Social capital, costs of transaction and co-ordination mode: econometrics tests on data of trader of food products in Benin.

by

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Summary. In this paper we analyze the causality between choice of co-ordination mode, accumulation of the social capital and profitability of the activity of marketing of the food products in Benin. In particular, we try to understand if adhesion to an association makes it possible for the trader to increase his profitability by reducing its transaction costs. Our statistical tests confirm the idea of efficiency of association as a co-ordination mode. Indeed, joining an association increases profitability. Moreover, the more social capital (networks) a trader have accumulated, the higher chance he has to be member of an association. But the estimate of the structural parameters lead us to relativize the role of the social capital.

Key words. C35 - Discrete regression and Qualitative Choice Models, D23 - Organizational Behavior; Transaction Costs; Property Rights, L14 - Transactional Relationships; Contracts and Reputation, P32 - Collectives; Communes; Agricultural Institutions, Z13 - Social Norms and Social Capital.

Introduction. Since the beginning of the Eighties, Sahelian countries are engaged in a process of liberalization of their economies. But the withdrawal of the State did not constitute a sufficient condition for a market of agricultural products to emerge. This is explained by the fact that the contractual relation of market cannot be established without a stable and respected legal framework. This failure of co-ordination by the market leads to the alternative modes of co-ordination defined by the trader. For this reason, the " private institutions " (North [1990], Brousseau and Fares [2000]) which appeared in the sector of the food products in Benin seem to have particular interests. These institutions, associations of trader, allow to pool a number of services, like the access to information, harmonization of prices, access to credit (system of "tontine") and solving of conflicts; services which make it possible to reduce the costs of transactions related to the activity of marketing.

This paper aims at analyzing the causality between choice of co-ordination, accumulation of the social capital and profitability of the activity of marketing. This work gives a precise evaluation of the role of social capital (cf. Fafchamps-Minten [1999, 2000, 2001], Gabre-Madhin and *alii* [2001]). We suppose that the trader has two ways to accumulate social capital: the development of the idiosyncratic capital, or membership of an association, which enables him to increase his network of relationship, to benefit from the reputation of a group (association), etc. Also we try to analyze if the choice of adhesion to an association makes it possible for the trader to increase his profitability by reducing its costs of transaction. Our findings show that the effect of social capital is positive but low. Our tests also confirm the idea of an efficiency of association.

This paper is organized in the following way. In section 2, we present the theoretical and empirical frameworks which enable us to explain the simultaneous choice of co-ordination mode

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and profitability level. Section 3 presents the data base, the variables used to carry out the tests and the discussion of our results.

2) The theoretical framework and empirical model. The idea of our test is to start from the results of the new institutional theory (NIT). We suppose that the trader seeks to minimize his costs of transaction (research of information) and his "traditional" production costs (labor, capital, transport etc..) to improve its Welfare (Williamson [1996], Williamson-Riordan [1985]). With the failure of the State the trader exploits an idiosyncratic social capital (networks) and/or enrols in association to reduce the costs of transaction. We make the assumption that, the higher the level of idiosyncratic social capital of the trader, the higher his the propensity to cooperate. Also we think that the higher the level of idiosyncratic social capital of the trader, the higher attractiveness he offer to an association. According to the NIT, actors seek to increase their welfare by choosing the adequate mode of co-ordination. Therefore, the assumption to test is as follows: does the fact of belonging to an association increases the income of the trader ? We will assume that this increase of income is caused by a reduction of the costs of transaction.

The empirical model tested is a simultaneous equations model with a discrete endogenous variable. This model has two equations (1, 2) : the first makes it possible to explain the profitability of the trader (the added value) y_1 , the second equation represents the desire to integrate an association y_{2*}:

$$\mathbf{y}_{1i} = \mathbf{X}_{1i}\boldsymbol{\alpha}_1 + d_i\,\beta_1 + y_{2i}{}^*\gamma_1 + U_{1i} \qquad\qquad (1) \qquad \text{(profitability)}$$

$$\mathbf{y}_{2i}{}^* = \mathbf{X}_{2i}\boldsymbol{\alpha}_2 + d_i\,\beta_2 + y_{1i}\gamma_2 + U_{2i} \qquad\qquad (2) \qquad \text{(association)}$$

where *d* is an indicator defined as follows:

$$d_i = \begin{cases} 1 & \text{si } y_2{}^* > 0 & \text{trader in association} \\ 0 & & \text{otherwise} \end{cases} \qquad\qquad (3)$$

i is an indices of trader. *X_1* (resp. *X_2*) is the matrix of explanatory variables of the gross margin y_1 (resp. propensity to integrate an association y_2* *which is a latent variable*). α, β and γ are the parameters. $U=(U_1,U_2)$ are the errors terms. Heckman [1978] calls it hybrid model with structural parameters (HMSS, *Hybrid Model with Structural Shift)* (cf. Heckman 1978, Amemiya [1978]). The shift parameters are $\beta=(\beta_1,\ \beta_2)$ that measure the effect of the choice of co-ordination modes on profitability and propensity to be attracted by association. $\gamma=(\gamma_1,\gamma_2)$ measure the effects of the latent variable y_2* *(resp.* the gross margin $y_1)$ on gross margin that is an endogenous variable (resp. the choice of co-ordination modes). To estimate this model, we must proceed by stages and use several types of estimators. After having determined the identifiable parameters[1] (cf. Maddala, Lee, 1976, Maddala, 1983), we propose three methods of estimating of these parameters (cf. tables III, IV): (i) the method of indirect least squares (called *Heckman I* method); (ii) method of direct least squares (called *Heckman II* method); method consisting in estimating the structural forms by the reduced forms (called *Amemiya I* and *Amemiya II* method). The recourse to the method *Heckman II* is justified by the problem of multiplicity of the estimators

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[1] For identification we impose : $\beta_2+\gamma_2\beta_1=0$.

because of over identification of the *Heckman I* method. The *Amemiya II* method makes it possible to complement the *Amemiya I* method by considering structural forms with a structural shift parameter posed at 0. Because a problem of heteroscedasticity arose, we used the correction of White.

3) Data used and results of the tests. The data used are extracted from a investigation that was carried out by the IFPRI and the LARES in Benin and Malawi on traders of agricultural products. By withdrawing the missing data, one obtains 512 observations collected in 1999. We used the following variables to identify the model (cf. table I for more details). The choice of the mode of coordination (to join or not an association) is explained by three categories of variables: socio demographic variables of the trader (gender called *"GENDER"*, age called *"AGE"*), variables of social capital (number of children of more than 15 years old called *"CHILD"*, the number of people known on market called *"CAPITALS"* and in the State administration variable called "STATE", the last activity of the mother called *"MOTH"*, the number of spoken languages called *"LANG"*), and finally the profitability of the activity of marketing y_1.

To estimate the profitability of the activity of marketing, we use a continuous proxy variable: the rate of commercial margin y_1. In order to explain this profitability, we use two types of causal variables : the variable of co-ordination mode, and the variables of production factor (value of equipment *"EQUIP"*, the wages *"WAGE"*, purchase price *"LPRICE"*, indicator variable which indicates if the trader has an activity which relates to maize *"MAIZE"*. We also use variables of geographical localization *"AREAS"* and we classify the areas according to their degree of remoteness (Tassou [1994]): remote or very remote areas (Zou, Atacora), slightly remote areas (Borgou, area of reference) and nearby areas because located close to great urban centres or large frontier markets (Ouémé, Cotonou, the Atlantic, Mono).

Table I Variables of test

Names of the variables	Modalities	Frequencies	Expected signs
Endogenous variables used		
d	*Mode of co-ordination (association)* = 1 if the trader is in association =0	62.4% 37.6%	+ on y_1
y_1	*Profitability* Logarithm of the continuous Variable gross margin	6.54(1.94)	+ on *d*
Explanatory variable of co-ordination's modes		
GENDER	*Gender* of the trader = 1 if woman = 0 otherwise	82.4% 17.6%	-
LANG	*Spoken language* (discrete variable) numbers = 1 if the number of language spoken is higher than two = 0 otherwise	44.1% 55.9%	+
CAPITALS	*Social capital* measured by the number of people known (in regular connection on the market of the goods and the market of the customers (continues variables)	55.20(80.16)	+
STATE	*Number of government officials known* = 1 if the trader knows a civil servant = 0 otherwise	35.2% 64.8%	-
CHILD	*Numbers of children* of more than 15 years old (binary discrete variable) = 1 if the number of children of more than 15 years is higher than 5 = 0 otherwise	14.5% 85.5%	+
MOTH	*Last principal activity* of the mother of the trader = 1 if agriculture (production, transformation, marketing) = 0 Otherwise	78.9% 21.1%	-

(Continuation of table 1)	*Explanatory variables of the gross margin (measured in logarithm)*		
MAIZE	MAIZE (discrete variable) = 1 if the mainly sold production is MAIZE = 0	73.6% 26.4%	+
LPRICE	Purchase price of the products to be sold in logarithm (continuous variable)	2.70(1.57)	
AREA	Geographical localization (variable discrete nominal) = 1 if it is the area of Atacora = 2 if it is the area of the Atlantic = 3 if it is the area of Borgou (situation of reference) = 4 if it is the area from the Mono = 5 if it is the area of Ouémé = 6 if it is the area of Zou = 7 if it is the area or town of Cotonou	17.2% 6.6% 25% 9.8% 10.9% 18.6% 11.9%	- + reference + + + +
EQUIP	Value of the equipment of the trader (continuous variable)	2528.25 (19603.83)	+
WAGE	Wages paid to the employees in logarithm (continuous variable)	0.69(1.71)	+
AGE	The age of the trader (in logarithm) (continuous variable)	3.66(0.26)	+

Source : LARES, IFPRI. Between bracket the standard deviation

We estimate simultaneously the choice of the co-ordination mode (to join or not an association) and the choice of the level of profitability using reduced forms (cf. table II) and of structural forms Cf. table III and IV). To have an idea of the weight of each exogenous variable on the endogenous variables we calculated the marginal effects for each individual of the sample (only the average marginal effect are published in the tables).

Co-ordination mode (cf. tables II and IV in appendix). Trader who are equipped with a higher social capital are more likely to join an association. Also, having a mother having who as worked as trader in the agricultural sector reduces the probability to enrol an association, although the estimate of the parameter associated with this variable is not robust. The knowledge of ten additional people on the market increases the probability of being in association of 1.2%. However, the marginal effect calculated with the structural form is weaker. Indeed, whereas the quasi-elasticity calculated from the reduced form is 3.8%, it is only 0.1% from the structural form. This illustrates the large interest of using structural forms for testing. The reduced forms lead us to over-estimate the role of the social capital. In addition, speaking more than two languages increases the probability of being in association of 0.02, whereas the reduced form over-estimates this marginal effect (the quasi-elasticity calculated from the reduced form is 5%). The estimates also highlight the heterogeneity of the social capital. If the trader has a network in the administration of State, he will not enrol in association. Indeed, the probability of being in association when a person of the administration is known decreases slightly (-0.4%, the marginal effect is statistically different from 0). The marginal effect of profitability y_1 on the probability of joining an association is negative. The quasi-elasticity of the probability of joining an association with regard to profitability is –3.4%. Concerning the impact of the socio demographic variables, the fact of being a man, and the fact of having a large family increases the probability of being in association.

Profitability (cf. tables II and III in appendix). The results of estimate of the structural form of profitability highlight a positive relation between the fact of joining an association and the gross margin of the trader. The production inputs prices also tend to increase the profitability of the

trader. The increase of 1% of the price of the inputs improves of 48% the gross margin (67% in the case of the reduced form). In the same way, the elasticity of the gross margin compared to the value of the equipment is 4%. On the other hand, it is not sure that the wages paid by the trader have an effect on profit. Indeed, the parameter associated with the wages is not statistically different from zero. Also, profitability varies well according to the nature of the transaction. According to our estimates, the trader who has an activity related to corn has on average 153.5 $ (200$, for the reduced form) of additional gross margin. In the same way, our results highlight a strong regional effect. The nearby areas are those where the profitability is higher. Indeed, compared to a trader of the area of reference (Borgou which is slightly remote), a trader of Ouémé, Mono or of the Atlantic (nearby areas) has a respectively more higher gross margin of 2 388.76$, 2 377.56$, and of 1 632.49$.

Conclusion. The major interest of this paper is to make clear the link between profitability and choice of adhesion to an association. The results of our tests show that the probability of membership increases profitability. Thus, it seems that we can show the efficiency of co-ordination by association. The results of our tests bring also some lessons concerning the relation between choice of joining an association and social capital. As we showed, the choice of adhesion is positively (but slightly) related to social capital. It seems that new members are those of traders who have no ties with administration. This raises the question whether the essential function of an association is to be used as an intermediary with the administration and to minimize transaction cost.

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Table II : Estimating a reduced form (co-ordination mode and level of profitability)

Symbolic Name	Probability of choosing an association Parameteres (1)	Estimating profitability Parameteres (1)	The marginal effect & quasi-elasticity Association	Profitability
LANG =1	0.273 (0.159) *	0.421 (0.158) ***	0.050 ***	190.012 ***
MOTH =1	-0.377 (0.182) **	-0.158 (0.201)	-0.082 ***	-61.726 ***
CHILD =1	0.657 (0.253) ***	-0.158 (0.263)	0.112 ***	-104.086 ***
STATE =1	-0.353 (0.171) **	0.269 (0.162) *	-0.070 ***	135.153 ***
CAPITALS	0.004 (0.002) ***	0.003 (0.001) ***	0.038 ***	0.148 ***
GENDER =1	-0.647 (0.225) ***	-0.475 (0.228) **	-0.05 ***	-196.033 ***
MAIZE =1	0.864 (0.156) ***	0.545 (0.227) **	0.151 ***	200.09 ***
LPRICE	0.190 (0.046) ***	0.249 (0.067) ***	0.107 ***	0.673 ***
EQUIP	0.000 (0.000) ***	0.000 (0.000) ***	-0.01 ***	0.025 ***
WAGES	0.106 (0.059) *	0.096 (0.045) **	0.012 ***	0.067 ***
AREAS =1	0.710 (0.273) ***	-0.889 (0.257) ***	0.127 ***	-167.860 ***
AREAS = 2	-1.613 (0.346) ***	0.643 (0.476)	-0.462 ***	246.079 ***
AREAS = 3	Référence	Référence	Référence	Référence
AREAS =4	-1.907 (0.300) ***	0.831 (0.497) *	-0.554 ***	312.121 ***
AREAS =5	-1.076 (0.288) ***	1.422 (0.336) ***	-0.302 ***	795.644 ***
AREAS =6	0.039 (0.222)	0.097 (0.231)	0.008 ***	26.075 ***
AREAS =7	-1.303 (0.268) ***	0.031 (0.365)	-0.340 ***	22.065 ***
AGE	0.577 (0.287) **	0.125 (0.300)	0.127 ***	0.1251392 ***
LRT	272.210			
IR²	0.400			
Estrella	0.430			
AKAIKE	676.390			
SCHWARTZ	404.970			
Number of observations	512.000	512.000		
Number of parameteres	18.000	20.000		
Test of White		198.59 (ddl=180) p-value= 0.1629)		
Correlation Coefficient between errors terms (U$_1$,U$_2$,)		-0.21		
Adjusted IR²		0.949		
Fisher F		13.540		

(1) Standard deviations robust to the heteroscedasticity (correction of White).
(2) a number of people on whom the calculation of the marginal effect was carried out.
* significant at 10%. ** significant at 5%. *** significant at 1%

Tableau III Estimating a structural form of profitability

variables	Heckman I	MCO			Heckman II			Amemiya I			Amemiya II			Marg effect		Freq (1)
INTERCEPT	11.006	3.146	(1.018)	***	5.327	(1.178)	***	0.251	(0.005)	***	4.822	(1.595)	***		***	
MAIZE	1.584	0.668	(0.174)	***	0.078	(0.223)		0.190	(0.004)	***	0.416	(0.291)		129.44	***	0.736
LPRICE	0.724	0.345	(0.052)	***	0.181	(0.066)	***	0.754	(0.015)	***	0.236	(0.079)	***	0.489	***	1.000
EQUIP	0.000	0.000	(0.000)	***	0.000	(0.000)	***	0.000	(0.000)	***	0.000	(0.000)	**	0.042	***	1.000
WAGE	0.278	0.178	(0.041)	***	0.067	(0.047)		0.340	(0.007)	***	0.078	(0.066)		0.046	***	1.000
AREAS =1	-2.585	-0.963	(0.226)	***	-1.159	(0.226)	***	0.054	(0.001)	***	-1.029	(0.311)	***	-1223.92	***	0.172
AREAS =2	1.870	0.588	(0.335)	*	1.665	(0.427)	***	0.025	(0.000)	***	0.807	(0.569)		978.83	***	0.066
AREAS =3		Reference			Reference			Reference			Reference			Reference		
AREAS =4	2.416	0.732	(0.298)	**	2.051	(0.448)	***	0.015	(0.000)	***	0.992	(0.577)	*	990.08		0.098
AREAS = 5	4.135	0.848	(0.275)	***	1.903	(0.355)	***	0.018	(0.000)	***	1.540	(0.476)	***	3408.75	***	0.109
AREAS =6	0.281	0.105	(0.226)		0.139	(0.239)		0.049	(0.001)	***	0.102	(0.274)		162.55	***	0.186
AREAS =7	0.090	0.125	(0.298)		0.953	(0.337)	***	0.035	(0.001)	***	0.198	(0.449)		1181.04	***	0.119
AGE	0.364	0.241	(0.277)		-0.348	(0.307)		0.926	(0.019)	***	0.064	(0.227)		-034	***	1.000
Association=1	1.685	1.323	(0.191)	***	1.718	(0.787)	**	0.190	(0.004)	***				1639.19	***	0.631
Latent Var	0.547				0.508	(0.192)	***	0.339	(0.007)	***	0.567	(0.309)	**	0.28	***	1.000
Adjusted IR²		0.340			0.326											
Test of White		68.59 (ddl= 67)			77.65 (ddl= 82)											

Tableau IV : Estimating a structural form of the choice to enrol an association

	Heckman I	Probit			Heckman II			Amemiya II			Marginal effect		Frequencies (1)
LANG=1	0.794	0.031	(0.125)		0.248	(0.055)	***	0.454	(0.301)		0.022	***	0.441
MOTH =1	-1.095	-0.358	(0.144)	***	0.013	(0.066)		-0.484	(0.322)		0.001	***	0.789
CHILD =1	1.909	0.754	(0.199)	***	0.305	(0.084)	***	0.664	(0.429)		0.026	***	0.145
STATE =1	-1.026	-0.683	(0.132)	***	-0.054	(0.061)		-0.293	(0.306)		-0.004	***	0.352
CAPITALS	0.012	0.003	(0.001)	***	0.003	(0.000)	***	0.005	(0.002)	**	0.001	***	1.000
GENDER =1	-1.882	-0.345	(0.149)	***	-0.081	(0.074)		-0.909	(0.335)	***	-0.006	***	0.824
Association	5.883				4.671	(0.177)	***				0.929	***	0.631
Profitability	-3.491	0.143	(0.026)	***	-0.418	(0.028)	***	-0.359	(0.065)	***	0.034	***	1.000
LRT		132.730											
Pseudo IR²		24.33%											
Test of White					108.52 ddl=39								

Remarks on tables II and III : In Brackets : the standard deviations robust to heteroscedasticity (correction of White). (1) Number of people on whom the calculation of the marginal effect was carried out. * Significant at 10%, ** significant at 5%, *** significant at 1%.