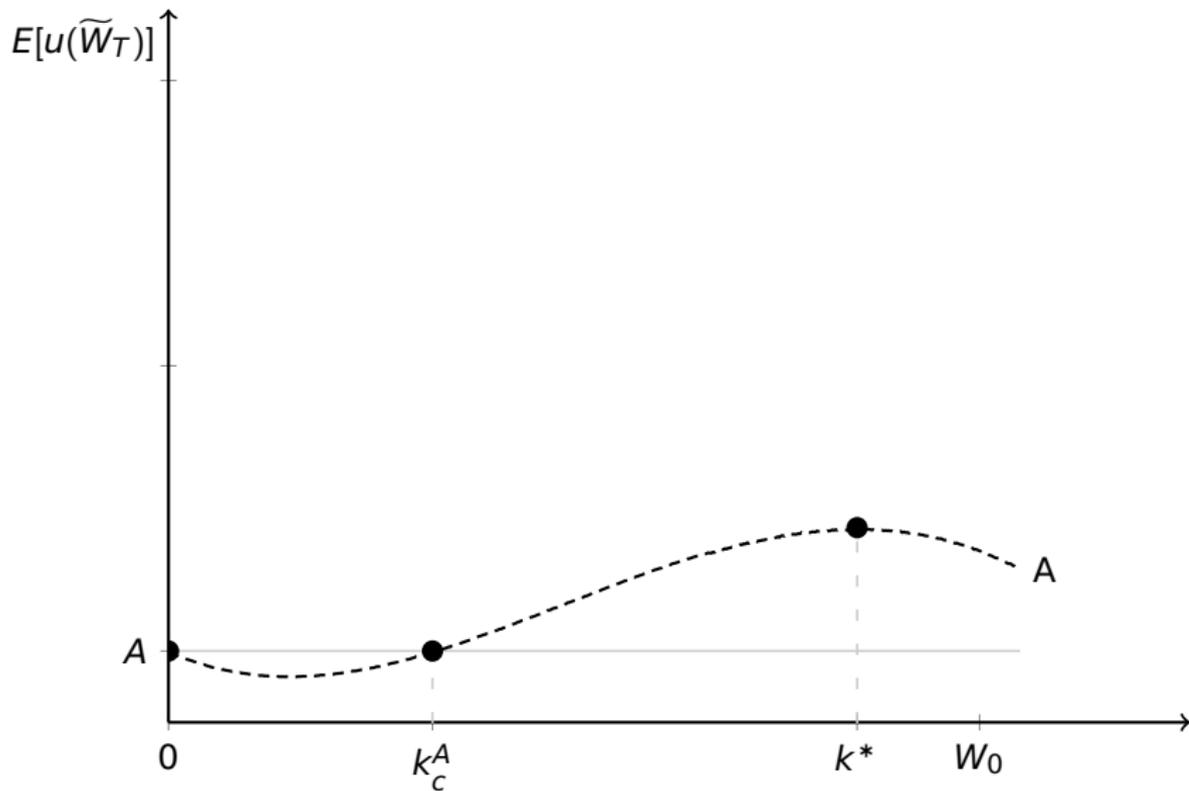
Some entrepreneurs with $E(\tilde{e} - r) \leq 0$
may switch from interior to corner solution when there is a marginal
reduction in tax rate.

→ A reduction in the tax rate drives out some entrepreneurs who only
invest because of the possibilities of tax sheltering.

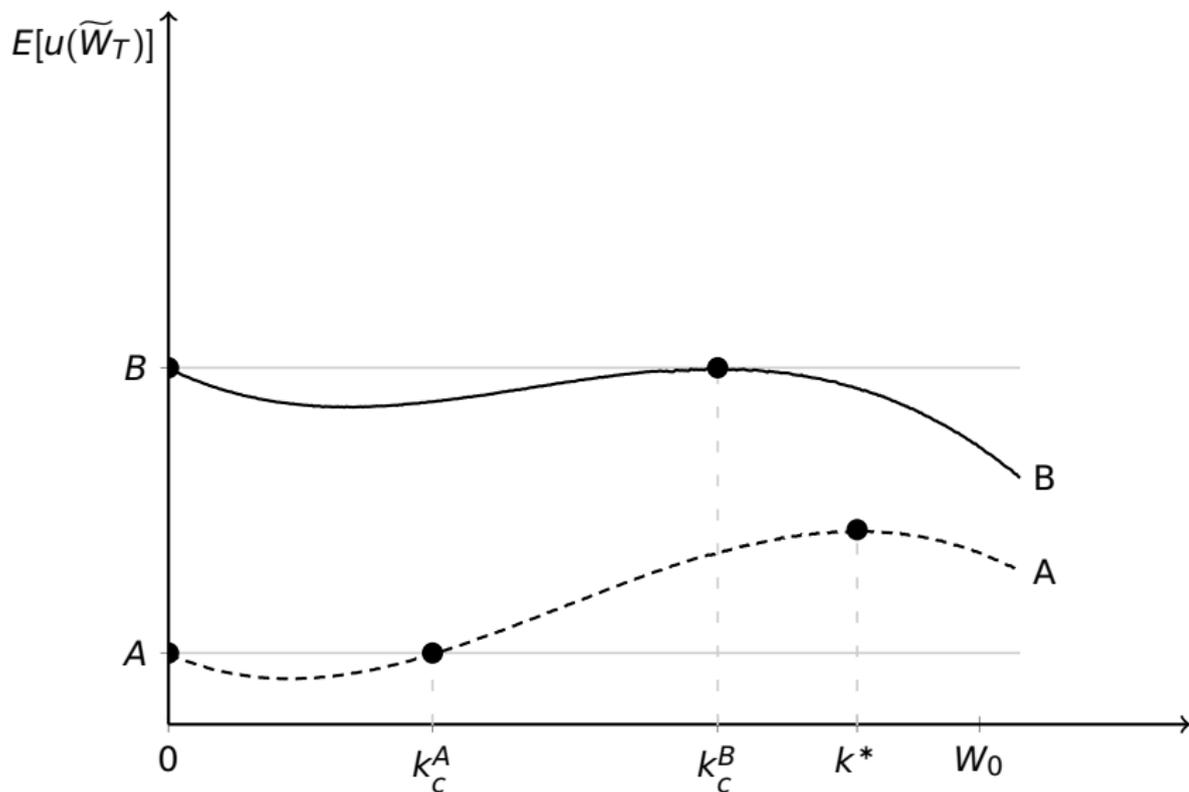
Consider three tax rates:

$$0 \leq t_C < t_B < t_A \leq 1$$

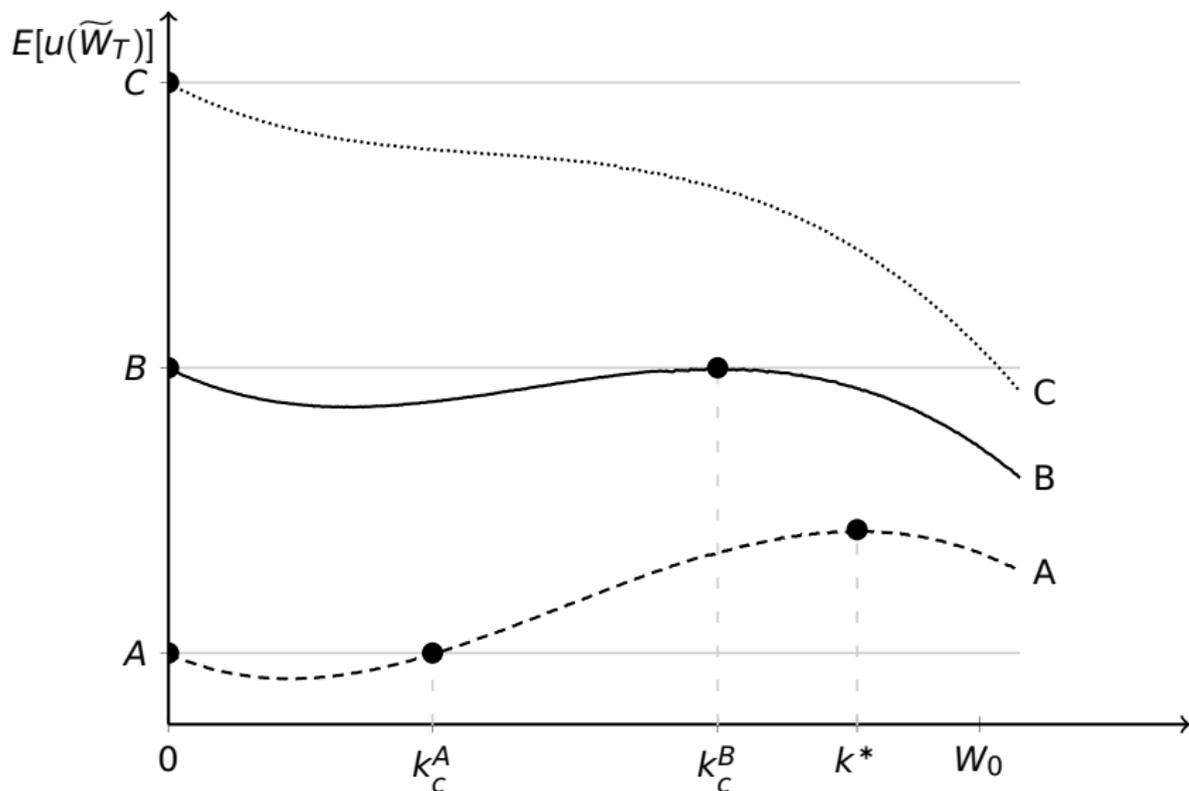
Optimum with $k^* > 0$ and Sheltering



Optimum with $k^* > 0$, Indifference, and Sheltering



Optimum with $k^* > 0$ and $k^* = 0$, Indifference, and Sheltering



Asset demand model with endogenous tax rate

Selection of individual i in year t into asset class m :

$$y_{mit} > 0 \text{ iff } v_{mit} < Z_{it}\gamma_m + \alpha_{mi}, \quad (9)$$

$$y_{mit} = 0 \text{ iff } v_{mit} \geq Z_{it}\gamma_m + \alpha_{mi}, \quad (10)$$

Demand of i in t for asset class m :

$$y_{mit} = X_{it}\beta_m + \mu_{mi} + u_{mit} \quad (11)$$

y_{mit} : Share of asset class m of gross wealth

X_{it} : Explanatory variables including the **marginal tax rate**

Z_{it} : Selection variables = X_{it} + entry regulation reform DiD + local unemployment rate

μ_{mi}, α_{mi} : Unobserved fixed effects (eliminated by first differencing)

Endogeneity of the marginal tax rate (in X and Z)

- ▶ Investment may change income and thus the tax rate
- ▶ IV: Simulated tax rate using exogenously updated income from 2002

Estimation

1st stage: Selection into asset holding

- ▶ Linear probability model for each asset class
- ▶ IV in first differences → coefficient vector $\hat{\gamma}_m$

2nd stage: Asset demand system

$$E(y_{mit}|X_{it}) = (Z_{it}\gamma_m)X_{it}\beta_m + \delta_m[(Z_{it}\gamma_m)^2 - Z_{it}\gamma_m], \quad (12)$$

- ▶ Involves transformation of X variables: $(Z_{it}\hat{\gamma}_m)X_{it}$
- ▶ Includes predicted selection terms $(Z_{it}\hat{\gamma}_m)^2 - Z_{it}\hat{\gamma}_m$
- ▶ Joint estimation of 6 asset demand equations
- ▶ GMM 3SLS estimation in first differences with IV for tax rate

Controls X (time varying): **gross income and net worth polynomials**, age, age sq., #children, married, risk attitude, local GDP per capita

References: Olsen (1980); Shonkwiler and Yen (1999)

German tax system

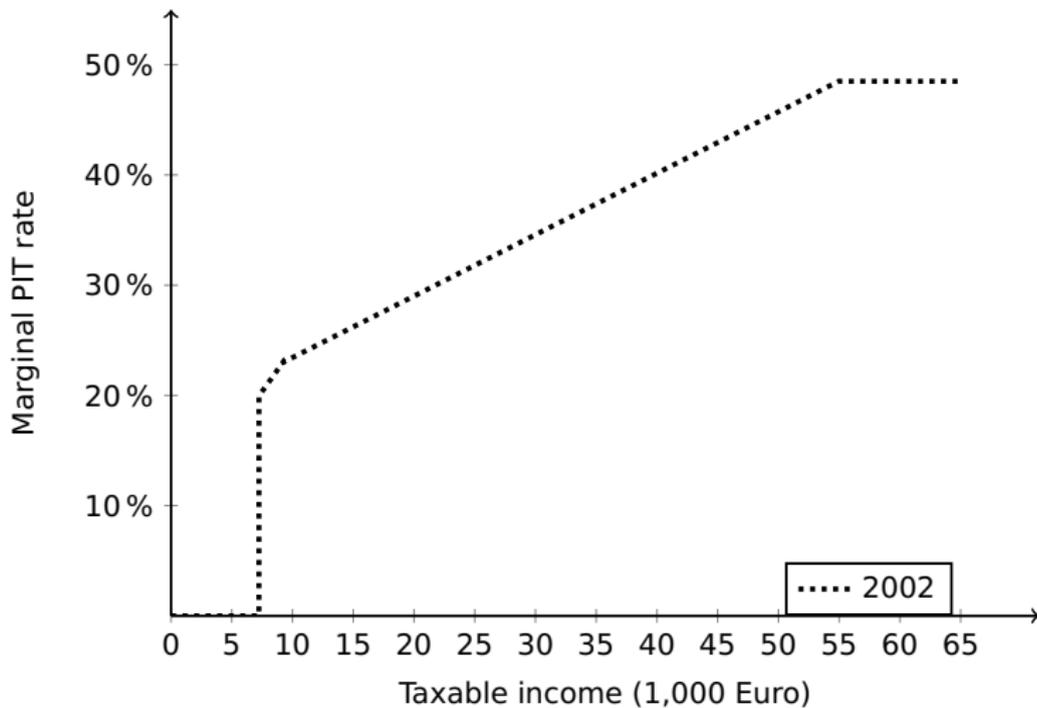
Same schedule for most income sources:

- ▶ Wage and salary income
- ▶ Profits from self-employment / unincorporated businesses
- ▶ Flat final withholding tax for interest and dividend income since 2009

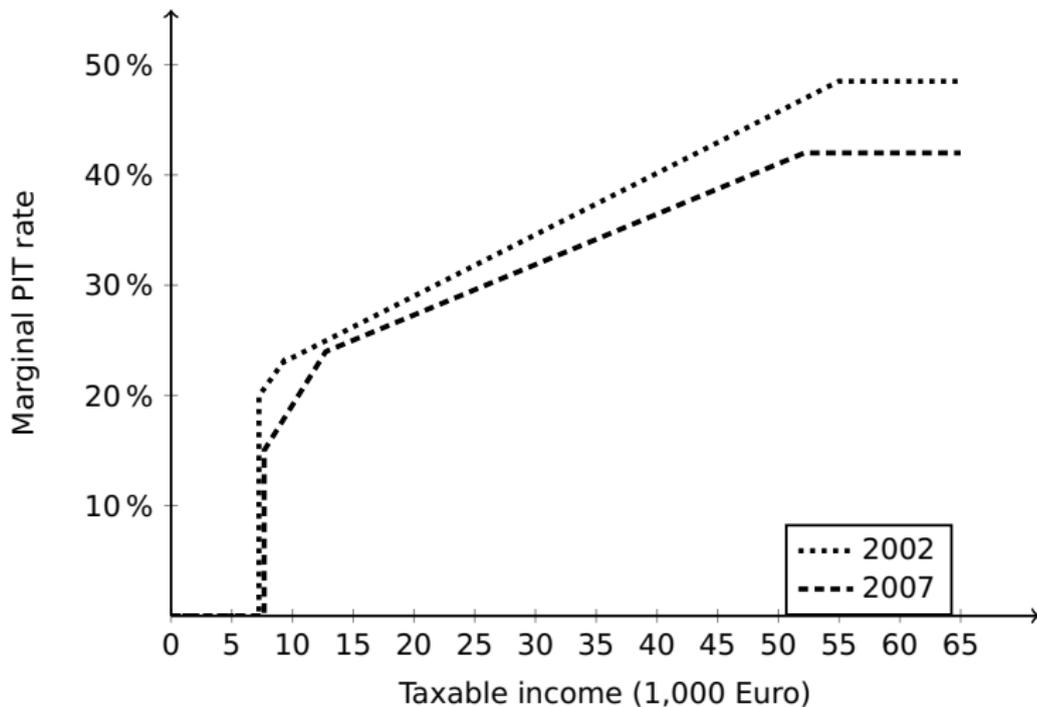
Identification of tax effects through:

- ▶ Personal income tax reforms between 2002 and 2012
- ▶ Individuals differentially affected (e.g., income splitting for married couples)
- ▶ Additional exogenous variation from bracket creep

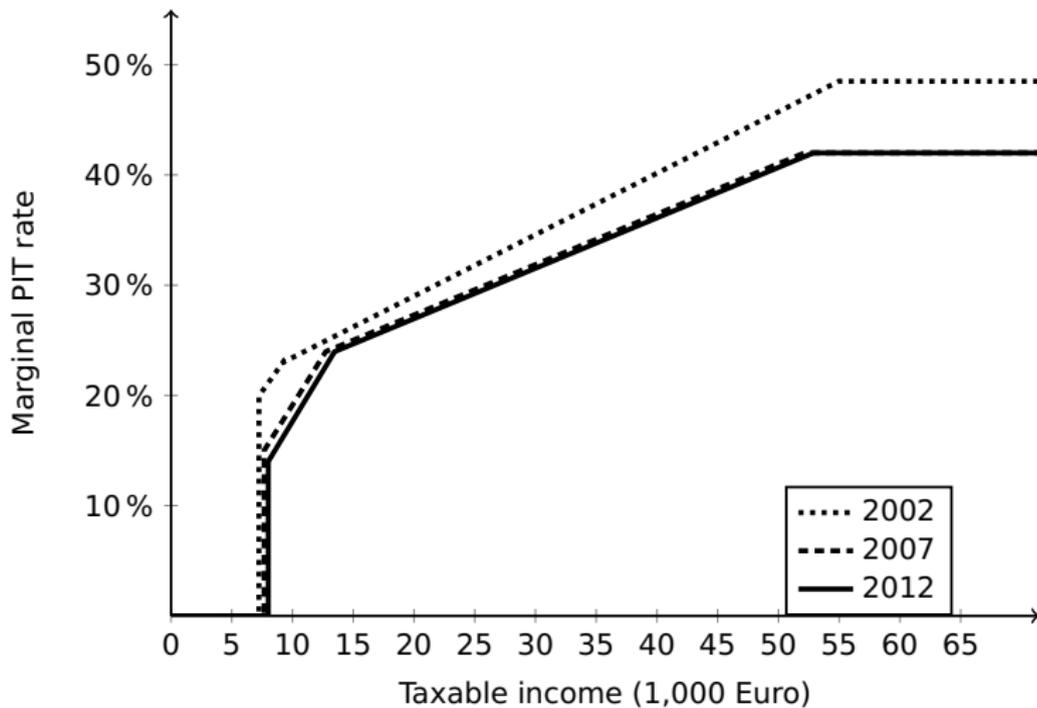
Personal income tax reforms in Germany 2002



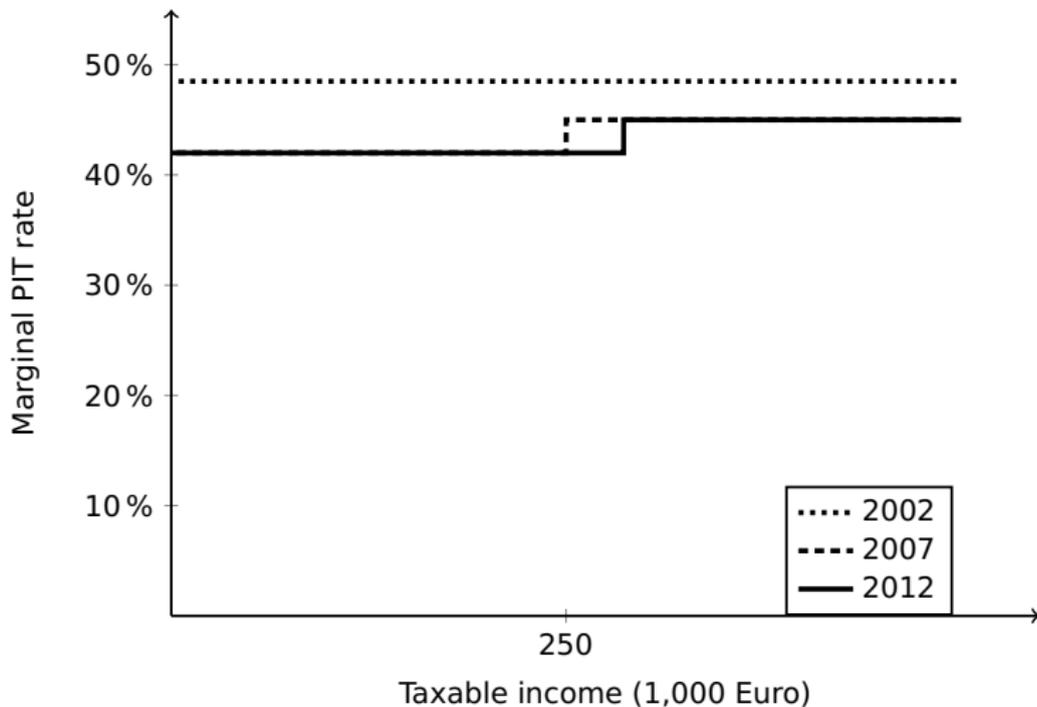
Personal income tax reforms in Germany 2002, 2007



Personal income tax reforms in Germany 2002, 2007, 2012



Personal income tax reforms in Germany 2002, 2007, 2012



Reform of entry regulation

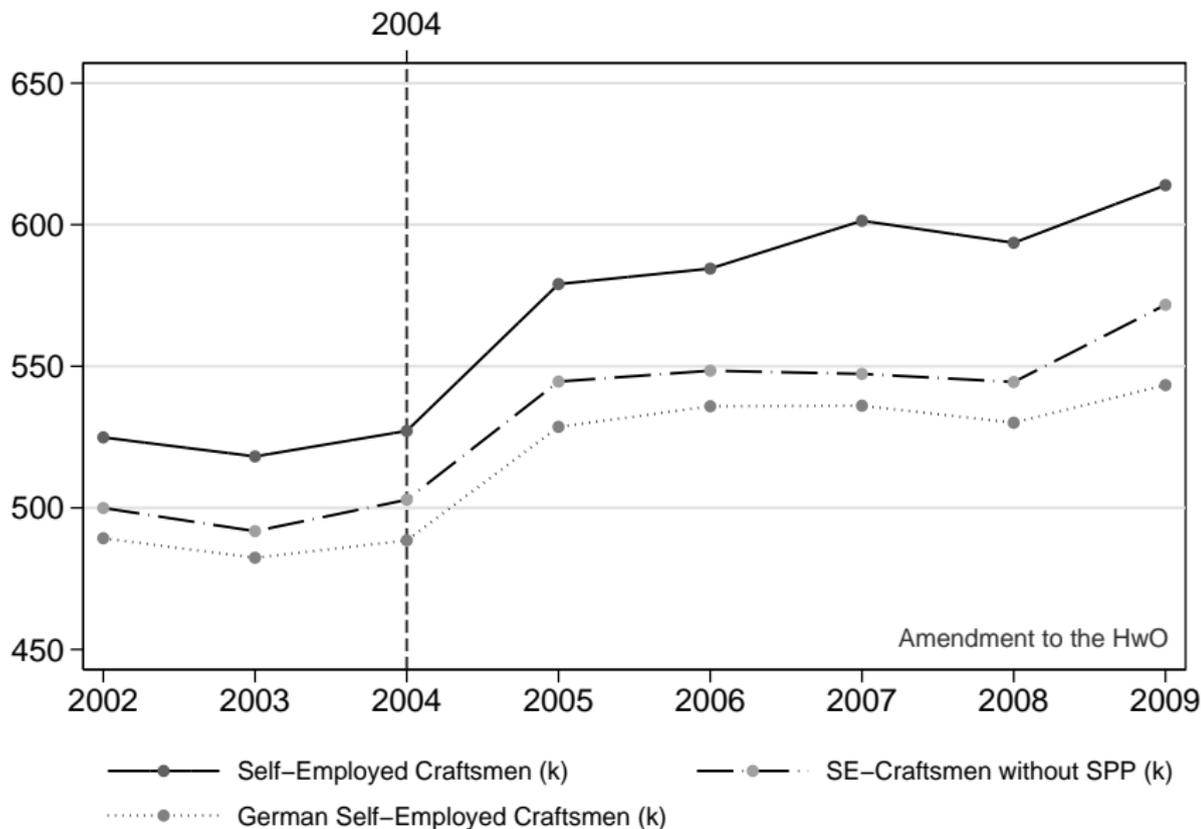
Deregulation of trades and crafts code (HwO) in Germany in 2004

Educational entry requirements (“Meister” degree) for registration as an entrepreneur removed in 53 occupations

Rostam-Afschar (2014) provides evidence of significant effects on entry into entrepreneurship

We use this exogenous variation to control for selection into entrepreneurship

Effects from 2004 amendment to HwO, **Rostam-Afschar (2014)**



Household panel data with business equity

German socio-economic panel

- ▶ Waves with household wealth balance sheets: 2002, 2007, 2012
- ▶ Sample: Ages 25-65, exclusion of unemployed, nilf, pensioners, students

Current market value of 6 asset classes:

- ▶ Owner-occupied housing
- ▶ Other property
- ▶ Financial assets
- ▶ **Private business**
- ▶ Life and private pension insurance
- ▶ Tangible assets

German Tax and Transfer Microsimulation Model (Jessen et al., 2017)

- ▶ Detailed calculation of individual marginal tax rates
- ▶ Taking into account income splitting, child allowances, ...

Private wealth portfolio in Germany

<i>Assets and Liabilities</i>		<i>Entrepreneurs</i>		
		Mean assets (in 2006 Euro)	% of total wealth	% of owners
I	Financial assets	51,061	10.5	59.2
II	Ownership equity	206,263	40.0	100.0
III	Contractual savings	35,943	13.4	74.7
IV	Tangible assets	3,588	0.8	13.4
V	Real estate			
	house or apartment	155,648	26.0	52.6
	Other (rental) property	152,835	9.2	29.3
	Gross wealth	519,565	100.0	100.0
VI	Mortgages			
	On house or apart.	38,125	8.9	33.3
	On other property	47,479	3.9	15.9
VII	Other liabilities	13,904	20.8	30.4
	Total Liabilities	99,507	33.6	62.7
	Net worth	441,494	67.1	95.3

Note: Weighted pooled averages of 1,135 entrepreneur-years based on the SOEP waves 2002, 2007, and 2012

Private wealth portfolio in Germany

<i>Assets and Liabilities</i>		<i>Non-Entrepreneurs</i>		
		Mean assets (in 2006 Euro)	% of total wealth	% of owners
I	Financial assets	16,291	23.0	57.9
II	Ownership equity	0	0.0	0.0
III	Contractual savings	12,637	30.8	70.3
IV	Tangible assets	815	1.7	7.4
V	Real estate			
	house or apartment	101,886	38.6	47.9
	Other (rental) property	25,031	6.0	12.8
	Gross wealth	109,726	100.0	100.0
VI	Mortgages			
	On house or apart.	29,506	13.0	32.6
	On other property	8,509	3.7	7.1
VII	Other liabilities	3,158	69.4	23.1
	Total Liabilities	41,173	86.1	50.9
	Net worth	82,229	15.4	91.4

Note: Weighted pooled averages of 13,409 non-entrepreneur-years based on the SOEP waves 2002, 2007, and 2012.

Asset ownership probability (IV in 1st diff.)

	Business	Housing	Rental Property	Financials
Marginal tax rate	0.1189*	-0.0576	-0.2069**	-0.0312
	(0.0617)	(0.0769)	(0.0868)	(0.1442)
Local unempl. rate	-0.0027	0.0042	-0.0038	0.0078
	(0.0021)	(0.0035)	(0.0032)	(0.0048)
Trade A1 $\times \geq 2004$	0.0351*	0.0340	-0.0413	-0.0266
	(0.0213)	(0.0278)	(0.0301)	(0.0418)
Trade A2 $\times \geq 2004$	0.0450	0.0806*	-0.0365	0.0934
	(0.0308)	(0.0417)	(0.0328)	(0.0603)
Trade AC $\times \geq 2004$	-0.0815	-0.1074*	0.0741	-0.0143
	(0.0607)	(0.0644)	(0.1140)	(0.0940)
Trade B1 $\times \geq 2004$	-0.0151	0.0104	-0.0418	0.0033
	(0.0176)	(0.0272)	(0.0309)	(0.0497)
Further controls	✓	✓	✓	✓
Observations	3,979	3,979	3,979	3,979
First stage <i>F</i> statistic	25.8651	25.8651	25.8651	25.8651

Life Insurance and Tangibles not shown. See paper for full results.

Asset class shares (GMM 3SLS in 1st diff. with selection)

	Business	Housing	Rental Prop.	Financials
Marginal tax rate	-0.0708** (0.0296)	0.0348*** (0.0130)	-0.0753** (0.0313)	0.0084 (0.0750)
Selection term $(Z\hat{\gamma})^2 - Z\hat{\gamma}$	-0.1540* (0.0793)	0.0076 (0.0208)	-0.1107* (0.0583)	-0.0358 (0.0773)
Gross income	0.1838*** (0.0459)	0.0151 (0.0160)	0.0081 (0.0666)	-0.1314*** (0.0455)
Gross income sq.	-0.0111** (0.0055)	-0.0017 (0.0031)	-0.0025 (0.0095)	0.0128*** (0.0047)
Net worth	0.0790 (0.0857)	0.0428 (0.0805)	0.1067 (0.1108)	-0.6237*** (0.1784)
Net worth sq.	-0.0294* (0.0165)	0.0041 (0.0212)	-0.0018 (0.0291)	0.0585** (0.0243)
Further controls	✓	✓	✓	✓
observations	3,979	3,979	3,979	3,979
Angrist/Pischke Partial R^2	0.1924	0.0576	0.0327	0.0516

Life Insurance and Tangibles not shown. See paper for full results.

What happens if the marginal tax rate is **decreased** by 10%-points?

- ▶ Conditional portfolio share of business equity (average: 40%) **increases** by 2.3%
- ▶ Unconditional portfolio share of business equity (average: 3%) **decreases** by 5.5%
- ▶ Driven by negative effect on ownership probability
ownership probability (average: 8%) **declines** by 14%

The opposing signs of the tax effects at extensive and intensive margins

- ▶ reject the standard portfolio choice model,
- ▶ but are **consistent** with our model allowing for tax sheltering.

Conclusions

- ▶ Our theoretical model of portfolio choice allows for tax sheltering
→ Tax may affect extensive and intensive margins with different signs
- ▶ Consistent with our econometric results:
A tax cut decreases (increases) investment in entrepreneurial business equity at the extensive (intensive) margin
 1. Lower personal income tax rates may drive out businesses that are viable only due to tax sheltering
 2. but increase entrepreneurial investment also worthwhile in the absence of taxes
- ▶ Further research
 - ▶ Randomized, controlled experiment:
 - ▶ collection of direct data on tax avoidance and evasion
 - ▶ Welfare effects

Thanks for your attention!

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Related studies on tax effects on portfolio choice

e.g., King and Leape (JPubE 1998), Poterba and Samwick (JPubE 2002), Alan et al. (JPubE 2010), Ochmann (2014):

Marginal tax rates (MTR) induce investment in tax-favored assets

E.g.: Poterba and Samwick (2002): 10pp higher MTR causes

- ▶ portfolio share of stocks to rise by 11%,
- ▶ share of bonds to fall by 3%

literature **excludes private business equity** due to data limitations

Exception: Samwick (2000), but no particular attention to this

What do we know?

1. Does a lower MTR lead to higher investment in own business?

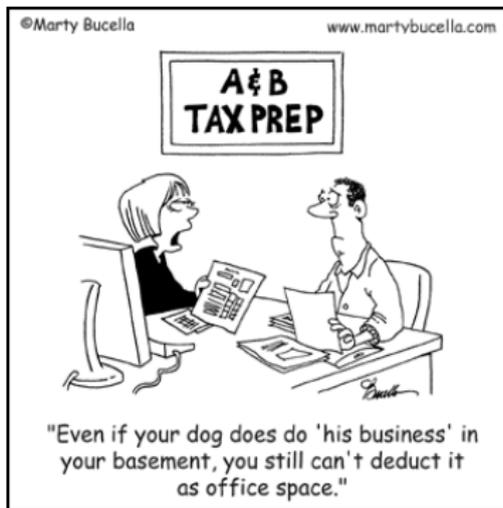
→ **No evidence**

2. Does a lower MTR drive out unprofitable businesses?

→ Literature on taxes and entrepreneurial choice is **inconclusive**:

- ▶ Cullen and Gordon (JPubE 2007):
A 5pp tax cut would lead to a 30% fall in entrepreneurship
- ▶ Hansson (2012): A tax cut would have positive effects on entrepreneurship

Does tax policy generate unprofitable businesses?



- ▶ Not in the standard model of portfolio allocation (with risky return and taxation)
- ▶ Predictions of the standard model:
 1. Lower marginal tax rate (MTR) leads to more investment in own business
 2. Lower MTR cannot drive out unprofitable businesses

Necessary conditions

1. Corner solution ($k^* = 0$), necessary condition:

$$(1-t)E(\tilde{e}-r) \leq 0. \quad (13)$$

2. Interior solution ($0 < k^* < W_0$), necessary condition:

$$\left. \frac{\partial \bar{U}}{\partial k} \right|_{k^* > 0} = Eu'(\tilde{W}_T)[(1-t)(\tilde{e}-r) + t\gamma_k(k^*, \tilde{e})] = 0 \quad (14)$$

Definition of wealth

The percentages of total wealth are means over individual percentage shares in gross wealth portfolios.

- ▶ *Financial assets* include savings balance, savings bonds, bonds, shares or investments,
- ▶ *ownership equity* commercial enterprise, i.e. a company, a shop, an office, a practice or an agricultural enterprise,
- ▶ *contractual savings* life insurance or private retirement insurance policies,
- ▶ *tangible assets* gold, jewelry, coins or valuable collections,
- ▶ *other liabilities* do not include mortgages or building loans.

Classification of crafts occupations

Group	Change in Entry Regulation in 2004	%	Example Occupations
AC	Craft and trade occupation with no change	0.3	Chimney sweeps, optometrists, hearing aid audiologists, orthopedic technicians, dental technicians
A1	Relaxation through "senior journeyman rule"	10.1	Roofers, surgical instrument makers, gunsmiths, plumbers, gas and water fitters, joiners, pastry cooks
A2	In addition, frequent exemptions for "easy jobs"	3.8	Masons and concreters, painters and varnishers, metalworkers, motor vehicle body and vehicle construction mechanics, bike mechanics, information electronics technicians, vehicle technicians, butchers
B1	Abolishment of entry requirement	4.9	Tile and mosaic layers, coppersmiths, turners, tailors, millers, photographers

Note: Some occupations that are legally not classified as crafts occupations may be included in the same occupational classification code in our data.