# Subsidies and Labour Adjustments:

## Evidence from EU agriculture

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# Outline

- Motivation
- Literature
- Theory: A Simple Exit Model
- Econometrical Specification
- Regression Results
- Conclusion

# Motivation

- CAP budget 2008:

50.000.000.000 €
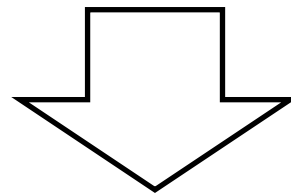
To protect farmers' income

BUT….

# Motivation

- Share of agricultural employment continues to decline in the EU15
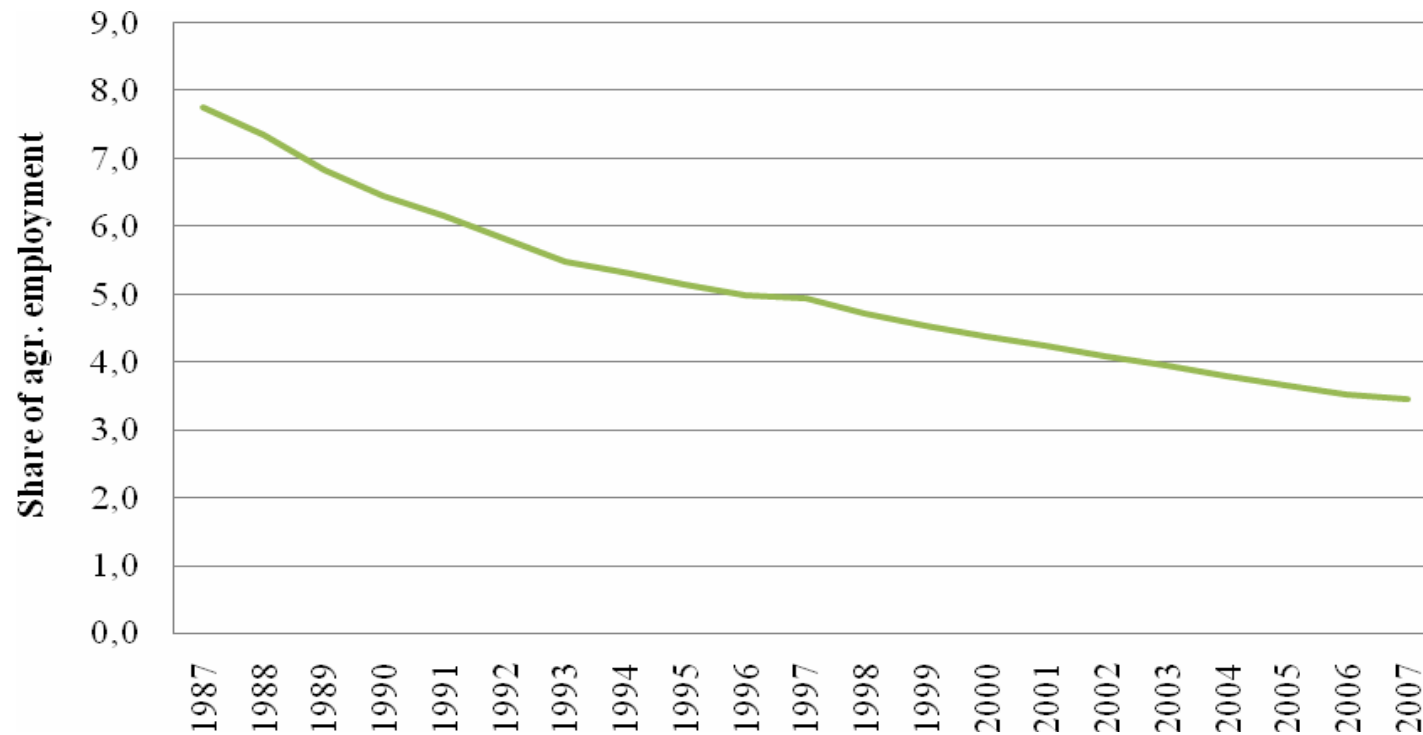
# Motivation

- Accession of 10 NMS to the EU:

  Number of farmers x2

  ⟹ Pressure on CAP budget

  ⟹ Serious questions on the sustainability and effectiveness of the CAP

  ⟱
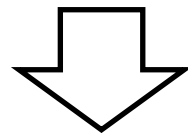
  Role of subsidies on labour adjustments

# Motivation

- Research Question:

  What are the main determinants of intersectoral labour flows and more in particularly what is the impact of subsidies on the decision to leave the agricultural sector?

# Literature

- Determinants to leave the agricultural sector

    1. Income:

        We would expect that subsidies⇧ the probability to stay in the agricultural sector as they are expected to increase net farmers' income

        BUT

    Second order effects of subsidies

# Literature

- Determinants to leave the agricultural sector

  1. Income:

     Second order effects ⇨ Subsidies are expected to be capitalized in farm input prices, such as land prices and fertilizer prices (Floyd 1965; Ciaian and Swinnen 2006, 2009)

     ⇨ Studies find mixed effects:

     - Barkley (1990) and Glauben et al. (2006): no effect
     - Goetz and Debertin (1996, 2001): increase labour outflow
     - Breustedt and Glauben (2007): decrease labour outflow, but very small effect

# Literature

- • Determinants to leave the agricultural sector

  2. Individual characteristics:
     Age, education, marital status

     (Sumner 1982; Huffman 1980; Rizov and Swinnen 2005; Bojnec and Dries 2005)

  3. Non Pecuniary Benefits:
     Independence and Pride associated with farming

     (Vandenheuvel and Wooden 1997; Gillespie et al. 2004; Hoppe and Banker 2006; Key and Roberts 2007)

  4. Costs of switching jobs:
     Personal and Regional characteristics

# Theory

- ## Simple Exit model

  (Todaro 1969; Todaro and Harris 1970)

  Assume 2 sectors ⇨ Logit model

  - Agricultural sector

  - Non Agricultural sector

  Assume 4 sectors ⇨ Multinomial logit model

  - Agricultural sector

  - Industry and Services

  - Unemployment

  - Out of employment (retired or disabled)

# Theory

- Discounted Utility of working in agriculture (A) or in another sector (i)

$$U_A = \int U\big(Y_{A,t}, h_{A,t}, Z_{A,t}\big)\, e^{-rt} dt$$

$$U_i = \int U\big(Y_{i,t}, h_{i,t}, Z_{i,t}\big)\, e^{-rt} dt \ \ with\ i = 1,....3$$

with $Y$ = income

$h$ = hours worked

$Z$ = utility shifters (personal or employment characteristics)

$r$ = discount rate

# Theory

- Transaction Costs

$$CT_{A,i} = \int CT_{A,i,t}\, e^{-rt}\, dt$$

$$CT_{i,A} = \int CT_{i,A,t}\, e^{-rt}\, dt$$

$\Longrightarrow$ depend on personal and regional characteristics

# Theory

- Decision to leave the agricultural sector

$$V_{A,i} = \max_{i=1,..3}\{U_i - U_A - CT_{A,i}\}$$

$\Longrightarrow V_{A,i} > 0:$ Leave agriculture

$V_{A,i} < 0:$ Stay in agriculture

# Econometrical specification

$$U_{ijk} = u_{ijk} + e_{ijk}$$

with $u_{ijk}$ = systematic component

$e_{ijk}$ = random component

AND

$$u_{ijk} = \beta_k' x_{ij}$$

with $x_{ij}$ = characteristics of the individual i living in region j (and also regional characteristics)

# Econometrical specification

- Logit model
- Multinominal logit model

$$P\left(Y_{ij} = k\right) = \frac{e^{\beta_k' x_{ij}}}{1 + \sum_{m=0}^{K} e^{\beta_m' x_{ij}}} \quad for \ k = 1,...K$$

$$P\left(Y_{ij} = 0\right) = \frac{1}{1 + \sum_{m=0}^{K} e^{\beta_m' x_{ij}}}$$

# Data

| | Description | Mean (Std. Dev) |
|---|---|---|
| **Income characteristics** | | |
| SUBS | Natural logarithm of subsidies per worker in PPP € | 7.60 (1.12) |
| COUPLED | Natural logarithm of coupled subsidies per worker in PPP € | 7.17 (1.17) |
| DECOUPLED | Natural logarithm of decoupled subsidies per worker in PPP € | 5.62 (1.75) |
| INCDIFF | Ratio of the average wage and the agricultural income per worker | 1.81 (0.78) |
| **Farm characteristics** | | |
| SMALL | Percentage of small farmers (<2 ha) in the region | 66.01 (20.89) |
| OWNED | Percentage of owned land in the region | 64.57 (22.08) |
| LIVESTOCK | Percentage of livestock farmers in the region | 58.55 (21.11) |
| CEREALS | Percentage of cereals farmers in the region | 45.08 (21.80) |
| **Personal characteristics** | | |
| AGE | Age of the individual in years | 47.34 (13. 14) |
| HIGHEDU | Dummy that takes a value of 1 if the individual received tertiary education and 0 otherwise | 0.05 (0.21) |
| MEDEDU | Dummy that takes a value of 1 if the individual received secondary education and 0 otherwise | 0.39 (0.49) |
| AGEDU | Dummy that takes a value of 1 if the individual received agricultural education and 0 otherwise | 0.14 (0.35) |
| MARRIED | Dummy that takes a value of 1 if the individual is married and 0 otherwise | 0.74 (0.44) |
| GENDER | Dummy that takes a value of 1 if the individual is male and 0 otherwise | 0.62 (0.49) |
| **Job characteristics** | | |
| SELFEMPL | Dummy that takes a value of 1 if the individual is self employed and 0 otherwise | 0.57 (0.49) |
| FAMILYWORK | Dummy that takes a value of 1 if the individual is a family worker and 0 otherwise | 0.13 (0.33) |
| **Regional characteristics** | | |
| DENSE | Dummy that takes a value of 1 if the individual is living in a densely populated area and 0 otherwise | 0.07 (0.25) |
| INTERDENSE | Dummy that takes a value of 1 if the individual is living in an intermediate densely populated area and 0 otherwise | 0.23 (0.42) |
| NMS | Dummy that takes a value of 1 if the individual in a NMS and 0 otherwise | 0.27 (0.45) |

# Regression Results

| | Exit from agriculture (prob= 7.3%) | | |
| --- | --- | --- | --- |
| | Coefficient | z-value | Marginal effect |
| Income characteristics | | | |
| SUBS | 0.197 | 3.97**** | 0.0106 |
| COUPLED | - | - | - |
| DECOUPLED | - | - | - |
| INCDIFF | 0.056 | 0.94 | 0.0030 |
| Farm characteristics | | | |
| SMALL | -0.001 | -1.02 | -0.0001 |
| OWNED | -0.002 | -1.21 | -0.0001 |
| LIVESTOCK | -0.010 | -5.54*** | -0.0005 |
| CEREALS | 0.005 | 2.76*** | 0.0003 |
| Personal characteristics | | | |
| AGE | 0.015 | 3.59*** | 0.0008 |
| HIGHEDU | 0.071 | 0.56 | 0.0039 |
| MEDEDU | 0.010 | 0.16 | 0.0005 |
| AGEDU | -0.456 | -6.51*** | -0.0214 |
| GENDER | -0.344 | -7.08*** | -0.0193 |
| MARIED | -0.399 | -8.72*** | -0.0236 |
| Job characteristics | | | |
| SELFEMPL | -1.459 | -21.62*** | -0.0914 |
| FAMILYWORK | -1.281 | -12.19*** | -0.0473 |
| Regional characteristics | | | |
| DENSE | 0.458 | 5.69*** | 0.0296 |
| INTERDENSE | 0.110 | 2.22** | 0.0061 |
| NMS | 0.554 | 3.88*** | 0.0337 |
| Intercept | -3.156 | -5.76*** | |
| Number of observations | 87105 | | |
| Likelihood ratio | 1245.36*** | | |

# Regression Results

| | Exit from agriculture (prob= 7.3%) | | |
| --- | --- | --- | --- |
| | Coefficient | z-value | Marginal effect |
| Income characteristics | | | |
| SUBS | - | - | - |
| COUPLED | 0.135 | 3.40*** | 0.0073 |
| DECOUPLED | 0.052 | 2.42** | 0.0028 |
| INCDIFF | 0.044 | 0.82 | 0.0024 |
| Farm characteristics | | | |
| SMALL | -0.002 | -1.56 | -0.0001 |
| OWNED | -0.002 | -1.16 | -0.0001 |
| LIVESTOCK | -0.011 | -5.99*** | -0.0016 |
| CEREALS | 0.004 | 2.53** | 0.0002 |
| Personal characteristics | | | |
| AGE | 0.015 | 3.52*** | 0.0008 |
| HIGHEDU | 0.063 | 0.51 | 0.0035 |
| MEDEDU | -0.003 | -0.05 | -0.0001 |
| AGEDU | -0.459 | -6.60*** | -0.0215 |
| GENDER | -0.342 | -6.97*** | -0.0192 |
| MARIED | -0.396 | -8.71*** | -0.0234 |
| Job characteristics | | | |
| SELFEMPL | -1.456 | -19.28*** | -0.0912 |
| FAMILYWORK | -1.280 | -11.64*** | -0.0472 |
| Regional characteristics | | | |
| DENSE | 0.462 | 5.69*** | 0.0299 |
| INTERDENSE | 0.115 | 2.35** | 0.0064 |
| NMS | 0.501 | 3.65*** | 0.0301 |
| Intercept | -2.757 | -6.01*** | |
| Number of observations | 87105 | | |
| Likelihood ratio | 1257.08*** | | |

# Regression Results

| | Industry and services (prob.= 2.7 %) | | | Unemployment (prob. = 1.0%) | | | Out of employment (prob. = 3.6%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | z value | Marginal effect | Coefficient | z value | Marginal effect | Coefficient | z value | Marginal effect |
| **Income characteristics** | | | | | | | | | |
| SUBS | 0.147 | 1.67* | 0.0022 | 0.074 | 0.67 | 0.0002 | 0.321 | 3.22*** | 0.0073 |
| COUPLED | - | - | - | - | - | - | - | - | - |
| DECOUPLED | - | - | - | - | - | - | - | - | - |
| INCDIFF | 0.177 | 1.95* | 0.0028 | 0.014 | 0.14 | -0.0000 | -0.034 | -0.40 | -0.0009 |
| **Farm characteristics** | | | | | | | | | |
| SMALL | -0.000 | -0.08 | -0.0000 | -0.003 | -0.09 | -0.0000 | -0.003 | -1.18 | -0.0001 |
| OWNED | -0.001 | -0.22 | -0.0000 | -0.002 | -0.70 | -0.0000 | -0.004 | -1.69* | -0.0001 |
| LIVESTOCK | -0.010 | -3.09*** | -0.0002 | -0.001 | -0.37 | -0.0000 | -0.014 | -4.41*** | -0.0003 |
| CEREALS | 0.007 | 2.10** | 0.0001 | 0.006 | 1.26 | 0.0000 | 0.002 | 0.72 | 0.0000 |
| **Personal characteristics** | | | | | | | | | |
| AGE | -0.035 | -8.48*** | -0.0006 | -0.020 | -4.80*** | -0.0001 | 0.062 | 11.11*** | 0.0014 |
| HIGHEDU | 0.986 | 6.82*** | 0.0255 | -0.345 | -1.38 | -0.0011 | -0.780 | -3.77*** | -0.0135 |
| MEDEDU | 0.575 | 6.07*** | 0.0100 | -0.254 | -2.00** | -0.0015 | -0.329 | -3.98*** | -0.0075 |
| AGEDU | -0.957 | -8.86*** | -0.0113 | -0.505 | -3.32*** | -0.0015 | 0.067 | 0.66 | 0.0019 |
| GENDER | 0.074 | 0.89 | 0.0015 | -0.355 | -3.43*** | -0.0013 | -0.703 | -11.02*** | -0.0177 |
| MARIED | -0.208 | -3.30*** | -0.0034 | -0.456 | -3.96*** | -0.0018 | -0.195 | -3.11 | -0.0045 |
| **Job characteristics** | | | | | | | | | |
| SELFEMPL | -1.373 | -11..33*** | -0.0243 | -2.952 | -16.19*** | -0.0172 | -1.1322 | -15.61*** | -0.0335 |
| FAMILYWORK | -1.063 | -7.74*** | -0.0118 | -2.836 | -9.41*** | -0.0048 | -1.391 | -8.19*** | -0.0206 |
| **Regional characteristics** | | | | | | | | | |
| DENSE | 0.707 | 5.03*** | 0.0152 | 0.381 | 2.33** | 0.0015 | 0.247 | 2.06** | 0.0058 |
| INTERDENSE | 0.256 | 3.60*** | 0.0044 | -0.037 | -0.25 | -0.0001 | 0.024 | 0.32 | 0.0005 |
| NMS | 0.312 | 1.21 | 0.0047 | 0.256 | 0.93* | 0.0008 | 1.013 | 3.51*** | 0.0296 |
| Intercept | -2.864 | -3.28*** | | -2.582 | -2.15 | | -6.455 | -7.51*** | |
| Number of observations | 87105 | | | | | | | | |
| Likelihood ratio | 4262.02*** | | | | | | | | |

# Regression Results

| | Industry and services (prob.= 2.7%) | | | Unemployment (prob. = 1.0%) | | | Out of employment (prob. = 3.6%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | z value | Marginal effect | Coefficient | z value | Marginal effect | Coefficient | z value | Marginal effect |
| Income characteristics | | | | | | | | | |
| SUBS | - | - | - | - | - | - | - | - | - |
| COUPLED | 0.039 | 0.50 | 0.0005 | 0.074 | 1.00 | 0.0002 | 0.238 | 2.62*** | 0.0054 |
| DECOUPLED | 0.118 | 2.92*** | 0.0018 | 0.040 | 0.72 | 0.0001 | 0.027 | 0.79 | -0.0006 |
| INCDIFF | 0.200 | 2.46** | 0.0032 | 0.027 | 0.28 | -0.0001 | -0.081 | -0.86 | -0.0019 |
| Farm characteristics | | | | | | | | | |
| SMALL | -0.002 | -0.83 | -0.0000 | -0.001 | -0.20 | -0.0000 | -0.003 | -1.13 | -0.0001 |
| OWNED | -0.001 | -0.18 | 0.000 | -0.002 | -0.79 | -0.0000 | -0.004 | -1.54 | -0.0001 |
| LIVESTOCK | -0.008 | -2.64** | -0.0001 | -0.001 | -0.37 | -0.0000 | -0.017 | -4.58*** | -0.0004 |
| CEREALS | 0.005 | 1.52 | 0.0001 | 0.005 | 1.00 | 0.0000 | 0.003 | 0.90 | 0.0001 |
| Personal characteristics | | | | | | | | | |
| AGE | -0.036 | -8.63*** | -0.0006 | -0.020 | -4.87*** | -0.0001 | 0.062 | 10.87*** | 0.0014 |
| HIGHEDU | 0.965 | 6.76*** | 0.0245 | -0.359 | -1.43 | -0.0011 | -0.791 | -3.74*** | -0.0134 |
| MEDEDU | 0.539 | 5.89*** | 0.0092 | -0.267 | -2.13** | -0.0009 | -0.321 | -3.94*** | -0.0073 |
| AGEDU | -0.972 | -9.03*** | -0.0113 | -0.503 | -3.32*** | -0.0015 | 0.065 | 0.64 | 0.0019 |
| GENDER | 0.079 | 0.93 | 0.0015 | -0.353 | -3.44*** | -0.0012 | -0.702 | -10.93*** | -0.0177 |
| MARIED | -0.205 | -3.25*** | -0.0033 | -0.451 | -3.90*** | -0.0017 | -0.195 | -3.13*** | -0.0045 |
| Job characteristics | | | | | | | | | |
| SELFEMPL | -1.300 | -11.00*** | -0.0224 | -2.935 | -15.86*** | -0.0170 | -1.380 | -13.69*** | -0.0355 |
| FAMILYWORK | -0.964 | -7.57*** | -0.0108 | -2.816 | -9.04*** | -0.0048 | -1.465 | -7.98*** | -0.0213 |
| Regional characteristics | | | | | | | | | |
| DENSE | 0.746 | 5.42*** | 0.0161 | 0.399 | 2.53** | 0.0016 | 0.226 | 1.86** | 0.0052 |
| INTERDENSE | 0.249 | 3.56*** | 0.0042 | -00020 | -0.14 | 0.0001 | 0.038 | 0.52 | 0.0007 |
| NMS | 0.254 | 1.12 | 0.0037 | 0.318 | 1.32 | 0.0011 | 0.886 | 3.24*** | 0.0251 |
| Intercept | -2.606 | -3.54*** | | -2.739 | -2.94*** | | -5.570 | -6.71*** | |
| Number of observations | 87105 | | | | | | | | |
| Likelihood ratio | 4141.26*** | | | | | | | | |

# Conclusion

- ## Role of subsidies:
  - – Positive impact on the decision to leave agriculture:
    - Subsidies unequally divided over the farm population + high capitalization in farm input prices: net income of a farmer that receives less than the average subsidy even decreases compared to a situation where there are no subsidies (Key and Roberts 2006)
    - Subsidies make it easier for the farmers that stay in agriculture to buy out those farmers that are seeking to exit the sector, accelerating the rate of exits (Goetz and Debertin 2001)
    - Labour/ capital substitution (Goetz and Debertin 1996)

# Conclusion

- Other important determinants of labour flows:
  - Non pecuniary benefits (self employed; family worker)
  - Education
  - Regional farm characteristics

Thank you for your attention

Questions?