SHORT COMMUNICATION

East-West European farm investment behaviour - The role of financial constraints and public support

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Abstract

The article investigated farm investment behaviour among East (Hungarian and Slovenian) and West (French) European Union farms using individual farm accountancy panel data for the 2003-2008 period. Despite differences in farm structures, except for the presence of capital market imperfections evidenced in the East, farms' investment behaviour was not substantially different. Farm gross investment was positively associated with real sales' growth. In addition, it was positively associated with public investment subsidies which can mitigate capital market imperfections in the short-term. On the long run, the farm's ability to successfully compete in the output market by selling produce and securing a sufficient cash flow for investment is crucial.

Additional key words: farm credit; soft budget constraint; investment subsidy; panel data analysis; European Union.

Abbreviations used: ESU (European Size Unit); EU (European Union); FADN (Farm Accountancy Data Network); GMM (Generalized Method of Moments)

Introduction

There is a wealth of research on farm investment (*e.g.*, Bierlen & Featherstone, 1998; Benjamin & Phimister, 2002; Petrick, 2004a,b; Latruffe, 2005; Bakucs *et al*., 2009; Bokusheva *et al*., 2009; Zynch & Odening, 2009; Latruffe *et al*., 2010; Hüttel *et al*., 2010; Bojnec & Latruffe, 2011; Kallas *et al*., 2012). However, studies dealing with agriculture are generally limited to one country and exclude cross-country comparisons, except for Benjamin & Phimister (2002), who compared France and the United Kingdom.

Previous research provides evidence of capital market imperfections in Central and Eastern European (CEE) countries during transition and after accession to the European Union (EU) (Latruffe, 2005; Bojnec & Latruffe, 2011). Some papers tested the persistence of soft budget constraints in transition economies. However, soft budget constraints may also persist once the countries have shifted to market economies, which may lead to a postponed restructuring (Kornai, 2001; Kornai *et al*., 2003). Soft budget constraints may be more important in the agricultural sector, since farms' government support is generally much higher than subsidies aimed for firms in the manufacturing sector.

The aim of this paper was to investigate the presence of soft budget constraints and credit market imperfections in three EU countries, a Western Old Member State (France) and two Eastern European New Member States (Hungary and Slovenia), by using an Euler equation model in a dynamic panel setting. The historical development and the evolution of farms in the EU vary by countries, not only between Eastern and Western Europe, but also within these

regions. In Eastern Europe, differentials in farm size and growth are caused by the initial conditions arising from the previous communist system and by the institutional and policy reforms of the 1990s, while in Western Europe these are due to the long-term institutional - policy factors and market conditions. During the communist system Hungarian agriculture was collectivised, the average farm size in this country was, and still is, among the largest in Europe. In Slovenia the communist collectivisation failed and small-scale farm structure persisted, thus the average farm size is among the smallest in Europe (Bojnec & Latruffe, 2013). In France, farm structure has developed under market conditions and policy support, shaped in particular by the Common Agricultural Policy (CAP) measures introduced after the Second World War (Piet et al., 2012). Its farms are on average larger than in Slovenia but smaller than in Hungary. Transition from centrally-planned to market economy in Slovenia has strengthened further development of small-scale family farms, while in Hungary a bi-modal farm structure has emerged with a greater number of small-scale family farms and less numerous large-scale corporate farms. The proportion of small farms in Slovenian agriculture is much higher than in Hungary. Therefore, our comparative analysis includes three countries with different historical-institutional developments and different farm structures: small-scale farms in Slovenia, medium-sized farms in France, and bi-modal structure with small-scale and large-scale farms in Hungary.

Our study contributes to the literature by examining the empirical aspects of investment and financial constraints in East-West European agricultural farms in three different countries, East (Hungary and Slovenia) and West (France). There has been some previous research on the issue of investment-cash flow sensitivity. For example Bakucs *et al.* (2009) and Bojnec & Latruffe (2011) found evidence of capital market imperfections in Hungary and Slovenia during transition. But no previous study focuses on whether such imperfections persist after EU accession or how these may vary between countries with different farming structures and historical-institutional development. In addition, no prior study compares Western and Eastern European countries. Our comparative paper thus seeks to fill this gap using micro farm-level data.

Material and methods

Methodology

We started with the model developed by Bond & Meghir (1994) assuming that the farm investment behaviour is a dynamic process which describes

capital accumulation rates in individual periods. Thus, our baseline investment or adjustment costs model specification is defined by the following Euler equation:

$$\left(\frac{I}{K}\right)_{it} = \alpha_0 + \alpha_1 \left(\frac{I}{K}\right)_{it-1} + \alpha_2 \left(\frac{I}{K}\right)_{it-1}^2 + \alpha_3 \left(\frac{CF}{K}\right)_{it-1}$$
$$+ \alpha_4 \left(\frac{S}{K}\right)_{it-1} + d_t + \beta_i + v_{it}, \quad [1]$$

where the investment I of farm i in a particular year t is defined not only by sales growth S and farm liquidity proxied by cash flow CF in the year *t-1*, but also by farm investment in the year *t-1*. All variables are normalised by capital K. From the theoretical model we can derive the following hypotheses. It is expected that the coefficient of the lagged investment term α_1 is positive and greater than one if the farm's real discount rate is positive. The coefficient of the squared investment term α_2 is expected to be negative and greater than one in absolute value, reflecting costs of adjustment that are increasing and convex in the size of investments. The sign of the coefficient of cash flow term α_3 should be negative or not significant under the assumption that the farm can raise as much money as it desires at a given cost. A positive and significant cash-flow coefficient is usually interpreted as an indicator of financial constraints. Under assumption of perfect competition and constant return to scale $\alpha_4=0$, thus a positive sign on the sales variable implies the presence of imperfect competition in the output market.

Second, we included in the Euler equation investment model the quadratic term of debt (D) variable (Rizov, 2004):

$$\left(\frac{I}{K}\right)_{it} = \alpha_0 + \alpha_1 \left(\frac{I}{K}\right)_{it-1} + \alpha_2 \left(\frac{I}{K}\right)_{it-1}^2 + \alpha_3 \left(\frac{CF}{K}\right)_{it-1}$$
$$+ \alpha_4 \left(\frac{S}{K}\right)_{it-1} + \alpha_5 \left(\frac{D}{K}\right)_{it-1}^2 + d_t + \beta_i + v_{it} \quad [2]$$

The specification in Eq. [2] allows testing for non-separability between investment and borrowing decisions (Bond & Meghir, 1994). The coefficient of the debt D variable, α_5 is expected to be zero under perfect capital markets ($\alpha_5 = 0$). It may be positive and significant ($\alpha_5 > 0$) signalling that the firm relies on borrowing for financing its investment, whilst if it is negative ($\alpha_5 < 0$) it can be interpreted as an indicator of bankruptcy costs.

Third, we included the investment subsidy as a controlling explanatory variable into the model derived in the previous steps. Thus we estimate the augmented investment model of the form:

$$\left(\frac{I}{K}\right)_{it} = \alpha_0 + \alpha_1 \left(\frac{I}{K}\right)_{it-1} + \alpha_2 \left(\frac{I}{K}\right)_{it-1}^2 + \alpha_3 \left(\frac{CF}{K}\right)_{it-1}$$
$$+ \alpha_4 \left(\frac{S}{K}\right)_{it-1} + \alpha_5 \left(\frac{D}{K}\right)_{it-1}^2 + \alpha_6 X_{it} + d_t + \beta_i + v_{it} \quad [3]$$

Two definitions of investment subsidy are used in the empirical procedure, first a continuous variable (X_{it}), and second a dummy (DX_{it}), which takes the value of one, if the farm has received an investment subsidy in a given year and zero otherwise.

We employed the Generalized Method of Moments (GMM) estimator developed by Arellano & Bover (1995) and Blundell & Bond (1998), also referred to as GMM-system estimator. Windmeijer (2005) proposed a finite sample correction that provides more accurate estimates of the variance of the two-step GMM estimator (GMM-SYS). As the t-tests based on these corrected standard errors are found to be more reliable, the paper estimates the coefficients using a finite sample correction.

In addition, we imposed outlier rules by removing farms from econometric estimations if their investment capital ratio is above 99% in absolute value (as in Benjamin & Phimister, 2002).

Data

Our analysis was based on French, Hungarian and Slovenian individual farm data. The data were extracted from national Farm Accountancy Data Network (FADN) databases, which provide homogenous accountancy data for farms through the EU. Only farms above a specific size threshold are included in the FADN, the threshold being two European Size Units (ESUs; one ESU is equivalent to €1,200 of gross margin). FADN implements yearly survey to farm businesses employing bookkeeping, with a rotating panel of about five years. It follows, that our panel datasets were unbalanced. The time span of the unbalanced panel dataset used for analysis was the five-year period 2004-2008 for Hungary and Slovenia and 2003-2007 for France.

Most of the variables used were directly available in the FADN database (EC, 2006). Gross investment is the FADN variable coded SE516 ('gross investment'), defined as the difference between purchased and sold assets. The cash flow variable is the FADN variable coded SE526 ('cash flow'), defined as the difference between the farm receipts and expenditure for the accounting year, not taking into account operations on capital and on debts and loans. The investment subsidy variable is the FADN variable coded SE406 ('subsidies on investment'); these subsidies include subsidies on agricultural land, buildings, rights, forest land including standing timber, machinery and equipment, and circulating capital. The sale growth variable is proxied by the change in total output between two consecutive years; total output is the FADN variable coded SE131 ('total output'), defined as the total of output of crops and crop products, livestock and livestock products and other output. Debt is defined as the sum of short (SE490) and long term (SE495) loans. All the above listed variables are related to capital, which is the FADN variable coded SE436 ('total assets'), including fixed and current assets owned by the farm.

Results and discussion

Table 1 presents descriptive statistics of the data used. Gross investment to capital was the highest for Hungarian farms and the lowest for Slovenian farms on average. The data shows disinvestments by some farms in Slovenia and France, but not in Hungary. Real sale growth to capital was the highest for French farms and the lowest for Slovenian farms on average. As for real cash flow to capital, it was the highest for French farms and the lowest for Hungarian farms on average. Similarly to real sale growth to capital, real cash flow to capital varied within the samples from negative to positive values. Real investment subsidy in period *t-1* to capital is on average similar for French, Hungarian or Slovenian farms. Debt is the highest in France and the lowest in Slovenia.

Econometric results

Our results suggest that the current farm investments were significantly and positively associated with the lagged farm investments, which is valid for each of the analysed countries (Table 2). The coefficient of the squared investment term was significantly negative for each of the country specific farm sectors and greater than one in absolute value for Slovenia, implying adjustment costs that were increasing and convex in the size of investments. Our estimations confirm the positive and significant association between farm gross investment and farm real sale growth for each country, implying that the investment behaviour of farms was driven by competitive output market conditions and the farm abilities to sell output and invest in such a market environment. These results are in line with findings of previous studies set in Hungary and Slovenia before the EU accession (Bakucs *et al*., 2009; Bojnec & Latruffe, 2011). Farm gross investment was positively and significantly associated with cash flow for Hungary, confirming the presence of financial constraints. The results were mixed for Slovenia, the coefficient of cash flow was weakly significant when continuous subsidy variable is used, but it is insignificant when the subsidy dummy was employed. The significantly positive cash flow coefficients were largely similar to the ones obtained by previous studies on the financial constraints and

Table 1. Descriptive statistics (whole period averages)

	Obs	Mean	SD	Min	Max
Hungary (in €), 2004-2008					
$\left(\dfrac{I}{K}\right)_{it-1}$	8,367	0.096	0.220	0.000	11.633
$\left(\dfrac{CF}{K}\right)_{it-1}$	8,367	0.014	0.275	-10.784	3.593
$\left(\dfrac{S}{K}\right)_{it-1}$	8,367	0.253	0.230	-0.939	8.004
$\left(\dfrac{D}{K}\right)_{it-1}$	8,367	0.172	0.226	0.000	7.289
X_{it}	8,367	0.004	0.029	0.000	1.080
Slovenia (in €), 2004-2008					
$\left(\dfrac{I}{K}\right)_{it-1}$	2,237	0.049	0.097	-0.206	1.738
$\left(\dfrac{CF}{K}\right)_{it-1}$	2,237	0.031	0.182	-1.076	6.973
$\left(\dfrac{S}{K}\right)_{it-1}$	2,237	0.096	0.180	-0.360	7.036
$\left(\dfrac{D}{K}\right)_{it-1}$	2,237	0.028	0.066	0.000	0.912
X_{it}	2,237	0.004	0.022	0.000	0.371
France (in €), 2003-2007					
$\left(\dfrac{I}{K}\right)_{it-1}$	25,782	0.076	0.174	-3.440	12.500
$\left(\dfrac{CF}{K}\right)_{it-1}$	25,782	0.131	0.246	-12.325	9.370
$\left(\dfrac{S}{K}\right)_{it-1}$	25,782	0.299	0.292	-0.729	12.049
$\left(\dfrac{D}{K}\right)_{it-1}$	25,782	0.402	0.318	0.000	15.972
X_{it}	25,782	0.004	0.019	0.000	0.868

Source: Authors' calculations based on FADN data for France, Hungary and Slovenia (EC, 2006).

Table 2. Dynamic Panel Model (GMM-SYS) estimations (without outlier farms)[1]

	Slovenia		Hungary		France	
	Sub. (Cont.)	**Sub. (Dum.)**	**Sub. (Cont.)**	**Sub. (Dum.)**	**Sub. (Cont.)**	**Sub. (Dum.)**
$\left(\dfrac{I}{K}\right)_{it-1}$	0.375***	0.395***	0.875***	0.938***	0.016	0.022**
$\left(\dfrac{I}{K}\right)^2_{it-1}$	-1.684***	-1.711***	-0.005	-0.007**	-0.00***	-0.002**
$\left(\dfrac{S}{K}\right)_{it-1}$	0.124*	0.093	0.871***	0.926***	0.022	0.018
$\left(\dfrac{D}{K}\right)^2_{it-1}$	0.121*	0.089	0.563***	0.57***	0.088***	0.09***
$\left(\dfrac{D}{K}\right)_{it-1}$	0.378*	0.423**	-0.029	-0.017	0.029*	0.029*
X_{it}	1.021***		3.351***		0.603***	
DX_{it}		0.023***		0.18***		0.01***
N	1407	1407	5911	5911	16992	16992
Constant	0.024	0.022	0.124***	0.121***	0.021	0.019
P. AR(2)	0.0839	0.0708	0.1377	0.319	0.9239	0.818
chi2(8)	10.382	11.96992	7.767	8.3459	11.271	11.684
P. Sarg.	0.2392	0.1526	0.4565	0.4004	0.1868	0.1658

[1]Outlier farms are farms for which the investment capital ratio was above 99% in absolute value. All explanatory variables except subsidy were divided by capital. N: number of observations. ***/**/*: statistically significant, respectively, at the 1%, 5%, and 10% levels.

farm investment behaviour in Hungarian and Slovenian agriculture (Bakucs *et al.*, 2009; Bojnec & Latruffe, 2011). Insignificant cash flow coefficients implied soft budget constraints for France. The significantly positive coefficients of squared debt variables suggest that investment and financing decisions could not be separated in France and Slovenia. This result is similar to Bokusheva *et al.* (2009) and Zinych & Odening (2009) for farm investment behaviour in Russian and Ukrainian agriculture respectively. The insignificant debt variable implies perfect capital market for Hungary. Finally, farm gross investment is found to be positively and significantly associated with investment subsidies for each of the analysed countries.

In summary, we investigated farmers' investment behaviour in three countries using the Euler equation model. We found evidence of the presence of financial constraints in Hungary and the existence of soft budget constraints in France. Despite the differences in farm structures across the three countries, our results show that their investment behaviour does not differentiate substantially. Farm gross investment was positively associated with real sale growth, suggesting that farm investment decisions were based on market conditions in each of the analysed countries.

Farm gross investment was positively associated with investment subsidies. Public programmes to support farm investment with subsidies seem to be

successful in enhancing investment in these countries in the short-term. However, farms' investment behaviour pertaining to investment subsidies is more cautious in the long-term. This implies that investment subsidies can mitigate some capital market imperfections such as interest rate volatility, but that in the long-term what are crucial are farm competitiveness and its ability to successfully compete in the output market: selling and gaining sufficient cash flow enable investment and thus ensuring competitive survival and farm growth. In long-term improvement of farm profitability can play important role vertical integration of farms in agri-food value chain (Grau & Reig, 2015). The large state intervention in the agriculture of developed countries is well known. In the EU for example, the cost of the CAP, amounts to about half of the EU budget. During the period studied, French, Hungarian and Slovenian farmers could benefit from investment subsidies provided in the frame of the CAP. Although our paper does not provide evidence of soft budget constraints, it nevertheless highlights the role of the state in shaping the farming structure of the three countries studied. State subsidies help farms to cover their investment cost in the short-term, and therefore contribute to their survival. But by contrast to the soft budget constraints situation, investment subsidies in the period studied were not freely provided to farms: farmers needed to motivate their subsidy application with a detailed business plan, and usually obtained subsidies up to a specific share (generally, half) of the investment cost. While state subsidisation of farm investments may have some justification (*e.g.* food is crucial to a country; farms help maintain some economic activity in isolated areas; subsidies can give incentives to create positive environment externalities), it is nevertheless costly for the taxpayers. Further research could therefore investigate whether other less costly subsidisation channels are possible, such as zero interest state loans.

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