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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 grass-roots cooperatives. We estimate an ECM (Error correction model) using various specifications as robustness checks on an exhaustive French cooperative database. We find empirical evidence of an impact of crisis on cooperative financial constraint, but we highlight that this constraint is more stringent for cooperatives

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Keywords: Capital constraint, credit rationing, cooperatives, error correction model.

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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. Credit rationing is defined as the situation in which lenders are unwilling to advance additional funds to borrowers at the prevailing market interest rate (Jaffee and Modigliani, 1969). More generally, an enterprise facing capital constraint is unable to acquire sufficient risk capital to finance profitable investment opportunities (Hubbard, 1998). Therefore, financial constraints have both negative effects on households' consumption expenditures (Li et al., 2016) and on firm survival probability (Carreira and Silva, 2010).

Previous research indicates that capital constraints are time variant, changing in line with the macro-credit conditions and financial market structure in the economy. For

example, Gaies et al. (2019a) show that in the case of developing countries, FDI reduces the probability of banking crises by promoting supervision and risk managing in the domestic financial markets through the presence of foreign investors, and enhancing liquidity and technology transfer. Loss of capital due to financial crisis could cause banks to shrink lending and therefore exclude profitable firms from credit market (Peek and Rosengren, 2016).

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; Lambro and Petrescu, 2014; Bentivogli and Viviano, 2012; Zamagni, 2012; Carini and Costa, 2013; Carini and Carpita, 2014), O'Toole et al. (2014) found that financing constraints are binding and the impact of constraints becomes much more acute following the financial crisis.

In the following, We estimate an ECM (Error correction model) using various specifications as robustness checks with an exhaustive database on French craftsmen cooperatives. We establish empirical evidence of 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, describing the database and the

econometric model. The section 3 shows our results for benchmark estimation and alternative specifications and the section 4 concludes.

2 Materials and Methods

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. Knowing that, Authors (Soboh et al., 2011, 2012; Hirsch and Hartmann, 2014) used listwise deletion methods (complete case analysis), but that may lead to biased estimations if there is an informative drop-out or if the data is not missing completely at random (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. Following data quality assessment procedures described in Hazen et al. (2014), the data was also checked for accuracy, 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 also exist in this industry. The cooperatives were created between 1968 and 2012. The 50th cooperative created in 2014 was not included in our study. Therefore, we have an unbalanced longitudinal database for our population between 2004 and 2014. 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 (see appendix). 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) leads to the creation of new cooperatives (as half of the cooperatives were created since 2000).

2.2 Empirical strategy: An investment behavior equation

There are two different ways to address the issue of capital constraint (Petrick, 2005). Direct approaches are built 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 its flexibility (see also Cummins et al. (2006)). The basic idea of the ECM is to nest a long-run specification for the firm demand for capital within a regression model that allows a flexible specification for short-run investment dynamics to be estimated from the data (see Ek and Wu (2018) for a theoretical presentation). Since the seminal paper of Bond et al. (2003), this framework has been extensively used in the analysis of investment behavior at the company level (e.g. Yoon and Ratti (2011); Bertoni et al. (2015); Ek and Wu (2018)).

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 (difference GMM) for linear dynamic panel data may suffer from small sample bias and is not robust to heteroskedasticity. To consider this problem, following Gaies et al. (2019b), we use instead the GMM system dynamic panel data estimator (Two-step system GMM) developed by Arellano and Bover (1995) and Blundell and Bond (1998), and we compute robust two-step standard errors by following the methodology proposed by Windmeijer (2005). The same model has been estimated by recent papers on capital constraints (within the ECM framework (e.g. Bertoni et al. (2015))). This method is implemented in Stata 15 with the package `xtdpdgm` (Kripfganz, 2018).

As a robustness checks, we use various alternative estimators. 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) implemented in Stata by Kripfganz (2016). The model can finally be estimated using the iterative bootstrap-based bias correction proposed by Everaert and Pozzi (2007); De Vos et al. (2015) (BC FE). Inference with nonparametric wild bootstrap (`wboot`) resampling scheme has been performed in order to consider potentially non-normal distribution and heteroskedasticity

The baseline ECM specification is as follow:

$$\frac{I_{it}}{K_{i(t-1)}} = \alpha_0 + \alpha_1 \frac{I_{i(t-1)}}{K_{i(t-2)}} + \alpha_2 \Delta s_{it} + \alpha_3 \Delta s_{i(t-1)} + \alpha_4 (k_{i(t-2)} - s_{i(t-2)}) + \alpha_5 \frac{CF_{it}}{K_{i(t-1)}} \quad (1)$$

$$+ \alpha_6 d + \alpha_7 r + \alpha_8 Age + \alpha_9 Sector + \alpha_{10} Time + \alpha_{11} Time \cdot Sector + \epsilon_{it}$$

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 empirical strategy of O’Toole et al. (2014), we extend this model in

order to take into account crisis impact.

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

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 (Cash Flows) (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 described in the previous section (with or without interactions). The validity of the GMM system estimator is conditioned upon the exogeneity of the instruments (Hansen test of over-identifying restrictions), as well as no autocorrelation of errors of order 2 (Arellano–Bond test AR2) (Gaies et al., 2019b). The tests confirm the validity of our benchmark models 1 and 5. Interestingly, 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 (as the joint test of both parameters is significant). More specifically we also find 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, appears for cooperative with medium volume of CF and decreases 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 Conclusions

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 cooperatives 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).

¹See CAPEB Facts and Figures 2017 <http://www.capeb.fr/www/capeb/media/capeb-chiffres-cles-2017.pdf>

Beyond the help of cooperative union, social finance institutions dedicated to cooperative and social economy enterprises are a way to relax this constraint, as they act as a lever for the accession of other investment fundings (Bouchard et al., 2017). Roelants (2013) also proposes some legislative and creative ways at the national and the international levels 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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5 appendix

Table 1: Descriptive statistics

Variable	signification	Obs	Mean	Std. Dev.	Min	Max
LK	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	437	0.594	0.492	0	1
sector	1 for construction and sanitary equipment and 0 otherwise	437	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)	437	12.622	11.536	0	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)	-0.082 (0.060)	-0.029 (0.028)	-0.023 (0.031)	-0.007 (0.048)	-0.081 (0.053)	-0.028 (0.028)	-0.025 (0.031)	-0.009 (0.043)
s	1.134*** (0.414)	0.678*** (0.168)	0.582*** (0.228)	0.576** (0.258)	0.827*** (0.242)	0.683*** (0.169)	0.585** (0.184)	0.579*** (0.211)
Lag(s)	0.754** (0.334)	-0.140 (0.191)	0.036 (0.212)	0.013 (0.388)	0.795* (0.422)	-0.182 (0.198)	-0.020 (0.217)	-0.039 (0.380)
Lag2(k-s)	-0.037 (0.097)	-0.054 (0.044)	-0.025 (0.046)	-0.026 (0.063)	0.002 (0.098)	-0.050 (0.045)	-0.006 (0.047)	-0.009 (0.062)
sector		0.124 (0.114)	0.000 (0.000)			0.135 (0.114)	0.000 (0.000)	
crisis	-1.327 (1.400)	-1.012 (0.667)	-0.700 (0.683)	-0.668 (0.969)	1.635 (1.052)	-0.838 (0.698)	-0.539 (0.717)	-0.518 (0.935)
age	-0.108** (0.050)	-0.053** (0.022)	-0.050* (0.026)	-0.047 (0.039)	-0.102*** (0.032)	-0.053** (0.022)	-0.051** (0.025)	-0.048 (0.038)
d	-0.647** (0.297)	-0.474*** (0.176)	-0.509*** (0.187)	-0.489 (0.302)	-0.434 (0.341)	-0.419** (0.183)	-0.417** (0.193)	-0.400 (0.288)
r	-0.765 (0.536)	0.215 (0.149)	0.156 (0.158)	0.152 (0.239)	-0.320 (0.352)	0.202 (0.149)	0.130 (0.158)	0.125 (0.221)
crisis#d	-0.074 (0.129)	0.052 (0.072)	0.032 (0.073)	0.033 (0.090)	-0.215 (0.162)	0.020 (0.077)	-0.008 (0.079)	-0.004 (0.097)
crisis#r	0.675* (0.397)	-0.138 (0.133)	-0.042 (0.143)	-0.029 (0.195)	0.377 (0.263)	-0.137 (0.133)	-0.040 (0.142)	-0.024 (0.177)
crisis#sector	0.225 (0.193)	0.119 (0.109)	0.113 (0.114)	0.097 (0.127)	0.167 (0.155)	0.115 (0.109)	0.115 (0.113)	0.098 (0.125)
crisis#age	0.023 (0.015)	0.010 (0.006)	0.010 (0.006)	0.010 (0.009)	0.026** (0.012)	0.011* (0.006)	0.013* (0.007)	0.013 (0.008)
CF/K	-0.007 (0.081)	-0.018 (0.070)	-0.007 (0.074)	0.001 (0.087)				
crisis#CF/K	0.247*** (0.078)	0.195*** (0.074)	0.218*** (0.077)	0.217** (0.098)				
negCF#CF/K					-0.737 (1.608)	0.173 (0.990)	0.523 (1.048)	0.497 (0.444)
medCF#CF/K					-1.383 (0.997)	-0.396 (0.420)	-0.401 (0.445)	-0.368 (0.440)
highCF#CF/K					-0.113 (0.099)	-0.038 (0.076)	-0.022 (0.080)	-0.014 (0.104)
crisis#negCF#CF/K					0.742 (1.627)	0.105 (0.991)	-0.437 (1.052)	-0.406 (0.463)
crisis#medCF#CF/K					2.400** (1.250)	0.792 (0.489)	1.056** (0.521)	1.029** (0.511)
crisis#highCF#CF/K					0.498*** (0.124)	0.240*** (0.086)	0.311*** (0.091)	0.311*** (0.106)
sigma_u		0.000 (0.048)				0.000 (0.055)		
sigma_e		0.327*** (0.015)				0.326*** (0.015)		
Constant	-10.878** (5.507)	0.928 (0.767)	-0.259 (1.824)		1.433 (2.459)	-8.761* (5.328)	-0.421 (1.810)	
AR2 p-value	0.495				0.955			
Hansen p-value	0.856				0.983			
Observations	249	249	248	248	249	249	248	248
Number of id	44	44	43	43	44	44	43	43

Note: Robust 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.

** * $p < 0.01$, ** $p < 0.05$, * $p < 0.1$