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Farm growth in Hungary, Slovenia and France

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Structural Change in Agriculture: Modeling Policy Impacts and Farm Strategies
Berlin, April 15-16, 2010

Outline

- Motivation
- Data and methodology
- Results
- Conclusions

Motivation

- There is a wealth of literature on Gibrat's Law in industry
  - However research on the growth of farms is still limited
  - Less research on transition countries
  - No cross-country comparison
- The aim of the paper is to investigate whether Gibrat's Law holds for French, Hungarian and Slovenian

Empirical evidences

- Upton and Haworth (1987) - UK,
- Bremmer et al (2002) - the Netherlands
- Kostov et al. (2005) - Northern Ireland

  Reject Gibrat's Law
- Weiss (1999)

  Reject Gibrat's Law, and found that 'age, schooling and sex of the farm operator, size of farm family, and off-farm employment as well as initial farm size, significantly influence farm growth and survival
- Hennings and Katchova (2005) – U.S.

  Financial management, cost cuts, resource management and income maximising strategies have positive influence upon farm capital growth rate
- Bakucs and Fertő (2009a, 2009b) – Hungary

  Reject Gibrat's Law if all farms (corporate and family) are considered together, regardless of the size measure used

Measuring farm size

- Acreage farmed, livestock number, total capital value, gross sales, total gross margin and net income
- Output value measures
  - are subject to inflation, and changes in relative prices
- The physical input measure
  - since farms are characterised by a non-linear production technology, this changes in size involve changes in the mix and proportions of inputs used

Data

- FADN data
- Dairy and field crop farms
- 2001-2007: France, Hungary
- 2004-2006: Slovenia
- Size measures:
  - Field crop farms:
    - utilised agricultural area, hectares
    - labour: AWU
  - Dairy farms
    - livestock unit: total number of livestock heads
    - labour: AWU

Model

$$\log S_{i,t} = \beta_0 + \beta_1 \log S_{i,t-1} + \varepsilon$$

Where

$S_{i,t}$ is the size of farm i at time

$S_{i,t-1}$ is the size of farm i at the previous period

If β_1 =1, growth rate and initial size are independently distributed

If β_1< 1 small farms tend to grow faster than large farms

If β_1>1 larger farms grow faster than smaller farms

Methodology

- Two-step Heckman selection model
- Quantile regressions
- Panel unit root tests
  - Levin et al. (2002) method (common unit root process)
  - Im et al. (2003) method (assuming individual unit root processes)
  - ADF-Chi square
  - PP-Chi square

Table 1. Descriptive statistics

		Dairy farms		Crop farms	
		Livestock units	**Labour in AWU**	**Arable land in hectares**	**Labour in AWU**
Hungary	Number of obs.	692	692	5482	5482
	Mean	3300.66	4713.89	3318.35	2905.37
	St. Dev.	1759.29	2210.02	1871.98	2304.78
	Min	255	63	50	1
	Max	6,169	8376	6517	8436
France	Number of obs.	7598	7598	13403	13403
	Mean	88.97	1.80	133.82	1.85
	St. Dev.	51.50	0.84	82.44	1.47
	Min	12.33	0.8	2	0.75
	Max	658.59	8.19	774.42	41
Slovenia	Number of obs.	726	726	174	174
	Mean	38.69	2.45	20.33	2.15
	St. Dev.	31.89	0.87	38.77	1.59
	Min	3.86	0.38	2.07	0.21
	Max	236.03	6.75	325.62	11.93

Note: 1 AWU is equivalent to 2,200 hours full time labour in France and Hungary, and 1,800 hours in Slovenia.

Table 2. Heckmann and quantile regression (q50) estimates for crop farms

	2001 – 2007				2001 – 2003 (2001 – 2005)[a]				2004 – 2007 (2006 – 2007)[a]			
	Heckmann		Quantile		Heckmann		Quantile		Heckmann		Quantile	
	land	lab	land	lab	land	lab	land	lab	land	lab	land	lab
					Hungary							
Size	0.55*	0.25*	0.51*	0.74*	0.35*	0.49‡	0.74*	0.64*	0.6*	0.88*	0.92*	0.92*
cons	3.47*	5.82*	4.00*	2.07*	5.06*	3.87*	2.15‡	2.94*	3.04*	0.82*	0.66	0.59◊
Mills λ	0.00	0.00	-	-	0.00	0.00	-	-	0.00	0.00	-	-
Wald1	0.00	0.00	-	-	0.00	0.00	-	-	0.00	0.00	-	-
Wald2	-	-	0.02	0.00	-	-	0.00	0.00	-	-	0.00	0.00
Wald3	14.89*	194.4*	-	-	33.43*	172.6*	-	-	174.1*	681.5*	-	-
Pseudo R^2	-	-	0.08	0.31	-	-	0.16	0.31	-	-	0.49	0.54
N surv	240	240	240	240	248	248	248	248	295	295	295	295
N total	272	272	-	-	272	272	-	-	330	330	-	-
					France							
Size	0.97*	0.83*	0.99*	1.00*	0.98*	0.85*	0.99*	1.00*	0.99*	0.97*	1.00*	1.00*
cons	0.17*	0.09*	0.02◊	0.00	0.11*	010*	0.01◊	0.00	0.01	0.01*	0.00	0.00
Mills λ	0.00	0.00	-	-	0.00	0.00	-	-	0.00	0.00	-	-
Wald1	0.00	0.00	-	-	0.00	0.00	-	-	0.64	0.00	-	-
Wald2	-	-	0.00	0.00	-	-	0.00	0.00	-	-	0.00	0.00
Wald3	11081*	1620*	-	-	19618*	2446*	-	-	10144*	1998*	-	-
Pseudo R^2	-	-	0.80	0.52	-	-	0.85	0.57	-	-	0.94	0.86
N surv	975	975	975	975	1277	1277	1277	1277	1571	1571	1571	1571
N total	2061	2061	-	-	2061	2061	-	-	1838	1838	-	-

Notes: land = UAA (ha), lab = labour (AWU), Mills λ = probability (significance of the inverse Mill's Ratio)

Table 2. Heckmann and quantile regression (q50) estimates for crop farms

	2001 – 2007				2001 – 2003 (2001 – 2005)[a]				2004 – 2007 (2006 – 2007)[a]			
	Heckmann		Quantile		Heckmann		Quantile		Heckmann		Quantile	
	land	lab	land	lab	land	lab	land	lab	land	lab	land	lab
						Slovenia[b]						
Size	-	-	-	-	-	-	-	-	1.07*	0.81*	1.04*	0.97*
cons	-	-	-	-	-	-	-	-	-0.16	-0.38	-0.11	0.02
Mills λ	-	-	-	-	-	-	-	-	-0.02	0.79	-	-
Wald1	-	-	-	-	-	-	-	-	0.03	0.37	-	-
Wald2	-	-	-	-	-	-	-	-	-	-	0.56	0.88
Wald3	-	-	-	-	-	-	-	-	1038*	15.89*	-	-
Pseudo R^2	-	-	-	-	-	-	-	-	-	-	0.84	0.51
N surv	-	-	-	-	-	-	-	-	27	27	27	27
N total	-	-	-	-	-	-	-	-	48	48	-	-

Notes: land = UAA (ha), lab = labour (AWU), Mills λ = probability (significance of the inverse Mill's Ratio)

Table 3. Heckmann and quantile regression (q50) estimates for specialised dairy farms

	2001 - 2007				2001 – 2003 (2001 – 2005)[a]				2004 – 2007 (2006 – 2007)[a]			
	Heckmann		Quantile		Heckmann		Quantile		Heckmann		Quantile	
	liv	lab	liv	lab	liv	lab	liv	lab	liv	lab	liv	lab
Hungary												
Size	0.48*	0.53*	0.73*	0.76*	0.78*	0.69*	0.91*	0.66*	0.47*	0.7*	0.81*	0.92*
cons	4.1*	4.04*	2.21	2.01	1.62◊	2.6*	0.69	2.92*	4.22*	2.51*	1.57	0.60
Mills λ	0.00	0.00	-	-	0.00	0.00	-	-	0.00	0.00	-	-
Wald1	0.00	0.00	-	-	0.07	0.00	-	-	0.00	0.00	-	-
Wald2	-	-	0.07	0.1	-	-	0.09	0.18	-	-	0.12	0.00
Wald3	10.95*	32.15*	-	-	43.29*	68.43*	-	-	19.3*	68.7*	-	-
Pseudo R^2	-	-	0.29	0.28	-	-	0.43	0.47	-	-	0.43	0.47
N surv	26	26	26	26	41	41	41	41	42	42	42	42
N total	108	108	-	-	108	108	-	-	84	84	-	-
France												
Size	0.99*	0.83*	1.00*	1.00*	0.98*	0.90*	0.99*	1.00*	1.00*	0.95*	1.00*	1.00*
cons	0.01	0.08‡	-0.01	0.00	0.05	0.04‡	0.00	0.00	-0.02	0.01*	0.00	0.00
Mills λ	0.00	0.00	-	-	0.00	0.00	-	-	0.00	0.00	-	-
Wald1	0.81	0.00	-	-	0.26	0.00	-	-	0.17	0.00	-	-
Wald2	-	-	0.83	0.00	-	-	0.55	0.00	-	-	0.03	0.00
Wald3	2965*	731*	-	-	7240*	1308*	-	-	25471*	8955*	-	-
Pseudo R^2	-	-	0.70	0.54	-	-	0.75	0.61	-	-	0.86	0.87
N surv	417	417	417	417	601	601	601	601	761	761	761	761
N total	1267	1267	-	-	1267	1267	-	-	973	973	-	-

Notes: liv = livestock units, lab = labour (AWU), Mills λ = probability (significance of the inverse Mill's Ratio)

Table 3. Heckmann and quantile regression (q50) estimates for specialised dairy farms

	2001 - 2007				2001 – 2003 (2001 – 2005)[a]				2004 – 2007 (2006 – 2007)[a]			
	Heckmann		Quantile		Heckmann		Quantile		Heckmann		Quantile	
	liv	lab	liv	lab	liv	lab	liv	lab	liv	lab	liv	lab
					Slovenia[b]							
Size	-	-	-	-	-	-	-	-	1.00*	0.63*	1.00*	0.92*
cons	-	-	-	-	-	-	-	-	0.02	0.28*	0.00	0.05
Mills λ	-	-	-	-	-	-	-	-	0.00	-0.37*	-	-
Wald1	-	-	-	-	-	-	-	-	0.68	0.00	-	-
Wald2	-	-	-	-	-	-	-	-	-	-	0.99	0.01
Wald3	-	-	-	-	-	-	-	-	5338*	76.01*	-	-
Pseudo R^2	-	-	-	-	-	-	-	-	-	-	0.83	0.44
N surv	-	-	-	-	-	-	-	-	180	180	180	180
N total	-	-	-	-	-	-	-	-	217	217	-	-

Notes: liv = livestock units, lab = labour (AWU), Mills λ = probability (significance of the inverse Mill's Ratio)

Table 4. Panel unit root tests for crop farms

	Land				Labour			
Specification	**LLC**	**IPS**	**ADF**	**PP**	**LLC**	**IPS**	**ADF**	**PP**
				Hungary				
intercept	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
intercept, trend	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
				France				
intercept	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
intercept, trend	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00

Note: LLC = Levin, Lin and Chu test (probability, assumes common unit root process)

IPS= Im, Pesaran and Shin test (probability, individual unit root process)

ADF= ADF Fisher Chi square (probability, individual unit root process)

PP = PP Fisher Chi square (probability, individual unit root process)

Lag length 0 selected by Schwarz Bayesian Criterion

Table 5. Panel unit root tests for dairy farms

	Livestock				Labour			
Specification	**LLC**	**IPS**	**ADF**	**PP**	**LLC**	**IPS**	**ADF**	**PP**
				Hungary				
intercept	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
intercept, trend	0.00	0.03	0.02	0.00	0.00	0.00	0.00	0.00
				France				
intercept	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
intercept, trend	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00

Note: LLC = Levin, Lin and Chu test (probability, assumes common unit root process)

IPS= Im, Pesaran and Shin test (probability, individual unit root process)

ADF= ADF Fisher Chi square (probability, individual unit root process)

PP = PP Fisher Chi square (probability, individual unit root process)

Lag length 0 selected by Schwarz Bayesian Criterion

Conclusions

- Our results strongly reject the validity of the Gibrat's Law for crop farms in France (with one exception) and Hungary
- Smaller farms grow faster than larger ones
- Estimations confirm the validity of the Gibrat's Law for French and Slovenian dairy farms