Identifying the impact of crisis on cooperative capital constraint. A short note on French craftsmen cooperatives

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Abstract

This research note addresses for the first time the issue of capital constraint and credit rationing for craftsmen cooperatives, which are small to medium grassroots cooperatives. We estimate an ECM (Error correction model) using various specifications as robustness checks on an exhaustive French cooperative database. We find empirical evidence on an impact of crisis on cooperative financial constraint, but this constraint is more stringent for cooperatives with medium volume of cash flow. This result leads to the question of cooperatives financing during the period of a global economic downturn.

Keywords: Capital constraint, credit rationing, cooperatives, error correction model.
JEL Classification: D22, G32, P13

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1 Introduction

Our research note addresses for the first time the issue of capital constraint and credit rationing for craftsmen cooperatives, which are small to medium grassroots cooperatives.

On the one hand, the academic literature on cooperative credit constraint is sparse and had been only related to agricultural cooperatives (Richards and Manfredo, 2003; Chaddad et al., 2005; Maietta and Sena, 2010; Li et al., 2015). According to Chaddad et al. (2005), investment constraints arise in agricultural cooperatives as a result of free rider, horizon, and portfolio problems. At the exception of (Li et al., 2015) who found long-run financial constraints but not in the short-run, the results of these various studies substantially confirm the capital-constraint hypothesis. The existence of capital constraints may therefore force cooperatives to merge (Richards and Manfredo, 2003) or increase their productivity (Maietta and Sena, 2010).

On the other hand, the impact of the 2007-2009 crisis on credit rationing had been studied for individual entrepreneurs such as agricultural farms (O'Toole et al., 2014), but not for cooperatives. While the literature show better social and economic performances of cooperatives than other businesses (Cheney et al., 2014; Lambru and Petrescu, 2014; Bentivogli and Viviano, 2012; Zamagni, 2012; Carini and Costa, 2013; Carini and Carpita, 2014), O'Toole et al. (2014) find that financing constraints are binding and the impact of constraints becomes much more acute following the financial crisis.

We estimate an ECM (Error correction model) using various specifications as robustness checks with an exhaustive database on French craftsmen cooperatives. We find empirical evidence on an impact of crisis on cooperative financial constraint, but this constraint is more stringent for cooperatives with medium volume of cash flow.

The next section presents our empirical strategy (database and econometric model). The section 3 shows our results for benchmark estimation and alternative specifications and the section 4 concludes.

2 Empirical strategy

2.1 The database on cooperatives

We use an exhaustive data for the French craftsmen supply cooperatives , based on a matching of the directory of craftsmen cooperatives provided by the French Federation and Amadeus/ Orbis. Orbis is usually viewed as an untrusted source because of missing data. Authors (Soboh et al., 2011, 2012; Hirsch and Hartmann, 2014) used therefore listewise deletion methods (complete case analysis), that may lead if there is an informative drop-out or the data is not missing completely at random to biased estimations (Seiler and Heumann, 2013). Our analysis is not plagued by such problems, although no comparison can be made with for-profit organizations, for which no exhaustive directory is available. Note that all the cooperatives had survived for the whole period, suggesting the absence of informative drop-out and the absence of survivor bias. The data was also checked for reliability and consistency using qualitative data coming from interviews with directors of cooperatives (10).

The population of interest is the 49 craftsmen supply cooperatives. In order to study a homogeneous population, we do not take into account the bargaining and marketing cooperatives that exist also in this industry. The cooperatives were created between 1968 and 2002. The 50th cooperative created in 2014 was not included in our study. Therefore we have a balanced longitudinal database for our population between 2004 and 2014. A first interesting point is that all the cooperatives survive during that period. The average size of the cooperatives is between 8 to 10 millions euros of turnover, with an average number of 100 members. Descriptive statistics are reported in table 1. These cooperatives are under the umbrella of ORCAB, which is a French Union of Craftsmen Cooperatives created as an association in the 1990. Since 1998 and its transformation on a consortium of cooperatives (a second level cooperative), ORCAB plays an active role in the development of the network : creation of a collective brand, promotion of collective immaterial investment, development of the human capital (training of the elected members), providing (by purchasing) the cooperatives with commodities to sell to their members and furthermore support to the creation of new cooperatives in a more "top-down" approach (Billaudeau et al., 2016). The success of this cooperation among cooperatives (Fici, 2015) lead to the creation of new cooperatives (as half of the cooperatives were created since 2000).

2.2 Empirical strategy: An investment behavior equation

There is two different ways to address the issue of capital constraint (Petrick, 2005). Direct approaches are based on subjective assessment of borrowers access to credit, based on qualitative or quantitative indicators. This approach has been implemented in the Enterprises surveys of the World Bank for Developing Countries (Kuntchev et al., 2013)

Taking into account the possibility of biased assessments, since the seminal works of Meyer and Kuh (1957), the econometric analysis of dynamic investment decisions is a much more standard approach in finance. Due to the nature of our database, we are unable to calculate Tobin's q as in Chaddad et al. (2005). We estimate the alternative specification, ECM (Error correction model), proposed by Bond et al. (2003); Guariglia (2008); Colombo et al. (2013). Guariglia (2008) shows that the main advantage of ECM is that it leads to a more flexible specification (see also Cummins and Hasset (2006)).

In order to address potential unobserved heterogeneity and endogeneity, we use different estimators. Our benchmark analysis is based on GMM (Generalized Method of Moments)(Arellano and Bond, 1991). This classical estimator for linear dynamic panel data may suffer from small sample bias. A first alternative is the CRE (correlated random effects) for dynamic panel data estimated by MLE (Maximum Likelihood) proposed by Wooldridge (2010). Another estimator is the dynamic fixed-effects models for short panel data estimated by QML (Quasi-Maximum Likelihood) (Hsiao et al., 2002). This model has been implemented in Stata by Kripfganz (2016). This model can also be estimated using the iterative boostrap-based bias correction proposed by Everaert and Pozzi (2007); De Vos et al. (2015) (BC FE). Inference with 1000 non-parametric bootstrap iterations has been performed in order to take into account potentially non-normal distribution.

The baseline ECM specification is as follow:

$$\begin{aligned}\frac{I_{it}}{K_{i(t-1)}} &= \alpha_0 + \alpha_1 \frac{I_{i(t-1)}}{K_{i(t-2)}} + \alpha_2 \Delta s_{it} + \alpha_3 \Delta s_{i(t-1)} + \alpha_4 (k_{i(t-2)} - s_{i(t-2)}) + \alpha_5 \frac{CF_{it}}{K_{i(t-1)}} \\ &+ \alpha_6 d + \alpha_7 r + \alpha_8 Age + \alpha_9 Sector + \alpha_{10} Time + \alpha_{11} Time \cdot Sector + \epsilon_{it}\end{aligned} \quad (1)$$

for a cooperative i, with I the investment, K the value of its capital stock, k the logarithm of K, s the logarithm of real sales and CF the cash flow. We include d and r, respectively the logarithm of debt and of receivables, as control variables. In the presence of capital constraints, α_5 is expected to be positive.

Mimicking the previous model of O'Toole et al. (2014), we extend this model in order to take into account crisis impact.

$$\begin{aligned}\frac{I_{it}}{K_{i(t-1)}} &= \alpha_0 + \alpha_1 \frac{I_{i(t-1)}}{K_{i(t-2)}} + \alpha_2 \Delta s_{it} + \alpha_3 \Delta s_{i(t-1)} + \alpha_4 (k_{i(t-2)} - s_{i(t-2)}) + \alpha_5 \frac{CF_{it}}{K_{i(t-1)}} \\ &+ \alpha_6 d + \alpha_7 r + \alpha_8 Age + \alpha_9 Sector + \alpha_{10} Crisis + \alpha_{11} Crisis \cdot Sector \\ &+ \alpha_{12} Crisis \cdot \frac{CF_{it}}{K_{i(t-1)}} + \alpha_{13} Crisis \cdot d + \alpha_{14} Crisis \cdot r + \alpha_{15} Crisis \cdot Age + \epsilon_{it}\end{aligned} \quad (2)$$

α_{12} reflect the effect (positive or negative) of the financial crisis on capital constraint.

Following Cleary et al. (2007) and Guariglia (2008), in addition to this baseline model, we estimate models with dummies for negative, medium (positive but below the 75th percentile of the distribution) and high CF (above the 75th percentile of the distribution) in order to test for the inverted U-shaped investment curve hypothesis.

$$
\begin{aligned}
\frac{I_{it}}{K_{i(t-1)}} = {} & \alpha_0 + \alpha_1 \frac{I_{i(t-1)}}{K_{i(t-2)}} + \alpha_2 \Delta s_{it} + \alpha_3 \Delta s_{i(t-1)} + \alpha_4 (k_{i(t-2)} - s_{i(t-2)}) \\
& + \alpha_5 \frac{CF_{it}}{K_{i(t-1)}} \cdot negCF + \alpha_6 \frac{CF_{it}}{K_{i(t-1)}} \cdot medCF + \alpha_7 \frac{CF_{it}}{K_{i(t-1)}} \cdot highCF \\
& + \alpha_8 d + \alpha_9 r + \alpha_{10} Age + \alpha_{11} Sector + \alpha_{12} Crisis + \alpha_{13} Crisis \cdot Sector \\
& + \alpha_{14} Crisis \cdot \frac{CF_{it}}{K_{i(t-1)}} \cdot negCF + \alpha_{15} Crisis \cdot \frac{CF_{it}}{K_{i(t-1)}} \cdot medCF \\
& + \alpha_{16} Crisis \cdot \frac{CF_{it}}{K_{i(t-1)}} \cdot highCF + \alpha_{17} Crisis \cdot d + \alpha_{18} Crisis \cdot r \\
& + \alpha_{19} Crisis \cdot Age + \epsilon_{it}
\end{aligned} \tag{3}
$$

3 Results

The results are reported in table 2 (see appendix) for the various specifications with or without interactions. For our benchamrk models 1 and 5, Sargan Test is not significant, which allows us not to reject the null hypothesis of valid instruments. The various models lead to the slightly same coefficients.

The parameter cash flow/capital is positive and significant after the crisis. Results suggest therefore the absence of credit rationing before the crisis (as the main effect is not significantly different from zero) and the presence after the crisis. More specifically we find also some evidence of an inverted U-shaped impact of CF on investment after the crisis: the constraint does not hold for cooperative with negative CF, appear for cooperative with medium volume of CF and decrease for cooperative with high volume of CF.

Other interesting empirical findings are the lack of strong evidence of the impact of crisis on other components of the investment behavior equation. We can underline also theoretical consistent impacts of turnover on investment (positive) and debts (negative) on investment.

4 Discussion and Conclusion

The presence of capital constraint leads to the question of cooperatives financing during the period of a global economic downturn even if these organizations appeared to be more resilient (Bouchard and Rousselière, 2016). The credit rationing may threaten the future performance and resilience of the cooperatives, and that must be detrimental to the local economy. Cooperatives are actually an important support for "the first French construction industry", artisans in this industry representing 419,486 businesses and

630,994 employees all over the French territory [1]. They are playing a key role regarding local dynamics (Kasabov, 2014).

Chaddad et al. (2005) suggest that relaxing restrictions on residual claims – such as in the corporate ownership structure – might be a necessary condition for the attenuation of cooperative capital constraints. However, one should note that increasing heterogeneity in cooperative may have negative impact of the social capital and raise internal costs on the investment decision (Nilsson et al., 2012; Feng et al., 2016; Hohler and Kuhl, 2018).

Appart from the help of cooperative union, social finance institutions dedicated to Cooperative and social economy enterprises are a way to relax this constraint, as they function as a lever to access other investment fundings (Bouchard et al., 2017). Roelants (2013) also propose some legislative and creative ways at the national and the European level to face the problem of capital constraint for cooperatives, including the creation and strengthening of non-banking financial institutions and the opening to new investors.

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[1] See CAPEB Facts and Figures 2017 `http://www.capeb.fr/www/capeb/media//capeb-chiffres-cles-2017.pdf`

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5 appendix

Table 1: Descriptive statistics

Variable	signification	Obs	Mean	Std. Dev.	Min	Max
I_K	investment ratio	365	0.003	0.362	-2	0.960
s	logarithm of real sales	414	9.062	0.974	6.910	11.572
k	logarithm of capital stock	414	1801.345	2876.81	2	16355
crisis	1 for 2008 and after and 0 otherwise	490	0.594	0.492	0	1
sector	1 for construction and sanitary equipment and 0 otherwise	490	0.489	0.500	0	1
d	logarithm of debt	365	8.467	0.874	6.288	10.829
r	logarithm of receivables	365	-2.223	0.480	-4.154	-0.504
CF_K1	ratio of cash flow on capital stock	365	0.203	1.024	-7.8	4.1985
age	age (in year)	490	12.622	11.536	-6	47
negCF	1 for negative cash flow and 0 otherwise	365	0.192	0.394	0	1
medCF	1 for medium and positive cash flow and 0 otherwise	365	0.556	0.498	0	1
highCF	1 for high and positive cash flow and 0 otherwise	365	0.252	0.435	0	1

Table 2: Results of the various estimations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	GMM	Dynamic CRE	QML FE	BC FE	GMM	Dynamic CRE	QML FE	BC FE
Lag(I/K)	-0.022	-0.029	-0.023	-0.007	-0.017	-0.028	-0.025	-0.011
	(0.031)	(0.028)	(0.031)	(0.046)	(0.031)	(0.028)	(0.031)	(0.045)
s	**0.762*** **	**0.678*** **	**0.590*** **	**0.576** **	**0.726*** **	**0.683*** **	**0.585*** **	**0.577** **
	(0.213)	**(0.168)**	**(0.185)**	**(0.258)**	**(0.211)**	**(0.169)**	**(0.184)**	**(0.248)**
Lag(s)	0.358	-0.140	0.036	0.028	0.182	-0.182	-0.020	-0.026
	(0.255)	(0.191)	(0.212)	(0.373)	(0.264)	(0.198)	(0.217)	(0.362)
Lag2(k-s)	-0.019	-0.054	-0.025	-0.026	-0.018	-0.050	-0.006	-0.010
	(0.059)	(0.044)	(0.046)	(0.074)	(0.060)	(0.045)	(0.047)	(0.065)
sector	0.000	0.124	0.000			0.135	0.000	
	(0.000)	(0.114)	(0.000)			(0.114)	(0.000)	
crisis	-1.121	-1.012	-0.700	-0.653	-0.670	-0.838	-0.539	-0.492
	(0.987)	(0.667)	(0.683)	(0.999)	(1.039)	(0.698)	(0.717)	(1.057)
age	**-0.091*** **	**-0.053** **	**-0.050* **	-0.060	**-0.085*** **	**-0.053** **	**-0.051** **	-0.059
	(0.032)	**(0.022)**	**(0.026)**	(0.049)	**(0.032)**	**(0.022)**	**(0.025)**	(0.043)
d	**-1.131*** **	**-0.474*** **	**-0.509*** **	-0.506	**-0.958*** **	**-0.419** **	**-0.417** **	-0.414
	(0.226)	**(0.176)**	**(0.187)**	(0.322)	**(0.238)**	**(0.183)**	**(0.193)**	(0.297)
r	0.169	0.215	0.156	0.151	0.084	0.202	0.130	0.123
	(0.207)	(0.149)	(0.158)	(0.245)	(0.209)	(0.149)	(0.158)	(0.231)
crisis#d	0.102	0.052	0.032	0.035	0.044	0.020	-0.008	-0.003
	(0.108)	(0.072)	(0.073)	(0.094)	(0.115)	(0.077)	(0.079)	(0.103)
crisis#r	0.017	-0.138	-0.042	-0.034	0.043	-0.137	-0.040	-0.026
	(0.185)	(0.133)	(0.143)	(0.194)	(0.184)	(0.133)	(0.142)	(0.198)
crisis#sector	0.147	0.119	0.113	0.110	0.153	0.115	0.115	0.112
	(0.154)	(0.109)	(0.114)	(0.122)	(0.157)	(0.109)	(0.113)	(0.121)
crisis#age	0.010	0.010	0.010	0.010	0.010	**0.011* **	**0.013* **	0.013
	(0.009)	(0.006)	(0.006)	(0.009)	(0.009)	**(0.006)**	**(0.007)**	(0.008)
CF/K	-0.032	-0.018	-0.007	0.006				
	(0.083)	(0.070)	(0.074)	(0.096)				
crisis#CF/K	**0.182** **	**0.195*** **	**0.218*** **	**0.214** **				
	(0.090)	**(0.074)**	**(0.077)**	**(0.092)**				
negCF#CF/K					-0.959	0.173	0.523	0.489
					(1.323)	(0.990)	(1.048)	(0.455)
medCF#CF/K					-0.428	-0.396	-0.401	-0.368
					(0.509)	(0.420)	(0.445)	(0.434)
highCF#CF/K					-0.026	-0.038	-0.022	-0.010
					(0.090)	(0.076)	(0.080)	(0.111)
crisis#negCF#CF/K					1.022	-0.031	-0.437	-0.395
					(1.326)	(0.991)	(1.052)	(0.438)
crisis#medCF#CF/K					**1.173* **	0.792	**1.056** **	**1.024* **
					(0.615)	(0.489)	**(0.521)**	**(0.542)**
crisis#highCF#CF/K					**0.225** **	**0.240*** **	**0.311*** **	**0.306*** **
					(0.102)	**(0.086)**	**(0.091)**	**(0.103)**
sigma_u		0.000				0.000		
		(0.048)				(0.055)		
sigma_e		**0.327*** **				**0.326*** **		
		(0.015)				**(0.015)**		
Constant	1.212	0.928	-0.259		1.433	0.791	-0.421	
	(2.461)	(0.767)	(1.824)		(2.459)	(0.779)	(1.810)	
Sargan Test Chi2(20)	24.767				24.063			
	$p = 0.210$				$p = 0.240$			
Observations	205	249	248	248	205	249	248	248
Number of id	43	44	43	43	43	44	43	43

Note: Standard errors in parentheses, average time variants variables and initial conditions variables included in dynamic correlated random effects models not reported, Bias corrected models do not include a constant.
$***p < 0.01$, $**p < 0.05$, $*p < 0.1$