

# Ownership Structure and Agri-Food Innovation

## Empirical Hypotheses from Algerian Manufacturing Firms

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### Abstract

This study tested a model that attempts to describe the influence of ownership structure on willingness of firms to innovate. We empirically examine the relationship between ownership structure and innovation across firms. Results based on data related to a set of 130 food manufacturing firms advance that the nature of ownership affects the firm's willingness to innovate.

More specifically, the correlation between ownership structure and firms' willingness to innovate is determined ex-ante by the corporate governance system. Results indicate that ownership structure affects the probability that firms introduce product-line innovations. The same findings underline that important and statistically significant differences do exist across the studied firms.

*Keywords: ownership structure, ownership nature, innovation, food sector, Algeria*

### I. INTRODUCTION

The objective of this study is to shed some light on the effects of ownership structure on willingness of firms to innovate exploiting a rich survey of over 130 Algerian food manufacturing firms. The dataset provides thorough information on firm's innovation willingness which is based directly on firm's responses to the survey questions. It also contains precise measures of firm's ownership structure.

After accounting for the possible endogeneity of the ownership structure and scheming for a variety of factors that may also affect innovation, we found that ownership structure affects the probability of product innovations' introduction among firms.

The current research proceeds as follows: section 2 by briefly describing existing theories related to firm ownership

structure and innovativeness invoking the research hypotheses. Section 3 gives a description of the model used in the underlying study, while section 4 shows the empirical results. Section 5 concludes.

### II. LITERATURE REVIEW

Firms' ownership form represents the shares concentration of the owners, which could be expressed by two forms: concentrated or dispersed ownership. However, there is an ambiguity of empirical measures in the economic analysis. Traditionally the degree of capital ownership concentration is considered as the main factor defining the firm's ownership. The relationship between ownership structure and innovation focuses on two approaches developing two contradictory theses [1]; [2]; [3]; [4]. The first approach supports the thesis that, in the context of agency relationship, the concentrated ownership leads to more control which reduces the agency costs associated with innovation. The second approach supports the thesis that dispersed through a multitude of incomplete contracts, reports a variety of means of settling disputes -enforcement- for specific investments such as innovation, due to the diversity of capital owners.

Many contemporary theories invoke a more general conceptual framework of this causality framing two schematic forms called the U-shaped form and the inverted U-shaped form [2]. These forms emphasize that the causality is non-linear. The explanation of the two curves is the basis of the potential control and managers' incentives. The U-shaped forms argued that concentrated ownership has a positive effect on innovation. In other words, the more concentrated ownership is developed, the more the innovation level is higher. This is due to the reduction of agency costs resulting from the exercise of effective control. Besides, gradual dilution of ownership inhibits innovation at a given point. The ownership dispersion should weaken the level of innovation. However, it turns into a profitable position for the benefit of

their managers who provide more freedom of action due to the informational asymmetry and a high degree of decentralization.

In the inverted U-shaped forms, it is argued that concentrated ownership affects negatively innovation because of the bounded rationality of owners and their risk aversion. Gradual dilution of ownership promotes innovation until an optimal point with the expansion of the cognitive map stimulating more flexibility [4]. Beyond that, more dispersion of ownership will cause an exacerbation of conflicts of interest between the different blockholders. From theoretical evidence on agency costs, this implies that the dispersion of firm ownership affects negatively the innovation level by the decentralization's abuse [5]. With a high degree of decentralization, managers pursue their own interests over the interests of shareholders.

This analysis remains very incomplete without incorporating several elements such as the cognitive dimension and few other details about the owner's status. It could also encounter empirical difficulties. In addition, we find several authors who defend the thesis raising from previous analyses with various arguments.

Researchers, such as La Porta *et al.* [6], Agrawal *et al.* [3] and Baysinger *et al.*, showed that the ownership concentration is a guarantee of the shareholders' effective control of managers [4]. In this perspective, LaPorta *et al.* [6] referred to empirical tests, using the percentage of capital held by shareholders as a variable (at least 20% of voting rights). Indeed, the main shareholders' capital (holding a large share) has a certain interest to invest in the management control of the firm and to reduce the risk of managers' discretionary behavior.

Furthermore, Demsetz and Lehn concluded that the structure of corporate ownership varies systematically in ways that are consistent with value maximization [7]. In another perspective, Hill and Snell confirmed the existence of a significant positive relationship between R&D intensity and ownership concentration [8]. These results showed that shareholders are encouraged to control carefully the decisions of managers in order to promote higher performance [9].

Holmström argued that the larger the firm is, the greater the incentive to increase costs in the principal-agent relationship is [5]. More particularly, the costs associated with the innovative activity are so high because of the long-term nature of the risk and innovation. This implies, as mentioned above, that large firms conduct innovation activities meeting more difficulties, because they should manage heterogeneous sets of easy measurable tasks. By the way, the agency theory predicts that the dispersed ownership affects negatively the innovation activity because it allows the managers to pursue their own goals. Indeed, as costs' control exceeds profits, small dispersed shareholders will have no incentives to managerial monitoring [9]; [10]; [11].

**H1.** Ownership concentration affects negatively the willingness of the firm to innovate.

For Fama and Jensen, the main peculiarity of the family business is that family members have many dimensions of exchange with one another over a long horizon. Therefore, they have advantages in monitoring and disciplining related to decision agents [12]. Indeed, these advantages reduce the agency costs in the thesis of interests' convergence.

Public ownership is defined as the provider of capital that represents the state as a moral person. As defined by OECD, a public firm is a company or a non-resident financial quasi-corporation that is subject to government control [13].

In terms of innovation, the thesis of the hostility of public firms is also advanced. The modern economic theory has shown that private activities of knowledge production, emanating from firms that maximize their private profit, are a crucial determinant of technological progress and growth [14]; [15]. Because of the independence of ownership and control, as well as the lack of control, there is a certain risk that managers of public firms pursue their own interests at the expense of shareholders' interests [16]. From another perspective, the control function takes place directly and the disciplinary role of the CEO board is limited [17]; [18]. The classic and important question in public business is the incentive schemes. We can make the example with the rat race model of Akerlof who nicely formalized this relationship [19].

**H2.** Owners' status affects the willingness of the firm to innovate.

In another hand, managerial ownership means the amount of capital held by managers as an incentive mechanism. The literature is abundant and presents ambiguous effects. The idea is that managers who hold significant shares in the company bear the consequences of decisions to risks that could negatively affect its business, and those who benefit from the increased value [20]; [7].

Jensen and Meckling [11] advanced that the larger the share of capital held by the managers, the less conflict would be significant and the business would be successful. Instead, Demsetz and Lehn [7] do not find a significant relationship between the level of managerial ownership and firm value.

Another type of ownership such as institutional ownership is removed in our case due to its low weight in this context, despite the strong influence it might have. However, in theoretical framework, Williamson [21] explains that the choice of financing depends on the specificity of the assets involved. In his approach, the debt should be non-specific assets and the issuance of shares to specific assets. This can be explained by the argument that self-financing or the issuances of shares are better suited to specific assets, while the debt will be adequate to finance traditional assets [22]. Institutional shareholders or other large owners will tend to have a long-term perspective [23]; [24]. With this vision, the shareholder is

considered not only as a provider of financial resources but also as a provider of skills and knowledge [25]. The shareholder could take a financial function and cognitive function and thus can positively influence the development of innovation activities. Generally, the ownership structure of the firm would have a significant influence on the strategic decision-making and the resulting choices [26]; [27].

### III. MODEL AND METHOD

The model used to estimate the effects of firm ownership structure on its willingness to innovate corresponds to a non-linear regression model. The logistic regression seems to be appropriate in this case, and it is followed by different statistical tests.

#### A. Data and Sample

The starting point of our data collection was the sample of 130 heterogeneous manufacturing and public firms operating in Algeria. The sample represents manufacturing firms operating in the beverage sector, the dairy sector and the other industrial food products. The source of data is a personal collection dataset administered by a questionnaire on the Algerian food sector in 2012-2014. The focus is on innovation and the internal structure characteristics.

#### B. Dependent variable: The innovativeness

The dependent variable we attempt to predict concerns the willingness of firms to innovate. We distinguished between product and process innovation because the two variables tend to respond to different factors and could have very distinct impacts on them [28]; [29]. To study product-line innovation, we used measures based on firm's responses to the following questions: How many product-lines did the firm have at the time of creation? We get  $P_0$ . 'Did the firm realize other product-line innovations?' We get the actual  $P_{(t)}$ . The difference makes:

$$P = P_{(t)} - P_0$$

We considered the case where the response variable is binary, assuming only two values, coded for convenience, as one or zero. We defined a binary variable  $Y$  that takes the value of one if  $P$  is a strictly positive value, otherwise zero when  $P$  takes the value of zero. In other words:

$$Y = \{1 \text{ if } P > 0, \quad 0 \text{ if } P = 0\}$$

The Logit regression model for dichotomous data is appropriate when the response takes one of only two possible values representing the presence or absence of an attribute of interest, the willingness to innovate in our case. The Logit model determines the impact of multiple independent variables presented simultaneously to predict membership of a dependent variable.

$$\text{Logit}(\pi_i) = \beta X_i$$

$y_i$  represents the random variable that can take the values one and zero with probabilities  $\pi_i$  and  $1-\pi_i$  (Dummy variable that takes the value of one if the firm innovates, zero otherwise).  $X_i$  represents the measure of the ownership characteristics held by the firm.

#### C. Independent variables: The ownership structure

The strength of the dataset lies on the detailed information about ownership structure. A first key explanatory variable is the ownership concentration of the firm, which we proxy by the share held by the main shareholders.

As another main explanatory variable, the ownership nature of a firm, also matters. We proxy a design variable with three binary variables reflecting public, individual, or family-owned firms. The first gets the value of 1 if the firm is a family-owned one, 0 otherwise. The second gets the value of 1 if the firm is an individual-owned one, and 0 otherwise. The third gets the value of 1 if the firm is a state-owned one and 0 otherwise. The survey also asks if the shareholders have direct control over the firm, expressed by a dichotomous variable, taking the value of 1 if the shareholder is engaged in the control function of the firm, and 0 otherwise.

We also measure manager participation in firm ownership by a variable which captures the adoption of different formal organizational practices and that allows manager participation in the firm's capital which seems like a strong mechanism aligning the managers' incentives with the owner's of the firm. This variable gets the value of 1 if the manager participates in the firm's capital and 0 if he doesn't. Finally, our data allows us to detect if the size of the firm's CEO determines its willingness to innovate.

### IV. RESULTS AND ANALYSIS

First, we list the descriptive statistics showing the correlation matrix of variables in Table I, from which we find no severe multi-collinearity issues among independent variables, excepting the individual and familial ownerships which present the majority of our sample, with respect of their proportions.

In the resulting Logit model (Table II), we find that the larger the share held by the main shareholder, the greater is the probability that the firm carries out product innovation. In the Logit estimation, the coefficients of our measure of ownership concentration and CEO size are respectively -0.040 and 0.569 for product innovation, the z-statistics are -2.692 and 2.682. The Logit estimates that they are likely significant effects on the product innovation. Hence, the main shareholder of an innovative firm could have little incentive and need to attract new shareholders if he expects profits from the introduction of new products. The ownership control and managerial ownership are jointly significant without an high effect on product innovation with coefficients respectively of -1.695 and -2.009 and the z-statistics -2.733 and -1.772 (p-value = 0.0062 and 0.076).

The p-value for a test of exogeneity of the measure of ownership concentration and CEO size is reported in the Logit model. Based on this test, we reject the null hypothesis postulating that the share ownership concentration and CEO size is exogenous with respect to the propensity to carry out product innovation.

The impact of managerial ownership on the likelihood of product innovation is neutral. The impact on product innovation is less significant (coefficients of -2.009).

The Logit model, using 130 observations with missing 6 dropped observations, has a number of correctly predicted and significant cases (87.9%). The model presents a relatively strong correlation (an adjusted R-squared of 0.44) with a minimized log-likelihood ratio and other error criteria. The whole model (related to all the independent variables) presents a beta of 0.5.

In what follows, the attention will be turned to the effects of firms' ownership nature on their willingness to innovate. First, it should be mentioned that one design variable is rejected from the model. The six cases of state-owned-firms are not statistically significant. It means that it has a perfect failure to predict on the dependant variable. Second, the design variable for the family-owned-firm is ejected. This omission is due to exact collinearity in predicting the dependant variable. Moreover, the design variable for the individual owned firms has a higher significant effect with a z-statistic equal to -4.377 (with coefficients equal to -3.172).

Other variables could also be inserted in the model. The constant, for example, has a positive and a significant estimated effect on dependent variables (coefficient equal to 4.47) and significant ( $z = 3.87$ ) with not rejected null hypothesis.

Treated separately, we get some robust models that we can shed some light in the direction of our hypotheses. In Table III, we tested the effect of ownership concentration. The resulting model shows a good prediction of 87, 7% with an adjusted R-squared of 0, 48 (p-value statistically significant) by the control of the firm size. The coefficient shows a negative low effect on the innovativeness unlike the effect of firm size. This is with a sensibility of 0,85 and a specificity of 0,89.

Moreover, modelling with the measures of ownership nature (Table IV), we have found that it have a statistically significant effects. The family-owned firms have a the great odds to have higher willingness to innovate more than others (4 chances on 0,2 of individual ones). The sensibility of the model is 0,79 and a specificity of 0,89. We can assert here that family-owned firms present a higher willingness to innovate.

Furthermore, in Table V, we model the effect of only the owners' engagement in their firms. It is shown that it has a statistically significant effect with a neutral impact on the

willingness to innovate. The model shows a sensibility of 0,68 and a specificity of 0,75.

As discuss earlier, the estimated negative effect of ownership concentration on firms' innovation stands in sharp contrast with the predictions of the theoretical literature. Suggesting that agency conflicts between large and minority shareholders or problems of lack of diversification could delay the innovation activities of sampled firms. Consequently, dummies of ownership control and managerial ownership are found to be insignificant effects on innovation activities. This is indeed consistent with our argument on ownership type diversification based on agency theory and property rights theory.

Our results indicate that a firms controlled by concentrated ownership does not necessarily tend to have a greater willingness to innovate than those controlled by any dispersed ownership. Hence, it is to say that concentration and ownership control may restrain the ability of the firm to innovate. In other words, our hypothesis one is supported: Ownership concentration affects negatively the willingness to innovate. The model results with design variables of the ownership nature dummy means that is have a significant effect, where the dummy of familial-owned firm is strongly adopted. Based on our analysis, family-owned firm are somewhat more likely to carry out product innovations than individual firms whose main shareholder is a private, while the State-owned firms are absolutely non-innovative. In other hand, the neutral effect of managerial ownership is also confirmed. Hence, our hypothesis two is supported: Owners' status affects the willingness to innovate. Moreover, reverse causality may also be an issue at play as willingness to innovate itself can shape the ownership structure, and suggested for research perspectives.

## V. CONCLUDING REMARKS

This study has been built on the hypothesis that the ownership structure of a firm impacts its willingness to innovate. Results indicate that, after accounting for its possible endogeneity, ownership has a large, positive and significant effect on product-line-innovation. These results are robust to using alternative instrument sets, and to controlling a variety of firm attributes (such as cognition and performances) and local conditions that may also influence innovation. We also believe that this analysis represents a first step in a potentially fruitful line of research.

In this research, we have also provided some preliminary empirical evidence to suggest that there is a relationship between firm ownership and the ability of firms to innovate. These results seem to be more consistent with the stated approaches.

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APPENDIX

TABLE I. CORRELATION COEFFICIENTS, USING THE OBSERVATIONS 1-130. 5% CRITICAL VALUE (TWO-TAILED) = 0.1723 FOR N = 130

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
[1] Innovativeness	1,00	-0,49	-0,58	0,67	-0,19	-0,43	0,41	0,25
[2] Ownership Concentration		1,00	0,41	-0,46	0,09	0,29	-0,37	-0,17
[3] Individual Ownership			1,00	-0,91	-0,23	0,39	-0,51	-0,41
[4] Familial Ownership				1,00	-0,18	-0,29	0,56	0,19
[5] Public Ownership					1,00	-0,24	-0,10	0,52
[6] Owners Engagement						1,00	-0,29	-0,49
[7] Managerial Ownership							1,00	0,52
[8] CEO Size								1,00

TABLE II. LOGIT MODEL FOR DEPENDENT VARIABLE INNOVATIVENESS STANDARD ERRORS BASED ON HESSIAN, USING 130 OBSERVATIONS. OMITTED DUE TO EXACT COLLINEARITY FOR FAMILIAL OWNERSHIP PREDICTS FAILURE PERFECTLY FOR PUBLIC OWNERSHIP (6 OBSERVATIONS)

Explanatory Variables	Coef.	Std. Error	z	p-value
Const.	4.475	1.155	3.872	0.00011 ***
Ownership Concentration	-0.040	0.014	-2.692	0.00709 ***
Individual Ownership	-3.172	0.724	-4.377	0.00001 ***
Ownership Control	-1.695	0.620	-2.733	0.00627 ***
Managerial Ownership	-2.009	1.133	-1.772	0.07632 *
CEO Size	0.569	0.212	2.682	0.00730 ***

  

Mean dependent var	0.459	S.D. dependent var	0.500
McFadden Rsquared	0.529	Adjusted R-squared	0.448
Log-likelihood	-40.216	Akaike criterion	94.432
Schwarz criterion	114.174	Hannan-Quinn	102.452

NUMBER OF CASES 'CORRECTLY PREDICTED' = 109 (87.9%)

F(BETA'X) AT MEAN OF INDEPENDENT VARS = 0.500

LIKELIHOOD RATIO TEST: KHI-SQUARE(5) = 90.6608 [0.0000]

TABLE III. LOGIT MODEL, USING OBSERVATIONS 1-130, DEPENDENT VARIABLE: INNOVATIVENESS, STANDARD ERRORS BASED ON HESSIAN

Explanatory Variables	Coefficient	Std. Error	z	p-value
Const.	-19.6342	4.19858	-4.6764	<0.00001 ***
Ownership Concentration	-0.0411	0.00939	-4.3753	0.00001 ***
Sales	1.0584	0.21429	4.9393	<0.00001 ***
Mean dependent var	0.438462	S.D. dependent var	0.498118	
McFadden R-squared	0.515883	Adjusted R-squared	0.482222	
Log-likelihood	-43.14546	Akaike criterion	92.29093	
Schwarz criterion	100.8935	Hannan-Quinn	95.78645	

NUMBER OF CASES 'CORRECTLY PREDICTED' = 114 (87.7%)  
 F(BETA'X) AT MEAN OF INDEPENDENT VARS = 0.498  
 LIKELIHOOD RATIO TEST: CHI-SQUARE(2) = 91.9531 [0.0000]  
 CONTINGENCY TABLE : A= 49 ; B=8 ; C=8 ; D=65

TABLE IV. LOGIT MODEL, USING OBSERVATIONS 1-130, DEPENDENT VARIABLE: INNOVATIVENESS, STANDARD ERRORS BASED ON HESSIAN MISSING OR INCOMPLETE OBSERVATIONS DROPPED: 6

Explanatory Variables	Coefficient	Std. Error	z	p-value
Individual Ownership	-1.57554	0.317135	-4.9680	<0.00001 ***
Familial Ownership	1.60944	0.365148	4.4076	0.00001 ***

NUMBER OF CASES 'CORRECTLY PREDICTED' = 103 (83.1%)  
 F(BETA'X) AT MEAN OF INDEPENDENT VARS = 0.500  
 LIKELIHOOD RATIO TEST: CHI-SQUARE(1) = 58.2924 [0.0000]  
 CONTINGENCY TABLE : A= 45 ; B=12 ; C=9 ; D=58

TABLE V. LOGIT MODEL, USING OBSERVATIONS 1-130, DEPENDENT VARIABLE: INNOVATIVENESS, STANDARD ERRORS BASED ON HESSIAN

Explanatory Variable	Coefficient	Std. Error	z	p-value
Const.	0.77319	0.28495	2.7134	0.00666 ***
Owners Engagement	-1.89015	0.393617	-4.8020	<0.00001 ***

NUMBER OF CASES 'CORRECTLY PREDICTED' = 94 (72.3%)  
 F(BETA'X) AT MEAN OF INDEPENDENT VARS = 0.498  
 LIKELIHOOD RATIO TEST: CHI-SQUARE(1) = 25.6003 [0.0000]  
 CONTINGENCY TABLE : A= 39 ; B=18 ; C=18 ; D=55