Impact of public policy on the up stream's dairy industries strategy

تأثير السياسة العامة على استراتيجية صناعات الألبان

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Abstract: The Algerian dairy industry has faced, supply problems linked mainly to the scarcity of raw milk. Resource dependency theory explains certain aspects of vertical relationships, notably those related to environmental conditions (availability of raw materials). The aim of this study is to evaluate the impact of vertical integration strategy imposed by the government on the strategy of the dairy industries. We try to determinate the relationship of subsidy amount and collected/integrated raw milk quantities in the four dairies chosen, using the estimation curve regression to verify whether the association varies for different size's dairy industries.
Keywords: Dairy industry; Resource dependency theory; Vertical integration; Subsidy amount.

Résumé : L'industrie laitière algérienne est confrontée à des problèmes d'approvisionnement liés principalement à la rareté du lait cru. La théorie de la dépendance des ressources explique certains aspects des relations verticales, notamment ceux liés aux conditions environnementales (disponibilité des matières premières). Le but de l'étude est d'évaluer l'impact de la stratégie verticale imposée par le gouvernement sur la stratégie des industries laitières. Nous essayons de déterminer la relation entre le montant de la subvention et les quantités de lait cru collectées / intégrées dans les quatre laiteries choisies, en utilisant la régression de la courbe d'estimation.
Mots-clés : Industrie laitière ; Théorie de la dépendance des ressources ; Intégration verticale ; Montant de la subvention.

ملخص: تواجه صناعة الألبان الجزائرية مشاكل في الإمداد مرتبطة بشكل أساسي بندرة الحليب الخام. تشرح نظرية اعتماد الموارد جوانب معينة من العلاقات الرأسية، خاصة تلك المتعلقة بالظروف البيئية (توفر المواد الخام). تهدف هذه الدراسة إلى تقييم أثر استراتيجية التكامل الرأسي التي تفرضها الحكومة على استراتيجية صناعة الألبان. نحاول تحديد العلاقة بين مقدار الدعم وكميات الحليب الخام المجمعة / المدمجة في المؤسسات الأربعة المختارة، وذلك باستخدام انحدار منحنى التقدير للتحقق مما إذا كان الارتباط يختلف بالنسبة لصناعات الألبان ذات الأحجام المختلفة.
الكلمات المفتاح: صناعة الالبان؛ نظرية الاعتماد على الموارد؛ التكامل الرأسي؛ مبلغ الدعم .

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I- Introduction :

The government has been actively involved in the dairy policy since the independence. Though the dairy program has undergone several changes since that, the dairy industry's raw material supply relies mainly and almost on the import of milk powder. Government intervention is mainly based on subsidies granted to dairy farmers (suppliers of raw milk) and also to the dairy industry.

Basically, milk is used by the industry for two purposes, packaging and sales of fresh milk, and derived dairy product. The government support the dairy industry by paying a subsidy either for the milk collected (the subsidy amounts to 5 DA / liter), or for integrated milk (the subsidy amounts to 4 DA / liter). in the second case, a condition is imposed: the dairy must sell the packaged fresh milk and also produce subsidized milk at 25 DA per liter.

The main strategy of public dairy policy is through the promotion of vertical integration. On the one hand, the main strategy of public dairy policy involves promoting vertical integration, on the other hand, the fabric of the local dairy industry is mainly composed of small SMEs and two large industries to which adds a public group. The vertical integration strategy is imposed by the government and is not due to a strategic choice of the market.

The question that arises is: What is the impact of this strategy on all of these industries? Is it positive or negative? In this work, we will try to answer the question posed dealing with the following assumption:

- The vertical integration strategy imposed by the government has a positive impact on the strategy of all the dairy industries.

To do this, we will use the relationship between the quantities of raw milk collected/integrated and the amount of the subsidy. Firstly, we will make a theoretical recall on the vertical relationships and resource dependency theory, then we will present our analysis based on the data of our field survey near four dairy industries (two larges industries and two SMEs) and the direction of the agricultural services (DSA) of Bejaia. We will use the curve estimation regression on SPSS 24 which will allow us to measure the vertical links resulting from public policy.

I.1. The resource dependency theory and vertical relationship

The approach of the theory of resource dependency studies the organizational action in its environment in which the organization evolves and the need to obtain resources which come from this environment, and tries to explain the interdependence of an organization (firm, institution ...) vis-a-vis him, it represents a major tool in the hands of leaders in the development of resource mobilization strategies (whatever they are) of an organization; thus the acquisition of an external resource (raw material) is an essential element of the strategy of any organization (Powell, Rey, 2015, p.94).

The theory of resource dependence focuses - as a whole - on (Pfeffer, Salancik, 1978, p.41; Oliver, 1991, p.148; Greening, Gray, 1994, p.471; Powell, Rey, 2015, p.94):

- The organizational need to adapt to environmental uncertainty,
- The confrontation of problems of interdependence,
- Management and control of critical resource flows.

The most important factor in the effectiveness of an organization is the external judgment of organizational activities, the use of an external perspective is necessary to describe an organizational effectiveness, while an internal perspective would describe the effectiveness of an organization (Delke, 2015, p.3-4; Pfeffer, Salancik, 1978, p.11).

Through their actions, the actors want to reduce their dependence, hence the central hypothesis in the resource dependence theory that says that who controls the resources has power over the actors who need these resources (Delke, 2015, p.3; Nienhüser, 2008, p.13). Thus, each actor in the environment wants to reduce his dependence or increase his power over the others.

I. 2. The main variables of the basic model of resource dependency theory

Two main principles (variables) can be drawn from the theory of resource dependence (Greening, Gray, 1994, p.471):

- Organizations are constrained by other organizations (institutions) which control the resources for them;
- Organizations are trying to manage uncertainty and their dependence on external groups in order to gain more autonomy and freedom.

Thus, the basic variables used in the resource dependency theory are dependence and uncertainty.

There are two types of interdependence, knowing that the relationships between two actors can involve both forms of interdependence (Dowling, et al., 1996, p.158; Pfeffer, Salancik, 1978, p.41):

- Competitive interdependence, where the result obtained by an organization can only be higher if the result obtained by a competing organization is lower (a zero-sum game),
- Symbiotic interdependence, where the exit of one is the entry of the other. They recognized that these interdependencies can also occur simultaneously, which leads to what we call multifaceted relationships.

Uncertainty refers to the extent to which future situations cannot be accurately predicted and predicted (Nienhüser, 2008, p.12). Uncertainty comes from various sources, Organizations are not autonomous (Delke, 2015, p.4; Hillman et al., 2009, p. 2), the existence of competition in the environment (Delke, 2015, p.3; Nienhüser, 2008, p. 13), and the concept of bounded rationality (Delke, 2015, p.4; Nienhüser, 2008, p. 12).

The structural characteristics of the environment can affect the uncertainty of companies when they seek to acquire the necessary resources and consequently the creation of inter-organizational relationships. We have three main characteristics according to Pfeffer and Salancik (1978):

- Concentration: the extent to which the power is dispersed.
- Munificence: the availability of critical resources.
- Inter-connectivity: number and structure of links between organizations.

I.3. Strategies for managing uncertainty and interdependence

Companies are interdependent with other organizations with which they exchange resources, information or personnel, and are therefore likely to influence. The extent of this influence is probably a function of the importance of the resource obtained and inversely related to the ease with

which the resource can be obtained from alternative sources (Pfeffer, 1976, p. 37; Pfeffer and Salancik, 1978, p. 40).

Interdependence and uncertainty interact on their effects on organizations. One of the main functions of the institutional level of the enterprise is the management of this interdependence and this uncertainty (Pfeffer, 1976, p.37). And the company uses different strategies to deal with it. Resource dependency theory is used to explain the extent to which organizations can reduce the interdependence and uncertainty associated with environmental factors. In general, a study based on the theory of resource dependence is constructed according to five options (Pfeffer, 1976, p.44; Hillman et al., 2009, p.1404- 1419): mergers / vertical integration, joint ventures and other inter-organizational relationships, co-optation within boards of directors, political actions, succession of the executive / staff movement. Here, we will focus on only two strategies: vertical integration and political action.

A- Vertical integration

Vertical integration occurs when a company internally produces or uses something that it might otherwise buy or sell to others (Hovenkamp, 2014, p.983). For example, a company that produces its own inputs is vertically integrated "upstream" in a source of supply. For Williamson (1973, p. 316) vertical integration would include moving from purchasing inputs to producing these inputs by hiring labor. The capital required could be owned or leased without changing the degree of vertical integration, and Leasing capital can allow control of production without property (Perry, 1989, p. 186). Studying the vertical dimensions of integration helps predict when companies are using manufacturing or purchasing decisions. Companies, in general, have the capacity to (Harrigan, 1985, p. 398-399, 1986, p.538):

- Control vertical relationships without fully owning adjacent business units,
- Being able to benefit from the advantages of vertical integration without transferring all their production internally,
- Being able (or not) to perform a variety of integrated activities at a particular stage of transformation,
- Engage in many (or a few) stages of transformation in the production chain.

Thus, companies can adjust the dimensions of their vertical integration strategies to meet their competitive needs; vertical integration does not have to be the same in all circumstances to be effective (Harrigan, 1985, p. 399).

B- Political actions

The organization can try to use the power of the state to obtain more favorable conditions in the environment (Pfeffer, 1972, p.5, Hillman et al., 2009, p.1411-1412). Regulation is only a specific form of organizational activity in government processes (Pfeffer, 1976, p.43). The government has the power of coercion, legally possessed by no other social institution. In addition, laws and regulations affect most of our economic institutions and markets, either indirectly through taxation, or more directly through purchasing, market protection or market creation (Pfeffer, 1976, p.43). As with regulation, political activities have both benefits and risks. The risk is due to the fact that once the government intervenes in a case on behalf of a company or sector, political intervention becomes legitimate, regardless of the interests of those who are helped or injured (Pfeffer, 1976, p.43).

The government is the only organization that would meet all the conditions supposed to generate an avoidance strategy to manage dependence (Pfeffer, 1972, p.19). Government cannot be absorbed, so companies, or industries that have worked a lot with government and are highly dependent on it, are more likely to engage in diversification to reduce interdependence, and are most likely to engage in political activities (Pfeffer, 1972, p.19-20, Hillman et al., 2009, p.1412-1413). From this research, Hillman and these co-authors (2009, p.1413) summarize the following facts:

- Political action is correlated to the degree of dependence of the company vis-à-vis the environment,
- Companies facing the same environment likely to choose the same forms of political behavior to manage it,
- Benefits in terms of performance benefit companies that create links with the political environment.

II– Methods and Materials:

The aim of this work is to evaluate the vertical relationship in dairy industry, with the study of a number of parameters as integrated/collected raw milk quantities, and the subsidy amount for each dairy.

Our sample is composed of the four dairies, two larges dairies (Soummam and Danone) and two SME dairies (Giplait and Gueldamen), whose located in Bejaia area. We dispose of monthly data of the two years 2018-2019 from a survey. We will try to compare the results to determine the difference between large and SME dairies consequences of vertical relationship.

For this, we will use curve estimation regression from SPSS 24 to explain the relationship between the collected/integrated milk quantities and the subsidy amount for each dairy.

The Curve Estimation procedure produces curve estimation regression statistics and related plots for 11 different curve estimation regression models. In our case, we choose the linear model whose equation is (Gonzalez-Rodriguez et al., 2009, p.361):

$$\boldsymbol{Y = b_0 + b_1 * x + \varepsilon} \qquad \textbf{(1)}$$

The series values are modeled as a linear function. $\boldsymbol{Y}$: dependent variable, $\boldsymbol{x}$: independent variable, $\boldsymbol{b_0}$: constant, $\boldsymbol{b_1}$: slope, and $\boldsymbol{\varepsilon}$: error of the Estimate.

In linear model, the following assumptions should be met:

- For each value of the independent variable, the distribution of the dependent variable must be normal.
- The variance of the distribution of the dependent variable should be constant for all values of the independent variable.
- The relationship between the dependent variable and the independent variable should be linear, and all observations should be independent.

The closer the representative points of the observations are to the regression line (i.e. the smaller the residuals), the greater the variability of $\boldsymbol{Y}$ explained by the estimated regression equation. the total variability of $\boldsymbol{Y}$ is therefore equal to the sum of explained variability and the residual variability. the value of R^2 is established between 0 (the estimated regression equation does not explain the variability of Y) and 1 (all the points (x, Y) belong to the regression line).

For each case choice, we will define the curve estimation and explain the model, one-way ANOVA and coefficients tables in the perspective of explaining the relationships between the subsidy amount and the integrated/collected milk quantities for each dairy.

III- Results and discussion :

For the curve estimation regression, we have the following variables:
Y: dependent variable represented by the subsidy amount (DA).
x: independent variable represented by the collected/integrated raw milk quantities (liter)

For Soummam and Danone, we take the collected raw milk quantities because the dairies don't benefit from subsidy for integration raw milk.

For Giplait and Gueldamen, we take the integrated raw milk quantities because the dairies benefit from subsidy for integration raw milk.

III.1. Larges dairies industries case's

Soummam and Danone are large dairies which are national leaders in the dairy chain with more than 80% of the part of the market (according to the results of our survey). Soummam and Danone are engaged in a vertical integration strategy to response to the public policy which encourages the development of vertical strategy in order to ensure the supply of raw milk.

The Table (1.a) illustrated the model summary and parameter estimates for the two dairies (Soummam and Danone), we found R which represent the absolute value of correlation coefficient (Cohen, 1988, p.75-76). R= 0.999 indicate that strong correlation exist between the subsidy amount and the collected raw milk quantities. The R Square statistic is a measure of the strength of association between the observed and model-predicted values of the dependent variable subsidy amount. The large R Square values R^2= 0.998 indicate strong relationships for the model.

A One-Way ANOVA that mirrors the independent samples t-test will provide F statistic. The ANOVA table is a useful test of the model's ability to explain any variation in the dependent variable, but it does not directly address the strength of the relationship between the dependent and independent variables (Lakens, 2013, p.1-8).

The ANOVA table (Table (1.b)) tests the acceptability of the model from a statistical perspective. The Regression row displays information about the variation accounted for by the model. The Residual row displays information about the variation that is not accounted for by the model. The regression sum of squares is considerably larger than the residual sum of squares, which indicates that most of the variation in the proportion of Subsidy amount is explained by the model. The significance value of the F statistic = 0.000 < 0.05 for the two dairies (Soummam and Danone), which means that the variation explained by the model is not due to chance.

The scatter plot in figure (1) indicates that a linear relationship exists between the two variables subsidy amount and collected raw milk quantities for Soummam and Danone. Therefore, a simple regression curve estimation analysis can be used to calculate an equation that will help predict subsidy amount.

According to the coefficients table, which determine the equation of curve, we obtain: the constant b_0 and the slop b_1 given by the table (1.c) should be substituted in the linear equation (1) to obtain the linear equation (2) to predict the Soummam's subsidy amount. For Soummam we noted ***Y=Ys***, then we obtain:

$$\boldsymbol{Ys} = -26212.533 + 17.943 * \boldsymbol{x} \qquad \textbf{(2)}$$

For $\boldsymbol{Ys} = 0$, so $-26212.533 + 17.943 * \boldsymbol{x_0} = 0$ thus $\boldsymbol{x_0}=\frac{26212.533}{17.943} = 1460.878$ (liters) So, the condition for Soummam to receive the subsidy is: $\boldsymbol{x} > 1461$, the collected raw milk quantities must be greater than 1461liters.

The constant b_0 and the slop b_1 given by the table (1.c) should be substituted in the linear equation (1) to obtain the linear equation (3) to predict the Danone's subsidy amount. For Danone we noted $\boldsymbol{Y}=\boldsymbol{Yd}$, then we obtain:

$$\boldsymbol{Yd} = -37173.303 + 18.548 * \boldsymbol{x} \qquad \textbf{(3)}$$

For $\boldsymbol{Yd} = 0$, so $-37173.303 + 18.548 * \boldsymbol{x_0} = 0$ thus $\boldsymbol{x_0}=\frac{37173.303}{18.548} = 2004.167$ (liters)

So, the condition for Danone to receive the subsidy is: $\boldsymbol{x} > 2004$, the collected raw milk quantities must be greater than 2004 liters.

We note that the equations (2) and (3) are the same that the equations given by the estimation curve in figure (1) for the two dairies (Soummam and Danone). In this figure (1), The estimated linear rows display the estimated values on which the observed values are perfectly posed for each dairy.

III.2. SMEs dairies industries case's

Giplait and Gueldamen are SME dairies, the first is a subsidiary from the public group Giplait which perfectly engaged in the public strategy to promote the vertical relationships. The second is a growing private dairy that is forced to follow public policy guidelines. Indeed, all dairies are obliged to promote vertical relationships upstream, and not by strategic choice based on market research.

The Table (2.a) illustrated the model summary and parameter estimates for the two dairies (Giplait and Gueldamen), we found R which represent the absolute value of correlation coefficient. R= 0.924 for Giplait and R=1 for Gueldamen, indicate that strong correlation exist between the subsidy amount and the integrated raw milk quantities. The R Square statistic is a measure of the strength of association between the observed and model-predicted values of the dependent variable subsidy amount. The R Square value R^2= 0.853 for Giplait indicate strong relationships for the model. The large R Square value R^2=0.999 for Gueldamen indicate a very strong relationship for the model.

The Table (2.b) represent ANOVA table for Giplait and Gueldamen. It tests the acceptability of the model from a statistical perspective. The regression sum of squares is larger than the residual sum of squares for Giplait, and it is considerably larger in the case of Gueldamen, which indicates that most of the variation in the proportion of Subsidy amount is explained by the model. The significance value of the F statistic = 0.000 < 0.05 for the two dairies (Giplait and Gueldamen), which means that the variation explained by the model is not due to chance.

To determine if there is a linear relationship, it's recommended to run a scatter plot which displays the nature of relationship between two variables. Judging from the scatter plot in figure (2), a linear relationship seems to exist between the subsidy amount and integrated raw milk quantities.

To determine the equation of curve, we have to analyze the coefficients table represented in Table (2.c). Replacing the values of the constant b_0 and slop b_1 in equation (1) with those given in Table (2.c) we obtain the linear equation (4) to predict the Giplait's subsidy amount. For Giplait we noted $\boldsymbol{Y}=\boldsymbol{Yp}$, then we obtain:

$$\boldsymbol{Yp} = -24757.535 + 24.261 * \boldsymbol{x} \qquad \textbf{(4)}$$

For $\boldsymbol{Yp} = 0$, so $-24757.535 + 24.261 * \boldsymbol{x_0} = 0$ thus $\boldsymbol{x_0}=\frac{24757.535}{24.261} = 1020.466$ (liters)

So, the condition for Giplait to receive the subsidy is: $\boldsymbol{x} > 1020.5$, the integrated raw milk quantities must be greater than 1020.5 liters.

Replacing the values of the constant b_0 and slop b_1 in equation (1) with those given in Table (2.c) we obtain the linear equation (5) to predict the Gueldamen's subsidy amount. For Gueldamen we noted $\boldsymbol{Y}=\boldsymbol{Ye}$, then we obtain:

$$\boldsymbol{Ye} = 842.301 + 20.886 * \boldsymbol{x} \qquad \textbf{(5)}$$

For $\boldsymbol{Ye} = 0$, so $842.301 + 20.886 * \boldsymbol{x_0} = 0$ thus $\boldsymbol{x_0}=\frac{842.301}{20.886} = 40.328$ (liters)

So, the condition for Gueldamen to receive the subsidy is: $\boldsymbol{x} > 40$, the integrated raw milk quantities must be greater than 40 liters.

According to figure (2), we observed that the equations given by the estimation curve are the same that (4) and (5) for the two dairies.

IV- Conclusion:

The aim of this study was to evaluate the relationship of subsidy amount and collected/integrated raw milk quantities in the four dairies chosen, using the estimation curve regression to verify whether the association varies for different size's dairy industries. The estimates of the linear regression coefficient given by the estimation curve of collected/integrated raw milk quantities were positive and had similar values across large dairies and SMEs dairies.

According to equations 2, 3, 4, 5, the subsidy amount is a linear function of the raw milk collected quantities for large dairies and a linear function of the raw milk integrated quantities for dairy SMEs. In a context of resource dependency, where dairies are highly dependent on public policy and the availability of raw milk, a large dairy can assume a vertical strategy on its own, while an SME cannot venture into this area without be exposed to the risks that this kind of strategy generates. The results we have obtained confirm the difference in the strategic intentions of a large dairy from those of an SME. Indeed, a large dairy has the financial, technical and human resources to invest in a vertical strategy led by the State. On the other hand, an SME is more cautious in its approach to such a strategy, an SME seeks to take advantage of such a situation through the collection, above all, of integration subsidies.

According to our results, we note that the impact of public policy on the strategy of SMEs is slightly less strong than that it has on large dairies. This is necessarily due to the large resources available to large dairies. From this, we cannot confirm our initial assumption which specifies that the impact of the strategy imposed by the government is different depending on the size of the dairy.

V- Appendices:

Table (1.a): Large dairies Model summary and parameter estimates

Soummam Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
,999	,998	,998	16481,933

Danone Model Summary

R	R Square	Adjusted R Square	Std.Error of the Estimate
,999	,998	,998	20583,487

The independent variable is Collected Quantities.

The Source: Results of the survey.

Table (1.b): Large dairies ANOVA test

Soummam ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	3848897296000,000	1	3848897296000,000	14168,375	,000
Residual	5976390342,000	22	271654106,500		
Total	3854873687000,000	23			

Danone ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	5531136623000,000	1	5531136623000,000	13054,988	,000
Residual	9320958929,000	22	423679951,300		
Total	5540457582000,000	23			

The independent variable is Collected Quantities.

The Source: Results of the survey.

Table (1.c) : Large dairies Coefficients

Soummam Coefficients

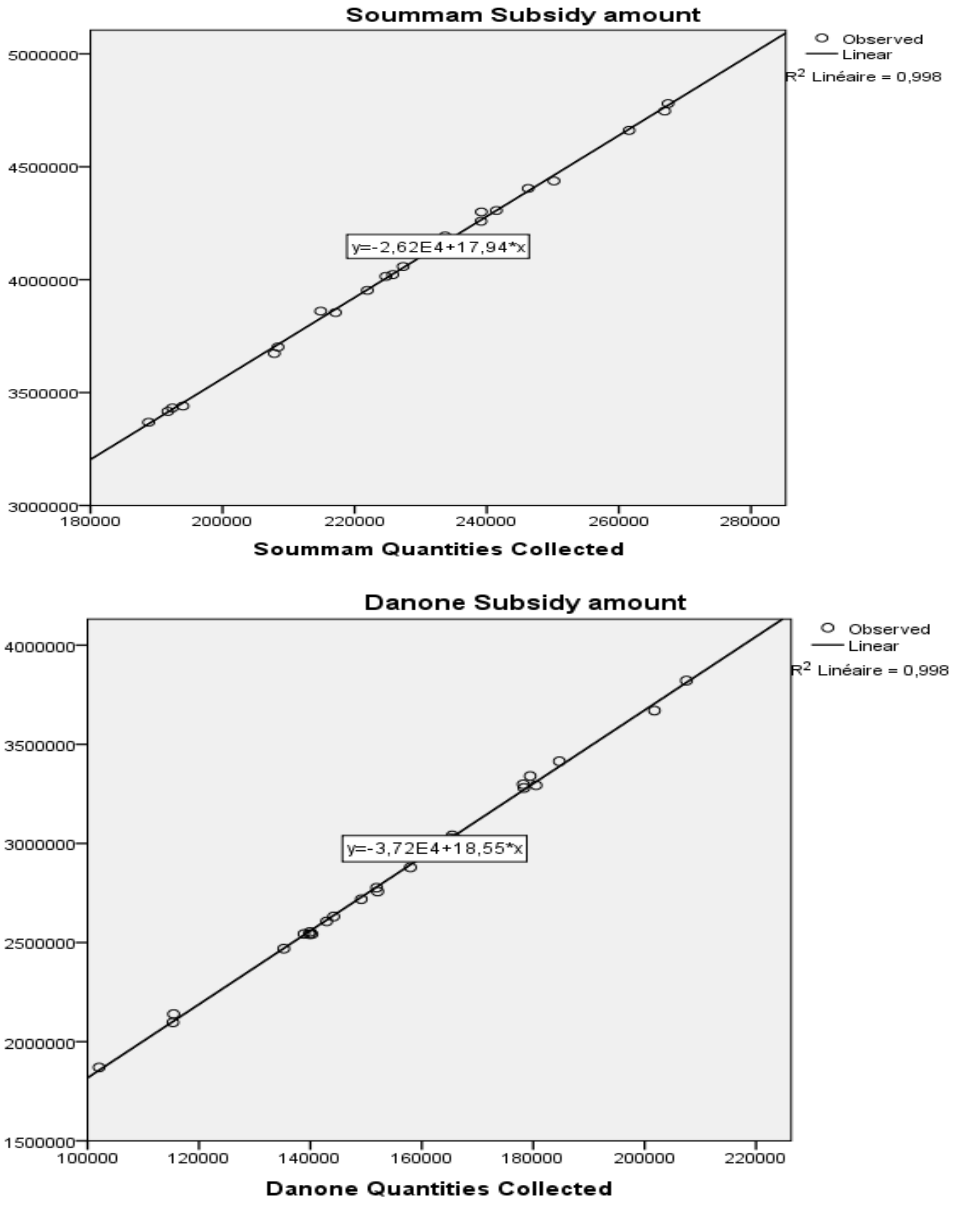
	Unstandardized Coefficients		Standardized Coefficients		
	b_1	Std. Error	Beta	t	Sig.
Soummam Collected Quantities	17,943	,151	,999	119,031	,000
(Constant)	-26212,533	34450,682		-,761	,455

Danone Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	b_1	Std. Error	Beta	t	Sig.
Danone Collected Quantities	18,548	,162	,999	114,258	,000
(Constant)	-37173,303	25592,402		-1,453	,160

The Source: Results of the survey.

Figure (1) : Large dairies Curve estimation



The Source: Results of the survey.

Table (2.a): SMEs Model summary and parameter estimates

Giplait Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
,924	,853	,846	358559,301

Gueldamen Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
1,000	,999	,999	1550,400

The independent variable is Integrated Quantities.

The Source: Results of the survey.

Table (2.b): SMEs ANOVA test

Giplait ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	16402103040000,000	1	16402103040000,000	127,579	,000
Residual	2828424988000,000	22	128564772200,000		
Total	19230528030000,000	23			

Gueldamen ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	55194473410,000	1	55194473410,000	22961,907	,000
Residual	52882298,760	22	2403740,853		
Total	55247355710,000	23			

The independent variable is Gueldamen Integrated Quantities.

The Source: Results of the survey.

Table (2.c): SMEs Coefficients

Giplait Coefficients

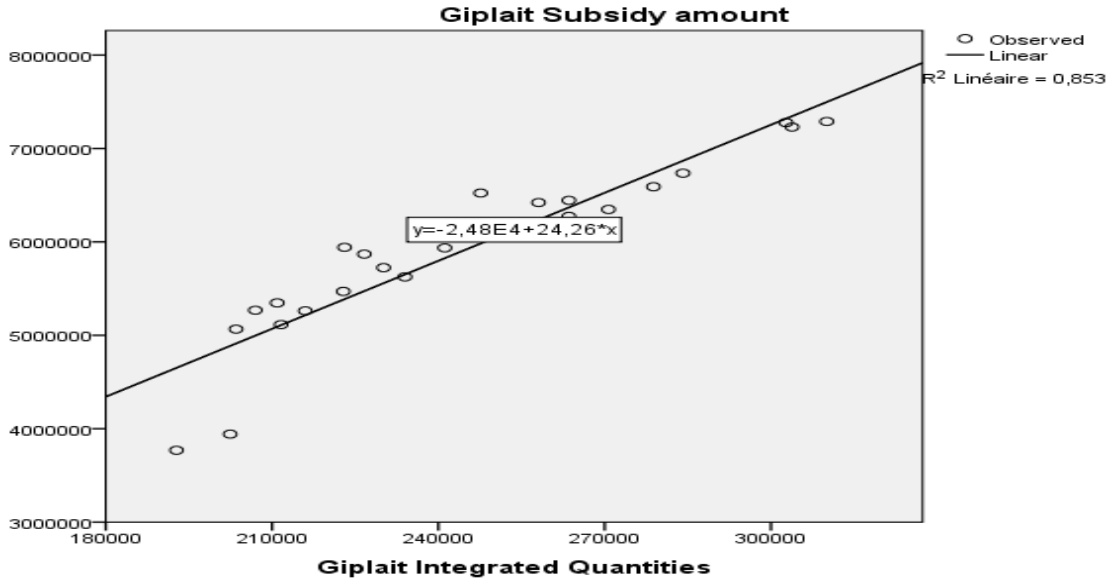
	Unstandardized Coefficients		Standardized Coefficients		
	b_1	Std. Error	Beta	t	Sig.
Giplait Integrated Quantities	24,261	2,148	,924	11,295	,000
(Constant)	-24757,535	529787,433		-,047	,963

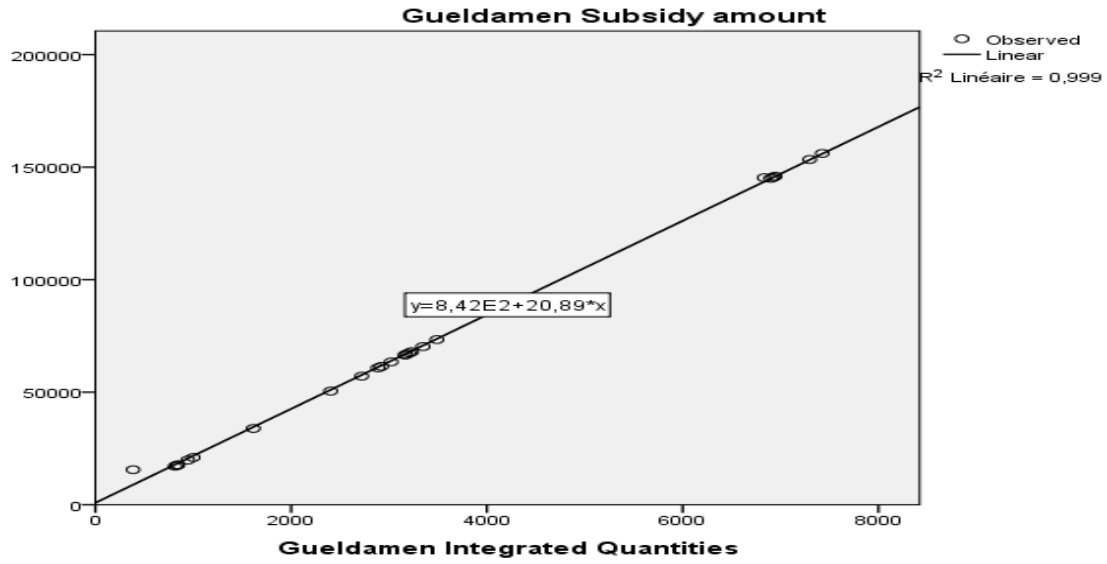
Gueldamen Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	b_1	Std. Error	Beta	t	Sig.
Gueldamen Integrated Quantities	20,886	,138	1,000	151,532	,000
(Constant)	842,301	568,924		1,481	,153

The Source: Results of the survey.

Figure (2): SMEs Curve estimation





The Source: Results of the survey.

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