Farm Houseland Decisions under Various Tax Policies

Comparative Static Results and Evidence from Household Data

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Background

Observation:

- special tax systems for the agricultural sector

Reason:

- difficulties in applying standard taxes due to the specific farm-household constellation

Consequence:

- analysis of special agricultural taxes
- especially farm household effects

Our Analysis

Methods:

- theoretical analysis and
- empirical estimation

Scenarios:

- various standard and agricultural taxes
- with and without labour market imperfections

$\Rightarrow$ assessing existing tax policies

$\Rightarrow$ derivation of ”optimal” tax systems

Model

Model types:

- separable farm household model (no market imperfections)
- non-separable farm household model (labour market imperfections)

Regarded problems:

- imperfect markets (in contrast to absent markets)
- testing for market imperfections
- estimation of (not directly observable) shadow prices

Model Specification

Assumptions about possible labour market imperfections:

- fixed costs for accessing the labour market
- increasing transaction costs for accessing the labour market

$\Rightarrow$ decreasing effective wage rate for selling labour

$\Rightarrow$ increasing effective wage rate for hiring labour

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Evaluated tax policies (exemplarily):

- income tax (standard tax)
- market surplus tax (special agricultural tax)

Model: Variables

Farm:

- home-consumed output (X_a) (**a**nimal)
- market output (X_c) (**c**rop)
- **l**abour input (X_l)
- commercial **v**ariable input (X_v)
- quasi-fix factor(s) (R) (**r**estricted factors)

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Household:

- self-produced good (C_a) (**a**nimal)
- purchased good (C_m) (**m**onetary)
- **l**eisure (C_l)

Model: Algebraic Specification

Utility maximisation:

$$\max_{x,c} U\left(C_m, C_a, C_l\right), \text{ s.t.}$$

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Budget constraints:

$$P_m C_m \leq$$

$$(1-\tau_Y)\left[P_c X_c + P_a X_a - P_v X_v - C\left(X_l^H\right) + R\left(X_l^S\right) + E\right] - P_a C_a$$

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$$(1-\tau_{MS})\left[P_c X_c + P_a\left(X_a - C_a\right)\right] - P_v X_v - C\left(X_l^H\right) + R\left(X_l^S\right) + E$$

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Time constraint:

$$T_l + X_l^H \geq X_l + X_l^S + C_l$$

Model: Algebraic Specification

Utility maximisation:

$$\max_{x,c} U\left(C_m, C_a, C_l\right), \text{ s.t.}$$

Budget constraints:

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Time constraint:

$$T_l + X_l^H \geq X_l + X_l^S + C_l$$

Technology constraint:

$$G\left(X_c, X_a, X_v, X_l, R\right) = 0$$

Theoretical Analysis

Comparative Static of tax-induced effects:

$$\frac{\partial Z}{\partial \tau_j} \text{ with } Z \in \left\{ X_{c,a,v,l}, C_{m,a,l}, X_l^{S,H} \right\}$$

Theoretical Analysis

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$$\frac{\partial Z}{\partial \tau_j} \text{ with } Z \in \left\{ X_{c,a,v,l}, C_{m,a,l}, X_l^{S,H} \right\}$$

Non-separable model:

$$\frac{\partial Z}{\partial \tau_j} = \left. \frac{\partial Z}{\partial \tau_j} \right|_{P_l^* = \text{const.}} + \frac{\partial Z}{\partial P_l^*} \frac{\partial P_L^*}{\partial \tau_j}$$

Theoretical Analysis: Results

Separable model (no market imperfections):

Tax	Farm				Household			Labour Market
	X_a	X_c	X_l	X_v	C_a	C_m	C_l	$X_l^S - X_l^H$
τ_Y	0	0	0	0	$(-)$	$(-)$	?	?
τ_{MS}	$-$	$-$	$-$	$-$	?	$(-)$	$(-)$	$(+)$

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τ_Y	0	0	0	0	$(-)$	$(-)$	?	?
τ_{MS}	$-$	$-$	$-$	$-$	?	$(-)$	$(-)$	$(+)$

Non-separable model (imperfect labour market):

Tax	Farm				Household			Labour Market		
	X_a	X_c	X_l	X_v	C_a	C_m	C_l	X_l^H	X_l^S	X_l^F
τ_Y	?	?	?	?	$(-)$	$(-)$	?	?	?	?
τ_{MS}	?	?	?	?	?	?	?	?	?	?

Theoretical Analysis: Summary

No market imperfections:

- standard taxes have no production effects

  $\Rightarrow$ superior to agricultural taxes

Labour market imperfections:

- standard taxes generally have production effects

  $\Rightarrow$ not necessarily superior to agricultural taxes

- most tax induced effects are theoretically not defined due to counteracting shadow price effects

  $\Rightarrow$ evaluation of taxes theoretically not possible

  $\Rightarrow$ ”optimal” tax is an empirical question

Empirical Analysis

Data:

- accounting data of farm households in Poland
- balanced panel of 76 farms from 1991 to 1994

Econometric estimation:

- farm: Sym. Norm. Quadratic profit function
- household: AIDS model
- labour market: exponential function

Tax "elasticities":

$$\varepsilon_{Z,\tau_j} = \frac{\partial Z}{\partial \tau_j}\frac{1}{Z} = \frac{\partial Z / Z}{\partial \tau_j}$$

Labour market

Separable model (P_l = exogenous)

$\Rightarrow$ linear labour revenue and labour cost functions

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Non-separable model (P_l^* = internally defined)

- labour cost function: $C\left(X_l^H\right)$ = convex
- labour revenue function: $R\left(X_l^S\right)$ = concave
- test for linearity of functions
- shadow price of labour:

$$P_l^* = \frac{1}{2}\left(\frac{\partial C}{\partial X_l^H} + \frac{\partial C}{\partial X_l^S}\right)$$

Empirical Analysis: Results

Separable model (no market imperfections):

Tax	Farm				Household			Labour Market
	X_a	X_c	X_l	X_v	C_a	C_m	C_l	$X_l^S - X_l^H$
τ_Y	-	-	-	-	-0.46	-0.87	-0.15	2.53
τ_{MS}	-0.21	-0.17	-0.07	-0.31	0.46	-0.78	-1.02	17.76

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Tax	Farm				Household			Labour Market
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Non-separable model (imperfect labour market):

Tax	Farm				Household			Labour Market		
	X_a	X_c	X_l	X_v	C_a	C_m	C_l	X_l^H	X_l^S	X_l^F
τ_Y	.005	.002	.008	.003	-0.52	-0.97	-0.10	-0.69	1.19	0.03
τ_{MS}	-0.18	-0.16	-0.02	-0.29	0.02	-1.48	-0.68	-4.84	8.33	0.16

Summary and Conclusions

- Effects of **standard taxes** and **special agricultural taxes** on **farm households**
- Influence of **labour market imperfections**
- Comparative static of a **separable** and a **non-separable farm household model**
- **Theoretical** and **empirical** results

Summary and Conclusions II

The theoretical analysis shows that in the case of labour market imperfections:

- standard taxes influence production decisions
- most effects are theoretically not defined

$\Rightarrow$ standard taxes are not necessarily superior to special agricultural taxes

$\Rightarrow$ the ”optimal” taxation is an empirical question

Summary and Conclusions III

The empirical analysis of Polish farm households shows that

- there are labour market imperfections, but
- standard taxes have only a small effect on production decisions

$\Rightarrow$ standard taxes are theoretically preferable to special agricultural taxes in Poland

$\Rightarrow$ this might be different in other regions!

The End . . .

Thank you for listening to my presentation!

Labour market functions

Non-separable model

- Labour Cost:

$$C\left(X_l^H\right) = \beta_H \left(X_l^H\right)^{\alpha_H} + \gamma_H$$

with $\gamma_H > 0$ and $\alpha_H > 1$

- Labour Revenue:

$$R\left(X_l^S\right) = \beta_S \left(X_l^S\right)^{\alpha_S} - \gamma_S$$

with $\gamma_S > 0$ and $\alpha_S < 1$