

# Modelling Price Response of Farm Households under Imperfect Labour Markets: A Farm Household Approach to Family Farms in Poland

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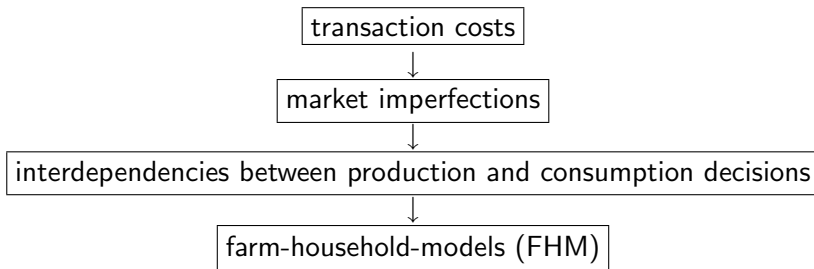
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# Outline

1. Introduction
2. Model Specification
3. Theoretical Analysis
4. Empirical Analysis
5. Summary and Conclusions

# Introduction

Conventional microeconomic models are often inappropriate to explain farm household behaviour



# Transaction Costs

## Classification of transaction costs (TC)

- ▶ FTC: fixed transaction costs
- ▶ PTC: proportional variable TC (constant marginal TC)
- ▶ NPTC: non-proportional variable TC (variable marginal TC)

Most studies using FHM consider only FTC and PTC:

- ▶ marginal transaction costs are constant
- ▶ effective prices are constant
- ▶ separability for households that participate in the market
- ▶ unrealistic for many empirical applications

# Labour Market

Transaction costs frequently occur on labour markets:

- ▶ institutional regulations
- ▶ information asymmetries
- ▶ travelling costs
- ▶ monitoring costs
- ▶ heterogeneity of labour
- ▶ ...

# Heterogeneity of Labour

- ▶ skill to work off-farm varies across family members
    - ⇒ order of supplied off-farm work corresponds to skills
    - ⇒ off-farm wage decreases with supplied off-farm work
  - ▶ skills of hired workers are heterogeneous
    - ⇒ most skilled labour is hired first (assuming uniform wages)
    - ⇒ effective wage rate increases with the amount of hired labour
- ⇒ the effective wage depends on the traded quantity
- ⇒ production and consumption decisions are non-separable

## Model: Labour Market

Net revenue from supplied labour

$$R(X_L^s, Z_L^s, Z_t^s) = R^*(X_L^s, Z_L^s) - TC(X_L^s, Z_t^s)$$

- ▶ heterogeneity  $\Rightarrow R^*$  is concave
- ▶ NPTC  $\Rightarrow TC$  is non-linear (convex)

$\Rightarrow$  net labour revenue  $R$  is concave in  $X_L^s$

$\Rightarrow$  Internal (shadow) wage  $P_L = \partial R / \partial X_L^s$  is decreasing in supplied off-farm labour  $X_L^s$

Correspondingly: Net cost for hiring labour

$$C(X_L^h, Z_L^h, Z_t^h) = C^*(X_L^h, Z_L^h) + TC(X_L^h, Z_t^h)$$

is convex in the amount of hired labour  $X_L^h$ .

## Model: Variables

### Farm:

- ▶ home-consumed outputs (animal):  $X_a$
- ▶ market outputs (crop):  $X_c$
- ▶ commercial variable inputs:  $X_v$
- ▶ labour:  $X_L$
- ▶ quasi-fixed factors (land + capital):  $Q$

### Consumption:

- ▶ self-produced goods:  $C_a$
- ▶ purchased market goods:  $C_m$
- ▶ leisure:  $C_L$

### Other:

- ▶ exogenous transfers:  $E$

## Model: Algebraic Specification

Utility maximisation:

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

Budget constraint:

$$P_m C_m \leq P_c X_c + P_a (X_a - C_a) - P_v X_v - C(X_L^h) + R(X_L^S) + E$$

Time constraint:

$$T_L + X_L^h \geq X_L + X_L^S + C_L$$

Technology constraint:

$$G(X_c, X_a, X_v, X_L, Q) = 0$$

## Theoretical Analysis: Comparative Static

Effect of exogenous price changes on  $W = C_i, X_i, X_L^s, X_L^h$ :

$$\frac{dW}{dP_j} = \left. \frac{\partial W}{\partial P_j} \right|_{P_L^* = \text{const.}} + \frac{\partial W}{\partial P_L^*} \frac{dP_L^*}{dP_j}$$

separable model (only direct component):

$$\frac{dW}{dP_j} = \frac{\partial W}{\partial P_j}$$

# Theoretical Results

	non-separable model				separable model				
	$P_c$	$P_a$	$P_v$	$P_m$	$P_c$	$P_a$	$P_v$	$P_L$	$P_m$
$X_c$	?	?	?	?	+	?	(-)	(-)	0
$X_a$	?	?	?	?	?	+	(-)	(-)	0
$X_v$	?	?	?	?	(+)	(+)	-	(-)	0
$X_L$	?	?	?	?	(+)	(+)	(-)	-	0
$C_m$	(+)	(+)	(-)	?	(+)	(+)	(-)	(+)	(-)
$C_a$	(+)	?	(-)	?	(+)	?	(-)	(+)	?
$C_L$	?	?	?	?	(+)	(+)	(-)	?	?
$X_L^{sn}$	(-)	(-)	(+)	?	(-)	(-)	(+)	(+)	?
$X_L^s$	(-)	(-)	(+)	?					
$X_L^h$	(+)	(+)	(-)	?					
$P_L^*$	(+)	(+)	(-)	?					

# Empirical Analysis

## *Data:*

- ▶ accounting data of farm households in Poland
- ▶ survey of 202 farms from 1994

## *Econometric estimation:*

1. farm: SNQ profit function with labour as quasi-fixed input  
⇒ shadow prices of labour
2. farm: SNQ profit function with labour as variable input
3. consumption: AIDS model
4. labour market: Heckman estimation

## Empirical Analysis: Labour Supply

Farms that supply off-farm labour

$$P_L = \frac{\partial R(X_L^s, Z_L^s, Z_t^s)}{\partial X_L^s} = P_L(X_L^s, Z_L^s, Z_t^s)$$

Coefficient of  $X_L^s$  significantly negative

⇒ decreasing marginal revenue of supplied labour

⇒ concave labour revenue function

⇒ significant labour market imperfections on supply-side

## Empirical Analysis: Labour Demand

Farms that hire on-farm labour

$$P_L = \frac{\partial C(X_L^h, Z_L^h, Z_t^h)}{\partial X_L^h} = P_L(X_L^h, Z_L^h, Z_t^h)$$

Coefficient of  $X_L^h$  significantly positive

⇒ increasing marginal costs of hired labour

⇒ convex labour cost function

⇒ significant labour market imperfections on demand-side

## Empirical Analysis: Price Elasticities

	non-separable model				separable model				
	$P_c$	$P_a$	$P_v$	$P_m$	$P_c$	$P_a$	$P_v$	$P_L$	$P_m$
$X_c$	-0.03	0.59	-0.32	0.06	0.14	0.79	-0.52	-0.41	0.00
$X_a$	0.44	0.40	-0.76	0.02	0.50	0.47	-0.83	-0.14	0.00
$X_v$	0.31	0.79	-1.07	0.01	0.33	0.82	-1.09	-0.05	0.00
$X_L$	0.16	-0.04	0.18	0.07	0.38	0.21	-0.08	-0.52	0.00
$C_m$	0.32	0.55	-0.44	-0.70	0.16	0.37	-0.26	0.42	-0.65
$C_a$	0.18	-0.48	-0.28	0.51	0.15	-0.51	-0.24	0.12	0.52
$C_L$	0.30	0.44	-0.51	-0.15	0.36	0.51	-0.58	-0.03	-0.17
$X_L^{sn}$	-13.84	-15.76	16.07	4.42	-19.50	-22.21	22.64	9.31	6.23
$X_L^s$	-5.59	-6.36	6.48	1.78					
$X_L^h$	3.59	4.09	-4.17	-1.15					
$X_L^f$	-0.04	-0.29	0.44	0.14					
$P_L$	0.42	0.48	-0.49	-0.14					

# Summary and Conclusions

## Model

- ▶ non-proportional variable transaction costs
- ▶ heterogeneity of labour
- ▶ non-separability even if households participate in markets
- ▶ full non-separable FHM based on flexible functional forms

## Theoretical Results

- ▶ ambiguous price responses
- ▶ differences between models

## Empirical Analysis

- ▶ labour market imperfections in Poland
- ▶ market imperfections affect price responses

The End . . .

*Thank you for your attention!*