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FINANCING AVAILABILITY AND INVESTMENT DECISIONS OF SLOVENIAN FARMS DURING THE TRANSITION TO A MARKET ECONOMY

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This paper investigates the financial determinants of investment decisions made by Slovenian family farms during the transition to a market economy in the period 1994-2003. Results from standard and augmented accelerator models indicate that farms' investment decisions were based on market opportunities during this period, ruling out the presence of soft budget constraints, but that these decisions were constrained by the availability of finance. Further analyses reveal a non-significant impact of investment subsidies received by farms, but a positive impact of operational subsidies for small farms only, on the alleviation of financial constraints.

JEL classification: G31, C33, Q14
Key words: farms, investment, accelerator model, financial constraints, soft budget constraint, subsidies, Slovenia

I. Introduction

Investment provides opportunities for a firm to expand, increase the value of its assets or replace its existing capital with more productive capital, which might increase its efficiency, competitiveness, survival and prosperity (Blomstrom, Lipsey

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and Zejan 1996). This is especially relevant for small and medium enterprises (SMEs) since they are the most dynamic firms with the largest growth potential, they are the engine of economic development, and they maintain employment as they are more labor-intensive than larger firms (e.g., Beck and Demirguc-Kunt 2006). Investment is thus essential for them as it enables them to keep up with new technology and to enlarge. Transition economies, moving from centrally-planned economies to market economies, are another case where investment is crucial. At the outset of transition, there was a substantial need for restructuring –mainly a modification of firms' structures in terms of organizational form, size, and quality of inputs used– and a reallocation of resources towards more efficient uses, which triggered reforms such as privatization, institutional changes, and policy liberalization. In this context, investment was required to transform and to update the obsolete capital stock (Konings, Rizov and Vandenbussche 2003).

This paper focuses on Slovenian farms' investment during the transition period. Understanding the determinants behind farm restructuring in transitional countries is crucial for adjusting public policies towards more efficient resource use and economic growth, in particular within the framework of the openness to markets brought about by accession to the European Union (EU) and the globalization of economies. In order to compete, in terms of output quantity and product quality, with their EU and other world farm counterparts, which are usually larger and –at least in some older Member States of the EU– better equipped, farms need to implement large investments to be able to expand their size and implement modern technology. Improving farm technology can also enable the farming sector to shed labor that may be used more efficiently in other economic sectors such as tourism and other service activities.

As in other former communist countries, the agricultural sector in Slovenia played a substantial role in the economy. Today, even though the agricultural sector does not seem to be relevant in terms of gross domestic product (GDP), it is still very much so in terms of employment (see Table 1). In 2006, the agricultural sector in Slovenia accounted for a large part of the country's employment (9.2 percent). In comparison, in the older Member States of the EU (the so-called EU-15), agriculture accounted for only 3.5 percent of employment. Slovenian agriculture is characterized by small family farms, due to its specific history of communism and transition, and because the country has always been highly influenced by Western countries resulting from their geographical proximity and the complex history with neighboring countries (Austria, Croatia, Hungary, and Italy). Contrary to most Central and Eastern European Countries (CEECs), in Slovenia large-scale collectivization failed. As a consequence,

the structure of agriculture was, and is still, dominated by family small-scale farming, and not by the dualistic structure of small subsistence farms and large corporate holdings as in most other CEECs. As Table 2 shows, many farm holdings in Slovenia are less than two European Economic Size Units (ESU), that is to say that their standard gross margin is less than 2,400 Euros per year. Slovenian farms are smaller than in the other EU countries: they operate on average 6.5 hectares (ha) of land, against about 50 ha in most of the EU-15 countries (European Commission 2008). Another feature of Slovenian agriculture is that investment in Slovenian farms has declined throughout the transition period. Figure 1 shows that real agricultural output declined in Slovenia during 1995-2005, and real gross fixed capital formation in agriculture experienced an even sharper decrease.

It therefore seems that the restructuring process expected for transition economies was less substantial in Slovenia. The transition period was indeed expected to have a positive impact on farm size in former centrally-planned countries, with the emergence of middle-size farms created by the disappearance of inefficient small farms from the sector and the break-up of very large inefficient holdings (Kydd, Buckwell and Morrison 1997). While there may be non-economic reasons (e.g., psychological factors or administrative issues; Latruffe 2008) that explain why

Table 1. Agricultural output and employment in Slovenian agriculture, 1995-2006

	Final agricultural output (AO)		Intermediate consumption (% of AO)	Value added (% of AO)	Agricultural employment	
	(billion SIT in 1995 prices)	% of national GDP			(1,000 employed)	% of national employment
1995	150.3	6.3	55.1	44.9	110.6	12.3
1996	157.9	6.3	59.6	40.4	111.1	12.6
1997	156.8	5.9	55.2	44.8	114.3	13.0
1998	145.7	5.4	53.9	46.1	111.3	12.5
1999	136.6	4.8	54.3	45.7	108.6	12.0
2000	136.5	4.6	56.3	43.7	107.8	11.9
2001	132.9	4.4	59.6	40.4	107.1	11.6
2002	140.2	4.4	53.1	46.9	106.0	11.5
2003	122.8	3.8	59.7	40.3	95.6	10.4
2004	138.1	4.1	55.3	44.7	90.2	9.8
2005	131.5	3.8	55.0	45.0	90.1	9.6
2006	128.2	3.5	57.2	42.8	88.7	9.2

Note: Slovenian tolar (SIT) was the Slovenian national currency from October 1991 up to 1st January 2007. Source: SORS (2006, 2007).

Table 2. Size of agricultural holdings in Slovenia and comparison with other EU countries

A. Agricultural holdings in Slovenia by classes of economic size			
	2003	2005	2007
Agricultural holdings in Slovenia by classes of economic size (ESU)*	Number of agricultural holdings	Number of agricultural holdings	Number of agricultural holdings
Total	77,149	77,175	75,340
<1	15,730	16,286	13,831
1-2	21,990	21,026	18,544
2-4	18,902	19,128	18,562
4-8	11,080	11,394	12,644
8-16	6,124	5,946	7,164
16-40	2,825	2,889	3,704
≥40	499	505	890

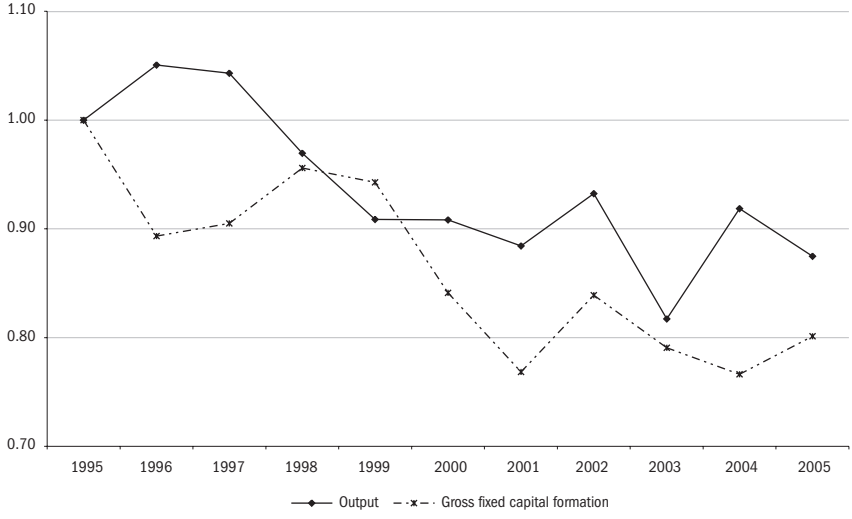
B. Comparison of Slovenian farm size average with other EU countries	
Country	Average agricultural area per farm (ha) in 2007
Slovenia	6.5
Czech Republic	89.3
Denmark	59.7
Germany	45.7
Ireland	32.3
Finland	33.6
France	52.1
The Netherlands	24.9
Slovak Republic	28.1
Sweden	42.9
United Kingdom	53.9

* ESU is the European standard economic size unit (1 ESU = 1,200 euros). Source: SORS (2008) and European Commission (2008).

farmers hold on to small low-productive units in transitional economies in general and in Slovenia in particular, financial obstacles might explain slow restructuring –particularly slow labor shedding and slow size increase: such financial obstacles may be in the form of soft budget constraints or in the form of financial constraints.

Firstly, soft budget constraints may still have been present during the transition period in Slovenia. The concept of soft budget constraints was originally introduced by Kornai (1980) to describe the paternalistic behavior of the state in centrally-

Figure 1. Developments in Slovenian real agricultural output and gross fixed capital formation during 1995-2005 (1995=1)



Source: Own calculations from SORS (2006).

planned economies. The government would bail out firms that were not profitable, by giving them large subsidies or allowing them credit on soft terms. Without the threat of bankruptcy, firms would continue to operate inefficiently, using labor which could otherwise have been reallocated to more efficient uses in other sectors of the economy (Kornai, Maskin and Roland 2003). Thus, soft budget constraints may prevent unprofitable or inefficient units from restructuring, and can thus hinder economic and productivity growth.

During the transition, soft budget constraints were still present in some transition countries, as much in the industrial sector as in the agricultural sector, as documented for example by the Organization for Economic Co-operation and Development (OECD 2001). One reason for the persistence of soft budget constraints brought forward by some researchers is the existence of policy burdens on firms, notably the employment burden: large firms, in particular, play the role of social buffer by providing jobs to numerous workers who would not find work opportunities elsewhere, and therefore governments continue to bail out these firms to avoid unemployment (Li 2008; Zinych and Odening 2009). This reluctance to shed surplus labor deters restructuring. For example, studying firms in 25 transition countries, Carlin, Fries, Schaffer and Seabright (2001) highlight the fact that soft budget constraints prevent

restructuring and performance. The presence and consequences of soft budget constraints have been greatly investigated in Central and Eastern European transition countries, but much less in other emerging economies with the exception of China. For example, Colombo and Stanca (2006) find that large state-owned firms were still subject to soft budget constraints in Hungary during 1989-1999. By contrast, Konings and Xavier (2003) estimate that soft budget constraints were not important during 1994-1998 for Slovenian manufacturing firms.

According to these phenomena, it is likely to find a clear link between the presence of soft budget constraints and firms' investments. For example, Hobdari, Jones and Mygind (2009) conclude from their analysis of Estonian firms in 1993-2002 that the existence of soft budget constraints reduced the probability investment was financially constrained.

Regarding agriculture, Rozelle and Swinnen (2004) suggest that the failure of some European and Asian transitional countries to eliminate soft budget constraints may partly be linked with the failure of farm restructuring. Indeed, several studies provide empirical evidence for the existence of soft budget constraints in agriculture. For example, Zinych and Odening (2009) report that 10 percent of their sample of Ukrainian large farms experienced soft budget constraints during 2001-2005. For the same period Bakucs, Fertő and Fogarasi (2009) provide evidence of the existence of soft budget constraints in Hungarian agriculture. In the Slovenian agricultural sector, no study has investigated the presence of soft budget constraints. It may, however, be legitimate to suspect their presence during the transition period, since Slovenian farms have always been highly subsidized compared to those in other former communist countries. Erjavec, Rednak and Volk (1998) report that, in the mid-1990s, the average producer subsidy equivalent (PSE) value in Slovenia was 36 percent, a figure close to the EU average of 43 percent. Bojnec and Latruffe (2009) indicate that the budgetary subsidy support to Slovenian agriculture has increased considerably since 1995.

Secondly, farms may be constrained in their restructuring by the availability of finance, preventing them from implementing investment and expanding. On the one hand, the increase in input prices and decrease in output prices (the 'cost-squeeze effect') may have reduced farm profits and, thus, their own financial resources. On the other hand, imperfectly functioning credit markets during the transition period, as for example reported by Swinnen and Gow (1999), might have induced a lack of external financing for farmers. Since credit markets were inexistent or less developed during the communist regime owing to the monopoly of a single state bank, the creation of the necessary institutions and the building of staff skills were a long process.

Empirical evidence of financial obstacles to farm investment decisions has been provided, for example, for farms in Poland (Petrick 2004; Latruffe 2005), Hungary (Bakucs, Fertő and Fogarasi 2009), Lithuania (Latruffe, Davidova, Douarin and Gorton 2010), Russia (Bezlepkina and Oude Lansink 2003) and Ukrainia (Zinych and Odening 2009). In the industrial sector, the lack of finance and an under-developed credit market were also found to be major obstacles to firms' capital accumulation and investment in Eastern European transitional economies (Budina, Garretsen and de Jong 2000; Konings, Rizov and Vandenbussche 2003) and in emerging markets such as in Argentina (Acosta and Loza 2005), Mexico (Gelos and Werner 2002) and South Korea (Laeven 2002). Beck and Demirguc-Kunt (2006) explain in a literature review that, in general, smaller firms are more affected by financial constraints since these prevent them from achieving an optimal size. In Slovenia, no research has investigated the presence of financial constraints to farm investment. However, one can imagine that they exist. Indeed, Slovenian farms have historically financed their investment needs from their own financial resources, which are the main source of financing gross fixed assets of enterprises, companies, and organizations in Slovenian agriculture. For example, in 2003 farms' own financial resources represented around 65 percent (75 percent in 2007) of the financing of gross fixed assets (SORS 2005; SORS 2008). Financial credits and leasing accounted for only 27 percent in 2003 and 18 percent in 2007. Such high reliance on own resources may suggest the presence of imperfections in the credit market, and the existence of financial constraints to investment as own resources for small farms may be too low to cover investment expenditures.

When the market cannot provide farms with the necessary funds, the government may intervene to relax financial constraints and promote farms' investment. Although Hoff and Stiglitz (1998) call for caution when recommending policy intervention in the form of subsidies in the credit market (as this may have adverse effects such as attracting to or keeping in the business low-quality agents), the literature suggests several types of policy intervention. For example Dries and Swinnen (2004) show that foreign direct investment and the related farm assistance programs increased dairy suppliers' investment in Poland. Also in Poland, Petrick (2004) argues that access to subsidized credit enhanced investment of farm households. Outside agriculture, public subsidies were also found to be a determinant in helping Italian SMEs overcome a credit rationing situation (Trovato and Alfò 2006). In the Slovenian farming sector, specific agricultural policies have targeted investments by agricultural households and other economic agents that are important for rural development. Supports to investment and for the restructuring of agriculture have been the most important axes of the rural development policy (MAFF 2006).

This background about potential obstacles to farm investment and the slow restructuring that has taken place in the Slovenian farming sector calls for an analysis of the financial determinants of Slovenian family farms' investment decisions during transition. The paper aims to provide insights into the issue by answering three main research questions. (i) Did Slovenian farms face binding constraints during the transition that impeded small-scale farming structures from achieving restructuring or fostering investment? (ii) If so, which type of constraints did they mainly face (soft budget constraints and/or financial constraints to investment)? (iii) Can subsidy policies help relax constraints and enhance farm investment? We find that, during the analyzed period 1994-2003, while soft budget constraints were ruled out, Slovenian farms' investment decisions were constrained by the availability of finance, the problem being exacerbated for small farms. Public policies in terms of subsidies directly targeted to investment did not help farms overcome their financial difficulties. Instead, operational subsidies, provided to farms to support their production activities, helped small farms to implement investment.

The rest of the paper is structured in the following way. In Section II, we present the methodology and data used, whereas Section III explains the econometric results. Section IV concludes.

II. Methodology and data used

In order to investigate the constraints to investment for Slovenian farms, an accelerator investment model is used. The standard accelerator model, initiated by Clark (1917) and developed by Koyck (1954), suggests that investment decisions are based on sales' growth. Based on observations of firms' behavior in the industrial sector, Clark (1917) postulated that the demand for new capital depends on the growth of sales of the finished product. The demand for capital increases when the demand for the final good accelerates, thus the name of accelerator. The accelerator model has been widely used in empirical studies, despite not being based on a theoretical model. The intuition behind Clark's (1917) concept can however be given some theoretical foundations, using assumptions made by Jorgenson (1963) in his neoclassical extension. Jorgenson starts from the firm's objective to maximize its profits, calculated as revenues less costs:

$$\text{Max} \quad p_t Y_t - c_t K_t - \omega_t X_t \tag{1}$$

subject to

$$Y_t = f\{K_t, X_t\} \tag{2}$$

$$K_t = (1-\delta)K_{t-1} + I_t \tag{3}$$

where Y_t is the output supply; f is the production function; X_t is the level of variable inputs; K_t is the capital; p_t is the output price; c_t is the user cost of capital; ω_t is the variable input price; I_t denotes gross investment; δ is the depreciation rate.

Specifying a Cobb-Douglas production function as in Jorgenson's (1963) neoclassical model and using the first-order condition of equation (1) with respect to capital brings:

$$a\frac{Y_t^*}{K_t^*} = \frac{c_t}{p_t} \tag{4}$$

where a is the elasticity of output with respect to capital such that $0 < a < 1$; K_t^* is the desired stock of capital; Y_t^* is the desired output.

Equations (3) and (4) allow to derive the expression of gross investment in terms of the desired output:

$$I_t = a\left(\frac{p_t}{c_t}Y_t^* - \frac{p_{t-1}}{c_{t-1}}Y_{t-1}^*\right) + \delta\, K_{t-1} \tag{5}$$

From this equation, the implicit assumptions behind the accelerator model are that the ratio of the output price to the cost of capital is constant over time, and that the desired output Y_t^* is the actual output Y_t. Under these two assumptions the investment demand can then be written as a function of the growth in output:

$$I_t = \varphi(Y_t - Y_{t-1}) + \delta\, K_{t-1} \tag{6}$$

where $\varphi = a\frac{p}{c}$ is the accelerator coefficient, with $\frac{p}{c}$ the constant ratio of the output price to the user cost of capital.

The accelerator model therefore relies on the neoclassical assumption of profit maximization, and relates firms' gross investment level to the change in sales between two periods. In the econometric regression a non-significant, or significant but negative, coefficient for the growth of sales would indicate the presence of soft budget constraints, as it would indicate that some firms do not base their investment behavior on market opportunities and obtain on soft terms external resources to cover their investment expenditure. Lizal and Svejnar (2002) explain that a coefficient

not different from zero would signal that firms' access to credit for investment does not depend on their profitability. According to the authors, a stronger version of the soft budget constraint is that the coefficient is negative, revealing the case of low performing firms obtaining more investment credit than highly performing firms. Based on their empirical application for Czech firms in 1992-1998, the authors find that, for some firms, investment is negatively related to their profitability proxy.[1]

In order to test for the presence of financing constraints on investment behavior, Fazzari, Hubbard and Petersen (1988) suggest introducing a cash flow variable into standard investment models. This method is based on the idea that, if firms do not face financial constraints, their internal financing (e.g., profits) and their external financing (e.g., credit) have the same cost in equilibrium and thus are perfect substitutes; in this case, no financial variable should play a role in the investment decisions. By contrast, financial constraints mean that there is a gap between the cost of internal financing and the cost of external financing (Hubbard 1998), and either one or the other financing means would be a determinant of investment. Thus, introducing a cash flow variable (i.e., a variable proxying the firms' availability of internal financial resources) provides the possibility of testing for the presence of financing constraints. A significant positive coefficient for the cash flow variable indicates that some firms in the sample are financially constrained. The accelerator model in which a cash flow variable has been introduced is called the augmented accelerator model. This approach has, for example, been used by Budina, Garretsen and de Jong (2000) for Bulgarian firms, Konings, Rizov and Vandenbussche (2003) for firms in various CEECs, Latruffe (2005) for Polish farms, and Bakucs, Fertő and Fogarasi (2009) for Hungarian farms.

Our objective is to answer the three research questions posed in the previous section. Based on the existing literature in other transition and emerging economies and the characteristics of Slovenia's agriculture, we formulate the following hypotheses. 1) We expect that there were no soft budget constraints in the Slovenian farming sector during the transition period studied 1994-2003. Although Slovenian farms were highly subsidized during the transition period, we believe that the influence of neighboring countries through trade liberalization and steps taken to adjust to the EU accession have given Slovenian farmers incentives to behave according to the market opportunities

[1] Tobin's *q* model (Tobin 1969), which considers that a firm's investment decisions are driven by the firm's value in the market, has often been used by researchers to study firms' investment behavior. However, Tobin's *q* approach is not followed here as the concept of market value (the market value of the firm divided by the replacement cost of its capital is the proxy for *q*) is not relevant for small Slovenian family farms. Moreover, Maurel (2001) argues that in transitional economies this value is generally not reliable when it is available.

rather than relying only on public support. This will be tested with the help of the standard accelerator model (Model I, see below) and the market-opportunity proxy (namely sales' growth): a positive and significant coefficient of this proxy indicates the absence of a soft budget constraint. 2) We postulate that Slovenian farms were financially constrained in their investment decisions during the transition period, that is to say we expect a positive and significant coefficient for the cash flow variable in the augmented accelerator model (Model II). 3) In order to see whether financial constraints were stronger depending on farm size, we then include in the augmented accelerator model an interaction term of the cash flow variable with farm size (in the previous period) (Model III). This is firstly measured by land area in ha (econometric results shown) and secondly by the output level in real value (results not shown but discussed). Several papers have shown that smaller farms are more constrained (e.g., Latruffe, Davidova, Douarin and Gorton 2010), due to their lack of collateral or low internal resources. We expect this to be the case for Slovenian family farms. We therefore expect a negative coefficient for the size interaction term. 4) We investigate the role of the public subsidies that farms received in their investment behavior. For this, we introduce in the augmented accelerator model the ratio of the previous period's operational subsidies to assets and the ratio of the previous period's investment subsidies to assets (Model IV). Operational subsidies are subsidies provided to farms to support production activities. During the period studied, these included: subsidies to products; payments per ha of specific crop produced or per head of specific livestock bred; subsidies to input costs; aids given in the case of natural disasters; ecological payments; and support to farms situated in less favored areas. As for investment subsidies, they are subsidies that were specifically targeted at implementing investments for the restructuring of agriculture and agricultural holdings, and for the development of rural areas, and aimed at covering, at least partly, the cost of investment. We hypothesize that both types of subsidies have helped farmers overcome their financial constraints by providing additional cash to cover large expenditures, and that investment subsidies had a stronger impact than operational subsidies. This means that we expect a positive and significant coefficient for both types of support, but a higher one for investment subsidies. Although operational subsidies are not designed to influence farms' investment decisions, they may increase the demand for new capital in agriculture by reducing credit rationing problems or, in the case of perfect markets, by increasing farmers' wealth (e.g., Sckokai and Moro, 2009). 5) We further investigate the role of support by examining the interaction of both subsidy variables with the size variable measured by land area in ha in the augmented accelerator model (Model V). Our expectation about the results of Models V is that subsidies may be more useful in

relaxing financial constraints for those farms that are severely affected by these constraints: thus, we expect a negative coefficient for the interaction term between subsidies and farm size.

Mathematically, the five models to be estimated are as follows:

$$\text{Model I:} \quad \frac{I_t}{K_{t-1}} = \beta_0 + \beta_1 \frac{\Delta S_t}{K_{t-1}} + u_t; \tag{7}$$

$$\text{Model II:} \quad \frac{I_t}{K_{t-1}} = \beta_0 + \beta_1 \frac{\Delta S_t}{K_{t-1}} + \beta_2 \frac{CF_{t-1}}{K_{t-1}} + u_t; \tag{8}$$

$$\text{Model III:} \quad \frac{I_t}{K_{t-1}} = \beta_0 + \beta_1 \frac{\Delta S_t}{K_{t-1}} + \beta_2 \frac{CF_{t-1}}{K_{t-1}} + \beta_3 \frac{CF_{t-1}}{K_{t-1}} \times s_{t-1} + u_t; \tag{9}$$

$$\text{Model IV:} \quad \frac{I_t}{K_{t-1}} = \beta_0 + \beta_1 \frac{\Delta S_t}{K_{t-1}} + \beta_2 \frac{CF_{t-1}}{K_{t-1}} + \beta_4 \frac{OS_{t-1}}{K_{t-1}} + \beta_5 \frac{IS_{t-1}}{K_{t-1}} + u_t; \tag{10}$$

$$\text{Model V:} \quad \frac{I_t}{K_{t-1}} = \beta_0 + \beta_1 \frac{\Delta S_t}{K_{t-1}} + \beta_2 \frac{CF_{t-1}}{K_{t-1}} + \beta_4 \frac{OS_{t-1}}{K_{t-1}} + \beta_5 \frac{IS_{t-1}}{K_{t-1}} + \beta_6 \frac{OS_{t-1}}{K_{t-1}} \times s_{t-1} + \beta_7 \frac{IS_{t-1}}{K_{t-1}} \times s_{t-1} + u_t, \tag{11}$$

where Model I is the standard accelerator model, Model II is the augmented accelerator model, and Models III, IV and V are more sophisticated versions of the augmented accelerator model; $\frac{I_t}{K_{t-1}}$ is the farm gross investment in period t to assets in period t-1; $\frac{\Delta S_t}{K_{t-1}}$ is the change in the farm real sales between period t-1 and period t to assets in period t-1; $\frac{CF_{t-1}}{K_{t-1}}$ is the farm cash flow in period t-1 to assets in period t-1; $\frac{OS_{t-1}}{K_{t-1}}$ and $\frac{IS_{t-1}}{K_{t-1}}$ are the ratios of operational (*OS*) and investment (*IS*) subsidies in period t-1 to assets in period t-1; s_{t-1} is farm size in period t-1; β_i, for $i = 0,1,2,3,\ldots,7$, are the regression parameters to be estimated; u_t is an error term.

Gross investment is calculated as the difference in the real value of total assets between the current period t and the previous period t-*1*, plus real depreciation in the previous period t-*1*, as defined in equation (3). The change in real sales is calculated as the difference in real value of total revenue from sales between the

current period *t* and the previous period *t-1*. The farm cash flow is proxied by real farm profit (revenue minus current costs) in period *t-1*. In order to control for size effects, all value variables are divided by the real value of total assets in the previous period *t-1*. In all models year dummies were included. As panel data are available, estimation with individual effects was performed. The specification of random *vs*. fixed effects was tested employing a Breusch-Pagan test. Test results always indicated that a fixed effect model was preferable, and thus all econometric results are provided for such a specification. Moreover, despite accounting for potential size effects by dividing all variables used in the regression by the real value of total assets, the issue of heteroscedasticity might still affect the econometric results. Therefore, in the estimation of the empirical models, the White robust estimator is used.

The data used are from the Slovenian Farm Accountancy Data Network (FADN) over the period 1994-2003. The FADN sample includes 'representative' farms for each main production branch. The farm sample includes 13 agricultural production branches. As Slovenia is a small country, FADN returns for individual farms are not available for research due to identification issues; instead, averages for production branches are provided. Table 3 displays some basic characteristics of the whole sample per year during the period 1994-2003. Over this period, unlike for Slovenian agriculture as a whole (Figure 1), which was shrinking, the FADN sample farms on average have expanded and increased their real revenue (Table 3). Table 4 presents average values, over the whole period, of the variables used in the investment models for the FADN sample used.

Table 3. Structural characteristics of the FADN farms: averages

	Total revenue (real million SIT)	Utilized land (ha)	Labor (AWU)
1994	2.50	12.39	2.02
1995	2.98	12.59	2.05
1996	3.16	12.14	2.29
1997	3.32	11.14	2.08
1998	3.99	10.98	2.26
1999	4.36	12.15	2.01
2000	7.39	15.89	2.31
2001	7.72	16.40	2.09
2002	7.51	21.50	5.57
2003	7.27	18.49	5.39

Note: AWU means Annual Working Units (1 AWU = 1,800 hours labor per year). Source: Own calculations based on FADN data.

Table 4. Variables used in the investment models: averages for the FADN sample over the 1994-2003 period

Variables	Average value
Gross investment to assets ($\frac{I_t}{K_{t-1}}$)	0.1153
Change in real sales to assets ($\frac{\Delta S_t}{K_{t-1}}$)	0.0335
Real farm profit to assets ($\frac{CF_{t-1}}{K_{t-1}}$)	0.0610
Ratio of operational subsidies to assets ($\frac{OS_{t-1}}{K_{t-1}}$)	0.0096
Ratio of investment subsidies to assets ($\frac{IS_{t-1}}{K_{t-1}}$)	0.0042

Note: Farm profit is the proxy for farm cash flow. Source: Own calculations based on FADN data.

III. Econometric results

Econometric results of the standard accelerator model (Model I) are reported in Table 5. The model is highly significant, with a positive and significant coefficient for the market opportunity proxy (0.829). Results show that the growth in real sales (market opportunity proxy) was a major determinant of investment decisions for Slovenian farms during this period, as the coefficient for this variable is positive (0.829) and highly significant. This confirms that the accelerator model is an appropriate representation of Slovenian small family farms' investment behavior during the transition. This indicates that farms' investment was based on market opportunities, ruling out the presence of soft budget constraints and confirming our first hypothesis. Thus, while soft budget constraints may have prevailed under the communist regime, family farms now base their investment decisions on market opportunities. Their desire to invest may have increased in view of Slovenia's entry into the Single European Market in order to compete with their European counterparts in terms of quantity and quality of produce.

Results of the augmented accelerator model (Model II) are also reported in Table 5. Statistical F- and log-likelihood tests comparing both the standard and the accelerator models indicate that the augmented accelerator model is preferable to the standard accelerator model at the one percent significance level, suggesting that Slovenian farms' investment decisions were affected by farms' financial characteristics. In the augmented accelerator model (Table 5), the positive and highly significant

Table 5. Results of the standard accelerator model (Model I), the augmented accelerator model (Model II) and the augmented accelerator model with size interaction term (Model III)

	Model I	Model II	Model III
Constant	0.239 *	0.209 *	0.204 *
	(0.125)	(0.108)	(0.112)
Growth of real sales to assets ($\frac{\Delta S_t}{K_{t-1}}$)	0.829 ***	0.918 ***	0.918 ***
	(0.212)	(0.234)	(0.238)
Real farm profit to assets ($\frac{CF_{t-1}}{K_{t-1}}$)		1.187 **	1.352
		(0.426)	(0.898)
Interaction term between cash flow to assets and size in ha ($\frac{CF_{t-1}}{K_{t-1}} \times s_{t-1}$)			-0.013
			(0.077)
F-test	13.31 ***	20.16 ***	103.07 ***
Breusch-Pagan test (Chi^2)	Chi^2 = 0.75	Chi^2 = 0.00	Chi^2 = 0.04
R^2	0.45	0.47	0.47
Number of observations	117	117	117
Comparison Model II with Model I			
Likelihood-ratio test ($Chi^2_{(1)}$)	8.10 ***		
F-test ($F_{(1,94)}$)	6.74 ***		

Note: The dependent variable is the ratio of gross investment to assets ($\frac{I_t}{K_{t-1}}$). Farm profit is the proxy for farm cash flow. *, **, *** indicate significance levels at 10, 5 and 1 percent respectively. The robust (White) standard errors are in parentheses. Estimated using fixed effects as the Breusch-Pagan test does not reject the null hypothesis of a fixed effects model. Year dummies for 1995-96 through 2002-2003 not reported.

coefficient of the farm profit variable (1.187) gives evidence of the presence of financial constraints for some farms during the transition period studied. This confirms our second hypothesis and is in line with other existing studies in CEECs, particularly Poland, where the agricultural structure is similar. However, as the results for Model III show (also reported in Table 5), such constraints were not stronger for smaller farms: indeed, the coefficient of the interaction term between cash flow and farm size measured by land area in ha is not significant (not shown in the table, a similar non-significant effect is found when interacting the cash flow variable with farm size measured by the past period's output level). This finding goes against our intuition but confirms studies carried out in Poland, that do not provide evidence of the greater financial constraints faced by smaller farms (Latruffe 2005). The hypothesis that the latter, being not able to provide sufficient collateral to guarantee their loans and to generate enough internal resources to cover their investment expenditures, are more constrained than larger farms, is not confirmed.

It seems that in Slovenia all farms, whatever their size, were subject to financing difficulties in implementing investment as in Poland.

Finally, Table 6 presents results for Models IV and V, that is to say augmented accelerator models including subsidy variables, firstly alone and then along with an interaction term with size. In Model IV, operational subsidies and investment subsidies are included. Table 6 indicates that coefficients of both these variables are not significant. It therefore seems that policy subsidies did not alleviate farms' financial constraints.[2] However, a different picture emerges when the interaction of both subsidy variables with farm size measured by land area in ha is examined, in Model V[3]: the coefficient of the operational subsidy variable is significant and positive (with a value of 28.022) and the coefficient of the interaction term between the operational subsidy variable and size is also significant but negative (with a value of -1.357). This indicates that operational subsidies had a positive impact on farms' investment behavior for small farms but a negative impact for large farms, and for this reason the straight effect of operational subsidies alone in Model IV was not detected. More precisely, the size threshold at which the effect reverses is 20.65 ha. For farms smaller than 20.65 ha, operational subsidies helped them overcome their financial difficulties and enhance investment (as the overall effect of operational subsidies (28.0221.357 × size) remains positive); by contrast, for farms larger than 20.65 ha, operational subsidies had a negative effect on investment decisions (the overall effect of operational subsidies becomes negative). This finding suggests that smaller farms made use of operational subsidies to cover their investment expenditures in the next period, while larger farms may have used such subsidies for other means (e.g., to cover variables costs) than replacing obsolete capital and expanding. It should however be noted that such opposite effects between small and large farms does not arise when using total output as the size variable: there is

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[2] Before estimating Model IV, the overall effect of total subsidies (including both operational and investment subsidies) was investigated, by (i) including in Model II a single variable of total subsidies instead of two separate variables of operational and investment subsidies; and (ii) replacing the cash flow variable of Model II by a variable aggregating cash flow and total subsidies. Results confirm the non-significant effect of subsidies: in case (i) the total subsidies variable's coefficient is non-significant, and in case (ii) the coefficient for the aggregated variable is only slightly higher than the one for the cash flow variable provided by Model II (1.264 *vs*. 1.187) and the significance level is similar (0.015 *vs*. 0.016). Model IV, that includes separate subsidies, was thus privileged as it enabled investigating whether a specific type of subsidies had a significant effect that was hidden when using total subsidies.

[3] Again here, a model including the total subsidies and the total subsidies interacted with size, in lieu of separate subsidies variables, was estimated before the estimation of Model V. Results indicate no significant coefficients for the subsidy variable and the interacted term.

no significant impact of operational subsidies on investment for both small and large farms. This may be due to the way the majority of operational subsidies are provided in Slovenia, per ha of land used or head of specific livestock. The non-significant impact of investment subsidies, even when interacted with farm size, suggests that, contrary to our fourth expectation, support policies targeted at farms' investment were not adequate to help farmers overcome their financial constraints, while operational subsidies were adequate, for small farms at least.

Table 6. Results of the augmented accelerator models (Models IV and V) for the additional terms only

	Model IV	Model V
Ratio of operational subsidies to assets ($\frac{OS_{t-1}}{K_{t-1}}$)	3.030	28.022 **
	(5.194)	(12.931)
Ratio of investment subsidies to assets ($\frac{IS_{t-1}}{K_{t-1}}$)	1.261	-8.878
	(4.707)	(7.647)
Interaction term between ratio of operational subsidies to assets and size in ha ($\frac{OS_{t-1}}{K_{t-1}} \times s_{t-1}$)		-1.357 **
		(0.644)
Interaction term between ratio of investment subsidies to assets and size in ha ($\frac{IS_{t-1}}{K_{t-1}} \times s_{t-1}$)		0.785
		(0.694)

Note: The dependent variable is the ratio of gross investment to assets ($\frac{I_t}{K_{t-1}}$). Farm profit is the proxy for farm cash flow. *, **, *** indicate significance levels at 10, 5 and 1 percent respectively. The robust (White) standard errors are in parentheses. Estimated using fixed effects as the Breusch-Pagan tests do not reject the null hypothesis of a fixed effects model. Results for the constant, the growth of real sales to assets, the real farm profit to assets and the year dummies for 1995-96 through 2002-2003 are not reported.

IV. Conclusions

In this paper we have investigated the financial determinants of investment decisions made by Slovenian family farms during the transition to a market economy in the period 1994-2003. Using FADN data and an investment accelerator model, we have provided three important findings.

Firstly, the econometric results confirmed a positive and statistically significant association between the farms' gross investment decisions and the growth in real sales, indicating that Slovenian farms were not subject to soft budget constraints during the period studied. The farms' investment decisions were determined by increase in real market sales. Secondly, we have identified that some family farms in the sample were financially constrained in their investment behavior during the period studied, but that the constraint did not differ across farm sizes. Thirdly, we

have investigated the best way forward for policy measures. Our econometric results showed a non-significant impact of investment subsidies received by farms, but a positive impact of operational subsidies for small farms only. This third finding seems unintuitive, as investment subsidization schemes are designed specifically to promote investment in agriculture, contrary to operational subsidies which are direct payments per ha or head of specific livestock or payments to variable inputs. Operational subsidies may, however, act as a lever for farm investment by providing financial resources to those farms that are credit constrained, or by increasing non-rationed farmers' wealth. Kallas, Serra and Gil (2009) for example gave evidence of increased investment implied by direct payments of the European Common Agricultural Policy for cereal, oilseeds and protein seeds farms between 2000 and 2004. The discrepancy in effect on investment between both types of subsidies might result from the fact that investment subsidies received by the Slovenian sample's farms during the period studied were lower than operational subsidies (less than half, see Table 4), and were thus not sufficient to relieve financial constraints.

The low level of investment subsidies delivered to farms might arise from the complexity and the cost involved in obtaining such investment grants, for example, drawing an investment plan with potential future returns. Eligibility for such program was not always guaranteed, contrary to operational subsidies: the latter were provided by simple declaration of crops and livestock (with fewer ex-post controls) or by showing the proof of purchase of variable inputs. A second reason for the finding may be that operational subsidies were mostly helpful for small farms may be due to the differences in capital and production structure between small and larger farms. A larger scale of production implies that larger farms are reliant on operational subsidies to cover the cost of their daily business operations. By contrast, smaller farms may be more autonomous and have less variable input expenses. Therefore, any cash transfer from the government is more considered as an income transfer that can be reinvested. In addition, during the period studied smaller farms may have had older assets that needed replacement, while larger farms' capital may be more modern. A third reason may be that, in order to invest in new assets or replace their large-scale machinery, large farms need a more important source of money than smaller farms, which operational subsidies cannot cover. For this, investment subsidies would be more useful, but the eligibility difficulties mentioned above are limiting. Our findings may therefore suggest that increasing investment, and thus fostering restructuring and improving productivity, in the Slovenian farming sector may necessitate improving the conditions of delivering well targeted and monitored investment subsidies.

This is a first analysis of the Slovenian farming sector – and one among the rare existing studies for transition and emerging market economies regarding the role of subsidies in relieving investment constraints. From a policy point of view, it is difficult to draw general conclusions for other transition countries or for emerging economies since conditions and policies vary strongly across countries. For example, it seems that in countries with similar-looking agricultural structure and history such as Slovenia and Poland, there is no size effect identified for farms, by contrast to what is found for farms in other transition countries, such as in Russia and in Lithuania, in terms of financing constraints. However, our paper has highlighted that direct subsidies to farms (or SMEs) can help alleviate investment constraints for necessary investment and farm restructuring. In the literature about financing constraints on firms' or farms' investment decisions it is frequently found that government intervention should concentrate on eliminating capital market imperfections in order to foster investment of economic units. While perfectly functioning credit markets and easy access to loans may present advantages for the economy in the long term, our findings show that providing cash subsidies to firms or farms may help to enhance investment, particularly during an economic and financial crisis or necessary restructuring for emerging market economies. Governments must however be careful in the way they design support schemes, as they may favor some specific farms or even persistence of inefficient farms and farm structures.

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