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Regulation, supervision and deposit insurance for financial cooperatives: an empirical investigation[†]

Amr Khafagy

Abstract

This paper analyses the impact of different regulation and supervision approaches, as well as deposit insurance schemes, on the development of financial cooperatives in developing countries, using random and fixed effects estimators. Information on laws regulating financial cooperatives, the supervisory approaches adopted, and deposit insurance schemes in sixty-five developing countries were collected—mostly—from original legislations for the period 1995–2014. Key findings suggest that indicators of financial cooperative development are positively correlated with the existence of a specialized regulation; supervision under non-bank financial supervisory authorities; and the presence of deposit insurance schemes, while general cooperative society's regulations and banking regulations are negatively correlated with financial cooperatives' indicators. These results are robust after controlling for economic and institutional factors as well as potential endogeneity bias.

1. Introduction

The 2007–2008 financial crisis showed how rapid financial expansion without sufficient regulation could have drastic consequences that go beyond the financial sector and threaten the stability of the whole economy. A financial system dominated solely by

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joint-stock commercial and investment banks may have serious weaknesses and systemic risks that affect the stability of the sector. Growing empirical literature suggest that financial cooperatives tend to be more stable as they are risk-averse and less exposed to capital markets' volatilities, and—in many cases as or—more cost-efficient compared to other commercial banks. In addition, there is solid empirical literature showing that financial cooperatives provide credit to more small and medium enterprises than commercial banks do, and are better able to reach low-income populations than other microfinance institutions.[1] Yet, few empirical studies explored why financial cooperatives grow in some emerging economies and not in other similar ones. Périlleux et al. (2016) argued that financial cooperatives benefit from the underdevelopment of the commercial banking sector in developing countries, while Khafagy (2017) found that political institutions have incentives to deliberately oppose or support the development of financial cooperatives. This essay is highly inspired by Cuevas and Fischer (2006). Here I used unbalanced panel data covering the period from 1995 to 2014 to examine the impact of different regulation and supervision approaches, in addition to deposit insurance schemes, on the development of financial cooperatives in developing countries. An enabling regulatory and supervisory environment is a prerequisite for the growth and development of financial cooperatives, and as the sector grows and becomes more complex, regulations must be responsive to ensure the stability and the effectiveness of the sector.

In many developing countries, financial cooperatives are fully regulated by a general cooperative societies' law that regulates all type of cooperative organisations, including non-financial cooperatives (e.g. agricultural, consumer, or housing cooperatives…etc.), ignoring the financial intermediation nature of financial cooperatives. While in other countries, financial cooperatives fall completely under the regulatory and supervisory responsibility of the central bank or the bank superintendence. In the last decade, more countries adopted a specialised law for financial cooperatives or separate and detailed provisions regulating financial cooperatives under a non-specialised financial cooperatives law. In few countries, especially in Latin America, central banks or bank superintendence regulate and supervise large financial cooperatives only while smaller financial cooperatives fall under different regulatory framework. Other countries keep

[1] See Berger et al. (2005), Cuevas and Fischer (2006: 55), Hesse and Cˇ ihák (2007), Ayadi et al. (2010: 116), Tchuigoua (2011), Birchall (2013: 24), Hasan et al. (2014), and Butzbach and von Mettenheim (2014: 33–41) for a comprehensive overview on empirical literature on the comparative performance of financial cooperatives.

financial cooperatives under legislations intended to govern the operations of all microfinance institutions. There is no common agreement over which of these different legal approaches work better to support the growth and resilience of the sector in developing countries. In addition, there is no empirical evidence that argues in favour of a specific supervisory approach to be more suitable for financial cooperatives, or whether deposit insurance schemes enhance or threaten the growth of financial cooperatives. In this chapter, I tried to explore whether the size and outreach of the financial cooperative sector is shaped by the regulatory and supervisory approach adopted, and if deposit insurance schemes support or discourage the development of the sector.

The findings of this chapter has important policy implications suggesting that a specialised regulation for financial cooperatives is more likely to support the growth of the sector, while there is a serious concern over the viability of applying commercial banks or cooperative societies' regulations to financial cooperatives. In addition, the analysis encourages the introduction of deposit insurance as an important instrument that can promote confidence in the sector. The following sections of the chapter are organized as follows: Section 2 briefly discusses current regulation and supervision approaches, and the advantages and disadvantages of deposit insurance schemes and their implication on financial cooperatives. Section 3 defines the data and the methodology used. Results are presented and interpreted in Section 4. Section 5 concludes.

2. Regulation, supervision and deposit insurance for financial cooperatives

Financial Cooperatives'—hereafter as FCs—are member-owned financial institutions such as cooperative banks, credit unions, credit cooperatives, as well as savings and credit cooperatives. Benefiting from strong social relations between small-group members, FCs with few members are similar to formalised rotating savings and credit associations (ROSCAs) that are able to provide financial services to their members at low operational costs, by reducing information asymmetry problems associated with any financial intermediation. However, social relations and FCs' informational advantage weaken as the number of members grows, and establishing an efficient regulatory framework becomes necessary (Poyo 2000: 140). There are strong incentives to put the FC sector under a prudential regulatory and supervisory framework regardless of their size. Jansson et al. (2004: 51) explained that large FCs should be regulated

under prudential regulation and supervision in order to protect the deposits of large number of cooperative members. Furthermore, common bond is probably weak in large FCs making self-supervision more difficult, besides that large FCs may impose systematic risk to the whole sector. While acknowledging the challenges of applying prudential regulation and supervision on small FCs, Jansson et al. (2004: 51) does not undermine the importance of putting small FCs under the supervision of a qualified authority. In addition to the delegated/auxiliary approach—explained below—they recommend charging FCs a cost-covering supervision fees to ensure adequate supervision and to avoid cross-subsidising FCs by commercial banks.

FCs regulation should guide basic credit operations such as—among other things—internal credit policy, pricing, defining collaterals, contractual transparency, legal reserves, documentation, risk classification and risk weighting, non-performing loans, loan loss provisions and write-offs (Jansson et al. 2004: 27–48). In addition, FCs regulation should maintain the autonomy of cooperatives and protect the sector from unsupportive government interference (Bamrungwon 1994: 55–56; Musumal 1994: 157–158; Münkner 2014; Khafagy 2017), mitigate agency problems inherited in cooperatives governance structure (Taylor 1971;Westley and Shaffer 2000: 87; Branch and Baker 2000: 210–211; Cuevas and Fischer 2006). Regulations should also support institutional integration between financial cooperatives and facilitate the creation of second-tier cooperatives or federations (Poyo 1995: 31; Guinnane 1997: 251–252; Desrochers and Fischer 2003; Cuevas and Fischer 2006: 16–17), and set adequate capital requirements (Davis 1994; BCBS 2012, 2015a, b).

The most desired approach for designing a cooperative law is participatory law-making process as suggested by (Münkner 1986: 123) in which cooperative representatives (e.g. second-tier cooperatives or federations) directly contribute, along with the legislator, in framing the cooperative legislation. Poprawa (2009: 2) argued that the evolution of FCs' regulatory and supervisory frameworks in most countries is highly associated with the development stage of the movement. In early stages, regulations focus on licensing and registration only. While in more advanced stages, policy makers introduce prudential measurements, financial and regulatory reporting standards, through the establishment of prudential standards and risk-based supervision framework that aims to assess capital adequacy and mitigate liquidity risks. Finally, in a well-developed financial cooperative system, the regulatory framework enforces a deposit guarantee system that creates confidence to depositors that their money is protected partly or fully. Cuevas and

Fischer (2006: 30) recognized three main legal frameworks that govern the FC sector in most countries. These are a specialized FC law, a general cooperative society's law, and a banking law. The latter framework is usually applied on all country's banking sector, including FCs, or only applied to large cooperatives while smaller ones are left to the cooperative society's law. Cuevas and Fischer (2006) called this legal approach a "dual regime", widely common in Latin America, where only few FCs are governed by the banking authorities based on specific criteria, such as the size of the cooperative or if it provides services to non-members (open FCs). Table 1 below follows Cuevas and Fischer (2006: 45) and compares regulation and supervision approaches adopted by countries included in the sample to govern the activities of FCs in 1995 versus 2014. The table shows how several countries in the last two decades chose to regulate FCs through a specialised law or separate provisions instead of general cooperative law or commercial bank law.

Table 1. Regulation and supervision approaches of financial cooperatives in 1995 vs 2014

Financial cooperatives regulation and supervision approaches in 1995

	Cooperative society's regulation	Specialized financial cooperatives regulation	NBFIs regulation	Dual regulatory regime	General Banking regulation
Cooperative societies supervision	Bangladesh Belarus[1] Benin Côte d'Ivoire Dominican Republic El Salvador Ethiopia Guatemala Guinea-Bissau Guyana Honduras Indonesia Kenya Lesotho Liberia Macedonia[2] Malaysia Mauritius Moldova Mongolia Nepal Nicaragua Niger Panama Paraguay Romania[2] Rwanda Sri Lanka Swaziland Tanzania Thailand Togo Uganda Uzbekist-an[3] Viet Nam[2] Zimbabwe	Cameroon		Colombia	
NBFIs supervisory authority		Burkina Faso			
Banking authority supervision	Peru	Azerbaijan Gambia Lithuania Mali Papua New Guinea Senegal	Cambodia[4]		Brazil Lao PDR Latvia
Dual supervisory regime		Costa Rica Philippines		Bolivia Chile Ecuador India Uruguay	

Auxiliary supervision	Jamaica Malawi Mexico Poland Russia South Africa	Ukraine	Ghana		

Financial cooperatives regulation and supervision approaches in 2014

	Cooperative society's regulation	Specialized financial cooperatives regulation	NBFIs regulation	Dual regulatory regime	General Banking regulation
Cooperative societies supervision	Belarus Dominican Republic Ethiopia Guatemala Guyana Lesotho Liberia Malaysia Mauritius Nicaragua Panama Sri Lanka Thailand Uganda Zimbabwe	Indonesia Paraguay			
NBFIs supervisory authority		Benin Burkina Faso Côte d'Ivoire Ecuador Guinea-Bissau Kenya Mali Moldova Mongolia Niger Senegal South Africa Swaziland Togo Ukraine	Bangladesh		
Banking authority supervision		Azerbaijan Gambia Lao PDR Latvia Lithuania Macedonia Malawi Papua New Guinea Poland Romania Rwanda Tanzania Uzbekistan[3]	Cambodia Cameroon		

		Viet Nam			
Dual supervisory regime		Bolivia Colombia Costa Rica Philippines Uruguay		Chile El Salvador Honduras India Nepal	
Auxiliary supervision	Jamaica	Brazil Mexico Peru Russia	Ghana		

Source: author's compilation

[1] Belarus as of 1998; [2] Macedonia, Romania and Viet Nam as of 1996; [3] Uzbekistan as of 2002 and 2010; and [4] Cambodia, as of 1997.

While for supervision, the Basel Committee for Banking Supervisions (BCBS) had recently issued Guidance for the implementation of its 'Core Principles' for institutions engaged in financial inclusion, which addresses financial cooperatives, among other microfinance providers. The Core Principles provide adequate guidance for supervising banks, as well as non-bank depository financial institutions, proposing that different types of financial institutions should be regulated differently than commercial banks, especially if they do not possess a significant percentage of the financial system's deposits. In addition, supervision can be reduced to monitoring only when there are large numbers of small non-bank depository financial institutions operating in geographically remote areas. The Guidance encourages proportionate supervision approach, so that countries can allocate supervisory resources efficiently among the financial system based on the risk-associated by the financial institution on depositors and the whole financial system (BCBS 2012: 13 and BCBS 2015b: 5–9). Currently, there are four types of supervisory approaches adopted to monitor the FC sector in developing countries (Cuevas and Fischer 2006: 45; Poprawa 2009: 2–3). First approach is direct supervision by a prudential regulator over the entire sector. Second approach is direct supervision over large FCs only, while small FCs are supervised by another governmental agency (like ministries of cooperatives with limited non-prudential monitoring. Third approach is delegated or auxiliary supervision which gives the supervisory responsibility to a third party—most commonly to the national federation of FCs. Last approach is supervision by ministries of cooperatives that regulate and supervise the entire cooperative sector, including agricultural or housing cooperatives, and other non-financial cooperatives.

Finally, deposit insurance schemes are widely recommended to protect depositors' assets and the total financial system from bank runs, however, the effectiveness of deposit insurance remains quite controversial. The general economic theory suggests that deposit insurance can improve the stability of banks by reducing the possibility of depositors' runs. However, such explicit safety net of insurance may reduce market discipline and creates amoral hazard by providing incentives for banks to invest in riskier assets, without being sufficiently monitored by the depositors, because any losses incurred will be shifted from the depositors to the insurance fund (Demirgüç-Kunt and Detragiache 2002: 1378). Several empirical findings suggest that deposit insurance schemes tend to increase banks' instability, risk-taking behaviour, and reduce monitoring of large depositors on banks (Grossman 1992; Alston et al. 1994; Demirgüç-

Kunt and Detragiache 2002; Ioannidou and Penas 2010). While Hovakimian et al. (2003) found that introducing deposit insurance schemes might increase risk-taking behaviour for banks operating in countries with weak institutional structures such as low political and economic freedoms, high corruption and poor contract enforcement mechanisms. Contrary to that, Gropp and Vesala (2004) found that risk-taking behaviour of European banks had significantly decreased after the introduction of explicit deposit insurance. But unlike investor-owned financial institutions, there is no evidence in the literature of financial cooperatives supporting the argument that the adoption of deposit insurance schemes increases the likelihood of institutions to adopt risk-taking behaviour. That is because theoretically, the mutual ownership structure implies limited risk-taking behaviour. In investor-owned firm, shareholders are only residual claimants, thus they have incentives to adopt riskier behaviour as they can gain benefits from higher dividends or selling shares at market value. Shares in investor-owned financial institutions are considered highly leveraged claims on the institution's residual profits, unlike mutual institutions where shareholders are also depositors, thus their shares are unleveraged (Karels and McClatchey 1999: 107–108). Moreover, several approaches can make deposit insurance schemes for FCs more incentive compatible, and reduce agency costs and moral hazard. One approach is limited coverage that makes the insurance forces large depositors to closely monitor the performance of the institutions, and which will increase market discipline. Similar approach is coinsurance, in which depositors are not compensated for their total deposits, thus some of the depositors will be forced to monitor the institutions' risk strategy as they are exposed to losses (Beck 2004). Another commonly preferred approach is risk-based deposit insurance, where insurance premiums are adjusted to reflect the risk of the institution's assets or capital adequacy performance (Hannafin and Mckillop 2007: 47).

3. Data and method

Common measurements of financial sector development—as a whole—cover the size, depth, efficiency and stability of the sector (Beck et al. 1999). However, the available data on FCs can only reflect the size and depth of the sector and do not give insightful information on the level of efficiency and stability of the sector in most countries. The data used here to measure the level of development of the FC sector was obtained from the annual statistical reports of the World Council of Credit Union's (WOCCU).

WOCCU's dataset are the most comprehensive dataset available for FCs. Additional data on primary agricultural credit cooperatives in India was collected from the National Federation of State Cooperative Banks. FCs development is measured using three indicators. First indicator is member penetration rate; which is the total number of FCs' members as percentage of the total economically active population (obtained from International Labour Organization—ILO) in each country. This variable can reflect the depth of the sector and its ability to attract and organise people. Second and third indicators are FCs' total deposits and assets per GDP. Both indicators show the sector's size in the national economy. The three variables were log transformed to normalize data distribution.

Information on regulations governing FCs, the responsible supervisory agencies, and deposit insurance schemes in sixty-five developing countries were self-collected by the author for the period from 1995 to 2014. These data were mainly collected from original legislations, and only for view countries, I relied on secondary sources, like central banks reports and international monetary fund reports (and other multilateral institutions). Annex 4 presents a list of all laws and sources reviewed. Countries covered in the study are those with total population greater than 500,000 per country and are classified as emerging and developing economies by the International Monetary Fund's (IMF)World Economic Outlook of 2012 (IMF 2012: 181). Tables 2 and 3 below provide an overview over variables used to measure FCs development, as well as the classification of regulatory, supervisory and deposit insurance variables, as well as the control.

Fixed and random effects ordinary least squares (OLS) estimators are used to measure the relationship between FCs' indicators and the type of regulation that governs them, the supervisory agency responsible to monitor their activities, and the existence of a deposit insurance scheme for the period from 1995 to 2014. Using panel data is convenient in this study to observe how changes in FCs' regulations, supervisory authority or the introduction of deposit insurance scheme affect the changes in size and depth of the sector in the economy. The basic structure for the OLS regression models here take the form of

$$y_{it} = \alpha + X_{it}\beta + \mu_i + \nu_{it}. \quad (1)$$

The fixed-effect estimator performs OLS regression on

$$(y_{it} - \bar{y}_i) = \alpha + (X_{it} - \bar{X}_i)\beta + (v_{it} - \bar{v}_i). \quad (2)$$

For each investigation (regulation, supervision and deposit insurance), I performed three tests reported in panels A, B and C in tables 4, 5 and 6 and A1, A2 and A3. In Panel A, the dependent variable y_{it} represents the logarithm of indicators used as proxy for the development of the FC sector in country i at year t. Namely, y denotes *log(penetration rate), log(deposits per GDP), and log(assets per GDP)*. In addition, α is the intercept, and β are the coefficients that need to be estimated to determine the potential relationship between the dependent variables y and each explanatory variable X. Since there are three main tests in the study, the explanatory variables X represent dummy variables for laws regulating FCs in the first test; the responsible supervisory agency in the second test; and the existence of deposit insurance scheme in the last test. In addition, the explanatory variables include a set of variables to control for gross domestic production (GDP) per capita, domestic credit provided to private sector as percentage of the GDP, legal origin, and geographic region. The control variables were selected following findings from earlier research reported in Khafagy (2017). Accordingly, I excluded GDP growth rate, inflation rate, unemployment rate and percenatge of urban population from the estimations here for weak or lack of statistical significant correlations with FCs' indicators. Moreover μ_i are time-invariant and unobservable country-specific effects that were not included in the regression and differ across countries (e.g. political and cultural country-specifications). Whereas v_{it} are the remainder disturbances which varies across countries and years, and has similar characteristics to the usual "error term" of linear regression equation, assumed to be homoscedastic, normally distributed with a mean equals to zero, uncorrelated with itself, and uncorrelated with μ_i and X.

Panels B explain the effect of changing FCs' regulatory framework or supervisory approaches or introducing deposit insurance schemes in year $(t-1)$ on the growth of FCs' indicators in year t. Thus, the dependent variable in panels B are the change in FCs' indicators using the first difference of *log(penetration rate), log(deposits per GDP), and log(assets per GDP).* The changes in FCs' indicators are regressed against the first lag of the indicators and the first lag of the main explanatory variables (regulations, supervisions, and deposit insurance) in addition to the control variables used in panels A regressions. Finally, panels C report results of reversed regressions, to

explore whether the size and depth of the sector predetermine the type of regulatory and supervisory approaches and the presence of deposit insurance schemes or not. The reversed regressions also show if the presence of deposit insurance or a specific regulatory and supervisory approach is associated with the level of economic development of a country or the size of its financial sector. For that, the dependent variables in the regressions of panels C are the dummy variables that represent the type of FCs regulation and supervision and the presence of deposit insurance. These variables are regressed against the first lags of: FCs indicators, GDP per Capita, domestic credit provided to private sector, besides the control variables mentioned before.

A main advantage of fixed and random effects estimators is that they recognise the presence of unobserved heterogeneity between the countries. Fixed effect estimator, known as the within estimator, treats μ_i as fixed parameters that do not have a distribution. It controls for all country-specific effects and these time-invariant parameters are omitted. The remainder disturbances v_{it} are assumed to be independent and identically distributed (IID), while X_{it} are assumed to be correlated with μ_i and independent from v_{it} for all countries i at any period t (Baltagi 2005: 12-13 and Stata 2013: 366 and 384). The standard errors reported for the OLS regressions are obtained using Huber-White sandwich robust estimator to correct for the heteroscedasticity and serial correlation indicated by Breusch-Pagan / Cook-Weisberg test and Lagram-Multiplier test. The coefficients estimated by the robust estimator of variance are similar to the coefficients produced by the non-robust estimators, however, the robust estimator of variance allows us to relax the assumption of identically distributed disturbances v_{it} over the panels, and the no serial correlation assumption (Stata 2013: 383). I report regression results obtained only from the fixed-effects estimations following Hausman-test results and the high correlation between the country-specific effects μ_i and the explanatory variables X found in all the regressions, all which suggest fixed-effects estimations to be more efficient than random-effects estimations for the analysis. The random-effects results are reported in the appendices. Moreover, the R-squared within in the baseline regressions (panels A) range from 29.8 per cent to 38.6 per cent, noting that the reported R-squared "within" obtained from a fixed effects estimator is equivalent to ordinary R-squared of OLS regressions. Tables 2 below provide a brief statistical description on the variables included in the model, and table 3 gives an overview on the data sources and variables used in the analysis.

Table 2. Data description

Variable	Mean	Std. Dev.	Min	Max	*N*
Log penetration rate	−1.50	0.75	−4.47	−0.11	1108
Log deposit per GDP	−2.64	0.92	−6.00	−0.92	1065
log assets per GDP	−2.46	0.91	−5.71	−0.83	1035
Cooperative societies' regulation	0.40	0.49	0	1	1108
Specialized financial cooperatives regulation	0.44	0.50	0	1	1108
Dual regulatory regime	0.09	0.29	0	1	1108
General banking regulation	0.01	0.12	0	1	1108
Non-bank financial institutions regulation	0.05	0.23	0	1	1108
Cooperative societies' supervision	0.36	0.48	0	1	1108
Auxiliary supervision	0.14	0.35	0	1	1108
Dual supervisory regime	0.16	0.36	0	1	1108
Banking authority supervision	0.18	0.39	0	1	1108
Non-bank financial institutions supervision	0.15	0.36	0	1	1108
Deposit insurance	0.28	0.45	0	1	1108
Log GDP per capita	3.17	0.47	2.10	4.05	1108
Domestic credit to private sector	0.34	0.26	0.01	1.66	1108
Financial freedom	0.48	0.16	0.1	0.9	1108
Property rights	0.41	0.16	0.05	0.9	1108
Legal origin	0.86	0.72	0	2	1108
Region	2.42	1.24	1	4	1108

Table 3. Information on the data sources and variables used in the analysis

Financial cooperatives variables (dependent variables)	
Penetration rate	The total number of financial cooperatives' members in a country obtained from the WOCCU, as percentage of the total economically active population, obtained from International Labour Organization statistics. The variable was log transformed to normalize data distribution.
Total deposits per GDP	The total deposits of financial cooperatives in a country, reported by the WOCCU, as percentage of the Gross Domestic Product (GDP) at

	market prices. The variable was log transformed.
Total assets per GDP[2]	The total assets of financial cooperatives in a country, reported by the WOCCU, as percentage of the Gross Domestic Product (GDP) at market prices. The variable was log transformed.
Regulations, supervision and deposit insurance variables (explanatory variables)	
Cooperative society's regulation	A dummy variable that takes the value of 1 if financial cooperatives are fully regulated under a general cooperative society's law that regulate the operations of all forms of organizations with a cooperative ownership structure, without any special provisions for financial cooperatives concerning credit and deposit services, and capital requirements, or statutory provisions concerning financial intermediation activities.
Specialized financial cooperatives regulation	A dummy variable that takes the value of 1 if financial cooperatives are regulated by a specialised law or regulated under special or detailed provisions under a non-specialised financial cooperatives law.
General Banking regulation	A dummy variable that takes the value of 1 if financial cooperatives are fully regulated by the banking law.
Dual regulatory regime	A dummy variable that takes the value of 1 if the financial cooperative sector is regulated by two separate legal frameworks, that is some financial cooperatives are regulated under a general cooperative law, while other financial cooperatives are regulated by the banking law, based on specific criteria (based on assets size, minimum capital requirements, providing services to non-members).
Non-bank financial institutions regulation	A dummy variable that takes the value of 1 if financial cooperatives are fully regulated by a law regulating other non-bank financial institutions (e.g. microfinance laws).
Cooperative societies supervision	A dummy variable that takes the value of 1 if financial cooperatives are supervised by a government authority that supervises and monitors all types of cooperative organizations

[2] Missing data for total assets in West African countries (Benin, Burkina Faso, Cote d'voire, Guinea Bissau, Mali, Niger, Senegal and Togo) were calculated using average total assets to total savings ratio from other available years of the same country.

Non-bank financial institutions supervisory authority	A dummy variable that takes the value of 1 if financial cooperatives are supervised by a government authority that supervises and monitors other non-bank financial institutions (microfinance institutions). Noting that I did not include a separate dummy variable for a specialised financial cooperative supervisory authority, because in our sample special governmental supervisory authorities supervise only financial cooperatives in Kenya and South Africa.
Banking authority supervision	A dummy variable that takes the value of 1 if financial cooperatives are supervised by banking authorities (e.g. central bank or bank superintendent).
Dual supervisory regime	A dummy variable that takes the value of 1 if financial cooperatives by two different supervisory authorities, that is some financial cooperatives are supervised by a general cooperative supervisor (e.g. ministry), while other financial cooperatives are supervised by the banking authorities, based on specific criteria (e.g. based on assets size, minimum capital requirements, providing services to non-members).
Auxiliary supervision	A dummy variable that takes the value of 1 if financial cooperatives are supervised by indirect supervisory approach, where the responsible authority allows another organisation to take defined supervisory responsibilities.
Deposit insurance	A dummy variable that takes the value of 1 if financial cooperatives' deposits are covered by a deposit insurance scheme or other similar arrangements.
Control variables	
GDP per capita	Calculated as the annual Gross Domestic Product (GDP) divided by midyear population of a country. Data are in constant 2005 U.S. dollars as obtained from the World Bank Open Data. This variable was log transformed.
Domestic Credit to private sector	Financial resources provided by depository institutions to the private sector that create a claim for repayment, as percentage of the Gross Domestic Product (GDP) at market prices. Data obtained from World

by banks as (%GDP)[3]	Bank Open Data
Property rights	This indicator is obtained from the Index of Economic Freedom released by the Heritage Foundation, and measures the degree to which private property rights are secured by clear and enforceable laws or not, and evaluates the independence and corruption of the judiciary, as well as the ability of individuals and firms to enforce contracts.
Financial freedom	This indicator is obtained from the Index of Economic Freedom released by the Heritage Foundation, which measures the independence of the banking sector from government control and interference.
Legal origin	A dummy variable that takes the value of 0 if the country's legal system is based on British common law, the value of 1 for French civil law origins, and the value of 2 for socialist laws. Data obtained from La Porta et al. (1999).
Geographic region	A dummy variable that takes the value of '0' for African Countries, '1' for Countries from Latin America and the Caribbean, '2' for Asian Countries, and '3' for European Countries.

4. Results and Discussion

4.1. Financial cooperatives regulations

Table 4 shows regression results that examine the relationship between indicators of FCs and the type of regulation governing their activities. In panel A, each of the three indicators (natural logarithm of penetration rate, deposits per GDP, and assets per GDP) are regressed against dummy variables representing the type of the relevant regulation. The main explanatory variables are dummy variables representing specialised financial cooperative regulation; dual regulatory regime; banking regulation, non-bank financial institutions regulation (NBFI); and general cooperative society's regulation, in addition to a set of variables to control for GDP per capita, credit to private sector, financial freedom and property rights. In panel B, the changes in FCs' indicators are regressed against the first lag of the main explanatory variables, and the first lag of the FC

[3] Data for Uzbekistan were collected from the International Monetary Fund country reports (2006 No. 07/133; 2008 No. 08/235; and 2013 No. 13/278) and for Zimbabwe from the Central bank, under domestic statistics (available at http://www.rbz.co.zw/assets/monthly-economic-data-from-2009-to-date.pdf).

indicator to control for the impact of the sector's size and outreach on its growth. Finally, panel C reports the reversed regressions.

Columns (1), (6) and (11) in panels A and B of table 4 suggest a positive statistical correlation between the existence of a specialized FC regulation and higher members' penetration rate, deposits per GDP and assets per GDP. Panel B suggests that countries with specialised FC regulation have experienced positive change in the sector's penetration rate, deposits and assets per GDP. The results supports the argument that a specialised regulation may boost the growth and outreach of the sector, because FCs need a different legal framework that addresses their unique economic objectives and their distinctive ownership structure that differ from traditional investor-owned financial institutions and also other types of cooperative organisations. Results of panel C suggest also that countries with high penetration rates are most likely to be regulated by a specialised regulation in the following year. Thus, it might also be the case that high penetration rates push governments to introduce specialised laws (or detailed provisions in existing laws) for regulating the sector, as it becomes economically and politically significant. It is difficult to claim with certainty that changes in the type of regulation has a causal effect on the growth of the sector, as generally, the results of fixed-effects regressions does not prove causation, thus it does not imply that a specialised regulation is necessarily leading the growth of the sector. Similar arguments apply also considering the negative correlations discussed below between the size of sector and cooperative societies' regulations or banking regulations.

Nevertheless, the results are coherent with arguments made by Poyo (2000), Jansson et al. (2004: 50), Cuevas and Fischer (2006), Branch and Grace (2008) and WOCCU (2015) that members-owned financial institutions should be regulated under specialised legal framework that addresses their special contractual arrangements, and the distinctive form of agency conflicts inherited in their structure. A specialised regulation should also take into account the risks faced by FCs which differ from risks faced by other types of cooperatives or investor-owned financial institutions, so that for instance, they require different licensing criteria, capital requirements, monitoring procedures, and risk management standards. The results are also consistent with Cull et al. (2011) who - though not focusing on financial cooperatives - found that profit-oriented microfinance institutions tends to limit their outreach to cover the costs of compliance with prudential regulations while maintaining the same profit rates. In contrast, not-for-profit microfinance institutions are more likely to reduce their profit rates to maintain

the same outreach levels. Similarly, the findings of Akande et al. (2016) indicate the need for microfinance regulations to distinguish between the different institutional types of microfinance providers in Africa. It is not surprising then that columns (5), (10) and (15) in panels A and B of table 4, indicate a negative statistical correlation between FCs' penetration rate, deposits and assets per GDP on one hand and general cooperative society's regulation on the other hand. That is because a unified general cooperative society's law that regulate the operation of all cooperative organisations is usually inadequate for financial intermediation activities (Cuevas and Fischer, 2006: 33; Branch and Grace, 2008: 4; WOCCU, 2015: 10). In addition, in many developing countries there were no tangible reforms introduced to cooperative society's regulations since they were originally adopted in the 1960s and 1970s', making them insufficient for FCs (Poyo, 2000: 142). While Hartarska and Nadolnyak (2007) did not find a direct impact for financial regulations on the profitability or outreach of microfinance institutions, they suggested an indirect effect for regulations as they found that high leveraged institutions are able to reach more borrowers. Such argument is also relevant for FCs, as adequate financial regulation - contrary to general cooperative regulations - will enhance the cooperatives' ability to attract deposits or seek external funds and thus increase their services' outreach.

The results of columns (8) and (13) in panel A suggest that laws regulating traditional commercial banks are not associated with high indicators of FCs, with significant high negative correlations between the presence of a banking regulation and FCs' deposits and assets per GDP. In addition to a negative correlation between the change in deposits per GDP and commercial banking regulation reported in and column (8) in panel B. These results are not entirely unexpected, as Poyo (2000: 138) and Branch and Grace (2008: 3) have pointed out that FCs require prudential regulations that differ from traditional commercial banks regulations due to their governance structure, the geographic or sectoral concentration of their loan portfolios, and their focus on micro and small entrepreneurs. Adams (1999: 44) noted that bank-supervising authorities in many developing countries struggle to maintain effective monitoring over commercial banks in the first place, and it is not clear if they have the technical capacity to perform adequate supervision over FCs as well. In addition, banking authorities in developing countries may impose rules and practices that suit commercial banks but not necessarily adequate for FCs (Cuevas and Fischer, 2006: 32). Commercial banking regulations may ignore the distinctive structure of FCs, especially in terms of capital requirements

and governance structures. Traditional banking regulations may also impose regulatory burdens that are unreasonable for the non-complex activities of FCs. On the other hand, the results do not provide supporting evidence to Poyo (2000), WOCCU (2015: 10), and Branch and Grace (2008:. 4) argument that, legislations intended to govern the operations of all microfinance institutions do not consider the cooperative nature of FCs and their orientation to mobilise and promote deposit services. In fact, results of panel B suggest that FCs regulated by a NBFI regulation has witnessed growth in their penetration rate, deposits and assets per GDP. While the results in panel A do not indicate any significant correlation between FCs' indicators and non-bank financial institutions law or dual regulatory framework. Nevertheless, it is important to emphasise that designing a unified law that regulates cooperatives and other microfinance providers should respect the different institutional structure of each type of organisation. More specifically, a unified microfinance law should enable institutional integration among FCs to form advanced networks, and to be able to provide full banking services to their members and not just microfinance services. Thus, equal treatment does not imply identical treatment but unbiased treatment[4].

Finally, panel C shows a positive correlation between specialised FC regulation and GDP per capita, statistically significant at 5 per cent level. While there is a negative correlation between cooperative societies' regulation and GDP per capita also statistically significant at 5 per cent level. Together with the results of panels A and B, it seems clearly that countries with high GDP per capita tend to have well-developed financial cooperative sector regulated under specialised law instead of a general cooperative law. The results also demonstrate that the size of the financial sector, as well as property rights and financial freedom do not play major roles in determining the type of law that regulates financial cooperatives.

[4] United Nations (2003, pp. 10) cited by Cuevas and Fischer (2006, pp. 1)

Table 4. Fixed-effects regression results for financial cooperatives indicators and regulations

Panel A: fixed-effects regressions for financial cooperatives indicators against regulations

Dependent variable	Log penetration rate					Log deposit per GDP					Log assets per GDP				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
FC regulation	0.248**					0.278**					0.227**				
	(0.102)					(0.138)					(0.121)				
Dual regulation		0.096					0.187					0.110			
		(0.092)					(0.148)					(0.154)			
Bank regulation			−0.196					−0.732**					−0.527**		
			(0.152)					(0.320)					(0.250)		
NBFI regulation				0.063					0.048					0.058	
				(0.048)					(0.051)					(0.040)	
Cooperative societies regulation					−0.316**					−0.266**					−0.223**
					(0.110)					(0.120)					(0.110)
GDP per capita	1.208***	1.455***	1.416***	1.424***	1.200***	1.271**	1.552***	1.451***	1.504***	1.320**	1.453***	1.660***	1.594***	1.629***	1.486***
	(0.432)	(0.437)	(0.431)	(0.431)	(0.434)	(0.520)	(0.521)	(0.508)	(0.519)	(0.522)	(0.506)	(0.506)	(0.495)	(0.502)	(0.509)
Credit to private sector	0.685***	0.698***	0.676***	0.716***	0.691****	0.799***	0.796***	0.688**	0.832***	0.808***	0.679**	0.697***	0.609**	0.715***	0.694***
	(0.222)	(0.220)	(0.234)	(0.219)	(0.215)	(0.272)	(0.263)	(0.284)	(0.262)	(0.266)	(0.256)	(0.253)	(0.270)	(0.251)	(0.252)
Financial freedom	0.692***	0.655**	0.677**	0.660**	0.597**	1.270***	1.218***	1.270***	1.240***	1.182***	1.083***	1.030***	1.066***	1.042***	1.003***
	(0.242)	(0.261)	(0.258)	(0.256)	(0.240)	(0.272)	(0.273)	(0.273)	(0.272)	(0.260)	(0.263)	(0.280)	(0.274)	(0.272)	(0.255)
Property rights	−1.349**	−1.419**	−1.438**	−1.425**	−1.257**	−1.692**	−1.734**	−1.791**	−1.761**	−1.624**	−1.666**	−1.706**	−1.744**	−1.720**	−1.602**
	(0.280)	(0.297)	(0.296)	(0.296)	(0.280)	(0.371)	(0.369)	(0.366)	(0.369)	(0.372)	(0.306)	(0.322)	(0.317)	(0.319)	(0.304)
Constant	−5.454**	−6.095**	−5.955**	−5.997**	−5.187**	−6.986**	−7.727**	−7.346**	−7.573**	−6.902**	−7.269**	−7.800**	−7.547**	−7.701**	−7.178**
	(1.368)	(1.387)	(1.374)	(1.372)	(1.407)	(1.620)	(1.631)	(1.598)	(1.622)	(1.657)	(1.571)	(1.586)	(1.559)	(1.573)	(1.616)
F-stat	15.05***	13.78***	17.01***	22.56***	15.54***	15.75***	15.82***	17.50***	28.66***	15.61***	16.23***	16.27***	18.58***	48.66***	15.76***
No. of obs.	1108					1065					1035				
No. of groups	65					65					65				
R^2(within)	0.378	0.356	0.357	0.355	0.386	0.320	0.306	0.322	0.304	0.316	0.334	0.323	0.333	0.322	0.332
Corr (μ_i, X)	−0.664	−0.715	−0.704	−0.711	−0.660	−0.650	−0.703	−0.668	−0.698	−0.658	−0.687	−0.723	−0.701	−0.719	−0.691

Panel B: fixed-effects regressions for change in financial cooperatives indicators against regulations

Dependent variable	Change in log penetration rate					Change in log deposit per GDP					Change in log assets per GDP				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Log penetration rate *(t-1)*	−0.165**	−0.157**	−0.158**	−0.157**	−0.168**										
	(0.030)	(0.030)	(0.030)	(0.030)	(0.031)										
Log deposits per GDP *(t-1)*						−0.269**	−0.262**	−0.272**	−0.263**	−0.268**					
						(0.050)	(0.049)	(0.051)	(0.049)	(0.050)					
Log assets per GDP *(t-1)*											−0.278**	−0.272**	−0.279**	−0.273**	−0.277**
											(0.059)	(0.059)	(0.060)	(0.059)	(0.060)
FC regulation *(t-1)*	0.062**					0.099**					0.097**				
	(0.024)					(0.046)					(0.048)				
Dual regulation *(t-1)*		0.005					0.011					−0.028			
		(0.041)					(0.047)					(0.073)			
Bank regulation *(t-1)*			−0.094					−0.264*					−0.194		
			(0.073)					(0.144)					(0.148)		
NBFI regulation *(t-1)*				0.041***					0.066***					0.069***	
				(0.011)					(0.024)					(0.019)	
Cooperative Societies regulation *(t-1)*					−0.071**					−0.093**					−0.081**
					(0.024)					(0.038)					(0.036)
Credit to private sector	−0.011	−0.011	−0.029	−0.009	−0.005	0.213**	0.216**	0.168**	0.219***	0.215***	0.195**	0.212**	0.170*	0.209**	0.203**
	(0.046)	(0.043)	(0.047)	(0.044)	(0.044)	(0.080)	(0.079)	(0.088)	(0.079)	(0.075)	(0.091)	(0.090)	(0.099)	(0.090)	(0.085)
GDP per capita	0.062	0.108	0.100	0.101	0.070	−0.085	−0.013	−0.023	−0.026	−0.069	0.067	0.124	0.126	0.121	0.086
	(0.099)	(0.104)	(0.104)	(0.104)	(0.104)	(0.176)	(0.179)	(0.178)	(0.177)	(0.177)	(0.189)	(0.194)	(0.194)	(0.194)	(0.192)
Property rights	−0.213**	−0.220**	−0.227**	−0.219**	−0.202**	−0.400**	−0.411**	−0.438**	−0.410**	−0.379**	−0.439**	−0.459**	−0.473**	−0.452**	−0.420**
	(0.067)	(0.067)	(0.068)	(0.067)	(0.066)	(0.151)	(0.148)	(0.147)	(0.148)	(0.153)	(0.143)	(0.142)	(0.141)	(0.142)	(0.144)
Financial freedom	0.115*	0.099	0.105	0.094	0.094	0.301**	0.270**	0.294**	0.263**	0.263**	0.280**	0.260**	0.269**	0.247**	0.248**
	(0.060)	(0.063)	(0.064)	(0.063)	(0.059)	(0.120)	(0.116)	(0.119)	(0.115)	(0.112)	(0.107)	(0.105)	(0.109)	(0.104)	(0.101)
Constant	−0.404	−0.499	−0.470	−0.478	−0.373	−0.497	−0.645	−0.619	−0.606	−0.453	−0.928	−1.037	−1.043	−1.031	−0.907
	(0.340)	(0.358)	(0.358)	(0.359)	(0.355)	(0.646)	(0.655)	(0.653)	(0.650)	(0.649)	(0.699)	(0.721)	(0.720)	(0.719)	(0.711)
F-stat	7.12***	7.26***	7.13***	7.73***	7.98***	6.14***	6.02***	6.05***	6.07***	5.92***	4.99***	4.93***	4.90***	5.35***	4.88***
No. of obs.	1007					949					917				
No. of countries	65					65					65				
R^2(within)	0.141	0.132	0.136	0.133	0.142	0.210	0.202	0.211	0.203	0.208	0.208	0.200	0.206	0.201	0.205
Corr (μ_i, X)	−0.844	−0.833	−0.827	−0.835	−0.848	−0.844	−0.836	−0.837	−0.838	−0.841	−0.877	−0.880	−0.877	−0.879	−0.876

Panel C: fixed-effects regressions for financial cooperatives regulations

Dependent variable	FC regulation			Dual regulation			Bank regulation			NBFI regulation			Cooperative regulation		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Log penetration	0.100*			0.022			−0.017			0.009			−0.115**		
rate *(t-1)*	(0.053)			(0.019)			(0.019)			(0.008)			(0.051)		
Log deposits per		0.062			0.020			−0.031			0.005			−0.054*	
GDP *(t-1)*		(0.040)			(0.017)			(0.028)			(0.006)			(0.029)	
Log assets per			0.059			0.014			−0.025			0.006			−0.054
GDP *(t-1)*			(0.041)			(0.017)			(0.024)			(0.006)			(0.033)
Credit to private	0.060	0.060	0.095	0.127	0.131	0.127	−0.131	−0.113	−0.122	−0.042	−0.040	−0.039	−0.014	−0.038	−0.060
sector *(t-1)*	(0.133)	(0.136)	(0.130)	(0.088)	(0.083)	(0.076)	(0.107)	(0.111)	(0.111)	(0.036)	(0.035)	(0.035)	(0.108)	(0.109)	(0.111)
GDP per capita	0.666**	0.679**	0.651**	−0.231	−0.209	−0.213	−0.071	−0.033	−0.044	0.164	0.177	0.172	−0.529**	−0.613**	−0.566**
(t-1)	(0.280)	(0.292)	(0.283)	(0.197)	(0.215)	(0.213)	(0.058)	(0.052)	(0.053)	(0.160)	(0.157)	(0.161)	(0.247)	(0.246)	(0.241)
Property rights	−0.144	−0.119	−0.111	−0.078	−0.107	−0.132	−0.057	−0.079	−0.065	−0.033	−0.038	−0.050	0.312	0.343*	0.358*
(t-1)	(0.203)	(0.197)	(0.205)	(0.136)	(0.118)	(0.129)	(0.041)	(0.064)	(0.055)	(0.037)	(0.046)	(0.052)	(0.196)	(0.198)	(0.200)
Financial freedom	−0.132	−0.110	−0.188	0.131	0.117	0.187	0.030	0.046	0.030	0.107	0.111	0.112	−0.136	−0.163	−0.142
(t-1)	(0.206)	(0.206)	(0.193)	(0.139)	(0.135)	(0.121)	(0.023)	(0.041)	(0.032)	(0.147)	(0.161)	(0.166)	(0.215)	(0.222)	(0.232)
Constant	−1.409	−1.459	−1.363	0.785	0.748	0.727	0.264	0.080	0.141	−0.475	−0.514	−0.493	1.835**	2.145***	1.988**
	(0.912)	(0.946)	(0.926)	(0.576)	(0.666)	(0.663)	(0.206)	(0.210)	(0.205)	(0.489)	(0.471)	(0.483)	(0.820)	(0.799)	(0.782)
F-stat	3.40***	2.99**	2.93**	0.85	0.76	0.90	0.82	0.67	0.66	0.70	0.66	0.67	3.14**	2.88**	2.78**
No. of obs.	1007	972	943	1007	972	943	1007	972	943	1007	972	943	1007	972	943
No. of countries	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
R^2(within)	0.122	0.111	0.108	0.023	0.028	0.029	0.055	0.073	0.063	0.018	0.019	0.019	0.150	0.136	0.127
Corr (μ_i, X)	−0.549	−0.542	−0.511	−0.406	−0.379	−0.392	−0.759	−0.649	−0.676	−0.466	−0.477	−0.471	−0.458	−0.509	−0.474

*, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively, while no asterisk means the coefficient is not statistically significantly different from zero. Standard errors in parentheses.

4.2. Financial cooperatives supervisory authority

Table 5 presents regression results exploring the correlation between FCs development - measured by the indicators discussed earlier- and the responsible supervisory authority, or the supervision model adopted in case of auxiliary and duel supervision. In these regressions, each of the three FCs' indicators were regressed on dummy variables representing the supervisory approach adopted, which are divided into: non-bank financial supervisory authority; dual supervision regime; banking supervisory authority; auxiliary supervision; and cooperative society's supervisory authority, in addition to the same set of control variables. There is no separate dummy variable for a specialised FCs supervisory authority, because only Kenya and South Africa had special authorities that supervise only FCs[5]. Nevertheless, I found no statistical significant correlation between FCs' indicators and a dummy variable constructed for the specialised supervision adopted in Kenya and South Africa (not included in the reported results).

Columns (1), (6) and (11) in panels A and B demonstrate how FCs supervised by non-bank financial institutions (NBFI) supervisory authorities tend to have higher penetration rates with statistical significant positive correlation at the 5 per cent, and is positively correlated with high deposits and assets per GDP statistically significant at 10 per cent. Panel B suggest that FCs supervised by NBFI supervisor are more likely to have positive changes in the size and outreach of the sector. These correlations between the changes in the three FCs' indicators and non-bank financial supervision are strongly significant at the 1 per cent level. Whereas, the rest of the regression results do not suggest any statistical significant correlations between indicators of FCs and other supervisory approaches, namely dual supervision regime; banking supervisory authority, auxiliary supervision; and cooperative society's supervisory authority. The exception is a negative correlation between penetration rate and the dummy variable of cooperative societies' supervision at the 5 per cent level. Similar result is obtained from panel B, suggesting negative correlation between the change in penetration rate and cooperative societies' supervision. These results are in line with argument that authorities responsible for the promotion and regulation of general cooperative societies may lack the required capacity to conduct sufficient prudential supervision over financial intermediary institutions, thus may hinder the development of FCs (Adams, 1999: 44; Poyo, 2000; Cuevas and Fischer, 2006: 32; BCBS, 2015a: 20). In addition,

[5] In Kenya by the SACCO Societies Regulatory Authority since 2008 and South Africa by the Co-operative Banks Development Agency CBDA since 2007.

column (13) in panel B shows a negative correlation between the change in FCs' assets per GDP and banking supervision, significant at the 10 percent level. Although the coefficients are not trivial and seem consistent with the results of table 4, that show negative correlation between FCs' indicators and banking regulation, however, I find it difficult to draw a solid conclusion from this result remotely from other results that does not show any correlation between banking supervision and FCs.

Moreover, the findings here do not provide insightful evidence to examine Cuevas and Fischer (2006: 31-32) argument in favour for dual supervision. Cuevas and Fischer explained how dual supervision puts the few big FCs who hold a significant number of members and assets under the well-developed supervision of banking authorities at lower cost, which can be adequate for a transition phase until establishing a unified supervisory framework to govern the whole sector. As noted before, effective monitoring and inspection over FCs is very challenging and expensive, as in many countries, there are hundreds or thousands of geographically remote and small FCs. Again, I found no evidence that auxiliary supervision (indirect supervision) is associated with higher degree of development in the sector, and the results do not support or contradict the promising perception that auxiliary supervision can overcome these challenges associated with supervising FCs as suggested by Cuevas and Fischer (2006), BCBS (2015a), and (2015b).

Table 5. Fixed-effects regression results for financial cooperatives indicators and supervision

Panel A: fixed-effects regressions for financial cooperatives indicators against supervision															
Dependent variable	Log penetration rate					Log deposit per GDP					Log assets per GDP				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
NBFI supervision	0.360**					0.328*					0.304*				
	(0.161)					(0.183)					(0.161)				
Dual supervision		−0.016					−0.099					−0.115			
		(0.132)					(0.181)					(0.159)			
Bank supervision			−0.026					−0.040					−0.074		
			(0.131)					(0.240)					(0.186)		
Auxiliary supervision				−0.079					0.042					−0.089	
				(0.175)					(0.309)					(0.250)	
Cooperative societies supervision					−0.226**					−0.201					−0.114
					(0.139)					(0.151)					(0.143)
GDP per capita	1.360***	1.434***	1.441***	1.426***	1.326***	1.455***	1.522***	1.522***	1.514***	1.414***	1.573***	1.647***	1.652***	1.631***	1.591***
	(0.434)	(0.430)	(0.427)	(0.429)	(0.435)	(0.515)	(0.519)	(0.518)	(0.518)	(0.520)	(0.498)	(0.501)	(0.500)	(0.499)	(0.508)
Credit to private sector	0.643***	0.715***	0.715***	0.702***	0.704***	0.765***	0.833***	0.831***	0.838***	0.822***	0.651***	0.717***	0.714***	0.698***	0.708***
	(0.191)	(0.219)	(0.219)	(0.210)	(0.216)	(0.245)	(0.261)	(0.262)	(0.264)	(0.264)	(0.228)	(0.251)	(0.252)	(0.244)	(0.251)
Financial freedom	0.673**	0.669**	0.675**	0.660**	0.635**	1.245***	1.248***	1.256***	1.251***	1.213***	1.059***	1.054***	1.065***	1.040***	1.038***
	(0.255)	(0.257)	(0.258)	(0.257)	(0.256)	(0.268)	(0.270)	(0.272)	(0.270)	(0.267)	(0.269)	(0.270)	(0.270)	(0.270)	(0.266)
Property rights	−1.286**	−1.431**	−1.427**	−1.433**	−1.327**	−1.659**	−1.779**	−1.760**	−1.763**	−1.681**	−1.590**	−1.739**	−1.713**	−1.727**	−1.674**
	(0.266)	(0.295)	(0.294)	(0.296)	(0.278)	(0.355)	(0.367)	(0.368)	(0.369)	(0.365)	(0.294)	(0.315)	(0.319)	(0.318)	(0.300)
Constant	−5.884**	−6.026**	−6.047**	−5.983**	−5.625**	−7.486**	−7.608**	−7.628**	−7.614**	−7.230**	−7.610**	−7.734**	−7.771**	−7.683**	−7.552**
	(1.372)	(1.366)	(1.358)	(1.369)	(1.402)	(1.603)	(1.618)	(1.620)	(1.630)	(1.640)	(1.551)	(1.567)	(1.569)	(1.571)	(1.603)
F-stat	15.57***	13.82***	14.24***	14.08***	14.00***	16.31***	16.17***	15.87***	15.87***	15.45***	17.27***	16.77***	16.30***	16.72***	16.56***
No. of obs.	1108					1065					1035				
No. of countries	65					65					65				
R^2(within)	0.381	0.355	0.355	0.356	0.368	0.315	0.304	0.304	0.304	0.310	0.335	0.323	0.322	0.322	0.324
Corr (μ_i, X)	−0.669	−0.714	−0.714	−0.707	−0.693	−0.667	−0.704	−0.700	−0.702	−0.682	−0.691	−0.725	−0.721	−0.716	−0.713

Panel B: fixed-effects regressions for change in financial cooperatives indicators against supervision

	Change in log penetration rate					Change in log deposit per GDP					Change in log assets per GDP				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Log penetration rate *(t-1)*	−0.164**	−0.156**	−0.156**	−0.156**	−0.162**										
	(0.030)	(0.029)	(0.029)	(0.030)	(0.029)										
Log deposits per GDP *(t-1)*						−0.269**	−0.262**	−0.263**	−0.262**	−0.264**					
						(0.049)	(0.049)	(0.048)	(0.049)	(0.049)					
Log assets per GDP *(t-1)*											−0.280**	−0.273**	−0.274**	−0.271**	−0.273**
											(0.059)	(0.059)	(0.058)	(0.059)	(0.059)
NBFI supervision *(t-1)*	0.068**					0.142***					0.132***				
	(0.030)					(0.053)					(0.044)				
Dual supervision *(t-1)*		0.024					0.022					−0.027			
		(0.042)					(0.055)					(0.057)			
Bank supervision *(t-1)*			−0.006					−0.120					−0.133*		
			(0.038)					(0.079)					(0.071)		
Auxiliary supervision *(t-1)*				0.015					0.066					0.053	
				(0.047)					(0.096)					(0.090)	
Cooperative societies supervision *(t-1)*					−0.067**					−0.062					−0.053
					(0.025)					(0.042)					(0.042)
Credit to private sector	−0.017	−0.010	−0.010	−0.008	−0.009	0.197**	0.217***	0.219***	0.228***	0.215***	0.188**	0.209**	0.211**	0.216**	0.204**
	(0.045)	(0.044)	(0.045)	(0.045)	(0.043)	(0.081)	(0.079)	(0.079)	(0.079)	(0.078)	(0.088)	(0.090)	(0.090)	(0.091)	(0.088)
GDP per capita	0.101	0.104	0.108	0.107	0.081	−0.034	−0.019	0.008	−0.012	−0.041	0.113	0.134	0.150	0.133	0.111
	(0.105)	(0.105)	(0.105)	(0.104)	(0.103)	(0.174)	(0.178)	(0.169)	(0.176)	(0.177)	(0.190)	(0.196)	(0.192)	(0.193)	(0.195)
Property rights	−0.209**	−0.218**	−0.220**	−0.219**	−0.204**	−0.390**	−0.409**	−0.397**	−0.408**	−0.396**	−0.420**	−0.460**	−0.435**	−0.451**	−0.437**
	(0.068)	(0.067)	(0.068)	(0.068)	(0.066)	(0.147)	(0.151)	(0.148)	(0.149)	(0.151)	(0.140)	(0.143)	(0.142)	(0.142)	(0.143)
Financial freedom	0.102	0.099	0.101	0.101	0.095	0.274**	0.271**	0.297**	0.279**	0.265**	0.262**	0.256**	0.280**	0.261**	0.252**
	(0.064)	(0.064)	(0.064)	(0.063)	(0.063)	(0.114)	(0.116)	(0.111)	(0.115)	(0.116)	(0.105)	(0.106)	(0.105)	(0.104)	(0.105)
Constant	−0.502	−0.491	−0.500	−0.502	−0.403	−0.620	−0.631	−0.714	−0.668	−0.541	−1.054	−1.067	−1.123	−1.080	−0.986
	(0.359)	(0.359)	(0.361)	(0.360)	(0.353)	(0.639)	(0.650)	(0.617)	(0.647)	(0.650)	(0.705)	(0.723)	(0.708)	(0.713)	(0.722)
F-stat	7.70***	7.78***	7.37***	7.33***	8.45***	7.01***	6.02***	7.48***	6.21***	6.02***	5.95***	4.88***	6.58***	5.04***	5.04***
No. of obs.	1007					949					917				
No. of countries	65					65					65				
R^2(within)	0.138	0.132	0.132	0.132	0.139	0.210	0.202	0.208	0.204	0.204	0.209	0.200	0.207	0.201	0.201
Corr (μ_i, X)	−0.833	−0.827	−0.832	−0.836	−0.842	−0.840	−0.833	−0.827	−0.838	−0.836	−0.875	−0.882	−0.875	−0.881	−0.876

Panel C: fixed-effects regressions for financial cooperatives supervision

Dependent variable	NBFI supervision			Dual supervision			Bank supervision			Auxiliary supervision			Cooperative supervision		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Log penetration	0.082*			0.000			−0.010			−0.019			−0.053		
rate *(t-1)*	(0.048)			(0.018)			(0.025)			(0.038)			(0.042)		
Log deposits per		0.039			−0.007			0.002			0.000			−0.034	
GDP *(t-1)*		(0.027)			(0.011)			(0.035)			(0.036)			(0.026)	
Log assets per			0.048			−0.010			0.005			−0.020			−0.022
GDP *(t-1)*			(0.034)			(0.013)			(0.030)			(0.037)			(0.028)
Credit to private	0.121	0.144	0.153	0.010	0.017	0.018	0.043	0.027	0.030	−0.178*	−0.192*	−0.192	0.004	0.004	−0.009
sector *(t-1)*	(0.088)	(0.094)	(0.099)	(0.041)	(0.043)	(0.042)	(0.074)	(0.072)	(0.072)	(0.097)	(0.101)	(0.100)	(0.082)	(0.086)	(0.087)
GDP per capita	0.127	0.160	0.169	0.081	0.120	0.105	0.245	0.226	0.156	−0.066	−0.077	−0.045	−0.387	−0.428*	−0.385*
(t-1)	(0.176)	(0.163)	(0.171)	(0.087)	(0.091)	(0.098)	(0.187)	(0.173)	(0.161)	(0.120)	(0.113)	(0.108)	(0.241)	(0.229)	(0.229)
Property rights	−0.206	−0.197	−0.274*	−0.082	−0.129	−0.113	−0.027	−0.003	0.064	−0.007	0.022	0.004	0.321	0.307	0.319
(t-1)	(0.148)	(0.131)	(0.161)	(0.095)	(0.085)	(0.101)	(0.124)	(0.138)	(0.123)	(0.069)	(0.080)	(0.079)	(0.192)	(0.190)	(0.200)
Financial freedom	−0.099	−0.089	−0.114	0.028	0.026	0.046	0.244**	0.246**	0.205*	−0.096*	−0.101*	−0.095*	−0.078	−0.083	−0.043
(t-1)	(0.094)	(0.093)	(0.102)	(0.026)	(0.026)	(0.032)	(0.115)	(0.120)	(0.110)	(0.048)	(0.056)	(0.052)	(0.139)	(0.139)	(0.135)
Constant	−0.035	−0.177	−0.144	−0.078	−0.204	−0.176	−0.731	−0.655	−0.442	0.441	0.502	0.360	1.403*	1.534**	1.402*
	(0.568)	(0.508)	(0.541)	(0.265)	(0.291)	(0.313)	(0.640)	(0.586)	(0.547)	(0.383)	(0.353)	(0.328)	(0.805)	(0.750)	(0.755)
F-stat	1.68	1.45	1.61	0.69	0.69	0.76	1.10	1.11	0.92	1.10	1.11	1.10	2.19*	2.09*	2.02*
No. of obs.	1007	972	943	1007	972	943	1007	972	943	1007	972	943	1007	972	943
No. of countries	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
R^2(within)	0.090	0.072	0.089	0.009	0.017	0.011	0.034	0.034	0.026	0.039	0.037	0.042	0.091	0.088	0.075
Corr (μ_i, X)	−0.302°	−0.424	−0.403	−0.019	−0.109	−0.116	−0.340	−0.321	−0.256	−0.232	−0.258	−0.147	−0.274°	−0.315	−0.276°

*, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively, while no asterisk means the coefficient is not statistically significantly different from zero. Standard errors in parentheses. ° Represents p-value above 5% of Hausman-test suggesting that random-effects estimations are more consistent (see table A.2).

Panel C in table 5 suggests that countries that adopt auxiliary supervision to supervise FCs tend to have low levels of financial freedom and financial sector development, as shown in columns (10), (11) and (12), with a negative correlation between domestic credit to private sector and financial freedom with auxiliary supervision, statistically significant at 10 per cent. Whereas columns, (7), (8) and (9) suggest that, the banking supervisory authority is responsible for the FC sector in countries that have high levels of financial freedom. However, the consistency of these conclusions should be questioned in light of the statistical insignificance of the whole regression under estimation. Anyhow, it is clear that the classification of supervisory approaches analysed in this section does not provide sufficient information on the quality and the capacity of the bank, dual and auxiliary supervisory approaches. Monitoring the operations of FCs might be handled differently with specialised department or staff even if they fall under the supervision of a banking supervisory authority or an auxiliary supervision. In that case, the supervisor may allocate the required resources, tools, warning systems and corrective actions, which can be appropriate for effective monitoring of financial institutions with cooperative structure. While in other cases, the bank supervisory authority may apply an inadequate approach for monitoring FCs, or may lack the necessary resources and expertise. Thus, the same dummy variables that represent banking supervisor or auxiliary supervision may include different monitoring and supervision mechanisms.

4.3. Deposit insurance schemes for financial cooperatives

Table 6 shows the correlations between financial cooperatives' indicators and a dummy variable that takes the value 1 if the financial cooperative sector is covered by a deposit insurance scheme, and the value 0 if not, using the same set of control variables. Columns (1), (2) and (3) in panel A show positive correlations between financial cooperatives' penetration rate, deposits and assets per GDP on one hand, and the presence of a deposit insurance scheme on the other hand. The correlation is statistically significant at the 1 per cent levels for penetration rate and deposits per GDP respectively, and statistically significant at the 5 per cent level for assets per GDP. Panel B also suggests that deposit insurance schemes encourages the growth of financial cooperatives, with positive correlation between deposit insurance and the change in FCs' indicators, significant at the 1 per cent level. These results are consistent with Esty (1997: 26) who argued that mutual-owned financial institutions are less likely to adopt high-risk financial strategies, because the incentive to adopt high-risk behaviour is

determined mainly by whether the residual and fixed claims are separable or not. Claims are not separable in the case of mutual organisations, like cooperatives, so the total wealth of members is unaffected by the increase of the institution's risk behaviour, as the residual claim's possible gains is balanced by the possible losses on the fixed claim. That is why cooperatives are less likely to adopt risk-taking behaviour in the first place, even in the presence of deposit insurance systems, taking into account of course that the indicators tested here do not measure the risk-taking behaviour or the financial performance of financial cooperatives. These results however provide preliminary evidence that the introduction of deposit insurance may lead the financial cooperative sector to grow, because of increasing confidence in the sector, which helps in attracting new depositors (members), or encourage existing members to invest more in their cooperative. Karels and McClatchey (1999) found no evidence that credit unions' risk-taking behaviour in the United States had increased after the adoption of deposit insurance scheme, during the period 1971-1990. Their results showed that liquidity and asset quality improved, suggesting a decrease in risk–taking behaviour during the post deposit insurance period. However, Karels and McClatchey (1999: 132) suggested that not only the ownership structure that limits risk-taking behaviour is the reason for credit unions' stability, but also the strong regulatory environment adopted in the 1970s that had restricted credit unions' investment strategies. As regulations at that time imposed limitations on the maximum loan size that can be offered by credit unions, and the maximum maturity for secured and unsecured loans. Similarly, Hannafin and McKillop (2007) found no evidence of risk shifting behaviour in the performance of Irish credit unions after to the introduction of a deposit insurance scheme in 1989.

However, again a causal relation between deposit insurance and FCs' size and outreach is difficult to demonstrate here. Panel C shows that countries with deposit insurance schemes tend to have high penetration rate, deposit and assets per GDP in the previous year, and they have higher GDP per capita than their counterparts. These results are in line with the categorisation of financial cooperative evolutionary stages proposed by Ferguson and McKillop (2000). According to Ferguson and McKillop, the global financial cooperative movement can be divided into mature, transitional and nascent industries, whereas the establishment of deposit insurance mechanism is one of the key attributes of mature financial cooperative sectors alongside with large asset base.

Table 6. Fixed-effects regression results for financial cooperatives indicators and deposit insurance

Panel A: fixed-effects regressions for financial cooperatives indicators against deposit insurance

Dependent variable	Log penetration rate	Log deposit per GDP	Log assets per GDP
	(1)	(2)	(3)
Deposit insurance	0.293^{***}	0.335^{***}	0.250^{**}
	(0.096)	(0.116)	(0.112)
GDP per capita	1.172^{***}	1.207^{***}	1.435^{***}
	(0.397)	(0.508)	(0.494)
Credit to private sector	0.669^{***}	0.779^{***}	0.666^{**}
	(0.213)	(0.271)	(0.252)
Financial freedom	0.626^{***}	1.207^{***}	1.016^{***}
	(0.222)	(0.270)	(0.252)
Property rights	-1.395^{***}	-1.725^{***}	-1.700^{***}
	(0.276)	(0.366)	(0.309)
Constant	-5.255^{***}	-6.703^{***}	-7.132^{***}
	(1.257)	(1.584)	(1.543)
F-stat	16.48^{***}	18.34^{***}	17.14^{***}
No. of obs.	1108	1065	1035
No. of countries	65	65	65
R^2 (within)	0.387	0.329	0.337
Corr (μ_i, X)	-0.653	-0.634	-0.680

Panel B: fixed-effects regressions for change in financial cooperatives indicators against deposit insurance

Dependent variable	Change in log penetration rate	Change in log deposit per GDP	Change in log assets per GDP
	(1)	(2)	(3)
Log penetration rate *(t-1)*	-0.159^{***}		
	(0.031)		
Log deposits per GDP *(t-1)*		-0.268^{***}	
		(0.049)	
Log assets per GDP *(t-1)*			-0.276^{***}
			(0.058)
Deposit insurance *(t-1)*	0.018	0.072^{***}	0.055^{*}
	(0.022)	(0.027)	(0.030)
Credit to private sector	-0.011	0.211^{***}	0.198^{**}
	(0.044)	(0.079)	(0.089)
GDP per capita	0.095	-0.068	0.096
	(0.101)	(0.179)	(0.192)
Property rights	-0.222^{***}	-0.414^{***}	-0.454^{***}
	(0.067)	(0.149)	(0.142)
Financial freedom	0.099	0.274^{**}	0.252^{**}
	(0.063)	(0.114)	(0.104)
Constant	-0.465	-0.504	-0.968
	(0.349)	(0.645)	(0.706)
F-stat	7.43^{***}	6.25^{***}	5.04^{***}
No. of obs.	1007	949	917
No. of countries	65	65	65
R^2 (within)	0.132	0.206	0.202
Corr (μ_i, X)	-0.834	-0.837	-0.875

Panel C: fixed-effects regressions for financial cooperatives deposit insurance			
Dependent variable	Deposit insurance	Deposit insurance	Deposit insurance
	(1)	(2)	(3)
Log penetration rate *(t-1)*	0.165^{***}		
	(0.046)		
Log deposits per GDP *(t-1)*		0.095^{***}	
		(0.035)	
Log assets per GDP *(t-1)*			0.095^{**}
			(0.041)
Credit to private sector *(t-1)*	0.013	0.045	0.067
	(0.128)	(0.129)	(0.123)
GDP per capita *(t-1)*	0.587^{**}	0.686^{**}	0.618^{**}
	(0.274)	(0.310)	(0.302)
Property rights *(t-1)*	0.078	0.017	0.056
	(0.157)	(0.157)	(0.152)
Financial freedom *(t-1)*	0.011	−0.009	−0.003
	(0.214)	(0.238)	(0.242)
Constant	−1.359	−1.647	−1.477
	(0.839)	(0.979)	(0.964)
F-stat	4.57^{***}	3.85^{***}	3.42^{***}
No. of obs.	1007	972	943
No. of countries	65	65	65
R^2 (within)	0.135	0.120	0.106
Corr (μ_i, X)	−0.505	−0.532	-0.471°

*, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively, while no asterisk means the coefficient is not statistically significantly different from zero. Standard errors in parentheses. ° Represents p-value above 5% of Hausman-test suggesting that random-effects estimations are more consistent (see table A6.3).

As for the control variables, panels A in tables 4, 5 and 6 show statistically significant positive correlation between FCs' penetration rate, deposits per GDP, and assets per GDP on one hand and GDP per capita, domestic credit provided by banks, financial freedom on the other hand. Moreover, there is statistically significant negative correlation between the development of FCs and property rights index. These results are similar to the ones reported in Khafagy (2017). The positive correlation between FCs development indicators and GDP per capita is also consistent with Périlleux et al. (2016) showing that the level of economic development matters for the development of FCs. It is also in line with results of panel C in table 4 (discussed above); which suggest that a specialised FC regulation is associated with high GDP per capita while cooperative societies' regulations are adopted in countries with lower GDP per capita. Contrary to Périlleux et al. (2016), the results here show a statistically significant positive correlation between financial sector development (measured by domestic credit provided by banks) and FCs indicators. These findings are further supported by the results of panel B in tables 4 to 6, which show a statistically significant positive correlation between the growth of FCs' deposits and assets per GDP and domestic credit

provided to private sector. Furthermore, the positive correlation between financial freedom index and FCs indicators suggests that the development of the FC sector requires sound financial policies and regulations, and less intervention by the state in the operations of financial institutions or the allocation of credit in the financial sector. Finally, panels A and B show a statistically negative correlation between property rights index and FCs' growth. Khafagy (2017: 490) argued that the negative correlation between FCs' indicators and protection of property rights is reasonable because strict property rights laws aim to protect those who already have 'formal' assets, and limit the economic activities of the informal sector, where FCs' members are usually involved.

5. Conclusion

This essay examines the relationship between the development of financial cooperatives and the type of regulation that governs the sector, the supervisory agency responsible to monitor their activities, and the existence of a deposit insurance scheme, using panel data collected for sixty-five developing countries. Although causality is difficult to establish using only statistical methods, the results of this essay cautiously provide new empirical evidence to understand what is best suitable for the development of FCs. The main results can be summarized as follows.

First, high indicators of FCs and the growth of the sector are positively correlated with specialized regulations, giving support for opinions preferring that members-owned financial institutions should be regulated by specialised legislations. That can be considered the central conclusion in the analysis; a specialised regulation for FCs is more likely to support the growth of the sector, because FCs have different economic objectives, ownership structure and face different risks and challenges, such as access to liquidity facilities, net-savers against net-borrowers agency problems, low compensation for managers… etc. All of which require different regulatory approach compared to traditional investor-owned financial institutions and other types of cooperative organisations. Second, there are serious concerns over the viability of applying commercial bank regulations to FCs in developing countries, as the findings indicate that commercial bank regulation is negatively associated with FCs' deposits and assets per GDP. Commercial bank regulations may ignore the distinctive nature of FCs, especially its capital and governance structures, and may impose excessive regulatory burdens that are unreasonable for the non-complex activities of financial cooperatives. For instance, high capital adequacy requirements may restrain financial

cooperatives' growth rate compared to other investor-owned financial institutions, because equity is the amount of capital solely owned by the cooperative and which cannot be claimed by members or by external parties. For that, accumulated reserves are usually considered the main resource for cooperatives' equity, and shares held by the members are not treated as part of the equity in many cases. Compared to traditional banks, lower minimum initial capital requirements for FCs can be adequate giving the simplicity of their activities and their risk exposure.

Third, general cooperative societies' regulations are negatively correlated with penetration rate and deposits and assets per GDP. Such results are consistent with the view that a unified regulation that regulates the operation of all cooperative organisations is usually inadequate for financial intermediation activities. A unified cooperative regulation may not have sound measurements for protecting the members' deposits, or may not stress on creating a minimum capital base that enable cooperatives to mitigate unexpected losses. FCs also should apply prudential-financial standards and supervision, as well as facilitating access to liquidity mechanisms, money transfer, payment channels, settlement and clearing networks, all of which may be ignored in a general cooperative societies' regulation. Fourth, supervision by authorities responsible for supervising non-bank financial institutions is positively associated with high FCs' indicators. The results, however, do not support or contradict the arguments in favour for auxiliary supervision, as a promising approach to overcome challenges associated with supervising FCs, as we found no evidence that auxiliary supervision is associated with higher degree of development in the sector.

Fifth, the baseline regression analysis indicated a negative correlation between FCs' outreach and supervision under a general cooperative societies' supervisor, and no statistical correlation with the FCs' deposits and assets per GDP. However, it is important to keep in mind that authorities responsible for the supervision of general cooperative societies, in most developing countries, lack the required capacity to conduct sufficient prudential supervision over financial intermediary institutions that negatively affect the development of the sector. Finally, deposit insurance schemes are positively correlated with FCs development, providing cautious evidence that the introduction of deposit insurance may encourage the growth of FCs, by building confidence in the sector and attract new depositors (members) or encourage existing members to invest more in their cooperative. Noting that our calculations do not capture the risk-taking behaviour or the financial performance of FCs, so we cannot

demonstrate whether deposit insurance schemes threaten the stability of the sector or not.

Financial cooperatives are not only significant for financial inclusion and economic growth, but their unique organisational structure could enable them to stimulate inclusive economic development by redistributing economic resources and opportunities in their economies. Because of that, financial cooperatives regulations must be flexible and responsive to the distinctive function of cooperatives and the complexity of the overall financial sector, in order to guarantee the stability of the sector and protect the interests of the members. Thus, a specialised legal framework seems to be the most suitable approach to regulate and supervise the sector.

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