Subsidies and productivity

Introduction

- Growth models:
  - Neoclassical Solow Growth model,
  - Endogenous growth
- In **Solow model** growth occurs when labor increases and when productivity of labor and capital goes up
- Productivity improvements is an 'exogenous' variable.
- The Solow Model features convergence when a poorer country is catching up with a richer country because of inflow of capital caused by higher marginal rate of return on capital

Introduction

- In **Endogenous growth model** growth occurs due to innovation and investment in human capital which increases productivity
  - Investment in R&D
  - Investment in human capital and support of entrepreneurship
- Protection of property rights and contract enforcement
- Institutions that stimulate innovations lead to sustained growth of productivity
- Knowledge industries important

Introduction

- Governments important for economic growth: fight market failure
- We specially focus on one aspect of government policies: subsidies to companies
- Subsidies used to attract FDI, keep important businesses in the country, stimulate domestic expansion of firms
- Subsidies also used to achieve public objectives within EU funds
- In agriculture almost all firms receive subsidies for provision of public goods

Introduction

- EU spends annually aprox. 50 billion on CAP to support farmers' income and the environment
- The 2003 CAP reform replaced coupled payments with decoupled ones and RDP
- The impact of subsidies and of the 2003 reform is of high policy and academic interest
- Many studies on impact of subsidies on production or investment (Lagerkvist, 2005; Sckokai and Moro, 2009; Vercammen, 2007)
- Analysis of the affect of subsidies on farm productivity (TFP) is still missing

Introduction

- This study fills the gap by using the large FADN dataset and advanced semi-parametric TFP estimation technique
  - We directly introduce the effect of subsidies in a model of unobserved productivity
  - Estimate consistent production functions coefficients within sectors and countries
  - Obtain unbiased farm-specific TFP measures
  - Verify the impact of subsidies on TFP by the means of GMM regressions

Introduction

- Theoretically there are various channels through which subsidies impact on productivity.
- Subsidies may either increase or decrease productivity.
- Negative impact of subsidies on productivity results from allocative (and technical) efficiency losses owing to distortions in the production structure and factor use, soft budget constraints and the shift of subsidies to less productive firms.
- Positive impact stems from investment-induced productivity gains caused by the interaction of credit and risk attitudes with subsidies (subsidy-induced credit access, a lower cost of borrowing, a reduction in risk aversion and an increase in productive investment).

Subsidies and productivity

Negative impact of subsidies on productivity

- **Subsidies cause allocative inefficiency**
  - Recipient firms modify behavior, invest in subsidy-seeking activities that are less productive
  - Firms overinvest in subsidized inputs and change optimal capital-labor ratio

SUBSIDIES AND PRODUCTIVITY

Negative impact of subsidies on productivity

- **Subsidies give rise to technical inefficiency**
  - Subsidies lead to slack, a lack of effort and disinclination to seek cost improving methods
  - Subsidies give rise to soft budget constraint. Hard budget constraint forces firms to continually adjust to external conditions by behaving in entrepreneurial manner. Subsidy provider takes over the moral hazard. Recipient firms are less careful in protecting their wealth.
  - Subsidies transferred to less productive firms by policy makers with special interests. Reduce the rate at which resources are reallocated from one activity to another in response to new technologies or market conditions.

SUBSIDIES AND PRODUCTIVITY

Positive impact of subsidies on productivity

- The positive impact may stem from investment-induced productivity gains caused by the interaction of credit and risk attitudes with subsidies (subsidy-induced credit access, a lower cost of borrowing, a reduction in risk aversion and an increase in productive investment).

SUBSIDIES AND PRODUCTIVITY

Positive impact of subsidies on productivity

- The literature on credit constraints and risk behaviour in agriculture asserts a positive relationship between subsidies and productivity.
- If firms are credit rationed, then subsidies may provide an additional source of financing, either directly by increasing firms' financial resources or indirectly through improved access to formal credit.
- In other words, for credit-rationed farms subsidies may serve as a substitute for credit.

SUBSIDIES AND PRODUCTIVITY

Positive impact of subsidies on productivity

- Studies find that credit-constrained firms invest less and have lower allocative efficiency, which would improve as a result of subsidies.
- Cheaper credit would stimulate investments and input use, thus leading to improved firm performance.
- Firms that are not credit constrained may also be affected if subsidies present a cheaper source of financing than the credit available from the financial markets.

SUBSIDIES AND PRODUCTIVITY

Positive impact of subsidies on productivity

- Furthermore, Hennessy (1998) suggests that under uncertainty, subsidies affect markets through a wealth effect: subsidies affect wealth and thus risk attitudes.

SUBSIDIES AND PRODUCTIVITY

- Agriculture is well suited for testing the theory
- Subsidies heavily used in agriculture, which is in the EU subsidized within the Common Agricultural Policy of the EU
- Agricultural subsidies in the EU are either coupled (linked to particular activity) or decoupled, i.e. provided irrespective of current or future production level, they depend on past production and it is distributed to farms in the form of payments per unit of land cultivated

SUBSIDIES AND PRODUCTIVITY

- Previous empirical studies inconclusive:
  - In empirical studies mostly negative relationship between subsidies and productivity prevails (Latruffe et al., 2009, Lakner 2009, Zhu and Oude Lansink, 2010, Latruffe et al. 2011).
  - Some studies find positive relationship between subsidies and efficiency (Sauer and Park, 2009, Yee et al., 2004)

Subsidies and productivity

- These empirical studies follow a two-stage approach where the efficiency parameters estimated in the first stage are regressed on subsides in the second stage.
- We propose a structural semi-parametric approach built on Olley and Pakes which allows directly incorporating the effects of subsidies in the model of unobserved productivity.
- This approach controls for simultaneity bias without relying on instruments
- This approach controls also for selection bias in estimating production functions

SUBSIDIES AND PRODUCTIVITY

- Olley and Pakes is modified be including subsidies as an additional control variable to control for various channels through which subsidies affect productivity

SUBSIDIES AND PRODUCTIVITY

Coupled versus Decoupled Subsidies

- Efficiency loss stronger for coupled subsidies because they are allocatively more inefficient, bias production towards subsidised activities
- Coupled subsidies impose higher cost of monitoring by banks and bigger uncertainty which leads to lower willingness of banks to provide loans and lower investment

TFP estimation

- We use structural semi-parametric approach of Olley and Pakes in which we **directly incorporate the effects of subsidies in the model of unobserved productivity**
- OP approach controls for simultaneity bias without relying on instruments and for selection bias
  - **Selection bias**: firms with higher productivity and higher capital are less likely to exit, which leads to biased (downward) capital coefficients in balanced panels
  - **Simultaneity bias:** input choice is correlated with productivity shocks

TFP ESTIMATION

- We extend the Olley and Pakes (1996) algorithm by explicitly allowing farm decisions and market environment (factor markets and demand conditions) to be affected by the CAP subsidies which we directly introduce into the underlying structural model of the farm.

Data

- The FADN data of Eurostat for the EU-15
- Period 1990–2008, for A, Fin, and Sw 1995-2008
- Data representative of commercial agriculture and 90% of agricultural land used
- Six farm-type samples for each country (data sufficient for 83 regressions possible

Summary statistics

- Heterogeneity of farms in the EU-15
- G, DK, NL, and I have more capital abundant farms, invest and produce more
- GR, Por less capital abundant farms, invest less, and smaller production
- Farm employment variation small
- In NORTH subsidies per farm and per person higher than in SOUTH, subsidies per unit of capital lower than in SOUTH

TFP estimates

- Consistently estimated production function coefficients
- Variation across countries in coefficients of production function
  - materials coefficient: between 0.59 and 0.87
  - labour coefficient: between 0.07 and 0.26
  - capital coefficient: between 0.05 and 0.12

PRODUCTION FUNCTION COEFFICIENTS AND TFP ESTIMATES

Country	b_m (s.e.)	b_l (s.e.)	b_k (s.e.)	Adj. R^2 (No. obs.)	*TFP* index (*TFP* growth)
(1)	(2)	(3)	(4)	(5)	(6)
Belgium	**0.68**	**0.24**	**0.08**	**0.98**	**1.10**
	(0.03)	**(0.04)**	**(0.02)**	**(10693)**	**(-0.63)**
Denmark	**0.72**	**0.26**	**0.08**	**0.97**	**1.02**
	(0.02)	**(0.02)**	**(0.02)**	**(10697)**	**(-0.06)**
Germany	**0.84**	**0.17**	**0.07**	**0.93**	**1.05**
	(0.01)	**(0.01)**	**(0.01)**	**(54037)**	**(+0.63)**
Greece	**0.59**	**0.22**	**0.07**	**0.99**	**0.73**
	(0.02)	**(0.02)**	**(0.02)**	**(11957)**	**(+0.43)**
Spain	**0.60**	**0.26**	**0.07**	**0.98**	**1.09**
	(0.01)	**(0.02)**	**(0.01)**	**(32121)**	**(+1.98)**
France	**0.74**	**0.21**	**0.08**	**0.97**	**1.01**
	(0.01)	**(0.01)**	**(0.01)**	**(71274)**	**(+0.24)**
Ireland	**0.80**	**0.07**	**0.05**	**0.98**	**1.23**
	(0.02)	**(0.02)**	**(0.02)**	**(6088)**	**(-0.59)**

Notes: *TFP* index is an aggregate productivity measure in levels; *TFP* growth is the aggregate annual percentage growth. The total number of observations (No. obs.) reported is from the second-step estimated sample.

PRODUCTION FUNCTION COEFFICIENTS AND TFP ESTIMATES

Country	b_m (s.e.)	b_l (s.e.)	b_k (s.e.)	Adj. R^2 (No. obs.)	*TFP* index (*TFP* growth)
(1)	(2)	(3)	(4)	(5)	(6)
Italy	0.62	0.20	0.07	0.98	1.10
	(0.01)	(0.01)	(0.01)	(56977)	(+2.05)
Luxembourg	0.68	0.24	0.10	0.99	0.99
	(0.03)	(0.03)	(0.02)	(3799)	(+0.63)
Netherlands	0.70	0.27	0.11	0.98	1.04
	(0.01)	(0.02)	(0.01)	(12800)	(-0.61)
Austria	0.62	0.20	0.12	0.99	1.36
	(0.02)	(0.02)	(0.02)	(13228)	(+1.44)
Portugal	0.64	0.20	0.07	0.97	0.96
	(0.02)	(0.03)	(0.01)	(8341)	(+1.89)
Finland	0.68	0.16	0.11	0.93	1.67
	(0.03)	(0.02)	(0.02)	(5364)	(-0.78)
Sweden	0.87	0.11	0.06	0.95	1.20
	(0.03)	(0.02)	(0.01)	(4626)	(-0.47)
UK	0.80	0.22	0.08	0.94	0.99
	(0.01)	(0.02)	(0.01)	(27680)	(+0.18)

TFP estimates

- TFP index ranges between 0.73 in Greece and 1.67 in Finland
- Higher index suggests that relatively more productive farms and farm sectors dominate, i.e., they have larger market shares
- NORTH has more productive farm sectors, i.e. more productive farms dominate

TFP ESTIMATES

- Average annual growth of TFP ranges between -0.78% in Finland and +2.05% in Italy.
- Six small, north European countries show negative productivity growth
- Germany, France and the UK show small but positive productivity growth.
- The highest average annual productivity growth is recorded by the south European countries, Italy, Portugal and Spain.

Impact of Subsidies on Productivity

- Almost all EU farms receive some subsidies
- No natural treatment and control groups exist
- **Since subsidies used in estimating productivity to test the link between subsidies and productivity we use simple correlation analysis**
- Spearman correlation coefficient computed to identify whether two variables relate in a monotonic function

IMPACT OF SUBSIDIES ON PRODUCTIVITY

BEFORE DECOUPLING

- In both full and subsamples, **negative link between subsidies and the level of productivity** (DK and POR exceptions)
- **Correlation between subsidies and productivity growth is also negative** for most countries, for 4 countries it is positive but statistically insignificant.
- These results are consistent with findings by previous productivity studies which employ two-stage approaches to identify the CAP subsidy impact on farm technical efficiency (e.g., Latruffe et al.,2009; Lakner, 2009; Zhu and Oude Lansink, 2010, Mary, 2012).

IMPACT OF SUBSIDIES ON PRODUCTIVITY

AFTER DECOUPLING

- In subsamples, the magnitudes of change are larger compared to those in the full samples.
- In subsamples, productivity growth rates and subsidies are positively correlated in every country.
- The effects in the subsamples compared to the full samples clearly suggest that indeed **decoupling had an impact on productivity**.
- Our findings are consistent with Zhu et al. (2012) and Mary (2012),which investigate the impact of partial decupling (e.g., the introduction of the Agenda 2000).

IMPACT OF SUBSIDIES ON TFP

Country	Specification	b_I (s.e.)	b_K (s.e.)	b_S (s.e.)	b_{SX} (s.e.)	AR(2) Hansen J
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Belgium	Level	0.010	0.075	-0.001	0.009	0.121
		(0.005)	(0.045)	(0.002)	(0.011)	(0.324)
	Growth	0.002	0.040	-0.003	0.006	0.178
		(0.001)	(0.024)	(0.002)	(0.011)	(0.461)
Denmark	Level	0.002	-0.314	**-0.012**	**0.010**	0.205
		(0.001)	(0.074)	**(0.002)**	**(0.003)**	(0.194)
	Growth	0.002	-0.180	-0.003	**0.012**	0.183
		(0.001)	(0.056)	(0.002)	**(0.004)**	(0.344)
Germany	Level	0.008	-0.103	**-0.002**	-0.001	0.082
		(0.002)	(0.018)	**(0.001)**	(0.001)	(0.229)
	Growth	0.004	-0.104	**-0.003**	-0.001	0.114
		(0.001)	(0.018)	**(0.001)**	(0.001)	(0.215)
Greece	Level	0.006	-0.105	**-0.037**	**-0.017**	0.181
		(0.002)	(0.055)	**(0.006)**	**(0.007)**	(0.402)
	Growth	0.002	-0.036	**-0.035**	**-0.020**	0.286
		(0.001)	(0.016)	**(0.005)**	**(0.010)**	(0.537)
Spain	Level	0.003	-0.179	-0.003	**0.015**	0.228
		(0.001)	(0.057)	(0.002)	**(0.002)**	(0.198)
	Growth	0.003	-0.130	**-0.008**	**0.007**	0.361
		(0.001)	(0.050)	**(0.002)**	**(0.002)**	(0.399)

IMPACT OF SUBSIDIES ON TFP

(1)	(2)	(3)	(4)	(5)	(6)	(7)
France	Level	0.004	0.063	**-0.005**	**0.008**	0.111
		(0.002)	(0.031)	**(0.001)**	**(0.002)**	(0.295)
	Growth	0.004	0.047	**-0.007**	**0.011**	0.115
		(0.002)	(0.026)	**(0.001)**	**(0.002)**	(0.312)
Ireland	Level	0.008	0.067	-0.002	**0.029**	0.221
		(0.004)	(0.036)	(0.002)	**(0.015)**	(0.418)
	Growth	0.008	0.030	**-0.008**	0.019	0.104
		(0.004)	(0.015)	**(0.003)**	(0.012)	(0.372)
Italy	Level	0.002	0.014	-0.003	0.001	0.094
		(0.001)	(0.004)	(0.003)	(0.001)	(0.120)
	Growth	0.005	0.048	-0.002	**0.017**	0.195
		(0.003)	(0.021)	(0.002)	**(0.005)**	(0.210)
Luxembourg	Level	0.003	0.021	**-0.003**	**0.054**	0.225
		(0.001)	(0.011)	**(0.001)**	**(0.016)**	(0.580)
	Growth	0.004	0.030	**-0.005**	**0.042**	0.098
		(0.002)	(0.011)	**(0.002)**	**(0.016)**	(0.321)
Netherlands	Level	0.002	-0.188	-0.001	0.003	0.080
		(0.001)	(0.036)	(0.001)	(0.001)	(0.229)
	Growth	0.002	-0.281	**-0.004**	0.001	0.117
		(0.001)	(0.071)	**(0.002)**	(0.001)	(0.198)

IMPACT OF SUBSIDIES ON TFP

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Austria	Level	0.002	-0.084	**-0.009**	-0.009	0.224
		(0.001)	(0.029)	**(0.002)**	(0.010)	(0.154)
	Growth	0.009	-0.062	**-0.012**	-0.005	0.168
		(0.004)	(0.009)	**(0.002)**	(0.012)	(0.188)
Portugal	Level	0.002	0.002	0.004	0.004	0.106
		(0.001)	(0.001)	(0.004)	(0.006)	(0.115)
	Growth	0.015	0.024	0.004	0.008	0.241
		(0.007)	(0.008)	(0.004)	0.008)	(0.298)
Finland	Level	0.007	0.070	0.015	**0.039**	0.221
		(0.003)	(0.028)	(0.017)	**(0.020)**	(0.351)
	Growth	0.008	0.058	0.017	**0.055**	0.102
		(0.004)	(0.022)	(0.012)	**(0.018)**	(0.282)
Sweden	Level	0.009	0.086	-0.003	0.002	0.248
		(0.003)	(0.036)	(0.006)	(0.006)	(0.526)
	Growth	0.006	0.036	**-0.019**	-0.008	0.150
		(0.002)	(0.018)	**(0.008)**	(0.005)	(0.138)
UK	Level	0.013	-0.150	**-0.013**	**-0.005**	0.219
		(0.006)	(0.043)	**(0.002)**	**(0.002)**	(0.438)
	Growth	0.010	-0.153	**-0.009**	-0.003	0.193
		(0.003)	(0.035)	**(0.002)**	(0.002)	(0.278)

Conclusions

- We build a structural model of the unobserved productivity incorporating directly the effect of farm subsidies
- We find some evidence that aggregate productivity levels and growth rates systematically differ between the north and south European MS

CONCLUSIONS

- Subsidies impact negatively farm productivity in the period before the decoupling; after that the effect is more nuanced as in several MS it turned positive
- Our findings are consistent with the literature emphasising the inefficiencies of public subsidisation of production and at the same time lend support to the EU policy for decoupling of CAP subsidies

Thank YOU for attention

End