Business Administration and Business Economics

Corporate Tax And Financing Decisions: An Emerging Market Experience

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Abstract: The objective of this study is to determine the significance of the tax benefits in explaining observed leverage ratios amongst firms in Nigeria. To investigate how the results of previous studies and traditional theories on financial leverage compare with the real situation in the Nigeria corporate environment. The differential impact of tax treatment of debt on corporate financial policy in developed countries. The parameters of debt ratios are estimated by fitting multiple linear regression after this equation- l=f (τ r, s, v, π, m, c, σ). Our dataset covers a cross-section of 60 quoted firms from Nigerian stock Markets over a ten year period (1996-2005). The tax benefit of debt approximately equals fifteen (15) percent of firm value. However, this tax advantage does not seem to explain observed debt ratios since we could *not* obtain a statistically significant coefficient for the marginal tax rate. The provision of empirical evidence in support of known theories.

Keywords: tax shelter; capital structure; leverage; financing; firms

1 Introduction

The finance literature has long offered a simple model of how taxes affect financing decisions .The capital structure choice has long been an issue of great interest in the corporate finance literature. This interest is due to the fact that the mix of funds (leverage ratio) affects the cost and availability of capital and thus, firms' investment Tax shelters have received recent scrutiny in the financial economics literature because of their impact on firm decisions. Since the seminal capital structure irrelevancy proposition of Modigliani and Miller (1958), research and debate on capital structure have been intense but somewhat inconclusive .Tax

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shelters have brought to the fore the pervasive use of shelters and the many millions of dollars of profits that appear to have been sheltered. Accounting for debt tax shields and financial distress costs overturns the capital structure irrelevancy proposition and leads to an optimal gearing ratio which maximizes firm value (Kim 1978). A change in the corporate tax level can have a significant impact on rate making and capital structure for   companies. Financial economists recognize the importance of understanding the role and impact of tax shelters on financial decisions, and have recently initiated efforts to understand such transactions. Tax constitutes a potentially important consideration in firms' decisions. If a company is financed by debt capital, there will be tax relief available on interest payments.

Alternatively, if the company is financed with share holders' fund (that is equity capital), then dividend will be paid on the equity from the profit after tax, which will in turn give rise to a liability for personal income tax. In the presence of taxes, however, companies would generally favour debt, since the tax shield by deductible interest expenses increases the company value .Over the years, researchers have examined the differential impact of tax treatment of debt on corporate financial policy in developed countries .However the existing studies in this area are scanty in Nigeria. This is the lacuna this study attempts to fill. Studies on the incidence of company income tax and its impact on financing decisions of firms have concentrated on developed countries.

In Nigeria, corporate interests' payments are deductible before tax; 30% of corporate tax savings on interest deductions can lower the cost of debt to 70%. The rest of this paper proceeds as follows: In section 2, we briefly review the relevant capital structure literature. The dataset employed and methodology is discussed in section 3. The results are presented in section 4 while section 5 summaries the salient findings and concludes.

2. Capital Structure Theory and Evidence

Capital structure can be defined as the mixture of long-term financing sources such as debt, preference shares and equity interests which constitute the permanent capital used to finance an organization. It is simply the makeup of the permanent capital of the firm. Capital on the other hand is the amounts of wealth placed at the disposal of the firm to enable it carry out its functions.

A comprehensive summary of the capital structure literature is provided by such authors as Harris and Raviv (1991) and Frank and Goyal (2005). Central to our understanding of financing behavior is the trade-off theory which asserts that an optimal gearing ratio is reached by the firm at the point where the marginal benefits

of employing debt, such as interest tax shields, equal its marginal costs such as financial distress and bankruptcy costs (Kim, 1978).

The empirical case for the trade-off theory is not as strong as it looks. First, statistical results "consistent" with the trade off theory can be consistent with other theories as well. Second, there are too many examples of successful, highly profitable firms operating at low debt ratios. These firms are not "the exceptions that prove the rule; because studies of the determinants of actual debt ratios consistently find that the most profitable companies in a given industry tend to borrow the least. For example, Wald (1999) found that profitability was "the single largest determinant of debt/asset ratios" in cross-sectional tests for the U.S, U.K; Germany, France and Japan. Booth, et al. (2001) reached a similar conclusion for a sample of ten developing countries. High profits mean low debt, and vice versa. But if managers can exploit valuable interest tax shields, as the trade off theory predicts, we should observe exactly the opposite relationship. High profitability means that the firm can service more debt without risking financial distress. Debt is a contract that forces the firm to pay out cash. A high debt ratio can be dangerous, but it can also add value by putting the firm on a diet and curbing overinvestment. Stulz (1990) presents a model of how the diet works. He assumes that managers will always invest free cash flow; even in negative- NPO projects, unless the cash is required for debt services. The ideal level of debt (and debt service) leaves just enough cash to fund all-and only-positive-NPO projects. Thus leverage should depend on the investment opportunity set. Firms with valuable growth opportunities should choose low debt ratios to free up cash for expansion. Firms with limited growth opportunities should operate at high debt ratios to constrain management. Debt plays a similar role in leveraged restructurings, where a public firm all at once borrows a large fraction of the value of its assets and pays out the proceeds to stock holders. Wruck (1995) provided a fascinating case study of the leveraged restructuring at sealed Air Corporation. Lemmon and Zender separate firms into two groups on the forgone tax benefits associated with debt financing. They documented that a large fraction of firms are conservatively financed, and that neither the pecking order nor the trade off theory of capital structure adequately explain this result. In their corrected version of the classics MM'S propositions, Modigliani and Miller (1963). Show that when corporate tax is taken into consideration, the firm value becomes an increasing function of debt. Debt financing is viewed as more advantageous than equity because using more debt reduces the expected tax liability and increases the after tax cash flow. This result also implies that, giving the existence of bankruptcy costs or reorganization section costs due to debt usage, there should be an optimal capital structure that equates debt tax shields and the cost of financial distress. The analysis in Modigliani and Miller (1963) considers the impact of corporate tax while ignoring the effect of personal income tax. Miller (1997) explicitly takes into account the effect of the latter tax code and demonstrate that in equilibrium, the total amount of tax saving

will be equal to zero. In other words, the advantage of the corporate tax is cancelled by the disadvantage of the personal tax. The author further suggests that there should be no optimal debt ratio for any individual firms.

Determinants of Capital Structure

This section describes firm characteristics that existing theories of capital structure suggest may be related to the debt-equity choice made by firms. Our primary variables of interest is the tax benefits debt of quoted firms. In addition, we control for size, profitability, growth, collateral value of assets, non-debt tax shields.

A. Tax Benefits Variables.

Extrapolating from the argument in DeAngelo and Masulis (1980) that there exists a negative relation between leverage and the level of non-debt tax. In addition to the above factors, the effective tax rate has been used as a possible determinant of the capital structure choice. According to Modigliani and Miller (1958),as interest payments on debt are tax-deductible, firms with enough taxable income have an incentive to issue more debt. It must also be pointed out that higher corporate tax rates reduce firms' internal funds and increase their cost of capital. In other words, higher taxes might decrease the formation of fixed capital and demand for external funds (Kremp et al., 1999). Based on this between arguments, we expect a negative relationship in the level of debt and the effective tax rate

B. Profitability

Due to the tax deductibility of interest payments, it is argued that highly profitable companies tend to have high levels of debt (Modigliani and Miller, 1963). However, The pecking order theory of Myers (1984), Myers and Majluf (1984), and Shyam-Sunder and Myers (1999) suggests that firms prefer to finance investments first from retained earnings, second from debt, and third from equity. According to this theory, more profitable firms should have lower leverage ratios than less profitable firms since they are able to finance their investment opportunities with retained earnings.

C. Firm Size

Previous literature suggests that leverage ratios may be related to firm size. Warner (1977) and Ang, Chua, and McConnell (1982) provide evidence that direct bankruptcy costs increase as firm size decreases. Further, larger firms tend to be more diversified and less prone to bankruptcy. These observations suggest that large firms should be more levered than small firms. However, size can also proxy for asymmetric information and access to capital markets. Because of these two factors, Smith (1977) shows that issuing equity is more expensive for small firms than for large firms, suggesting that small firms may be more levered than large

firms. In addition, it is argued that smaller firms tend to have less long-term debt because of shareholder – lender conflict

D. Non-Debt Tax Shields from Operations

DeAngelo and Masulis (1980) suggest that tax deductions for depreciation and tax-loss carry forwards are substitutes for debt, and thus firms with large non-debt tax shield should have less debt.

E. Growth

Myers (1977) argued that due to information asymmetries, companies with high leverage ratios might have the tendency to undertake activities contrary to the interests of debt holders (under-invest in economically profitable projects).If firms with high growth opportunities have high information asymmetry, then we would expect these firms to have less debt. In addition, as suggested by Titman and Wessels (1988), if growth opportunities are viewed as capital assets that do not generate current taxable income, one would expect a negative relation between growth Opportunities and leverage .Finally, as suggested by Galai and Masulis (1976),Jensen and meckling (1976),and if stockholders have the incentive to expropriate wealth from bondholders by investing in a suboptimal fashion and the cost associated with this agency problem is higher for firms with high growth opportunities, then again, one would expect leverage to be negatively related to growth opportunities

F. Collateral value of Assets.

Myers and Majluf(1984) argue that if a firm's managers have better information about a security than outside shareholders, then there may be costs associated with issuing such securities. Since issuing debt that is secured by assets whose values are known would avoid these costs, firms with more collateral would tend to issue more debt. The agency arguments in the previous section, that suggest a negative relation between growth opportunities and leverage, would also imply a positive relation between collateralization and leverage. Firms with higher collateral assets should be able to take o more debt than other firms since there is less information asymmetry involved in these assets.

3. Methodology

To derive a proxy for the tax benefits of debt in the Nigerian corporate environment, we use TcB. Tc represents the corporate tax rate while B represents average debt issues for the selected firms and for the ten year period. Marginal corporate tax rate is measured as follows:

$$\mathcal{L}_c = \frac{\text{Taxation as per P \& L}}{\text{Operating Cash flow before taxes}}$$

This definition is consistent with (Homaifar, et. al. 1994:11). The basic model for establishing the nature and extent of relationship between the leverage ratio (ị) and firm's attributes identifies eight exogenous variables. these variable are the corporate tax rate (z), the non-debt tax shelter ratio (r), firm size (s), future growth opportunities (v), profitability (π), capital market conditions (m), tangible assets (c) and earning volatility (σ).

The parameters of debt ratios are- estimated by fitting multiple linear regression after this equation- l=f (τ r, s, v, π, m, c, σ).

The expected sign is that firms' leverage is an increasing function of their respective tax positions.

4. Empirical Results

Table 4.1. Average market values of Outstanding Debt and Net Assets of Sample Firms (1996 – 2005)

s/n	Name of company	Average outstanding debt (β_i)(N'b)	Net assets (NA_i)(N'b)
1	Dunlop	1, 231,032	3,470,421
2	R.T. Briscoe	845,763	1,514,570
3	Guinness	2,019,007	46,826,773
4	Nigerian Breweries	10,241,765	126,111,065
5	Ashaka Cement	2,664	13,753,664
6	WAPCO	10,659,102	34,470,938
7	First Bank (FBN)	160,646,842	207,084,034
8	UBA Plc	105,065,122	120,951,322
9	Union Bank (UBN)	169,523,200	220,222,800
10	CAP Plc	244,895	905,555
11	John Holt	1,748,200	3,297,000
12	Unilever	1,750,364	33,273,409
13	PZ Industries	1,021,851	18,931,344
14	UAC	4,244,709	10,640,361
15	7-UP Bottling Company	1,397,129	4,876,588
16	Cadbury	2,740,938	27,084,404
17	Flour Mills	5,565,057	13,911,759
18	Nigerian Bottling Company	2,603,398	36,685,639
19	May and Baker	230,862	810,816
20	Neimeth	476,971	967,944
21	Vita Foam	364,256	1,854,545
22	Mobil	2,850,103	29,268,428

23	Oando	8,619,471	27,793,913
24	Total Plc	232,842	27,282,966
25	Longman	119,565	489,430
26	Nestle	159,646,835	207,084,034
27	Texaco	104,765,124	120,951,322
28	Berger Paints	1,335,030	3,670,451
29	CFAO	741,763	1,714,177
30	First Aluminum	302,640	14,955,600
31	Julius Berger	169,222,834	219,020,864
32	Trans Nationwide Express	444,899	937,509
33	Nigerian Enamel Ware	1,758,602	4,295,050
34	Lennards Nigeria	1,550,360	32,271,309
35	Vono Products	1,611,853	18,903,440
36	Academy Press	4,234,307	11,540,341
37	Cement Co. of N/Nigeria	10,049,100	33,570,958
38	Poly Products Nigeria	9,881,765	124,100,060
39	SCOA Nigeria	2,219,057	48,837,778
40	Triple Gee	433,963	810,816
41	AVON	464,236	1,754,044
42	CAPPA AND D'ALBERTO	1,297,129	4,977,086
43	Northern Nig. Flour Mills	5,265,007	15,901,750
44	International Breweries	2,640,738	27,063,400
45	Alumaco Plc	2,703,598	34,695,648
46	Nigerian Wires and Cable	2,650	29,268,428
47	Nigerian German Chemical Plc	432,871	27,482,966
48	Glaxosmithcline Consumer	576,942	988,948
49	Okumo Oil	8,419,451	27,993,943
50	Afriprint	319,585	489,137
51	United Textile	464,276	1,954,551
52	Evans Medical	10,376,951	31,967,944
53	Morison	9,252,939	25,710,810
54	IPWA	10,659,502	32,297,000
55	Capital Oil Plc	232,842	26,482,966
56	Thomas Wyatt Plc	10,119,165	21,489,137
57	NCR	10,244,895	26,905,585
58	Presco	2,845,662	9,514,570
59	Costain	38,220,488	109,877,881
60	B.O.C. Gases	105,065,122	118,951,322
TOTAL		**1,186,668,259**	**2,430,910,613**

Source: Computed from Handpicked Data from the Annual Reports and Accounts of 60 Sampled Quoted Firms for Various Years.

Average outstanding debt is the aggregate data of each firm for the period under study(1996-2005).Debt for purpose of this study includes all borrowings or credit arrangement for which the firm (beneficiary) incurs periodic charges such as interest, rent, discount, commissions etc that are expensed over the periods to which they relate and are thereby tax-deductibles. The choice of total debt (long and short term) is best in countries where accounting data are not uniformly available. This is against the practice in some other countries where some researchers made use of long term debt. Average outstanding debt was computed for each firm thus:

$$\overline{\beta i} = \frac{\sum\limits_{t=1}^{n=10} \beta it}{n} \qquad 4.1$$

Average market value of net assets was computed for each firm thus:

$$NA_i = \frac{\sum\limits_{t=1}^{n} NA_{it}}{n} \qquad 4.2$$

These computations are consistent with Realdon (2006)

Given the results in Table 4.4 and the fact that the corporate tax rate equals 30 percent for the study period (1996 – 2005), we derive the tax benefits of debt (T_D) as follows:

$$T_D = \tau cB \qquad 4.3$$
$$= 30\% \times N1,186,668,259$$
$$= N356,000,477.7$$

In absolute terms, the tax benefits of debt for the sample firms are over Three Hundred and Fifty Six Billion Naira.

The percentage of these benefits that is captured in net assets can also be derived:

$$_PT_D = \frac{356000477.7}{2430910613}$$
$$= 14.6\%$$

Given that the values of net assets are equivalent to aggregate market valuation of firms; our results reveal that tax benefit of debt approximately equals 15 percent of firm value.

Graham's (2000) study of US firms indicates that the tax benefit of debt equals 9.7 percent of firm value. This might suggest that Nigerian companies derive greater tax advantages in the use of debt relative to their US counterparts. Paradoxically, the regression results presented earlier indicate that the tax rate (τ) is insignificant in the borrowing decisions of

firms.

4.1. Time-Series Results of the Determinants of Capital Structure

Table 4.2 below presents the results of our time-series leverage regression on our eight (8) regressors.

Table 4.2 a. Results Of Market Leverage Regression Using Time Series Data

Constant	Marginal tax rate (τ)	Non-debt tax shelter (r)	Size (s)	Growth (v)	Capital market (m)	Collateral (c)	Profitab ility (π)	Earnings volatility (σ)	Std. error of estimate	R^2	Adjusted R^2	Durbin Watson	N
0.14	-0.01	0.75	0.09	-0.00	-0.00	-0.24	-0.03	-0.00	0.18	0.59	0.58	2.12	600
(3.05)	(-0.91)	(3.44)	(4.75)	(-1.36)	(-0.47)	(-15.42)	(-4.53)	(-0.33)					

Table 4.2b. Results of Book Leverage Regression Using Time Series Data

Constant	Marginal tax rate (τ)	Non-debt tax shelter (r)	Size (s)	Growth (V)	Capital market (m)	Collateral (c)	Profitab ility (π)	Earnings volatility (σ)	Std. error of estimate	R^2	Adjusted R^2	Durbin Watson	N
0.27	-0.01	0.03	0.07	-0.00	-0.00	-0.21	-0.03	-0.00	0.23	0.43	0.42	1.88	600
(4.96)	(-1.53)	(0.13)	(3.07)	(-1.21)	(-0.11)	(-10.82)	(-3.59)	(-0.62)					

Source: Computed From Data In Table4.2 (using special package for social sciences SPSS computer statistical package

The results presented in Table 4.2 shows an inverse relationship between leverage and marginal tax rate for the years 1996-2005 and statistically significant at ten percent (0.10). This result contradicts the notion that firms leverage is an increasing function of their respective tax positions.

Interco-Relation Matrix Of The Relation Between Market Leverage (Ml) And The Eight Regressors

		ML	T	R	S	V	M	c	Π	Σ
	ML	1.00								
	T	-0.09	1.00							
	R	0.08	-0.04	1.00						
	S	-0.33	-0.06	0.32	1.00					
	V	-0.10	0.01	-0.05	0.02	1.00				
	M	-0.06	0.00	-0.03	-0.06	0.00	1.00			
	C	-0.69	0.03	0.18	0.72	0.05	0.03	1.00		
	Π	-0.13	-0.01	0.05	0.13	-0.01	-0.04	0.00	1.00	
	Σ	-0.08	-0.06	0.23	0.47	-0.09	-0.05	0.26	0.05	1.00
Sig (1-tailed)	ML									
	τ	.09								
	r	.11	.26							
	s	.00	.18	.00						
	v	.06	.47	.21	.40					
	m	.17	.48	.30	.17	.48				
	c	.00	.34	.00	.00	.23	.35			
	π	.02	.47	.23	.02	.45	.26	.49		
	σ	.12	.19	.00	.00	.08	.24	.00	.23	

Table above indicates that the explanatory variables are not highly multi-collinear. Thus, the regression estimates in Table 4.2a are quite reliable.

Source: Computed From Pooled OLS Regression Analysis.

Firms with higher collateral should be able to take on more debt, Ceteris paribus. Consistent with this hypothesis; we find that firms with tax benefits have lower ratios of property; plant & equipment to assets and marginally higher ratios of intangible assets to total assets, than firms without tax benefits. The marginal tax positions of firms do not influence managerial decisions on corporate finance in Nigeria. Without adjusting for bankruptcy costs, we report the tax benefit of debt to be as high as 14.6 percent of firm value.

5. Conclusion

There is clearly no discussion in capital structure   in corporate finance literature without a strong emphasis on the impact of tax. Tax constitutes a potentially important consideration in financing a firm. Recorded in literatures are that the presence of different kinds of tax creates one of the most important sources of imperfection in financial leverage decision. The much acclaimed benefits of debt financing rests on the finding that with corporate taxes, interest payment become tax deductible as an expense. Firm tend to make strategic changes in leverage in response to tax law changes. Governments in different countries use the said tax benefits arising from debt financing to moderate investment financing among firms.

The Nigerian Government taxes corporate income, but interest is tax-deductible expense. A taxpaying firm that pays an extra naira amount of interest receives a partially offsetting "interest tax shield" in the form of lower taxes paid. Financing with debt instead of equity increases the total after-tax return to debt and equity investors, and should increase firm value. The present value of interest tax shields could be a very big number.

Our result might suggest that the substitution effect, brought about by the existence of tax shelter substitutes, is greater than the income effect of increasing debt in order to reduce the corporate tax liability. On the basis of our empirical results, the tradeoff theory is in immediate trouble on the tax front, because it seems to rule out conservative debt ratios by taxpaying firms. If the theory is correct, a value-maximizing firm should never pass up interest tax shields when the probability of financial distress is remotely low. Our results fail to confirm a statistically significant positive tax coefficient in the observed debt ratios of Nigerian quoted firms.

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SMS Advertising in India: Is TAM
a Robust Model for Explaining Intention?

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Abstract: This study examined mobile users' intentions to receive SMS advertising in India using Technology Acceptance Model (TAM) as research framework. 242 respondents completed a structured questionnaire; measuring their responses for the TAM's five constructs viz. perceived utility, perceived ease of use, perceived trust, attitude and intention. Using Structural Equation Modeling (SEM) both measurement model and structural model testing was done to analyze the data. Findings indicated that specified TAM model contributed to 81.8% of variance in the intention to receive SMS advertising and was a valid model in explaining the intention to receive SMS advertising. Study further indicated that perceived utility was much better predictor of attitude towards SMS advertising than perceived ease of use and perceived trust. Study suggested marketers that to increase acceptance of SMS advertising they should focus more on increasing utility of SMS ads, so that users would develop positive attitudes towards SMS advertising.

Key Words: Intention; Mobile; Structural Equation Modeling.

JEL Classification: M30; M31

1. Introduction

Marketers are gradually shifting away from traditional marketing medium to more innovative, interactive and personalized mediums (Roozen et al. 2008; Mirbagheri 2010). One such concept is SMS advertising (Dickinger et al. 2005) which could be defined as marketing activities delivering advertisements to mobile phones using Short Message Service (SMS) to promote sales or build brand awareness (Gao 2008). In India, SMS usages are already substantial as average Indian mobile user spends 1/3 of total mobile usage time (14 minutes/day) on SMSing and handles 8.4 SMSes daily (Informate 2009). This trend is further expected to grow rapidly with increasing mobile phone penetration and declining tariffs. SMS advertising is catching eyeballs and is expected to touch $84.5 million by 2012 in India (eMarketer 2010).

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1.1 SMS Ad-vantage

Literatures suggest that SMS advertising has advantages over conventional channels and e-mail. Some advantages are due to inherit technology of SMS and some are due to habits of mobile users. Mobile users have tendency to carry their mobile with them everywhere (Bamba et al. 2006) thus SMS advertising ensures anytime, anywhere reach to consumers (Luxton 2009; Dickinger et al. 2005). Mobile users have a habit of reading SMS and further, mobile phones have no Spam filters as in e-mails, due to this SMS ads claim definite edge over e-mail ads (Bauer et al. 2005; Leppaniemi 2005; Mirbagheri 2010). SMS is highly interactive (Bauer et al. 2005; Barnes 2003) and is suitable for both pull as well as push promotions (Katzstone 2001). Further SMS ads enlarge campaign's reach through viral effects (Yaniv 2008; Bauer et al. 2005). At last, complemented with traditional media SMS advertising could allow marketers to maximize campaign effectiveness and reduce promotional cost (Frolick 2004).

1.2 Technology Acceptance Model & SMS Advertising

Technology Acceptance Model (TAM) explains the determinants of user acceptance of an end-user technology (Davis 1989). TAM points out that perceived ease of use and perceived usefulness affects attitude towards technologies and in turn affect the intention to use. Davis (1989) defined perceived ease of use as *"degree to which a person believes that using and dealing with a particular system would be free from effort"* and perceived usefulness as *"degree to which a person believes that using a particular system would enhance his performance"*. MacKenzie and Lutz (1989) defined perceived trust as "*perception of truthfulness and reliability of advertising and advertisers in general"*. TAM has gained wide spread attention because of its robustness across geographical boundaries and times (Cheung et al. 2005; Teo 2009a; Teo 2009b; Drennan et al. 2005). It has been used to study user acceptance of consumer services and applications such as internet services, e-commerce etc (Kaasinen 2005).
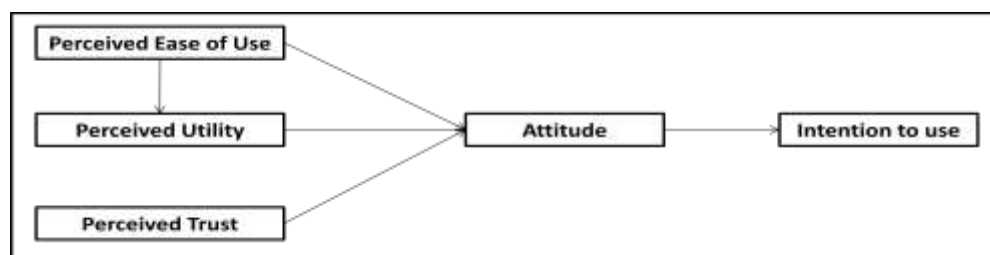

Figure 1. Technology Acceptance Model

Source: (Kaasinen, 2005)

SMS advertising could get competitive advantage over traditional channels very soon (eMarketer 2010). Yet detailed nature of this channel and attitude of

consumers towards it are little known especially in Indian context. Various authors have studied attitude towards SMS advertising (Table 1). Marketers are not only interested in identifying the core factors that influence intention to receive SMS ads, but also in complex interactions among such factors. Answer could be TAM potentially explaining acceptance of SMS advertising.

Table 1. Related Literature

Authors	Studied_at	Factors
Bauer et al. (2005)	UK	Perceived risk, Perceived utility, Customer knowledge
Blano et al. (2005)	Spain	Entertainment, Informativeness
Tsang et al. (2004)	Taiwan	Credibility, Entertainment, Informativeness
Radder et al. (2010)	S.Africa	Perceived risk, Perceived information utility, Information seeking behavior
Ratihayu et al. (2008)	Indonesia	Trust in privacy and law, Perceived utility, Perceived control
Al-alak et al. (2010)	Jordon	Trust, Privacy concern
Jayasingh et al. (2009)	Malaysia	Perceived ease of use, Perceived utility, Perceived trust
Parissa et al. (2006)	Austria	Entertainment, Informativeness, Credibility, Irritation

2. Objectives

1. To study the extent to which the TAM is a robust model to explain the intention to receive SMS advertising.

2. To study the influence of each construct in the TAM on the intention to receive SMS advertising.

3. Research Approach

A Structural Equation Modeling (SEM) approach was executed step by step.

Step 1: Model Specification

Figure 2 is the specified model under study depicting that intention to receive SMS advertising is a function of four variables viz. attitude, perceived ease of use, perceived utility and perceived trust.
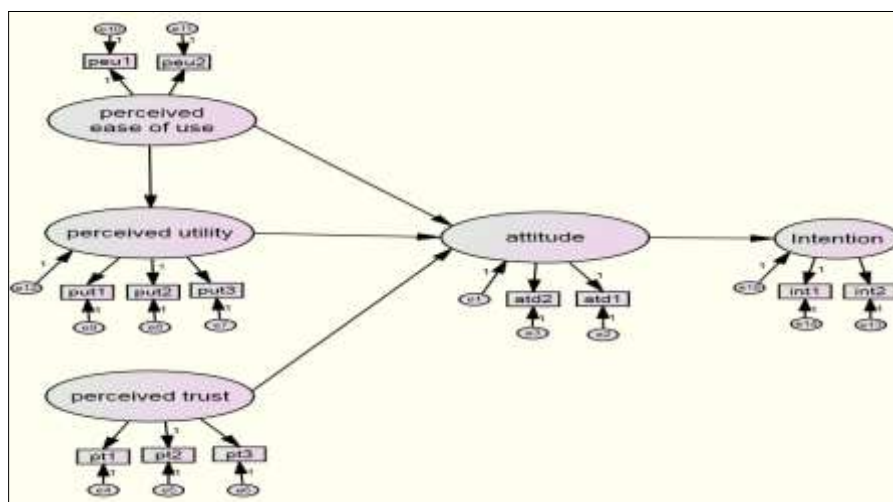
Figure 2. Specified Model

Step 2: Model Identifiability

Specified model had 12 observed variables (n) thus 78 distinct sample moments (n*{n+1}/2). Further in specified model 29 free parameters were to be estimated. As no. of distinct sample moments was greater than no. of free parameters so the specified model was overidentified, an acceptable condition.

Step 3: Measure Selection

To measure latent variables in the specified model pre-validated measures were adopted from previous studies (Table 2). It is recommended that there should be minimum two observed variables per latent variable (Joreskog 1993).

Table 2. List of Latent & Observed Variables

Latent_Variables	Observed_Variables	Adopted_from
Perceived_Utility	PUt1, PUt2, PUt3	*Bauer et al. 2005*
Perceived_Trust	PTs1, PTs2, PTs3	*Tusang et al. 2004*
Perceived_Ease_of_Use	PEU1, PEU2	*Tanakinjal et al. 2010*
Attitude	ATD1, ATD2	*Tusang et al. 2004*
Intention	INT1, INT2	*Shimp et al. 1984*

Step 4: Data Collection, Cleaning & Checking statistical assumptions

SEM is a large sample size technique and a ratio of 20 cases per observed variable is desirable (Kline 2005; Hoyle 1995). Thus for the study data from 242 mobile users was collected.

Data was first subject to cleaning i.e. missing value analysis & outlier detection. In 5 cases missing values were found, casewise deletion led to 237 usable cases (available-case method). For finding outliers standard scores (z scores) of observed variables were calculated using SPSS15. All scores were between +3 and -3 suggesting no outliers (|z| >3 indicating outliers; Kline 2005).

Data was next tested for univariate normality, multivariate normality, reliability and validity. Univariate normality was ensured using skewness and kurtosis indices. Skew and kurtosis indices should not exceed |3| and |10| respectively (Kline 2005). Here data was regarded as univariate normal as skew index ranged from -.62 to .75 and kurtosis index ranged from -.76 to.51.

Mardia coefficient is a measure of multivariate normality where critical ratio of coefficient 1.96 or less indicates multivariate normality (Gao et al. 2007). Critical ratio of Mardia coefficient calculated using AMOS18 was 1.53, suggesting multivariate normality.

Cronbach's α of scale was found to be 0.814, suggesting data reliability (α >or=0.7 acceptable; de Vaus 2002). In multivariate analysis ensuring convergent validity is very important (Abramson et al. 2005) and it exists when measures that purport to measure the same construct have moderate to high correlations (Kline 2005). Scanning of correlation matrix of observed variables confirmed convergent validity as significant correlation was present between observed variables measuring same construct.

Step 5: Model Estimation & Analysis

Model evaluation in SEM has 2 sub-steps: a.Measurement model testing b.Structural model testing. Generalized Least Squares method was used to test specified SEM model's fits with the data. AMOS18 took 7 iterations to produce initial results.

Table 3. Model Fit Indices

Index	Estimated value	Recommended value	Remark
Chi_squared df P	60.275 49 .201	> or =0.05*[#]	Model fit
Normed_Chi_squared (x^2/df)	1.23	< or =3[#]	Model fit
Goodness_of_Fit (GIF)	.921	> or =0.9*	Model fit
Root Mean Square Error of Approximation (RMSEA) P	.048 .598	0< RMSEA <0.08[#] > or =0.05[#]	Model fit
Incremental_Fit_Index (IFI)	.913	> or =0.9*	Sig. model fit compared to null model
Tucker_Lewis_Index (TLI)	.869	> or =0.9*	No significant fit compared to null model

Ref: ***** Klem (2000) [#] Kline (2005)

Step 5a: Measurement Model testing

For measurement model test no single index is perfect, instead multiple indices from various categories should be used (Hair et al. 2006). Table 3 summarizes various indices' used in study.

In SEM, Kline (2005) suggested reporting a number of fit indices, with greater the number of indices supporting the model fit, greater the confidence with the model. So the specified model was accepted as all indices except one index, TFI supported that specified model fits the observed data well. Further residual covariance matrix confirmed that model respecification is not required as all values in matrix were less than 2.58 (Abramson et al. 2005) so structural model was tested next.

Step 5b: Structural Model testing

Figure 3 shows unstandardized estimates i.e. unstandardized regression coefficients for direct effects on endogenous variables, variances for exogenous variables and error terms. The total effect i.e. combined direct and indirect effect on intention to receive SMS advertising was largest for attitude (2.111; when **attitude** goes up by 1, **intention** goes up by 2.111) followed by perceived utility (.974), perceived ease of use (.513) and perceived trust (.173).
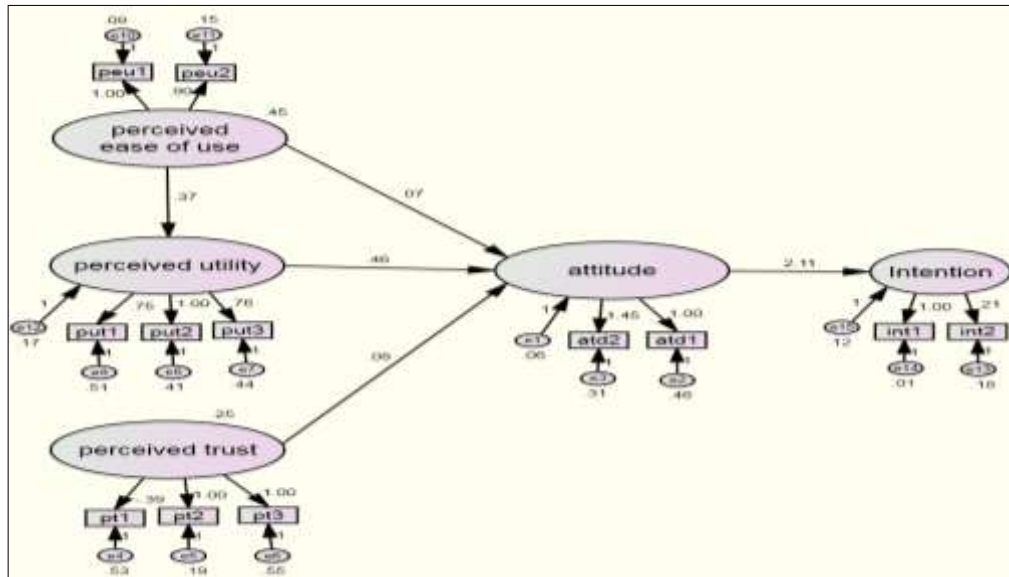
Figure 3. Unstandardized estimates

Table 4 shows standardized regression beta weights. These implied that in SMS advertising, effect of perceived ease of use on perceived utility, of perceived utility on attitude and of attitude on intention was found to be large (effect size>0.5; Kline 2005) whereas effect of perceived ease of use on attitude and of perceived trust on attitude was found to be moderate (0.5>effect size>0.1; Kline 2005). Further, standardized regression beta weights were used to evaluate relative effect of perceived ease of use, perceived utility and perceived trust on attitude towards SMS advertising. Perceived utility was found to 4.6 times better predictor of attitude towards SMS advertising than perceived ease of use and 5.5 times better than perceived trust.

Table 4. Standardized Estimates

Path			Standardized_Weights	Effect_size
Perceived_utility	<---	Perceived_ease_of_use	.511	Large
Attitude	<---	Perceived_utility	.638	Large
Attitude	<---	Perceived_ease_of_use	.137	Moderate
Attitude	<---	Perceived_trust	.116	Moderate
Intention	<---	Attitude	.905	Large

Table 5 shows squared multiple correlations (SMC) of variables. Specified model explained 26.1 % of variance in perceived utility and 52.8% of variance in attitude towards SMS advertising (Table 5). Further model was able to explain 81.8% of variance in intention thus leaving only 18.2% variance unexplained, suggesting robustness of TAM in explaining intention to receive SMS advertising.

Table 5. Squared Multiple Correlations

Latent variables	Predictors	SMC
perceived utility	Perceived ease of use	.261
Attitude	Perceived ease of use, Perceived utility, Perceived trust	.528
Intention	Attitude	.818

4. Conclusions

Study examined the extent to which the TAM is a robust model in explaining the intention to receive SMS advertising and the influence of each construct in the TAM on the above intention. Both measurement and structural model testing suggested that constructs in the TAM i.e. perceived utility, perceived ease of use and attitude towards SMS advertising were instrumental in determining the intention to receive SMS advertising as model contributed to 81.8% of the variance in the intention. Thus TAM was a robust model in explaining the intention to receive SMS advertising.

Teo (2009a), Teo (2009b) suggested that attitude is a significant predictor of the intention to use technology when users have complete freedom to make choice regarding use. Obviously mobile users in this study were free to decide whether to receive or not SMS ads, as 'Do-Not-Disturb' and 'Do-Not-Call' norms are strict in India. Thus findings of the study are consistent with past findings, as standardized estimate of the path from attitude to intention (.093) was substantially greater than other paths.

Among the constructs affecting the attitude towards SMS advertising, perceive utility was found to be strongest predictor than perceived ease of use and perceived trust. Davis (1989); Taylor (1995) stated that perceived usefulness evolves as stronger predictor of attitude than perceived ease of use, as users become more experienced familiar with technology. In India mobile phones are with common men more than a decade and average mobile user in India handles 8.4 SMSes daily (Informate 2009). So Indian mobile users seems to be very familiar with mobile technology, SMS in particular. Hence, It could be implied that respondents would have not perceived issues pertaining to opt-in/opt-out, interacting with SMS ads,

specifying time slots for receiving SMS ads etc. important; reflecting perceived ease of use a weaker predictor of attitude towards SMS advertising.

Perceived trust was another weaker predictor of attitude towards SMS advertising in comparison to perceived utility. One explanation of this could be that in India, 'Do-Not-Disturb' & 'Do-Not-Call' norms and third party privacy policies are clearly stated and strict. Because of these Indian mobile users seems to take it for granted that marketers would not send unsolicited SMS ads and would not misuse their personal information.

5. Implications

Findings have important implications for marketers. To increase acceptance of SMS advertising marketers should provide pleasant experiences, so that users would develop positive attitudes towards SMS advertising. This in turn would reinforce users' intention to receive SMS advertising. Perceived utility of SMS advertising is better predictor of attitude towards SMS advertising so marketers should focus on increasing perceived utility. This could be done by providing incentives (Tsang 2004; Bamoriya et al. 2011), informative content (Blano et al. 2005; Parissa et al. 2006), personalized messages (Scharl et al. 2005; Robins 2003).

6. Limitations & Future Research

Study has certain limitations. Firstly, it is recommended that the final model to be tested on a second sample (model replication, Kline 2005), but due to sample size consideration in the study model replication was not exercised. Secondly, study only dealt with prediction of behavior i.e. intention rather than actual behavior which may have led to loss of explanatory power of model. Third, there could be other factors possibly contributing in intention to receive SMS ads, like social norms (Karjaluoto et al. 2008), attitude towards advertising in general (Bauer et al. 2005). Study lacks accounting of such additional constructs' interaction. Here last 2 limitations indentified provide some good future research implications in area of SMS advertising.

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Bank Credit and Aggregate Import Demand
in Nigeria: A Cointegration Analysis

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Abstract: This study reformulated the aggregate import demand for Nigeria by including a financial variable (bank credit) into the traditional import demand function for the period 1970-2009. The Johansen Multivariate cointegration analysis was used to estimate the function. The result obtained from the study shows no evidence of the existence of cointegrating relations between bank credit and import demand. This shows that bank credit is found to be insufficient as a policy instrument for long term import demand in Nigeria. Thus, the financial variable should not be included in modelling the aggregate import demand for Nigeria.

Keywords: Aggregate import demand; Bank credit; Cointegration; Nigeria

JEL Classification: C22, C32, F14

1 Introduction

Nigeria's aggregate imports have grown substantially since the country's political independence in 1960. The growth of imports according to Egwakhide (1999) is attributable to several factors. These include the need to pursue economic development, the expansion in crude oil export that considerably raised foreign exchange earnings and the over-valuation of the local currency, which artificially cheapened imports in preference to local production and the astronomical expansion of domestic absorption which has to be satisfied by imports. Estimating import demand function is still popular in empirical research because of its relevance for trade and exhange rate policy formulation.

The relevance of aggregate imports demand has led to several studies trying to explain the behaviour of aggregate import demand function in Nigeria. Among such studies are Olayide (1968), Ajayi (1975), Khan (1974), Fajana (1975), Mouka (1982), Obadan (1986), Yekini (1999) Egwaikhide (1999), Aliyu (2005), Omotor (2010) and Babatunde and Egwakhide (2010). These studies adopted the traditional formulation of import demand equation, the volume of imported demanded to real income and relative price variables and have undoubtedly provided considerable

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insights into the quantitative effects of aggregate economic activity (proxied by real income) and import prices relative to domestic prices on total imports. These studies have presented different and yet interesting findings on the nature and influence of different variables determining the level of Imports demand functions in Nigeria.

Following Craigwell (1994) and Tang (2004, 2006), this study aims at estimating aggregate import behaviour for Nigeria by including bank credit variable as an additional determinant for import.

This study contributes to empirical literature by formulating an augumented import demand function which includes a financial variable (bank credit). The inclusion of the bank credit variable as an additional factor for explaining aggregate import demand is to accommodate increase in spending which includes spending on imported goods, which are not produced domestically. In other words, imports, like any other form of expenditure, have to be financed by bank credit, moreso when the domestic output have high import contents such as raw material or immediate goods which are not produced locally or lack of perfect substitutes, an increase in domestic demand might increase the need for bank loans for production. The knowledge of these association will enable us obtain a more complex picture of the effects and nature of bank credit for an importing country's-demand for import. The study also employed a correct economic activity variable i.e,. gross domestic product (GDP) minus real export as proposed by Senhadji (1998) and used by Tang (2006) rather than GDP as used in conventional import demand functions. Empirical evidence on the long-run relationship between bank credit and the behaviour of import demand is mixed and inconclusive. While Craigwell (1994) found that bank credit is an important variable in explaining the behaviour of aggregate import demand for Barbados. This was supported by Tang (2004) for Japan and Tang (2006) for Singapore, Indonesia and Thailand. However, Tang (2006) found no evidence of existence of cointegrating relations between bank credit and import demand for Malaysian and Philippines and concludes that bank credit should not be included in modelling Malaysian and Philippines import demand.

The structure of the study is as follows. Section 2 describes the methodolgy which includes the model specification, data and the estimation procedure. The empirical results are reported in section 3. Section 4 which is the last section concludes the study.

2. Methodology

The conventional formulation of the aggregate import demand function of the imperfect substitute model of Goldstein and Khan (1985) relates the quantity of imports to real income (or activity variables) and relative prices of imports (ratio of import prices to domestic prices). The imperfect substitution model is rooted in the assumption that a demand function is homogeneous of degree zero in price. In line with the above proposition and following the lead of Tang (2006) an augmented version of the aggregate import demand function for Nigeria can be written as:

$$M_t = M_t(YE_t, RP_t, CR_t) \qquad (1)$$

Where M_t is the desired quantity of imports demanded at period t, YE_t is the activity variables proposed by Senhadji (1998) that is calculated by real GDP minus real exports. RP_t is the ratio of import price index to domestic price level (relative price of imports), and CR_t is the volume of bank credit

A log linear specification of import demand equation is written as:

$$LM_t = \alpha_0 + \alpha_1 LYE_t + \alpha_2 LRP_t + \alpha_3 LCR_t + \varepsilon_t \qquad (2)$$

Where ε_t is the residuals series and L is natural logarithmic form

Economic theory expects that the signs of the coefficients be as follows: $\alpha_1>0$ or <0, $\alpha_2<0$ and $\alpha_3>0$. This is based on Keynes argument that an increase in domestic activity will stimulate imports yielding positive income elasticity. On the other hand, if an increase in domestic activity is due to an increase in the production of import-substitute goods, imports may actually fall, resulting in negative income elasticity. An increase in import price relative to domestic price levels will hurt import volume, yielding negative price elasticity. Lastly, a Credit variable is expected to be positively related to import flows.

2.1. Data Description and Source

The study uses annual data from 1970 – 2009; the sources of the data are the Central Bank of Nigeria (CBN) Statistical Bulletin, 2009 and the International Monetary Fund, International Financial Statistics CD, ROM (IMF/IFS, 2011). The description of the data is as follows:

The quantity of imports demanded (Mt) is real import; that is nominal import deflated by import price index. Volume of import was sourced from the CBN Statistical bulletin, 2009 and divided by US export price index (used as a proxy for import price index) – sourced from IMF/IFS, 2011. The activity Variable (YE_t), based on Senhadji (1998), is derived as Gross Domestic Product (GDP) minus exports then deflated by GDP deflator yielding a variable in real terms. All the data

used for the calculation was sourced from CBN Statistical Bulletin, 2009. Relative Price of Import (RP_t) is the ratio of import price index to GDP deflator. We used the export price index of US to proxy Nigeria's import price index. This is sourced from the IMF/IFS CD ROM, 2011. Real bank credit is defined as the nominal value of credit from Nigeria deposit banks deflated by GDP deflator. We used Private sector credit as a proxy; this was sourced from the CBN Statistical Bulletin, 2009.

2.2. Method of Analysis

The cointegration technique will be employed to estimate the variables in this study. To carry out the cointegration analysis, two steps are required: these are testing for order of integration and the cointegration.

2.2.1. Unit Root Test

The first step involves testing the order of integration of the individual series under consideration. Researchers have developed several procedures for the test of order of integration. The most popular ones are Augmented Dickey-Fuller (ADF) test due to Dickey and Fuller (1979, 1981), and the Phillip-Perron (PP) due to Phillips (1987) and Phillips and Perron (1988). Augmented Dickey-Fuller test relies on rejecting a null hypothesis of unit root (the series are non-stationary) in favour of the alternative hypotheses of stationarity. The tests are conducted with and without a deterministic trend (t) for each of the series. The general form of ADF test is estimated by the following regression

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \sum_{i=1}^{n} \alpha \Delta y_i + e_t \qquad (3)$$

$$\Delta y_t = \alpha_0 + \alpha_1 y_{|t-1} + \sum_{n=1}^{n} \alpha_1 \Delta y_i + \delta_t + e_t \qquad (4)$$

Where:

Y is a time series, t is a linear time trend, Δ is the first difference operator, α_0 is a constant, n is the optimum number of lags in the dependent variable and e is the random error term the difference between equation (1) and (2) is that the first equation includes just drift. However, the second equation includes both drift and linear time trend pp.

2.2.2. The Cointegration Analysis

The second step is to test the presence or otherwise of cointegration between the series of the same order of integration through forming a cointegration equation.

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The basic idea behind cointegration is that if, in the long-run, two or more series move closely together, even though the series themselves are trended, the difference between them is constant. It is possible to regard these series as defining a long-run equilibrium relationship, as the difference between them is stationary (Hall and Henry, 1989). A lack of cointegration suggests that such variables have no long-run relationship: in principle they can wander arbitrarily far away from each other (Dickey et. al., 1991). We employ the maximum-likelihood test procedure established by Johansen and Juselius (1990) and Johansen (1991). Specifically, if Y_t is a vector of n stochastic variables, then there exists a p-lag vector auto regression with Gaussian errors. Johansen's methodology takes its starting point in the vector auto regression (VAR) of order P given by

$$y_t = \mu + \Delta_1 y_{t-1} + - - - + \Delta p \quad y_{t-p} + \varepsilon_t \tag{5}$$

Where:

Y_t is an nx1 vector of variables that are integrated of order commonly denoted 1(1) and ε_t is an nx1 vector of innovations.

This VAR can be rewritten as

$$\Delta y_t = \mu + \eta_{yt-1} + \sum_{i-1}^{p-1} \tau_i \Delta y_{t-1} + \varepsilon_t \tag{6}$$

Where

$$\Pi = \sum_{i-1}^{p} A_{i-1} \quad \text{and} \quad \tau_i = -\sum_{j=i+1}^{p} Aj$$

To determine the number of co-integration vectors, Johansen (1988, 1989) and Johansen and Juselius (1990) suggested two statistic test, the first one is the Trace test (λ trace). It tests the null hypothesis that the number of distinct cointegrating vector is less than or equal to q against a general unrestricted alternatives q = r. the test is calculated as follows:

$$\lambda \text{ trace } (r) = -T \sum_{i=r+1} \text{In} \left(1 - \hat{\lambda}_t\right) \tag{7}$$

Where:

T is the number of usable observations, and the $\lambda_{1,s}$ are the estimated eigenvalue from the matrix.

The Second statistical test is the maximum eigenvalue test (λ max) that is calculated according to the following formula:

$$\lambda \max (r, r + 1) = -T \ln (1 - \lambda r + 1) \qquad (8)$$

The test concerns a test of the null hypothesis that there is r of co-integrating vectors against the alternative that r + 1 co-integrating vector.

3. Empirical Analysis

As discussed in the previous section, the analysis begins with the test for unit roots in the data. We use both the Augmented Dickey Fuller (ADF) and Phillips – Perron (PP) tests to find the existence of unit root in each of the time series. The results of both the ADF and PP tests are reported in Table 3.1 and 3.2.

Table 3.1. ADF and PP Stationarity test at level

Variables	ADF (Intercept)	ADF (Intercept & Trend)	PP (Intercept)	PP (Intercept & Trend)
LM	-0.127(-3.610)*	-1.840(-4.211)*	-0.061(-3.610)*	-1.849(-4.211)*
LYE	-2.633(-2.607)***	-2.113(-4.211)*	-2.500(-3.610)*	-1.717(-4.211)*
LRP	-5.241(-3.610)*	-5.490(-4.211)*	-5.245(-3.610)*	-5.481(-4.211)*
LCR	-0.384(-3.615)*	-4.892(4.211)*	-0.615(-3.610)*	-4.870(-4.211)*

Note: * denotes Significance at 1% level. Figures within parenthesis indicate critical values. Mackinnon (1991) critical value for rejection of hypothesis of unit root applied.

Source: Author's Estimation using Eviews 6.0.

The result in table 3.1 shows that the log of activity variable was stationary (ADF intercept) at 10 percent significance while log of credit achieved stationarity at 5 percent. All the other variables appear non stationary at levels. This can be seen by comparing the observed values (in absolute terms) of both the ADF and PP test statistics with the critical values (also in absolute terms) of the test statistics at the 1%, 5% and 10% level of significance. As a result of the non stationarity of the other variables, we differenced them once and both the ADF and PP test were conducted on them. The result is shown in table 3.2.

Table 3.2. ADF and PP Stationarity test first difference

Variables	ADF (Intercept)	ADF (Intercept & Trend)	PP (Intercept)	PP (Intercept & Trend)
LM	-7.083(-3.615)*	-7.035(-4.219)*	-7.031(-3.615)*	-6.987(-4.219)*
LYE	-5.188(-3.626)*	-7.086(-4.234)*	-7.740(-3.615)*	-14.337(-4.219)*
LRP	-6.464(-3.621)*	-6.399(-4.226)*	-14.678(-3.615)*	-15.232(-4.219)*
LCR	-9.887(-3.615)*	-6.389(4.226)*	-12.377(-3.615)*	-13.351(-4.219)*

Note: *denotes Significance at 1% level. Figures within parenthesis indicate critical values. Mackinnon (1991) critical value for rejection of hypothesis of unit root applied.

Source: Author's Estimation using Eviews 6.0.

The above table reveals that all the variables were stationary at first difference. On the basis of this, the null hypothesis of non-stationarity is rejected and it is safe to conclude that the variables are stationary. This implies that the variables are integrated of order one.

3.2. Cointegration test Result

With the confirmation of the stationarity of the variables, we proceed to examine the presence (or non-presence) of cointegration among the variables. When a cointegration relationship is present, it means that the variables share a common trend and long-run equilibrium as suggested theoretically. We started the cointegration analysis by employing the Johansen and Juselius multivariate cointegration test. Table 3.3 and 3.4 shows the result of the cointegration test.

Table 3.3. Unrestricted Cointegration Rank Test (Trace)

Lags interval (in first difference): 1 to 1

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.424297	36.95820	47.85613	0.3495
At most 1	0.195393	15.97596	29.79707	0.7140
At most 2	0.183334	7.714718	15.49471	0.4964
At most 3	0.000494	0.018781	3.841466	0.8909

Trace test indicates no cointegrating eqn(s) at the 0.05 level

*denotes rejection of the hypothesis at the 0.05 level

**Mackinnon-Haug-Michelis (1999) p-values

Table 3.4.Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Lags interval (in first difference): 1 to 1

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.424297	20.98224	27.58434	0.2773
At most 1	0.195393	8.261244	21.13162	0.8870
At most 2	0.183334	7.695937	14.26460	0.4105
At most 3	0.000494	0.018781	3.841466	0.8909

Max-eigenvalue test indicates no cointegrating eqn(s) at the 0.05 level

*denotes rejection of the hypothesis at the 0.05 level

**Mackinnon-Haug-Michelis (1999) p-values

From the result shown in both tables 3.3 and 3.4, trace statistic revealed the presence of no cointegrating vector and maximum Eigenvalue statistic also indicated no cointegration at the 5 percent level of significance, suggesting that there is no long run relationship between the variables tested. Though no cointegrating vector was found, we go ahead to ascertain the relationship between aggregate import demand and bank credit in Nigeria by normalizing the estimates of the unconstrained cointegrating vector. Normalizing on this vector for import demand yields:

$$LM = 1.000 + 0.056 LYE + 11.575 LRP - 3.050 LCR$$

From the normalised equation, the long-run relationship between import demand and economic activity is positive as expected. This result is consistent with economic theory, and it shows how important import is to the economy of Nigeria. In fact, Nigeria has been correctly labelled an 'import dependent economy'. The relative price variable is positively related to import demand; theory predicts that relative price should have a negative relationship with import. Thus, the costlier the domestic goods compared to imported goods, the more the increase in import demand. However, this did not hold for Nigeria as relative price revealed a positive relationship. Nigeria, like most developing countries, has a taste for foreign goods which most often does not depend on price. The country is very much dependent on foreign goods that the price tends to inelastic; the manufacturing industry imports raw materials and intermediate goods, government officials prefer to use foreign facilities and product from abroad and the poor in the society is not left out as anything foreign is often regarded as the best in the country.

Finally, the long run relationship between import demand and bank credit is negative. This result is contrary to economic expectation. The bank credit variable is expected to be positively related to import flows. The result shows that Nigerian banks do not play a significant role in financing this important sector of the

economy. This means that Bank credit is found to be insufficient as a policy instrument for long term import demand in Nigeria.

4. Conclusion

The traditional formulation of import demand equation relates the volume of import demand to real income and relative price variables. Following the studies of Craigwell (1994) and Tang (2004, 2006), this study reformulates the import demand function by including a financial variable (bank credit) to the traditional formulation. The equation was estimated using the cointegration analysis. The result of the study found no empirical evidence of the existence of cointegrating relations between import demand and bank credit. The coefficient of the cointegration analysis shows a positive relation between import demand and economic activity; a positive relation between import demand and relative prices and a negative relation between import demand and bank credit. The result from the study shows that Nigerian banks do not play a significant role in financing this important sector of the economy. This means that Bank credit is found to be insufficient as a policy instrument for long term import demand in Nigeria.

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Application of "Small Steps Strategy" in
the Management of European Companies

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Abstract: The extension of the European Union represents a huge opportunity for the companies, but in an equal measure it is a real challenge, namely the one to face competition with European enterprises. Quality stands for a constituent part of the competitiveness but the extension of the European Union has made the developing countries and the countries with economies in transition to experience difficulties in raising the quality of the goods and of the services supplied. In the following paper, the authors will propose some solutions to improve quality using the "strategy of small steps" which is widely known as Kaizen strategy.

Keywords: quality improvement; kaizen strategy; innovation.

JEL Classification: M12; M16; M54; O32.

1 Introduction

Among the functions of the quality management, quality improvement plays a significant role in reducing costs and raising competitiveness. A proof in this regard is the fact that the international standards ISO 9000 lay a particular accent on quality improvement: the enterprises managers are advised to implement a management system that should enable the continuous improvement of processes quality and their results in order to ensure the best satisfaction of the customers and society needs. Furthermore, organizations (even they are public offices or private organizations) have to be flexible and customer orientated. More and more clients expect perfect quality of products and services, short delivery time and a reasonable price. Therefore, companies need structured strategies that enable positive transformations to meet customer's needs and expectations; through Kaizen strategy which is a "strategy of small steps", a lot of barriers can be overcome and this implies to involve everyone, including managers and also workers. That is why, the aim of the present paper is to bring up solutions to apply kaizen strategy in European companies.

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2. What does Kaizen, the "Strategy of Small Steps" Represent?

Continuous improvement represents a gradual advancement of the quality of products and services, of the productivity and competitiveness based on the whole enterprise's staff participation (Olaru, Isaic-Maniu, Lefter, Pop, Popescu, Drăgulănescu, Roncea & Roncea, 2000).

This manner of increasing the level of quality had a distinguished development in Japan, where it is known as Kaizen (in Japanese kai means "change" and zen means "good" or "for the better", the compound term being translated by the syntagm "continuous improvement") (Palmer, 2001) (see figure 1).

Figure 1. Kaizen Definition
Source: (Masaaki, 2008)

The concept of kaizen has been developed by Masaaki Imai, chairman of Cambridge Corporation in Tokyo, which had set up the Kaizen Institute in 1986, a global organization that operates in Europe, Asia, America, Africa and Australia. In Masaaki Imai's vision, Kaizen represents an "umbrella" concept that brings together the main methods applied in Japan in quality management, such as: quality circles, system of suggestions, total productive maintenance, etc.

Kaizen strategy is based on the principle of the gradual and continuous improvements in "small steps", improvements generated by the employees through the application of a wide variety of structured methods and simple technologies; the message is that no day should pass without an improvement in the activity of the employees and of the whole company. The belief that the improvement represents an action without end is deeply rooted in Japanese mentality.

Kaizen is firstly focused upon the company's employees which are motivated to participate in a responsible way in achieving the objectives regarding quality through specific incentives of the Japanese management such as: life employment,

wages in correspondence with the quality of work, the existence of trade unions in each firm, awards for the best contributions, etc. (Ionita, 2002).

Kaizen philosophy has revolutionized the Japanese economy over the last 30 years and its basis are to establish a work standard and continue to improve processes correcting the differences between the standard and the new results (Inoki & Fukazawa, 2007).

As Masaaki Imai says, "Kaizen is a long-term strategy, for a minimum of three years initially and it has to be repeated regularly". As an example, the success of Toyota Motor Corporation comes from the fact that it has been carrying out Kaizen strategy from decades (the middle of the 20th Century) until today with no compromises (Masaaki, 2008).

Kaizen differs from quality improvement methods applied by European and American managers who put emphasis on innovations. The superiority of the Japanese concept results from the fact that in order to apply the "strategy of small steps" the necessary resources are of no significance while the strategies based on innovation require very high investments, changes being radical as compared to the initial situation (see figures 2 and 3). Improvements, even small, have a very strong effect on long-term due to continuous accumulation of new changes.
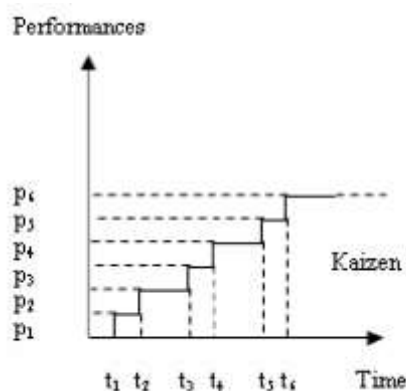
Figure 2. Quality improvement through Kaizen strategy ("strategy of small steps")
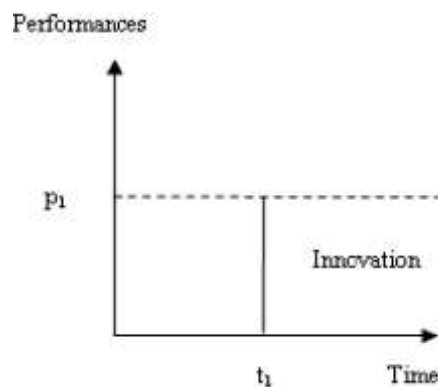
Figure 3. Quality improvement through innovation strategy ("strategy of big steps")

There are more aspects that make a blunt differentiation between Kaizen strategy and innovation strategy among whom are as follows:

- Kaizen strategy brings forward the employees of the company and it relies on the efforts of the entire enterprise's staff, these ones being motivated to participate in the most serious and responsible manner in achieving the objectives regarding quality improvement. Considering the innovations, they

require the implication of small elite, of the top managers who determine the introduction within the organization of the innovative discoveries.

- Kaizen strategy focuses on the process, while innovation focuses on the results (Filip, Morariu & Popescu, 2004).

- Kaizen strategy has as main factor of success the human factor, while innovation relies on the technical and financial factors (see table 1).

One of the most significant aspects is the fact that within enterprises who apply the Kaizen strategy, the main preoccupation, before the quality of product, is the "quality" of the employees. These employees have to understand the necessity of continuous improvement so that this should turn into a state of spirit for anyone of them.

Table 1. The main elements that makes difference between Kaizen strategy and innovation strategy

Criteria	Kaizen Strategy	Innovation Strategy
The complexity of change	Small	Big, radical
The frequency of change	Big	Small
Boundary in time	Continuous	By leaps
The degree of risk	Low	High
Participants	Every employee	Appointed persons for innovation
Motto	Maintain and improve	Renounce to previous situation and reconstruct
Technologies	Existing level of technique	Significant technological change, new solutions
Effort	Small investment, strong mobilization	Significant investment, weak mobilization
Main factor of success	Human factor	Technical factor, financial factor
Effect	Slow economic growth	Fast economic growth

According to Hamel M.R. there are ten basic ground rules of kaizen shown in figure below:

Kaizen ten basic ground rules

1. Leave all titles and ranks at the door.

2. Treat others as you would like to be treated.

3. Improvement requires change. Do not waste time justifying the current situation.

4. Keep an open mind.

5. Maintain a positive attitude.

6. Deal from data, not perception or emotion.

7. Create a blameless environment.

8. There is no substitute for hard work (serious work).

9. Plans are useful only if they can be applied and if the gains are sustainable.

10. Just do it…now!

Figure 4. Kaizen ten basic ground rules
Source: (Hamel, 2010)

There are many issues to be solved in the working environment where the enterprise's staff activates. According to Kaizen, firstly, people have to identify the problems. Then, they have to understand and to acquire the techniques and the instruments to solve those problems, so that, after having identified them, they should solve the problems themselves (Olaru, Isaic-Maniu, Lefter, Pop, Popescu, Drăgulănescu, Roncea & Roncea, 2000).

Both European and American managers have shown interest in Kaizen, but for the moment that strategy is not widespread in these continents. Masaaki Imai says that, in order to successfully implement Kaizen, some changes should occur in organizational culture and system of values. Managers in countries where material and financial resources are insufficient for sudden changes, such as radical innovations in technology, should take into account the possibility to implement the strategy of continuous improvement (Ionita, 2002).

To implement Kaizen in European companies, managers should consider the following aspects:

- top managers should renounce the idea that action takes place only in their own office; to have success managers should observe the real elements where they are taking place, finding possible causes of problems in "gemba" (in Japanese "gemba" means the place where events take place) (Masaaki, 2006);

- employees must be encouraged to develop the ability to work effectively in team (the Japanese have a cult for teamwork; their quality circles are worldwide known);

- every employee must be encouraged to express his own creative ideas, no matter how absurd they may seem to be (Japanese have introduced so-called "suggestions system" that involves collecting suggestions for improvement made by the company's employees, the best ideas being awarded);

- employees should be encouraged to make suggestions to improve the activity of their own and of the entire working group;

- managers should pay much more attention for the staff training so as their suggestions have practical applicability;

- there should happened a change of the employees mentality and attitude, those ones being much more difficult to achieve than the acquiring of new work methods;

- top managers should be the first involved persons considering the power of personal example;

- it is essential for managers to understand and properly assess the consequences before acting and this can be possible through the application of Deming's cycle (this cycle can be applied in any areas of activity within an organization, following four phases: Plan-Do-Check-Act).

3. Conclusion

The main advantage of kaizen strategy (a "strategy of small steps") is flexibility so that it can be adapted and put into practice by organizations regardless of their profile. The improvements, even if of small dimensions, have a very strong effect on long-term due to continuous accumulation of new and new changes. Unfortunately, many of the companies' managers try to resist changes and find reasons why they should not do them. Changing and continuously improve with kaizen strategy means to assume less risks and to invest less money for change but gain much more positive results.

Kaizen strategy may provide for companies the possibility to be competitive and to offer products and services that fulfill consumers' needs and expectations. The central point is that in order to apply continuous improvement, companies should consider quality not as a separate feature of a product but as a philosophy to be endorsed by the entire organization; ignoring clients' requirements in the field of quality will lead the company to business failure.

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Small and Medium Enterprises and Economic Growth in Nigeria

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Abstract: This paper seeks to critically investigate the impact of small and medium enterprises as a veritable tool on Economic Growth. A survey method was used to gather data from 200 SME/Entrepreneurial officers and Managers from five selected local government in Nigeria. Data was collected with a structured questionnaire and analyzed with several descriptive statistics to identify the perception of the roles of SMEs in Nigeria. The results of the study concludes that lack of financial support, poor management, corruption, lack of training and experience, poor infrastructure, insufficient profits, and low demand for product and services are seen as the most common constraints hindering small and medium scale business growth in Nigeria. Hence, it therefore recommends that Government should assist prospective entrepreneurs towards having access to finance and necessary information relating to business opportunities, modern technology, raw materials, market, plant and machinery which would enable them to reduce their operating cost and be more efficient to meet the market competitions.

Keywords: SMEs; Entrepreneurial Enterprise; Economic Growth; Development; local Government

JEL Classification: L26; L32; O10; O40

1 Introduction

The small and medium scale enterprises are being given increasing policy attention in recent years, particularly in third world countries partly because of growing disappointment with results of development strategies focusing on large scale capital intensive and high import dependent industrial plants. The impact of SMEs is felt in the following ways: Greater utilisation of local raw materials, employment generation, encouragement of rural development, development of entrepreneurship, mobilisation of local savings, linkages with bigger industries, provision of regional balance by spreading investments more evenly, provision of avenue for self-employment and provision of opportunity for training managers and semi-skilled workers.

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The vast majority of developed and developing countries rely on dynamism, resourcefulness and risk tasking of small and medium enterprises to trigger and sustain process of economic growth. In overall economic development, a critically important role is played by the small and medium enterprises. Small and Medium Enterprises advocates, firstly, it endurance competition and entrepreneurship and hence have external benefits on economy wide efficient, innovation and aggregate productivity growth. At this level, perspectives are directed towards government support and involvement in exploiting countries social benefits from greater completion and entrepreneurship. Secondly, proponents of SME support frequent claim that SMEs are generally more productive than large firms but financial market and other institutional improvements, direct government financial support to SMEs can boost economic growth and development.

Some argued that SMEs expansion boosts employment more than large firm growth because SMEs are more labour intensive thereby subsidizing SMEs may represent a poverty alleviation tools, by promoting SMEs and individual countries and the international community at large can make progress towards the main goal of halving poverty level by year 2020 i.e to reduce poverty by half and becoming among 20 largest World Economies (Nigeria Vision 20: 2020). Entrepreneurial development is therefore important in the Nigeria economy which is characterized by the following heavy dependence on oil, low agricultural production, high unemployment, low utilization of industrial capacity, high inflation rate, and lack of industrial infrastructural base. These constraints limit the rate of growth of entrepreneurial activities in Nigeria. Hence, this paper seeks to investigate Small and Medium Enterprises as a veritable tool in Economic Growth and Development.

This paper seeks to investigate Small and Medium Enterprises as a veritable tool in Economic Growth and Development in Nigeria. The purpose of this study is to come up with a set of potential determinates that affect the adoption of SMEs and set of potential supporting activities to influence economic development in Nigeria. In this research, focus was only on SMEs in five local governments in Ogun State - the western part of Nigeria. Therefore, the first limitation faced by this study is that the research findings of SMEs in the area might not be able to represent the correct situation in the rest of the country. The problem is that the majority of SMEs in Nigeria might face different problems from different sectors and business areas.

Another limitation in the research on these Nigerian SMEs is that since questionnaires are used to collect and investigate the roles of SMEs in Nigeria, the major disadvantage of this method is the inability to interact with respondents in order to ask more detailed and in-depth questions to discover more information as the study permits. This limitation pose a problem for this study as the inability to discover in-depth influenced between SMEs and economic development, and to measure accurately the clear reasons given by each respondents.

However, since this study makes use of primary data, the instruments need to be subjected to more statistical tests in order to establish a more robust validity and reliability. The instruments could be further refined to more closely capture each of the problem areas identified in the literature. It is suggested that that replication of this study should involve larger samples and a broader geographic base for cross-validation purposes.

4. Literature Review

In Nigeria, the Third National Development plan (1975-1980) defines s small business as a manufacturing or service organization whose employee is not more than 10. The individual research unit of Obafemi Awolowo *(1987) defines it as "one whose total assets or capital is less than N50, 000 and employee fewer than 50 full time workers". Glos et al (1976) referred to it as "a whole sales whose annual sales do not exceed 9.5million dollars. Small businesses are however very important in the nation's economy.

Meanwhile, a study by the Federal Office of Statistic (2001) shows that 97% of all business in Nigeria employed less than 100 employees. Going by this definition of SMEs, an umbrella term for firms with less than 250 employees, it means that 97% of all businesses in Nigeria and to use the term 'Small Business''. The SME sector provides an average of 50% of Nigeria's employment, and 50% of its industrial output (Ariyo, 2005).

In his own contribution to the definition of the subject matter, Birch (1970) argued that small firms are particularly important in job creation. He reported that over the 1970s, firm with fewer than 100 employees generated eight out of every ten new jobs in America. This evidence was however rejected by a wide array of evidence in the study conducted by Divine Brown (1990), which revealed that large firms were dominant source of net job creation in the manufacturing sector.

UNCTAD (2001) affirms that countries with a high rate of small industrial enterprises have succeeded in making the income distribution (both regionally and functionally) more equitable. This is in turn a key distribution to ensuring long term social stability by alleviating export redistribution presume and by reducing economic disparities between urban and rural areas.

This study therefore, aims at cross-examining various SME policies adopted by Nigerian Government to discuss the impact of business environment of SMEs development, to examine challenges and factors hindering the growth of SMEs and to proffer solutions to identified problems of SMEs.

4.1. Theoretical Framework

Small and Medium business constitute the very foundation upon which the large businesses were built, however, small and medium have been identified differently by various individuals and organization such that an enterprise that is considered small and medium in one place is seen differently in another. Even within a country, the definition changes over time. Some common indicators employed in the various definitions include total assets, size of labour employed, values of annual turnover and capital investment (Baenol, 1994).

The small scale industries of Federal Ministry of Industries defined small scale as "having capital (investment in land, building, machinery and equipment and working capital) up to N60,000.00 and employing not more than 50 person" as far back as 1979. The Central Bank's monetary and credit guidelines, small-scale industries were regarded as establishment whose annual turnover is less than N6million and capital not exceeding N10million. According to Brwon, Medott and Hamitton (1990), Many Small firms are created as a last resort rather than as first choice and have therefore invited growth potential.

Although, the pro-SME view argues that small firms are more innovative than large firms; the micro economic evidence is at best inconclusive. Examining US firms, Andretch (1987) find small firms have higher innovation rates in high technology, capital intensive industries. For a sample, Schiuardi (2001) study on European industries show a larger average firm size is associated with faster innovation rates. In developing countries, there is little R & D activity such that technology transfer from abroad and initiative drive productivity improvement Rosenberg (1976).

Thus, from a developing countries perspective, the firm level evidence does not favour SME subsidization as a mechanism for boosting innovation and productivity growth. Consistent with theoretical argument outlined, emerging empirical evidence supports the view that firm size responds to National characteristic. Maksimonie (2002) find that financially, more developed countries tend to have larger firms. This suggest that financial development ease financial constraints on successful firms and allow them to grow. Kumar, Rajan and Zingales (2001) show that countries with better institutions as measured by judicial system tend to have larger firms.

Furthermore, Agbonifor (1998) noted that SMEs is a crucial factor in economic development. They indicated that it is a means by which productive activities indigenously owned and controlled and it is a means by which productive resources and talents that might not otherwise be put into productive uses. This will at least reduce the unemployment menace which Nufakho (1998) said have reached an alarming proportion. Brian Levy (1993) explained that the study of entrepreneurship has relevance today, not only because it helps small business or

entrepreneurs better fulfill their personal needs, but also because of the economic contribution of the new ventures. Brian Levy therefore sees SMEs as a positive force in Economic growth and development. He stresses further by summarizing the importance of SMEs to include ensuring rapid development, increased utilization of local resources and provision of a training ground for indigenous managers and semi-skilled workers, reduction of the rural-urban drift, development of indigenous technology and raising the living standard of rural dwellers and so on. In fact, SMEs accounts for the economic development in most developed economies of the World today. It has helped in the balance of payment position of countries; it reduces over dependence on inputs relative to their capital investment.

Sequel to the aforementioned benefits, the Federal Government of Nigeria has made several attempts via the introduction of various policies at developing SMEs in Nigeria. Notable amongst these policies are; Small and Medium Enterprises Development Agency of Nigeria (SMEDAN), National Economic Reconstruction Funds (NERFUND), National Poverty Eradication Programme (NAPEP), National Economic and Empowerment Development Strategy (NEEDS), Small and Medium Industry Equities Investment Scheme (SMIEIS) and so on. Despite the huge amounts spent on the development of these policies for SMEs growth, Sagagi (2006) noted that not much changes and improvements have been achieved. The reason for this as he indicated was attributed to limited financing and support, as well as inadequate infrastructure, insecurity and lack of training and vocational facilities

3. Methodology

This paper seeks to investigate Small and Medium Enterprises as a veritable tool in Economic Growth and Development in Nigeria. The purpose of this study is to come up with a set of potential determinates that affect the adoption of SMEs and set of potential supporting activities to influence economic development in Nigeria. Registered SMEs operating in five local governments, namely: Ijebu North, Yewa South, Sagamu, Odeda and Ogun Waterside as shown on the register of the Ogun State Ministry of Commerce and Industry, constituted our target population. They are categorized into production, professional services and others. In order to confirm the greatest drawback for SMEs in Nigeria and fully appreciate their respective relevant significance, we had postulated the following hypotheses:

H0: There is no significance relationship between SMEs and Economic Growth and Development

H1: There is significant relationship between SMEs and economic growth and development.

Primary sourced data is the main data used for analysis. These were collected using a 5-point Likert scale questionnaire, administered to the selected SME operators. This did not pose a problem, due to the fact that the questionnaires were administered through the secretariat of the Ogun State Chamber of Commerce & Industry. The study was mainly based on information derived from responses to the questionnaire and data collected from Local Government records. Primary data employed for this study were collected from a cross section of SMEs in the selected local governments. Random sampling technique was used to determine the eligible entrepreneurs to be questioned. Data collected was presented in tabular form with descriptive statistic while the hypothesis formulated was tested with correlation coefficient to determine the respondents' perception on the subject matter. This study employed a multi-methodology approach in which both qualitative and quantitative approaches were used. In all, 200 respondents that made up the sample were randomly selected.

3.1. Tables and Figure

Table 1. Descriptive statistic on SMEs and Economic Growth

Response	Number	Percentage
Strongly Agreed	84	42
Agreed	67	33.5
Undecided	5	2.5
Disagreed	13	6.5
Strongly Disagreed	31	15.5
Total	200	100
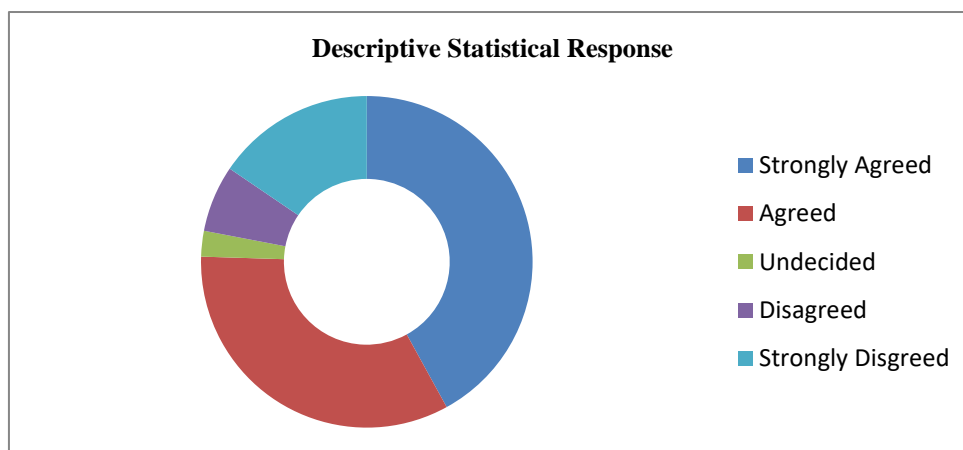
Figure 1 Showing Descriptive Statistical on SMEs and Economic Growth

Table 2. Showing Correlation Co-efficient Analysis

X	Y	X^2	Y^2	XY
320	75	102400	5625	24000
335	70	112225	4900	23450
405	84	164025	7056	34020
310	76	96100	5776	23560
380	77	144400	5929	29260
195	56	38025	3136	10920
265	59	70225	3481	15635
320	78	102400	6084	24960
450	84	202500	7056	37800
360	85	129600	7225	30600
ΣX	ΣY	ΣX^2	ΣY^2	ΣXY
3340	744	1161900	56268	254205

$$r = = \frac{n\Sigma XY - \Sigma X\Sigma Y}{n\Sigma X2 - (\Sigma X)2 \, . n\Sigma Y2 - (\Sigma Y)2}$$

$$r = 0.88$$

3.2. Interpretation of Result

On the analysis relating to the responses on the type of small business engaged by the people, reveals that majority 120 (60%) of the respondents are into trading business. Only 47 (23.5%) are into production business; another 28 (14%) are into services rendering business while 25 (12.5%) are into other types of small business that is, they combine trading, production and services rendering businesses.

Analysis on the responses on how business has been, reveals that more than half of 118 (59%) of the businesses in this study were considered profitable by the owners and/or management staff and 32 (64%) of the businesses were described as very profitable while 9% (18) were reported not profitable. However, the analysis showing responses on the estimated annual incomes of businesses, reveals that only 12.5 of the business surveyed made profits of at least N1 million naira (about US $10,000.00) per annum while the vast majority made profits of between N100,000 naira and N1 million naira per annum (between US $700.00 and US $7000.00).

From the findings and as indicated in the Table 1, it shows that majority of the respondents 151 (75.5%) agreed that there is significant relationship between SMEs and economic growth and development. Table 1 Showing Responses on the relationship between SMEs and Economic Growth and Development.

The coefficient size of the study suggests not only positive significant but has high correlation co-efficient of 0.88. The result has confirmed the economically

meaningful relationship between the importance of SMEs and the Economic growth and Development.

4. Conclusion and Recommendation

A major gap in Nigeria's industrial development process in the past years has been the absence of strong SME sub-sector. With over 165million people, vast productive farmland, rich variety of mineral deposits and other natural resources, Nigeria should have been a haven for SMEs. Unfortunately, SMEs have not played the significant role they are expected to play in Nigeria economic growth and development. Driven by the findings in the study, SMEs in Nigeria have a long way to go for the sector to be productive enough and play the curial role it is expected to be in relation to contributing to the growth and development of the economy of Nigeria.

This research therefore concludes that the main causative factor as to why Nigerian SMEs are performing below expectation as to having a relationship to our environment. This includes our culture, government, lackluster approach to government policy enunciation and poor implementation among others. The solution to the problems of Nigeria SMEs can only be realized if both the leaders and the citizens concertedly work together. The government has to take the lead by extending their reforms to the educational and industrial sectors especially as regards policy formulation and implementation, port reforms, transportation sector reforms, revamping the infrastructural facilities, value re-orientation and reduction of bribery and corruption to the barest minimum if not totally eradicated.

Given efficient and effective execution of these as well as the political will and good leadership and followership, the SME sector will certainly be an effective tool for rapid industrialization of the Nigerian Economy. Hence, this study recommends that Government should as matter of urgency assist prospective entrepreneurs to have access to finance and necessary information relating to business opportunities, modern technology, raw materials, market, plant and machinery which would enable them to reduce their operating cost and be more efficient to meet the market competitions. In the light of policy implication, understanding the factors hindering the growth and survival of SMEs in Nigeria will help policy makers – governments (federal, state, and local), NGOs, and other stakeholders to design targeted policies and programs that will actively stimulate innovation, as well as helping those policy makers to support, encourage, and promote SMEs for poverty alleviation in Nigeria.

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Information and Knowledge; Communication

Patterns in Standards and

Technologies for Economic Information Systems Interoperability

Vasile Irimia[1]

Abstract: This paper presets results from a review of the current standards used for collaboration between economic information systems, including web services and service oriented architecture, EDI, ebXML framework, RosettaNet framework, cXML, xCBL UBL, BPMN, BPEL, WS-CDL, ASN.1, and others. Standards have a key role in promoting economic information system interoperability, and thus enable collaboration. Analyzing the current standards, technologies and applications used for economic information systems interoperability has revealed a common pattern that runs through all of them. From this pattern we construct a basic model of interoperability around which we relate and judge all standards, technologies and applications for economic information systems interoperability.

Keywords: patterns; economic information system; standards; EDI; ebXML; RosettaNet; Web Services; enterprise interoperability; model of interoperability; collaboration; communication;

JEL Classification: D83; D85; M15; O14; O31; O33

1. Introduction

The current technological environment is characterized by heterogeneous hardware and software. The result is a set of components that cannot communicate and cannot collaborate. Today, there are many incompatible competing standards enabling enterprise collaboration. Questions remain about the utility of these standards and applications.

There are many books and articles discussing the various standards, applications and technologies discussed here, from various perspectives. To this moment I have no knowledge of one research that attempts a review of all major standards, technologies and applications for economic information systems interoperability. However there is some related work done on enterprise interoperability, one particularly important being the interoperability framework. (Man-Sze Li et al, 2006) and (Charalabidis et al, 2008) define the field of enterprise interoperability, the challenges we currently face, a brief state of the art in the field and proposes the

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research directions. One such direction, analyzing the current solutions for enterprise interoperability, has inspired this research. (Ullberg et al, 2009) presents a model of the current enterprise interoperability challenges. (Ameedeen et al, 2011) presents a model for interoperability via model driven development. The Athena Interoperability Framework (ATHENA Framework, 2011) is the most advanced work in the field, addressing the problem of interoperability in a holistic way, from different perspectives, including the research elements and the solutions to interoperability issues. Our research, while aware of the broader field, is more focused, dealing with the standards, technologies and applications for economic information systems interoperability.

This paper is structured in the following way: chapter II introduces the concepts used; chapter III sets the foundation of collaboration in communication theory; chapter IV, Standards categories, presents our model for interoperability and we end with conclusions.

2. Concepts

Standard provide the rules necessary for these diverse components, created by different independent vendors, to collaborate. In order for two independent economic information systems to collaborate to achieve a certain goal, they must communicate. Interoperability between two economic information systems is achieved through communication. As such, some concepts from communication theory are used in this paper.

Analyzing the current standards, technologies and applications used for enterprise interoperability has revealed a common pattern that runs through all of them. From this pattern we construct a basic model around which we relate and judge all standards, technologies and applications for economic information systems interoperability.

But before we begin, to reduce uncertainty and increase precision, the following conceptual delimitations must be made.

Standards have a key role in promoting economic information system interoperability, and thus enable collaboration. Standards are agreements between independent individuals or organizations to conform to a set of principles and norms. Standards facilitate collaboration, increase efficiency, reduce costs, reduce complexity, and enable data and information sharing. According to Eric Chiu, a standard is an effort to promote large scale utilization of protocols and formats the enable applications developed by different software vendors to interoperate (Chiu, 2002, p. 14).

According to Oprea D., "an economic information system is an assembly of human resources and capital, invested in a economic unit, with the purpose of collecting and processing the data needed to produce information that will be used at all decision levels of management and control of the organizations activities." (Oprea, 2005, p. 23).

Although enterprises, as part the national and international economic systems, are interdependent, their economic information system is independent in the sense that it can exercise its functions autonomously, without depending on someone from outside.

Enterprise Interoperability is a relatively new term for a new domain of activity that aims to improve the way in which enterprises, with the help of Information and Communication Technology, interoperate with other enterprises, organizations or other business units within the same enterprise, to achieve its goals. The Interoperability is defined by the IEEE as the common execution of a task by two or more different systems. (Irimia, 2011)

The economic information systems interoperability deals with the way in which two independent economic systems communicate, cooperate and collaborate to achieve a certain goal. Economic information system interoperability can be seen as the easy connection and communication between two different enterprise information systems, within a network of suppliers and business partners, with the help of the new information technologies. (Irimia, 2011)

A language is a system of communication. A symbol is a distinctive sign, object, image that represents indirectly an object, a being, a notion, idea, characteristic, feeling, etc (DEX, 1998). A word is the basic element of a vocabulary and represents the associations between a meaning or a complex of meanings and sound complex (DEX, 1998). A word is a particular type of symbol. The grammar includes the rules required to combine words into messages. The message is used to communicate. The message contains the words and the relations between them. A code is a system of signs and conventional signals used to transmit a message, to communicate. To codify means to use a code to represent a communication.

A data format represents the total characteristics of a data structure used to communicate a message. A data format includes the grammar and the vocabulary; as such it is a language, even if very primitive and particular.

3. Communication and Collaboration

In basic communication theory model, communication is achieved by transmitting messages from an emitter to a receiver using a communication channel. Due to their particular processing and communication characteristics, computers are used

nowadays to accomplish more efficient, activities that were previously done by people manually. Today we teach computers to do what we were doing using our own natural abilities. Unfortunately, even with today's most advanced technology it is almost impossible to transpose the cognitive abilities of a man into computer software. However, computers are used to communicate between them in an automatic and autonomous fashion, independent of the help of any user. For this, there have been developed communication protocols, similar to our natural language but much more primitive and particular. These were created to solve very specific problems. Their development was bottom-up, resulting in a multitude of languages, and later on we've started witnessing the emergence of unified languages like UML, MOF, etc. There are a series of characteristics common to all these languages: a sum of finite symbols which make up a vocabulary and o sum of rules used to combine these symbols into messages that can be interpreted by the machines. To sum this up: we are trying to program computers to do a multitude of cognition and communication activities just as we do them naturally.

But electronic computers cannot process and store internally the letters and numbers that we use in our daily communication, only binary data. As such, there have been developed a series of symbols that mediate the difference between the binary format and the alphanumeric format. These are known as character sets: ASCII, Unicode, ISO-8859-1 etc. These form a codification system. These are usually part of a language but because of the multitude of different encodings available that can be used almost interchangeably, we can view them individualized.

Using the basic characters and numbers defined above, we form data structures similar to the words and phrases in our natural language. We may form simple or complex structures (e.g. business messages) that are composed of more than a simple structure. These structures have a certain syntax, a certain order of structuring the elements. Each structure carries with it a semantic charge. These are the basics of a language: grammar and vocabulary. There have been many languages used to communicate messages between different economic information systems using computers: EDI formats (X12, EDIFACT, KEDIFACT, GS1 EANCOM etc.), GS1 XML, xCBL, UBL, NES UBL, UN/CEFACT CCL, RosettaNet RNTD etc. In the same category we can mention the standards for classifying products, like GS1, the standard for country codes: ISO 3166-1, the standard for currency codes: ISO 4127, the standard for date and time format: ISO 8601, etc. In order for two partners to communicate, they must agree on the language used.

To reach the receiver, the message must be sent using a communication channel. For this purpose there are many standards and technologies, some public, other private. The most known and widely used standard for communication between applications is TCP/IP, the Internet standard. In most cases, though, to accomplish

certain requirements needed for transmitting business messages, for example, this standard is further completed by superior level standards like http, smtp, web services, ebMS, EDIINT AS2, etc, and the message is enveloped in a data envelope like MIME, S/MIME, SOAP, etc. In order to collaborate, the two partners must agree on this level, too.

The fact that we can transmit a message from an emitter to a receiver using a common language is not enough to collaborate. Even if the receiver gets the message and can understand it, it doesn't mean he has to do something about it. Collaboration presupposes that the two have a contract, a protocol, an agreement of collaboration. In general, the collaboration between partners to achieve a certain goal is done in a succession of steps that must be known and respected by both the participants. This succession of steps defines a choreographic process, in which both participants respect the same protocol. These processes are defined by standards like ebXML and RosettaNet but they can also be the subject of particular agreements between both sides. The processes can be defines using standards like BPMN, BPEL, WS-CDL. If there is an agreement up to this point, we can say that both partners can collaborate.

The lesson of building high walls we have learned it from our enemies. Security has become an essential part of communication nowadays. We confirm identity using digital signature. We ensure non-repudiation of origin and receipt. Confidentiality and integrity is achieved by encryption and digital signatures. There are many security standards: S/MIME, SSL, X.509, XML Encryption, etc, and most of them use the asymmetric key algorithm X.509– this is a point of convergence in security.

Using the construct laid out so far we can begin to classify the standards.

4. Standard Categories

Today, there are a multitude of standards and specifications used to support the collaboration between economic information systems. To achieve interoperability of economic information systems we must agree on a language, a transmission method, a collaboration protocol and the security used (at least identity, integrity, confidentiality and non-repudiation). We have standards that solve a very particular problem, standards that solve two or more problems of interoperability and a group of "complete" standards that address all the mentioned issues of interoperability.

The hierarchy of interoperability illustrated in the figure above can be detailed on each level, with examples of standards as follows:

1. **Interoperability level**: ebXML, RosettaNet

1.1. **Language**:

1.1.1. Codification: ASCII, Unicode, ISO-8859-1, etc

1.1.2. Vocabulary: ISO 639-1, ISO 3166-1, ISO 4216, etc

1.1.3. Vocabulary + syntax: EDI (X12, EDIFACT, KEDIFACT, GS1 EANCOM, SAANA EDI, Odette, TRADACOMS, Ryutsu Business Message Standard), XML, etc

1.2. **Transmission**:

1.2.1. Application level: web services, ebMS, RosettaNet RNIF, EDIINT AS2, BusDox, http, smtp, etc

Network level: TCP

1.2.2. Internet level: IP

1.2.3. Link level: ARP, etc

1.3. **Protocol**: BPMN, BPML, BPEL, BPSS (ebXML), PIPs (RosettaNet), WS-CDL (web services), etc.

1.4. **Security**:

1.4.1. Enveloping: S/MIME, SOAP, SwA, PKCS#7, etc

1.4.2. Identity: RFC 2459 , RFC 3039, ITU-T Recommendation X.509 (1997) | ISO/IEC 9594-8 (X.509, RSA, DSA), XML Signature, etc

1.4.3. Confidentiality: XML Encryption, S/MIME, etc

1.4.4. Integrity: RFC 2459 , RFC 3039, ETSI TS 101 862 v. 1.2.1, XML Signature, etc.

1.4.5. Non-repudiation: RFC 2459 , RFC 3039, ITU-T Recommendation X.509 (1997) | ISO/IEC 9594-8, XML Signature, etc

We could have easily said the same thing as follows:

1. Languages for interoperability

1.1. Languages for data/messages

1.2. Languages for messaging

1.3. Languages for protocols

1.4. Languages for security

In this form we can decouple from the technical, hardware part of the interoperability, which, for the most part would be correct in our context (enterprise information systems interoperability). There have been substantial efforts made in the current standards to separate the language from a particular type of hardware representation, which has been a major step forward in interoperability and collaboration.
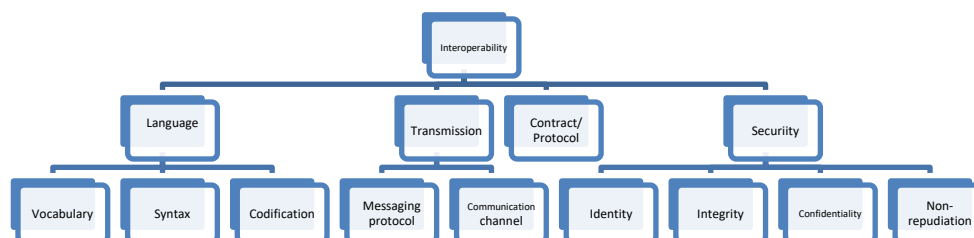
Figure 1. The hierarchy of interoperability

5. Conclusion

In order for two independent economic information systems to collaborate to achieve a certain goal, they must communicate. Interoperability between two economic information systems is achieved through communication. Standards have a key role in promoting economic information system interoperability, and thus enable collaboration. Analyzing the current standards, technologies and applications used for enterprise interoperability has revealed a common pattern that runs through all of them. From this pattern we construct a basic model around which we relate and judge all standards, technologies and applications for economic information systems interoperability. Today, there are a multitude of standards and specifications used to support the collaboration between economic information systems. To achieve interoperability of economic information systems we must agree on a language, a transmission method, a collaboration protocol and the security used (at least identity, integrity, confidentiality and non-repudiation). This model can be used to distinguish between the various components required to make interoperability happen, reuse the common elements as much as possible, and even develop interoperability methodologies and courses for future projects.

6. Acknowledgment

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Parent Entrepreneurs: to What Extent Can They Influence Their Children to Become Entrepreneurs?

Alexander Ayogyam[1]

Abstract: Many parents have not succeeded in using the mere fact that they are entrepreneurs to influence their children to also become entrepreneurs. This has been one of the reasons why many private businesses have collapsed. Since other researchers have concentrated on factors about the prospective entrepreneur as driving force, this research concentrates on parents as driving force for children. It therefore became necessary to discover other factors which parents could use to create this influence. A hypothesis was tested and that directed the focus of this study. 303 children who were 18 years and above and had entrepreneurial parents were sampled for the study. A questionnaire was used to generate primary data for the study. The dependent variable in the model was BEPI (Becoming an Entrepreneur through Parental Influence) was dichotomized so according to (Gujurati 2006), the Probit model (a regression statistical technique) was recommended for the analysis. Out of the five explanatory variables which were used in the analysis (Lifestyle of parents (LOP), Similarity in characteristics (SIC), Success in Business (SIB), Tides between child and parent (TCP) and Parent having other entrepreneurial friends(PEF)) four showed a positive correlation with BEPI except PEF which showed negative correlation. All the variables were significant at 1%, 5% or 10%. LOP was significant at 10%, PEF at 5% and TCP, SIC, SIB were all at 1%.

Keywords: Parent entrepreneurs; Influence; Extent; Children; Probit model

JEL Classification: J23

1. Introduction

The decision to become an entrepreneur is positively correlated with having parents who are or were entrepreneurs. These parents are referred to as parental role models (chlosta et al 2010; Drunn and Holtz, 2000). In Ghana some children take after their parents especially when it comes to trade. For instance, Ghana had pursued a system where children were being forced into learning the trade of their parents either directly or indirectly since three decades ago. With this system, children gradually developed the interest in the dynamics of those trades from childhood and eventually remained in them. Another school of thought indicated that if children are exposed to working life early, irrespective of whether it is

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ordinary or hazardous has a detrimental effect on human capital formation (Kanbargi and Kulkarni, 1991; Psacharopoulos,1997; Patrinos and Psacharopoulos, 1995; Jensen and Nilsen,1997; Akabayashi and Psacharopoulos, 1999; Heady, 2000; Ravallion and Wodon, 2000; Rosati and Rossi, 2001). Parents who share in this view develops a different model called succession plan which upgraded the skills of their children on regular basis and prepares them for future assignments. That also aroused the interest of children and relatives to inherit the businesses when it became necessary.

In situations where the survival of the family depended heavily on the parents, dependants were exposed to the rudiments of the business even when they had no interest. These practices in the past compelled many children into recognizing their parents as role models hence emulating their pursuits. Some recent developments restricted parents from exercising their utmost power to impose themselves on dependants or children as role models. A recent campaign by the International Labor Organization (ILO) on child labor has salvaged many children from pursuing the business of their parents against their wish. In 2006, the then Chief Executive Officer in charge of Ghana Cocoa Board advised cocoa farmers in the country to desist from using children to work on their farms. He said in doing so, children have no choice than to take to farming even if they had wanted to learn something different. And by that, children's right was not expected to be trampled upon. If children have no opportunity of assessing other professions, they become narrow minded and naive. Children of today are aware of their right and so prefer to make independent decisions. This is probably the reason why many children prefer wage employment as against setting up their own business. Undoubtedly, the ascendency rate of unemployment in the country is partly due to the fact that, the youth are shunning entrepreneurship.

2. Literature

The presence of individuals who have started their own business has been found to influence others within the environment where they live towards a similar behaviour (Lafuent et al, 2007). This indicates that a positive entrepreneurial example leads to an increase in the likelihood that other agent's also become entrepreneurs. This was affirmed by Gibson (2004) that the higher the number of entrepreneurs, the higher the likelihood that other agents within a society would change their propensity towards an entrepreneurial career.

A school of thought argues that, as individuals ascend to higher levels in education, their quests for role models are redirected as against the earlier case where parents were in control. In other words the human capital capacity of individuals has a role to play as to how and the extent to which role models influence their entrepreneurial propensity. A contrary view by Cohen and Levinthal (1990) argued

that the likelihood of role model presence is higher for people with higher level of human capital. This is also based on their absorptive capacities which represents the ability to value, interprets and apply role models directives. Another research finds the earlier statement contrary because there are claims that, the entrepreneur's human capital can serve as a substitute for the role model. This view argues that individuals with higher levels of human capital may be less likely to have role models as a source of inspiration because of the knowledge and experience acquired through learning (Gimeno et al; 1997; Hamilton 2000; Hartog et al., 2010; Stuart and Abetti 1990; Van Praag et al; 2009).

When individuals perceive some compatibility in behaviour between the role model and themselves, there is a high probability that those behaviours would be emulated. According to Slack (2005), role models may inspire potential entrepreneurs especially when they show a high degree of resemblance. For this reason, parents are likely to influence their children since the issue of resemblance is a possibility. Experimental evidence has shown that individuals and their role models tend to be similar in terms of gender and race (Hernandez 1995; Kalleberg et al; 1996). This is directed at the fact that fathers are likely to influence their male children into becoming entrepreneurs in their own field. Since different groups and individuals with similarities in goals and vision form a network to benefit from each other, Ibarra (1997) identified network homophile as a system where prospective entrepreneurs can access similarities in characters and behaviors.

2.1 The Environment and Personality Change

Luthans (1989) argued that culture makes a more significant contribution to personality than biological factors. Culture, to a larger extent influences what an individual is likely to learn. Again, the contribution of family and social groupings to personality development cannot be under estimated. It is the family, and later the social group, which selects, interprets and dispenses the culture. This contribution of family and social group in dispensing the culture is referred to as the process of socialization. It is the process in which an individual infant requires from the wide range of behavioral potentialities that are open to him at birth, those behavior pattern that are customary and acceptable according to the standards of his family and social group (Mussen, 1963). Simply, home environment and the immediate community of a person play a vital role in developing his beliefs. As a result of this, parents cannot be left out when it comes developing their children into personalities of their own. Generally entrepreneurial ability depends on individual's personality that determines his attitude towards an economic activity. It has been explained by the early theories of entrepreneurship that entrepreneurial personality is determined by several factors. Kimble et al. (1974) explained that the level of education, social status, type of cultural conditioning, and other personality

factors determine personality. Older people for instance, have different outlook in life compared to the younger ones because of experiences, education, and other factors that made them understand their environment better. On the other hand, entrepreneurial traits emerge in children at a young age (Kisker, 2003). Indeed, many children demonstrate entrepreneurial qualities such as risk taking, creativity in problem solving and high internal motivation to succeed during their early development but, as children grow older, many lose their entrepreneurial spark (Gutner, 1994).

2.2 Problem Statement

In Ghana today, the youth are in constant search for wage employment. It is surprising to note that children of successful entrepreneurs tend to set up different businesses and/or apply for wage employment despite the quest for more hands by the parents. This has been one of the reason why in Ghana, many businesses have collapsed after the demise of the real owners.

This trend is on the ascendency and so it can be argued that, the mere fact that a parent is an entrepreneur may not stimulate a child. Rather more discoveries must be sought to enable the research draw conclusions as to whether being a parent entrepreneur is enough to inculcate entrepreneurial spirit an off-spring or child. This is basically the cardinal objective for the study.

2.3 Research Questions

The research used the body of knowledge in the literature to arrive at the under listed questions. The questions have been formulated using some of the explanatory variables adopted from the literature. A hypothesis was developed from the research topic which talked about whether parents who are entrepreneurs are motivating factor enough to encourage their children to emulate their entrepreneurial examples. This developed the focus for the study

H_0: It is sufficient for parents who are entrepreneurs to influence their children towards entrepreneurship.

H_1: It is not sufficient for Parents who are entrepreneurs to influence their children towards entrepreneurship.

From the literature outlined above, it can be deduced that, just one factor is not enough to define the personality of an individual. Kimbe et al., (1974) underscores a point that many factors including education, social status, cultural setting and many more helps in determining the personality. By this assertion, Kimbe et al believes that, the mere fact that one's parent is an entrepreneur would not totally affect the personality of the child. Again from the literature, Slack discovered that,

when the child and the parent bear some resemblance, there is the likelihood that, the parent will be emulated. This notion was reaffirmed by Ibarra and other researchers like Hernandez and Kalleberg. This set of literature therefore establishes that, children of successful entrepreneurs cannot become entrepreneurs by the mere fact that their parents were once entrepreneurs. Rather, there are many other supporting factors which must be identified. The research therefore rejects the null hypothesis H_0 based on previous findings and explores further on other characteristics of the parents that can collectively influence their children.

Some of the variables establishing the research questions included; the lifestyle of the parents in question, how successful parents had been, coincidence of characters, the possibility of contacts between parents and children and the possibility of accessing other parents who are also successful entrepreneurs. These variables (deduced from literature) may impact on prospective entrepreneurs to take after their parents. These variables have led to the formulation of the following questions;

RQ1: Would children emulate their Parents based on their lifestyles which they find admirable?

RQ2: Would children be influenced into entrepreneurship if their parents were successful in business?

RQ3: Can the possibility of strong tides between child and parent lead to the child emulating the parent?

RQ4: Can the child be influenced by his parent because they have some similar characteristics?

RQ5: Can the possibility of the children seeing other entrepreneur friends of their parents influencing them to become entrepreneurs?

Though parents can sometimes excite the child to go into entrepreneurship, technological endorsement by the world at large has created an interesting scenario. This has brought about the fact that many role models worldwide are now staring in the face of the same child and so there are many alternatives to choose from (Gibson 2004). As a result of this, the child's "zone of tolerance" (the range set by the prospective entrepreneur) becomes broad. This explains why the research question five was developed.

3. Research Methodology

3.1 Target Group

The research targeted children whose parents were entrepreneurs. It did not include the remaining dependants of the entrepreneur such as the domestic workers and extended family members (in the case of Ghana) where such family system is common. The study did this segregation to ensure that research question four (RQ4) could produce reliable data. In order to ensure that quality data was acquired for the analysis, children who were eighteen years and above were contacted. The reason was that, this category of children was capable of making decisions devoid of parental interference. In some instances, parents of these children were engaged informally and through that, contact addresses of their children who were out of town were obtained.

3.2 Sampling Techniques and Research Strategy

A multi-facetted sampling techniques were adopted for the research so that the study could get access to a more reliable information. Many entrepreneurs in Ghana today have numerous dependants to take care of. They include members of the extended family, those of his own and domestic workers. The focus of the study demanded that only biological children were used for the study. As a result of this, purposive sampling was adopted to pick the entrepreneur's biological children from the other dependants. This was on the basis that purposive sampling is appropriate for cases that would be particularly informative (Neumann, 1991). After selecting the biological children for the exercise, convenient sampling was used to exclude those children who were living outside the borders of Ghana so that the research would stay within budget. Eventually, a simple random sampling approach was applied to generate the sample size for the study.

The research was an explanatory one as it sought to identify and describe the variability in different phenomena. It will also examine and explain relationships between variables in particular cause and effect relationships (Gill and Johnson, 1991)

3.3 Research Instrument

The study could not rely on a single research instrument because not all the respondents could be accessed easily. Some of them were contacted and engaged in a face-to face chat with the help of an interview guide. Secondly, those respondents who could not be contacted physically were given a questionnaire through their e-mail contacts and those without e-mail addresses were engaged in a telephone conversation by posing the same set of questions to respondents.

3.4 Sample Size and Data Collection

Moser and Kalton (1986) and Henry (1990) argued that using samples enables a higher overall accuracy than does a census. Though the research was expected to contact a total of 512 children based on the information gathered from the parent entrepreneurs in the Kumasi Metropolis in Ghana, 303 were successfully contacted which represented 59.2% of the population stated above. The reason was that, most of these children were outside the shores of Ghana and so a complete survey was highly difficult and expensive to contend with.

Basically, the data which was used for the analysis was exclusively primary. The data collected was entirely based on the perception and attitude of these children and since these two factors could change at anytime, the use of secondary data could not be relevant in this current research. According to Stewart and Kamins (1993), secondary data may have been collected for a specific purpose which may not match the needs of current research question(s) or objectives.

The sample was selected from Kumasi Metropolis in Ghana because it is the most industrialized city in the country. Many businesses are located in this city because of quick access to raw material. There was a high possibility of identifying a lot of entrepreneurs.

3.5 Analytical Framework

The decision by the child to become an entrepreneur like his/her parent (following the parents influence) is dichotomized into two mutually exclusive issues. The child may either be influence to become an entrepreneur (to be denoted by 1) or not to be influence (denoted by 0). Models for estimating such phenomenon where the dependent variable is binary include the Probit models (Gujarati, 2006). This binary phenomenon yields a binary dependent variable, y_i which takes on the values of 1 and 0 as indicated above. The probability of observing the value 1 is:

$$P_r \left(y_i = \frac{1}{x_i \beta_i} = 1 - F\left(-\chi_i \beta_i\right)\right) \tag{1}$$

Where F is a cumulative distribution function. It is continuous, strictly increasing function that takes a real value and returns a value which ranges from 0 to 1. It follows that, the probability of observing a value of 0 is:

$$P_r \left(y_i = \frac{0}{x_i \beta_i} = 0 - F\left(-\chi_i \beta_i\right)\right) \tag{2}$$

Given such a specification, the parameters for estimating this model by using the maximum likelihood estimation approach can be determined. The dependent variable y_i is related by the equation:

$$y_i = \beta_i x_i + \mu_i \tag{3}$$

Where μ$_i$ is the random disturbance term. The dependent variable is determined by whether the threshold value of y$_i$ is exceeded or not.

$$y_i = \begin{cases} \mathbf{1} \; \textit{if } \boldsymbol{y_i^*} > \mathbf{0} \\ \mathbf{0} \; \textit{if } \boldsymbol{y_i^*} \leq \mathbf{0} \end{cases} \tag{4}$$

Where y$_i$* is the threshold value for y$_i$ and is assumed to be normally distributed. One of the best models for estimating such models is the Probit model (Maddala, 2005).

The Model

Fig1: A model for influencing children whose parents are entrepreneurs
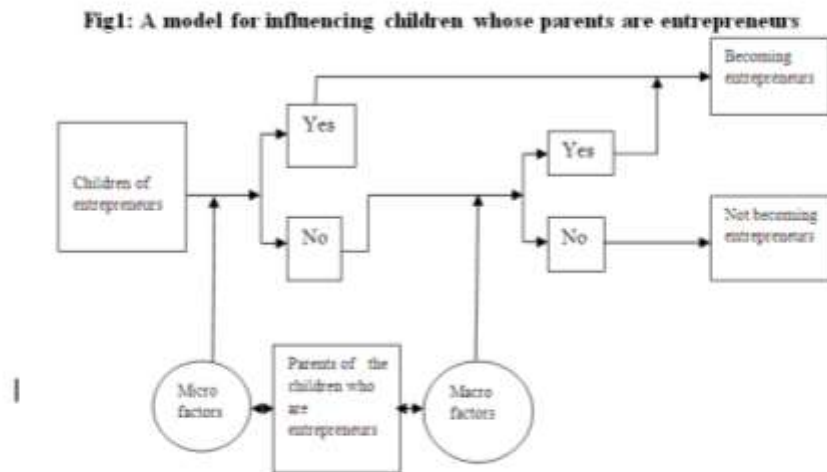
*NB: *Yes stands for 'the child is influenced' and *No stands for the reverse. *Micro factors consist of LOP, SIC and TCP whiles the Macro ones are PEF and SIB according to this research. They are the independent variables and becoming entrepreneur also represents the dependent variable (BEPI)*

Source: From authors field work.

Explaining the Model

Since the children lives in the same environment with parent, they would be subjected first and foremost the micro factors. At this stage, they are either influenced or not influenced (Yes or No). If it is yes, the child moves to become an entrepreneur. If No is the answer, the child would be subjected to the macro factors as indicated. At this point, the child can be influenced(Yes) which would mean

he/she becomes entrepreneur as in the model or may not be influenced(No) which would render him/her a non entrepreneur.

The Probit model is preferred to the other models because of its superior advantages. It is able to constrain the utility value of the child's decision to become an entrepreneur variable to lie between 0 and 1 and its ability to produce realistic probabilities and also distribute the error term (Nagler, 1994).

The probability that a child having a parent entrepreneur would become an entrepreneur P_i is given as;

$$P_i = P\ (y_i* < y_i)$$

$$Pi = P\ (y_i* < \beta_0 + \beta_i x_i) = F\ (y_i)$$

$$P_i = F(y_i) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{zi} exp(\frac{s^2}{2}) ds \qquad (5)$$

s is a random variable normally distributed with mean zero and variance one: yi represents the decision by the entrepreneur's child to become an entrepreneur after being influenced which is dichotomized into 0 and 1: y_i* is the threshold value for the dependent variable. The inverse of the cumulative normal distribution function gives the estimate of the index z.

$$y_i = F^{-1}(P_i) = \beta_0 + \beta_i x_i + \mu_i \qquad \textbf{(6)}$$

The empirical model is then stated as;

$$BEPI_i = \beta_0 + \beta_1 LOP + \beta_2 SIB + \beta_3 SIC + \beta_4 TCP + \beta_5 PEF + \mu_i \qquad (7)$$

Where;

BEPI= Becoming an entrepreneur through parental influence, which is a dummy variable (1 for the decision to becoming an entrepreneur after being influenced by parent and 0 for not being influenced)

LOP= Lifestyle of parents to influence child's decision (1 for becoming highly influenced by the parents lifestyle and 0 for otherwise).

SIC= Similarity of characteristics between parent and child (1 for becoming influenced when there are similarity in characteristics and 0 for otherwise).

SIB= Success in parent's business (1 for becoming influenced because the parent is successful in business and 0 for otherwise).

TCP= Tides between the child and parent (1 for becoming influenced because there exist strong tides between the two parties and 0 for otherwise).

PEF= Parent having other entrepreneur friends (1 for becoming entrepreneurs because parents have other friends who are entrepreneurs and 0 for otherwise)

4. Results and Discussion

From the results table 1 below, the likelihood ratio (LR) statistic of 82.61358 with a Chi-squared (χ^2) distribution at 5 degrees of freedom was highly significant at 1% level. This was an indication that more than one of the variables in the regression had significant effect on influencing the child to become an entrepreneur like his parent. The table actually showed that all the explanatory variables were extremely significant in influencing the child to become an entrepreneur.

Again from the table, the lifestyle of the parent as a variable in influencing the child to become an entrepreneur is significant at 10% level. The positive coefficient of this variable from the table indicates that higher values of this variable is likely to increase the probability of the child been influenced by his/her parent to become an entrepreneur.

It was again conspicuous from the results table that; the success in the parent business, similarity in characteristics between the parent and child and the strong tides existing between the child and parent were all significant at 1% level. As indicated in the table, these three variables showed positive coefficients in the regression, hence advertising that higher values of these variables are likely to increase the probability that, a child would be influenced by the parent's into becoming an entrepreneur. It is therefore in conformity with Slack (2005) assertion that higher degree of resemblance between two personalities is likely to result in one influencing the other. However, the result that higher values of entrepreneurial friends of the parent would decrease the chances of the child being influenced is contrary to observation made by (Gibson, 2004) as indicated in the literature above.

Though the table showed that, the presents of other entrepreneurial friends of the parent was crucial in influencing the child and was significant at 5%, the regression produced a negative coefficient for this variable. This negative coefficient meant that, higher values of this variable is likely to decrease the probability of the child been influenced to become an entrepreneur.

Table 1. Results from the regression

Dependent Variable: BEPI

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-1.107323	0.245911	-4.502947	0.0000
LOP	0.338253	0.175403***	1.928432	0.0538
PEF	-0.342724	0.162340**	-2.111156	0.0348
SIB	0.606980	0.161703*	3.753674	0.0002
SIC	0.591541	0.162804*	3.633463	0.0003
TCP	0.881951	0.168661*	5.229133	0.0000
Mean dependent var	0.524752	S.D. dependent var		0.500213
S.E. of regression	0.437787	Akaike info criterion		1.150735
Sum squared resid	56.92224	Schwarz criterion		1.224274
Log likelihood	-168.3364	Hannan-Quinn criter.		1.180156
Restr. log likelihood	-209.6522	Avg. log likelihood		-0.555566
LR statistic (5 df)	82.63158	McFadden R-squared		0.197068
Probability(LR stat)	2.22E-16			
Obs with Dep=0	144	Total obs		303
Obs with Dep=1	159			

Note: (*) indicates significant at 1%, (**) indicates significant at 5% and (***) indicates significant at 10%

Source: Computed from research data

5. Conclusions

Based on the results from the regression in the table below and the resulting discussions above, the following conclusions were drawn;

If an entrepreneurial parent leads a life that is worth emulating, the children of such a personality would be eager to learn and hence become easily influenced by them.

By so doing, children are likely to become entrepreneurs believing that entrepreneurship might have been the antecedent for that splendid lifestyle.

The entrepreneur's children would never be influenced by their parents to become entrepreneurs if they end up unsuccessful in their business pursuit. Hence, it is deduced from the discussion that children can easily be mentored and influenced by their parents if they were successful in their respective businesses.

If the parent has a particular characteristic which is also evident in the child, there is higher probability that this child would be challenged to learn from the parent. Most especially when the parent is exhibiting complete success with that condition.

The research again proved that if the parent creates a congenial atmosphere for coexistence, stronger tides would develop. This is likely to result in the child becoming submissive to the influence of the parent.

Finally, if a child develops strong tides with the parent after admiring his lifestyle, he/she may likely be comfortable with few friends of the parent. As the parent keeps making more friends, the child is likely to encounter strange lifestyles which do not conform to that of the parent. In this respect, as the number of entrepreneurial friends' increases, children become less influenced.

As a result of some limitations including inadequate funding, the paper could not exhaust all the critical issues in relation to this topic. It was thereby recommended that future researchers should try comparing the degree of influence of the parent on male and female children.

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Economic History

Someş County Agrarian Economy
During The Inter Wars Period of Economic Growth

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Abstract: After the Great Union of 1918, Someş County, one of the seven counties in the Someş Zone, Zone situated in north-western Transylvania, passed through different stages of economic development. It knew the recovery phase, followed by the reconstruction phase, it underwent the crisis and, finally, the growth stage. Given that agriculture accounted for over two thirds of household income is important to analyze the structure of the agricultural economy of the county, in those years of economic growth. Similar the place of each economic category was compared, hierarchical and compared to the similar categories in the Someş Zone and Romania. The result was a detailed picture of the agrarian economy of the county next to witch there were added the measures for modernize and streamline. Was analyzed the legal status of land, through the application of appropriation laws.

Keywords: Someş Zone; economic growth; agrarian economy; modernization

JEL Classification: N54; O13; O16; O47

1. Introduction

Transformations, momentum, progress made by Romania in the interwar period were due to the perfection of the national state of Greater Romania, which increased human and material potential of the country.

In the interwar period (1918-1938), Romania has gone through several stages of witch the period of 1934-1938 was the period of recovery due to protectionist policy and state intervention in the economy.

Romanian society was a society of contrasts; there is a difference between urban areas, where about 18% of the total populations were living, and the rural areas.

The peasantry is the main social class (about 80% of the population).

Enterprises and economic branches have established a direct links, leading to a restructuring and integration of the industry and agriculture, transport and communications systems.

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The Great Union was unbound energies and induced an economic and social changes throughout Transylvania, and more so in the land at the confluence of the Someş Rivers. In a poor county, mainly dominated by Hungarians both in administration and especially in what was the "engine" of development, the large estates, Someş County became in the interwar years a county of rapid development in all areas. Someş County proved a balanced, with a natural and human potential capable of development and able to adapt.

SOMEŞ County has a strong agriculture. Hills and mountains were forested and had set up some wood exploitation. The predominant industry was a food industry especially around Dej and Beclean. There were salt and gold mines, which were state property. Trade centres: Dej, Gherla and Beclean. Trade is mainly with pigs, cattle and hides. (***, 1939; Encyclopedia, vol. 3, p. 413)

Someş county had an area of 688.595 jugăre (396.500 ha). The landscape was varied with two distinguishing regions: the southern part that was part of the Transylvania Plain and the northern part belonging to the Lăpuş mountains region.

The county land distribution by category was as follows (in parentheses, percentage of total group and county total):

1.	Arable lands	131.641 ha	(33%)
	• Cereals	35.252 ha	25%
	• Meadows	10.865 ha	2%
	• Other cultures	25.524 ha	6%
2.	Natural meadow	73.922 ha	(20%)
	• Meadows	30.245 ha	8%
	• pastures	43.677 ha	12%
3.	Tree crops	3.581 ha	(0,89%)
	• Orchards	3.230 ha	0.8%
	• Vineyards	351 ha	0.09%
4.	Forests	131.151 ha	(33%)
5.	Building, roads, etc.	59.205 ha	(13.11%)
	TOTAL	396.500 ha	(100%)

2. County Agrarian Economy

2.1. Cereals, Food and Industrial Plants, Forests

Arable land was 131,641 hectares, or 33.20% of the county total area and 0.45% of total country land. Of the total arable area of the county, large estates had 3.844 hectares, or 2,92%, and smaller property 127.797 hectares, or 97,08%. (***, 1939; Encyclopedia Romania, vol. 2, p. 413). In 1940 arable land in Someş County (133,099 ha) represent 1% of the total arable land of Romania (13.357.817), a percentage of 4,1% from the total area of Transylvania (3.268.130) and 34,16% of total arable land in Northern Transylvania (389.675). County average was: 188.138 ha in Romania, 142.093 in Transylvania and 97.419 ha in Northern Transylvania. Compared with the national average, Someş County was below average (71%) but very close to Transylvania average (93.7%). (Rădulescu, 1942, p. 4)

Of the total arable land, grains occupied 95.252 ha, distributed as:

Corn occupied 42.855 hectares, with a production of 305.217 quintals. (average production of 7.1 quintals per hectare.), worth 72 million lei.

Wheat occupied 33.659 hectares, with a production of 319.436 quintals. (average production of 9.5 quintals per hectare), worth 126 million lei.

Oats occupied 14.624 hectares, with a production of 105.179 quintals. (average production of 7.2 quintals per hectare), worth £ 32 million.

Barley occupied 2.501 hectares, with production of 21.962 quintals. (average production of 8.8 quintals per hectare), worth 5 million.

Rye occupied 1.578 hectares, with production of 18.503 quintals. (average production of 11.7 quintals per hectare), worth 5 million.

Millet occupied 13 ha and buckwheat 4 ha.

Area planted with cereals increased from 94.383 ha in 1934 to 104.909 ha in 1937. Corn (47.332) and spring and autumn wheat (47.813) are the dominant cultures. To these there added oats (15.352 ha), barley (2.546) and rye (2.076). (***, 1937, p. 185)

Cultivated hay and other forage crops occupied 10.865 hectares. From this area, clover occupied 6.207 ha, with a production of 115.580 quintals. Hay (average of 18.6 quintals per hectare), worth 16 million lei and 475 quintals Seed.

Lucerne occupied 2.024 ha, with a production 43.304 ha hay (average 21.3 ha quintals.) worth 6 million lei and 300 quintals Seed.

Fodder roots occupied 544 hectares, with a production of 32.540 quintals. (average 59.8 quintals per hectare.), worth 2 million. In 1937, the hayfields most cultivated were the ones with hay clover (6.377), plus lucerne (2.510).

Food plants occupied 3.388 hectares. From this area potatoes occupied 886 ha with a production of 32.931 quintals (average 37.1 quintals per hectare.), worth 4 million lei, cabbage occupied 819 hectares, with production of 23,354 quintals (average 28.5 quintals per hectare.), worth 5 million lei, pumpkins occupied 528 ha. With a production of 2.112 quintals. (average 4.0 quintals per hectare.). Potatoes amongst corn gave a production of 61.624 quintals, worth 8 million lei. Beans amongst the corn gave a yield of 12.216 quintals, worth 4 million lei. Pumpkins amongst maize gave a production of 169.434 quintals worth 8 million lei. Vegetables were grown in irrigated areas, which amounted to 1.032 ha. The county occupies the 16 position of 71 and represented 1.83% of total area cultivated in Romania. (Săvescu, 1939, p. 373). In 1940, the area cultivated with vegetables (2.229 ha) is 0.51% of the cultivated area in the entire country (438.834), a rate of 3.51% of the cultivated area in Transylvania counties (63,519) and 33.1% in Transylvania North (6.742). County average was: Romania - 6.181 ha/county, Transylvania – 2.762, Northern Transylvania – 1.685. Someş County was well below the national average (36.1%) and over three quarters of Transylvania average (80.7%). Area planted with beans in Someş county (2.069 ha) is 0.62% of the bean culture of Romania (332.344), a percentage of 3.85% of the cultivated area in Transylvania (53.758) and 33% of Northern Transylvania (6.285). County average of areas planted with beans was: Romania – 4.681, Transylvania – 2.337 ha/county, North Transylvania – 1.571. Compared to Romania, the county was well below the average cultivated area (44.2%) and compared to Transylvania it was at 88.5%. Of total arable land of the county, the areas cultivated with beans represent 1.6%.

Industrial plants occupied 2.882 ha. From this area hemp occupied 1.676 hectares, with a production of 5.164 quintals. Bundle (average 3.0 quintals per hectare.), worth 18 million lei and 3.821 quintals. Seed (average of 2.2 quintals per hectare.) worth over 1 million lei. Sunflower occupied 1.003 hectares, with a production of 5.112 quintals. (average 5.1 quintals per hectare.), worth 2 million. In 1938, industrial plants have been grown on a total area of 3.572 ha as follows: hemp (2.017), sunflower (1.371), flax (139), canola (6), and soybean (4). (***, 1939, p. 414)

Natural meadows occupied 30.245 ha with a production of 456.699 quintals. (average production of 15.1 quintals per hectare average.), worth 50 million lei.

Grasslands occupied 43.677 hectares.

Diverse cultures. Of the total county area (396.500 ha), barren fields occupied 19.254 hectares decreasing to 11.947 ha in 1938.

Forests covered 131.151 hectares. The forests in Someş County were administered by four Forest Districts. Communal forests, church, school and composesorale (770 forests covering an area of 42.277 ha) were managed by th Forest Districts from

Dej, Beclean and Gâlgău, and the state forests, by the Forest District of Strâmbu-Baiuţ. There was also the private property, 6.416 owners with 36.636 hectares. By species, most (89.6%) were hardwoods (beech, oak, hornbeam). Resinous (fir, spruce) were only 0.5% and Others (hornbeam, locust) 9.9%. Of 370 forests summing 22.297 hectares, 458 hectares were exploited. Resulted in 1.530 cubic meters working wood (275.400 lei), 23.600 steri meters of firewood (1.888.000 lei) and 44.400 mc diverse (1.333.200 lei). The total value of holdings was 3.496.600 lei. In subsequent years these values have steadily increased reaching 5.44 million lei in 1936. (***, 1937, p. 198)

Plum orchards occupied 1.699 hectares, with a production of 23.786 quintals. (average 14.9 quintals per hectare.), worth 7 million lei. Northern Carpathians had nearly 3 million trees, scattered in Satu-Mare, Someş, Năsăud and Maramureş counties. Plum had a production rate of 46%, apple 34%, pear 7%, walnut 7.5%. Dej was part of the towns known as a fruit fairs and where you can resupply with larger quantities of apples, pears and plums. For comparison, in Romania there were 81 million trees, of which 77% plum. Other fruit trees occupied 1531 hectares. Vineyards occupied 351 hectares. (Teodorescu, 1939, pp. 424)

2.2. Animal Husbandry

After cereals, especially maize, Someş county economy was dependent on livestock.

Before 1930, it grew only steppe cattle breeds. From 1931 the Simmenthal race was introduced, in the towns of Cernuc, Reteag, Cuzdrioara and Căşeiu. Around Tg.Lăpuş it was introduced the Pintzgau race and the Schwyz race. With pig farming, the race Mangalita, the people from Chiochiş were involved.

The distribution of breeds that are raised in the county Someş was as follows: horses (Lipitzan, Mountain Horse, English), cows (Simmenthal, Schwyz, Steppe), sheep (Ţurcană), pigs (Mangaliţa, Bazna and York). (Conţescu, 1939, pp. 497, 499, 502, 504)

In SOMEŞ County there were in 1935: 56.803 cattle, 14.934 buffalo, 164.685 sheep, 11.647 goats, 21.428 pigs, 7,571 horses, 1,091 and 6.030 primitive hives. (***, 1939, p. 414)

For 1938 the statistics of domestic animals, poultry and beehives shows the Someş County structure quite different from the Someş Zone[1] or the national level. In horses category there were 7.827 horses, of which more than 3.160 mares older than three years and 2.485 horses over 3 years. The figure represented 3.56% of Zone and 0.36% of the country. The county was in the last place in the Zone, 7th

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[1] Someş Zone =7 countys (Bihor, Cluj, Maramureş, Năsăud, Sălaj, Satu Mare, Someş);

place. There were 87 donkeys (6.03%) and 15 mules (17.86%), and for the numbers in Romania they were 0.64% and 0.52%. The place held by the county in the Zone hierarchy was 5 and 4. The fewer horse from the Zone of Someş were in Someş County even in the categories with the most exemplars. (***, 1939, pp. 3-11)

Because farm work was done mostly with oxen and buffaloes, horses' breeding was not very developed. The horses were used mainly for light traction or riding.

In the category of cows and buffaloes there were 73.400 exemplars. Buffalo were 14.332, ie 17.79% and 8.18%, ranking at 3th place. The highest number is represented by buffaloes, 11.342 copies (20.49%, 8.94%, 2th place) and youth (up to 2 years), 2.293 exemplars (13.10%, 6.67%, 4th place). The number of cows was 59.068 exemplars, representing 11.27% and 1.42%, being at 5th place. Most were cows (over 3 years), 36.260 copies (12.97%, 1.79%, 4th place), and young cattle (up to 2 years), 13.092 copies (10.45%, 1.46% , 6th place).

Sheep were 212.894 exemplars, ie 17.93% and 1.68%, being the second county in number of sheep. Most were mature sheep (over 1 year), 186.013 exemplars (19.90, 1.76%, 1st place) and young sheep (up to 1 year), 23.950 exemplars (12.01%, 1.45%, 4th place). Note that Someş County has the most mature sheep and was second in total.

Almost the same situation is seen with goats that have been 11.528 exemplars, representing 13.58% for the total Zone, second place, and 2.89% for the country. Most were adult goats, 10.715 exemplars (13.81%, 3.17%, second place).

An animal raised throughout Someş County was the pig. However, only 27.160 pigs were registered, representing 4.35% and 0.86%, being the 5th in the Zone. Most were adult pigs, 13.140 exemplars (3.02%, 0.65%,5th place).

Poultry category consisted of chickens, geese, ducks and turkeys. In total, there were 286.554 exemplars representing 8.06% and 0.83%, 5th place. The majority were chickens, 260.958 exemplars (8.30%, 0.88%, 5th place). A significant percentage of the poultry in Someş Zone were ducks and turkeys. Ducks were 12.879 exemplars which represent 10.95% (60%, 4th place) and turkeys were 3.177 copies, ie 15.06% (0.62%, 3th place).

Rabbits were gown as well, 7.58% and 1.54%, or 1.402 exemplars. Place in the county was 5th. Also, beehives were 7.980 which represented 10.68% and 1.36%. Unfortunately most of them were primitive hives, 6.710 (18.48%, 2.61%, second place). (***, 1939, pp. 3-11)

Regional and national Animal Husbandry statistics[1]

	Someş County	Someş Zone	Transyl vania	Romania 1938	Romania 1937
Horses	7.827	220.128	372.073	2.158.266	2.064.976
Donkeys	87	1.444	3.477	13.668	16.092
Mules	15	84	903	2.861	1.510
Ox	59.068	523.957	1.476.792	4.161.056	4.184.400
Buffaloes	14.332	80.564	169.785	175.265	184.714
Sheep	212.894	1.187.515	3.632.689	12.767.510	12.372.390
Goats	11.528	84.896	189.353	398.501	407.803
Pigs	27.160	624.724	1.545.296	3.164.571	3.169.969
Rabbits	1.402	18.506	51.921	90.778	117.672
Poultry	286.554	3.553.672	8.208.171	34.666.031	38.281.449
Chickens	260.958	3.142.405	8.417.818	29.702.656	32.292.909
Gooses	9.540	272.618	648.590	2.292.283	2.759.301
Ducks	12.879	117.588	332.536	2.157.326	2.588.548
Turkeys	3.177	21.061	58.053	513.766	640.690
Beehives	7.980	74.711	208.120	588.298	578.513
Dogs	15.536	183.508	518.221	3.040.299	3.091.088

3. Modernizing the County Agrarian Economy. Agrarian Reform

In the action of modernizing the county agriculture and aid given to farmers there have been taken different actions:

a) Points agricultural and demonstration plots was in Şintereag, near Beclean (30 jug.) and in Dej (9 jug.). In Dej the land was cultivated with wheat (variety Cenad 117). Here was also a tree nursery (4 yoke).

b) Distribution of improved and selected seeds.

Improved wheat seeds were distributed in 1933, thru the Agricultural Service and the Chamber of Agriculture, with grants and cost reimbursement for treatment of diseases. Varieties distributed were: Bank 1201, Cenad 117 (wheat) and Ardelean (corn). Seeds were distributed to 10 communes; a quantity of 7.940 kg at a cost of

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[1] Year 1938.

4.50 lei/kg of witch the Chamber of Agriculture has supported the share of 1 lei/kg. In 1934 other 10 communes received 40.000 kg, distributed with 2.5 lei / kg, with a subsidy of 2 lei/kg of the purchase price (4.50 lei/kg). Other 29 communes received in 1935 over 200.000 kg seeds at a cost of 4.50 lei/kg (2 lei/kg, subsidy). For corn, were allocated 65.882 kg for 38 communes. Corn was purchased at the price of 5 lei/kg and distributed at a price of 1.25 lei/kg, following that 75% of the amount to be repaid in nature, at the harvest. In 1937, were distributed seeds of lucerne (1.416 kg), clover (5.429), mash (504) and beet (57 kg).

c) Fertilizer

Manure platforms were built and lectures were held on how to keep it in storage. Amongst the artificial fertilizer, Ciclovina phosphate was the most used, which were distributed two cars (approx. 30 tons)

d) Distribution of agricultural machinery and rent spots for them

To replace wooden tools and machines, the Chamber of Agriculture subsidized by 25% the price of modern machines purchased.

During 1934 - 1937 were distributed: 22 usual plows, 4 seeders for corn, 4 thresher, 3 harrows, and 1 shredder for fodder, 6 pumps for trees, 2 pumps for vineyards, 1 brooding, and 26 systematic hives. For small land holders, who could not to buy certain agricultural machinery and tools required for certain works of the season were 12 spots were they could rent. The machinery stock consisted of 3 wheat seeders, 4 corn seeders, 2 clover seeders, 2 fanner, 13 trioare, 2 weeding, 1 harrow. Charges for some tools were: large drill - 50 lei/day, corn seeder 30 lei/day, etc..

e) Agricultural exhibitions were held in:

- September 1934: for products of fruit, wine, agricultural, domestic industry and agricultural tools were awarded 56 medals (21 gold, 34 silver, 1 bronze) of over 100 exhibitors.

- May, 17 to 24, 1935, "Wine Week": wine samples were presented form 39 owners; the wines were from the following varieties: Pinot Gris, Riesling, Silvaner green and Muscat Ottonel.

f) Support for orchards

Due to favorable conditions of climate and soil, fruit was an important source of revenue for farmers. Most experienced people, whose main occupation was represented by fruit trees, were those of Ciresoaia, Maluţ, Unguras and Uriu. Action of planting fruit trees has resulted in over 90.000 seedlings, selected from the tree nurseries holding the best material. The amount by which these purchase was subsidized was 398.508 lei. For fruit industrialization there were built two fruit kilns, one in Dej and one Bârsău, worth 95.592 lei.

e) Build and maintain of pasture

Pastures were less fertile and could not provide adequate food for all animals. To improve their quality there has been clearing of weeds and thorns, harrowing and even new plating. To improve the common grazing flora, the most efficient system proved to be the cultivation for 1-2 years with plants (corn, beet, sunflower, soybean), and then a year with forage crops (lucerne, clover). Was practiced moving animal into stalls, on pastures. This way there was improved more than 250 ha. (***, 1937, pp. 195-200)

Agrarian reform works were far from being completed, due largely to lack of funds and cadastral experts.

Surface situation was:

-   From the total surface of 688.595 yoke were expropriated 98.406 yoke;
-   From this area 4.666 yoke, were yet to be measured;
-   Estates measured but remaining to be broken apart: 6.438 yoke;
-   Estates with established plot device but not yet broken apart: 9.764 yoke;
-   Final allotment of land was made for 75.737 yoke;
-   There have been reports for payment for 240 estates with an area of 53.362 yoke worth 49.686 lei (***, 1937, pp. 195-200)

4. Conclusions

Although Someş County, as well as all of Transylvania, was a region that did not have a very large area that is good for agriculture, the population survived with agriculture.The plains of the Great Someş River, Small Someş River and, after confluence, Someş, were very productive and gave a significant production especially after floods. Soil, in agricultural terms, is relatively easy to work with more or less modern machines, especially when normal rainfall during the year was distributed.

Among cereals, maize and wheat is cultivated in almost equal areas, the difference in favor of corn (20%). There were cultivated as well oats, rye, beans, potatoes and vegetables. They used to fertilize the earth with manure and less chemical fertilizers. They used to execute improvements of soil and pasture, especially locally. Due to favorable conditions of climate and soil, fruit was an important source of revenue for farmers. What characterizes the best this region, rich in pastures, meadows and forests, was the rugged configuration suitable for livestock.

The statistics of domestic animals, poultry and beehives shows a structure for Someş County quite different from the Someş Zone[1] or the national level. Horse

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[1] Someş Zone – 7 countys (Bihor, Cluj, Maramureş, Năsăud, Sălaj, Satu Mare, Someş);

breeding was not very developed because farm work was done mostly with oxen and buffaloes. Moreover, the number of buffaloes was only one that is significant both at in Someş Zone (almost 21%) and national (9%). Compared to the situation in Someş Zone, important were mature sheep (20%) and primitive hives (18.5%).

Agrarian reform works were far from being completed, due largely to lack of funds and cadastral experts. In the action of modernizing the county agriculture and aid given to farmers there have been taken different actions.

The agricultures in Someş County proved a well-balanced structure, with natural and human potential capable of development and adaptation.

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Accounting and Auditing

Public vs. Banking Sector Accounting - How Far Is Romania from International Referential?

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Abstract: The purpose of our paper is to identify the level of accounting harmonization in Romania for both public and banking sector with international referential (IPSAS and IFRS) focusing on financial reporting requirements, by providing both vertical and horizontal analysis beginning with the year 2001 up to present. Unlike prior studies conducted on the same topic, which measure the general accounting harmonization for private sector, our paper is focused on specific economic fields – public vs. banking sector – thus providing a different approach of accounting harmonization. The research methodology used for achieving our goal was based on both static and dynamic analysis of the degree of similarity and dissimilitude between national and international accounting frameworks, by using appropriate statistical tools (e.g. Euclidian distance, Jaccard and Spearman coefficients). Our results reveal continuous improvements in accounting regulations in both sectors along time, but banking sector was always much closer to international standards than the public one. Considering the controversies between cash and accrual basis accounting which affected harmonization in public sector, as well as the latest challenges for banking sector due to IFRS adoption, we appreciate the overview image of accounting development in Romania provided by our empirical results as valuable for a wide range of users: academics, researchers, practitioners for both public and banking sector.

Keywords: accounting harmonization; international referential (IFRS / IPSAS); public sector; banking sector; Romania

JEL Classification: M41, G21

1. Introduction

International harmonization and convergence of accounting had gradually become one of the most challenging topic of worldwide research and a very hot debated issue in practitioners' sphere, too. It was mainly due to an increasing internationalization of capital markets based on the background of a rapid development of economic globalization. Even if we can talk about accounting harmonization for quite a very long time, the progress has been slow in achieving this goal, among the most common impediments being cultural, economic, political

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and legal differences among countries.

Puxty et al. (1987:275) argue that 'the institutions and processes of accounting regulation in different countries cannot be understood independently of the historical and political-economical context of their emergence and development'. Haller (2002) insists on the political factor that it noticed in a different degree of manifestation in the European environment of Anglo-Saxon and Continental countries. Legal and political factors provide a much more substantial influence on standard development and implementation than cultural values provide (Sawani, 2009). From a historical point of view, accounting development is an evolutionary process dependent upon and interwoven with economic development (Lowe, 1967). The force of changing of accounting system may come from the effect of one or more factors mentioned above, the co-action of several factors or as a synthesis of all of them (Zhang, 2005). In support of the idea, Alexander and Archer (2001) recognize the need of accounting harmonization and convergence in the context of more slight desire of communication between countries, necessary to find viable solution that solve the global problems manifested, in all economic field (inclusive public and banking sector).

Harmonization scope allows making comparisons of international financial accounts easier, faster and cheaper (Carlson, 1997). Underlying the process of harmonization, financial statements must ensure a higher degree of comparability. Thus, the harmonization process request join effort of legislators and accounting standards setters to accomplish a great goal, namely to provide a quality and transparent information.

The purpose of our study is to identify the level of accounting harmonization for both public and banking sector to international referential (IPSAS and IFRS) focusing on financial reporting requirements. Thus, our paper provides an historic research in both fields beginning with the year 2001, up to present.

The implications of the study are representative for two levels. Worldwide, manages to position Romania in countries emerging field, which is important for the international bodies empowered to issue accounting regulations At national level, the study can be useful to a large category of users, namely: the bodies empowered to issue normative documents; the effective user of the legislative regulations, who by involving in the process of public debate of the normative documents will be able to influence their content through pertinent suggestions concerning their content, quality and novelty; the public who can have an idea about the way in which its representatives in Parliament and Government get involved in creating a correct, coherent and efficient accounting system in due time and with low costs.

Basing on this background, our paper proceeds as follows. Firstly, we briefly presenting the international referential (IPSAS and IFRS) applicable to public vs.

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banking sector, thus creating the basis for reviewing prior literature concerning accounting harmonization. We continued our study pointing out the main stages of accounting development in our country in these two areas – public vs. banking one. Than, we describe the research design, beginning by explaining the sample selection and data collection, followed by the research methodology used based on both vertical and horizontal analysis of material accounting harmonization. Finally, we provided our research findings and discussed their implications and future perspectives.

2. International Referential for Public vs. Banking Sector

International Public Sector Accounting Standard (IPSAS) was prepared by the International Public Sector Accounting Standards Board (IPSASB), an independent standard-setting body within the International Federation of Accountants (IFAC).
The objective of the IPSASB is to serve the public interest by developing high quality accounting standards for use by public sector entities around the world in the preparation of general purpose financial statements. Starting with 1998, the IPSASB has issued a total of 31 referential. This will enhance the quality and transparency of public sector financial reporting and strengthen public confidence in public sector financial management (IPSAS, 2012). They are based on IAS/IFAC referential.

There are several ways to characterize IPSAS: as an international version of national standards; as a government version of business accounting standards; and as a professional version of laws and regulations (Chan, 2008).

From this argument, in over 50 countries, IPSAS standards were actually applied in national and regional accounting system (Cardinaux et al., 2007). One thing is certain: international accounting standards become an international accounting culture (Whittington, 2008). Furthermore the standards are sustained by a large number of international organizations, including the United Nations, The Organization for Economic Co-operation and Development, NATO and others.

An undoubtedly contribution in worldwide accounting harmonization had the International Accounting Standards Committee (IASC) by issuing the so-called "IAS" (International Accounting Standards). Thus, anyway, between 1973 and 2001, a series of 41 accounting standards have been issued during that time ordered numerically, started with IAS 1, and concluded with the IAS 41.

Since 2001, the new International Accounting Standards Board (IASB) took over from the IASC its responsibility of standards settler and continued to develop the so-called "IFRS" (International Financial Reporting Standards), a series of 13 standards being issued up to present. One major implication worth noting is that any principles within IFRS that may be contradictory will definitely supersede

those of the IAS. Basically, when contradictory standards are issued, older ones are usually disregarded.

By now, more than 100 countries and regions over the world have permitted or even required their domestic listing companies to adopt IFRS to different extent, thus appearing that international accounting harmonization has been an unconvertible trend. The main reason of following this trend came from the worldwide perception and acceptance of accounting as a "business language" that inevitably is leading to the following question that has been recently in the center of attention - "Can all accountants worldwide speak the same language?" (Rezaee, et. al, 2010).

Nonetheless, IFRS/IPSAS is not universally perceived as a "panacea" because convergence is a very complex process influenced by political, cultural, and regulatory differences that often generate significant uncertainty and resistance (Johnson and Leone, 2008).

Consequently, all these events and whole questions aroused created an opportunity for accounting researchers to analyze trends in research on international accounting harmonization and to assess where this research may proceed from here.

3. State of the Art in Accounting Harmonization

Measuring accounting harmonization started in the early 1980's, but these studies (Nair and Frank, 1981; McKinnon and Janell, 1984; Doupnik and Taylor, 1985), were mainly focused on the application of International Accounting Standards in various countries around the world, examining the change in the level of conformity over time, without distinguishing between formal and material harmonization. Analysis reveals that between 1979 and 1983 Europe registered the lowest level of compliance with IASC standards among five broadly-defined geographic areas.

For public sector, a review of public sector literature shows that it is focused on research into annual accounts or comparability of standards and legislation (Sanchez, 2003), while banking sector was not in authors' interest for research papers on this topic.

Later, studies aiming to measure accounting harmonization were conducted on two different pillars: studies on *formal (de jure) harmonization* focused on accounting standards and studies on *material (de facto) harmonization* focused on accounting practice (financial reporting) (Van der Tas, 1988; Tay and Parker; 1990). The first attempt to measure the harmonization degree of a certain national accounting system (formal harmonization) led to development of a first indicator, namely *Herfindahl or H Index* (Van der Tas, 1988), followed by two derivatives of it *C Index* and *I Index* for comparing more systems (Van der Tas, 1992).

Along time, further improvements or developments to those indices have been made by various researchers (Archer, et al., 1995; Archer, et al., 1996; Herrmann and Thomas, 1995; Morris and Parker, 1998; Aisbitt, 2001; Pierce and Weetman, 2002; Taplin, 2004) materialized in derived measurement such as the *Total Comparability Index, the Within-country Comparability Index, the Disclosure-adjusted Index, the Adjusted "Between-country" Index, and Associations Coefficients*, but most of them have been used in studies aimed to determine the level of harmonization among the practices and treatments, thus using accounting information prepared by companies. Consequently these derived instruments are considered more suitable for measuring material harmonization.

The next decade (1990-2000) provides new methodologies developed for measuring exclusively the formal harmonization level of accounting systems. Thus, a *cross-national disclosure model* was developed (Adhikari and Tondkar, 1992), followed by a *disclosure index framework* (Adhikari and Tondkar, 1995) and the *Mahalanobis distance* using a subsidiary indicator named *Exact Matches* (Rahman, et al., 1996), based on clustering and discriminating analysis, focusing on both disclosure and measurement requirements.

Beginning with the year 2000, we assisted to a pronounced enrichment of research tools, new accounting harmonization measurement instruments being developed, such as the *Euclidian Distances* (Garrido et al, 2002), which in fact represents a particular form of the Mahalanobis Distance Method, followed by *Jaccard's similarity coefficients* and *Spearman's correlation coefficients* (Fontes et al., 2005), which proved to be better in reaching their aim.

Further studies developed (Aisbitt, 2006; Delvaille, et al., 2005; Tarca, 2004; Rahman, 2002) reveal more suitability of using the correlation and association coefficients in measuring the degree of accounting harmonization compared with the other statistical tools used in prior studies.

Because, almost all of the above-mentioned studies had defined the international differences in accounting as a variety of choices for one accounting issue by different national standards, and few had taken into consideration the comprehensiveness of one set of accounting standards compared with another, a new approach of identifying the nature and significance of the differences between accounting standards was noticed (Ding et al., 2005; Ding et al., 2007) and a new measure called *Average distance* was developed (Wang, et al., 2005), that proved to be much simpler and able to reflect the influence of the different enforcement level of regulations on harmonization better than the Mahalanobis distance used in Rahman et al. (1996).

The latter decade (2001-2010) ends with a new approach for measuring formal accounting convergence in a more informative and reasonable manner, relying on

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fuzzy clustering analysis to measure the formal accounting convergence (Zhang and Qu, 2009).

In conclusion, a wide range of instruments have been developed along time aiming to measure formal accounting harmonization, each of it having both benefits and shortcoming. Basing on the latest study developed in this respect (Qu and Zhang, 2010), we can sum up at the least the following ideas related to the methods and methodology employed in prior literature:

- "static" (vertical) formal accounting harmonization is better assessed through measuring methods based on coefficients (Jaccard's and Spearman's coefficients) because of using nominal variables, data sources including mainly regulations, standards, and stock exchanges' listing requirements;

- "dynamic" (horizontal) formal accounting harmonization is better assessed by using distance measures (Euclidian distances and Mahalanobis distances) because of using ordinal or interval variables.

4. Romanian Accounting System – An Overview from Public vs. Banking Perspective

4.1. Developments in Accounting System for Public vs. Banking Sector

Considering the main rules that were issued in Romania for approving the accounting regulations for public and banking sector that are synthesized in the following table, we identified five important stages in the whole process of transition form national to international standards.

Table 1 Accounting regulations in Romania – public vs. banking sector

Stages	Public Sector	Banking sector
before 2001	Law no.10/1991; no. 72/1996	Order no. 344/1997; no. 362/1998
2001 - 2005	Order no.61/2001; no.1792/2002; no.81/2003; no.1746/2002	Order no. 5/2001
2006 - 2008	Order no.1917/2005	Order no. 5/2005
2009 - 2011	Order no.1917/2005	Order no. 13/2008
2012 - present	Order no.1917/2005	Order no. 27/2010

Source: Own projection

For the public system, integrating the accounting system afferent to the 1989 (post communist) – 2001 period in international context, we can affirm that there is a cash basis accounting, which recognizes the incomes and expenses in the moment of pay. This period is characterized by a slow evolution of the public accounting

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system, which essentially was not influenced by the world tendencies. Technically, they use the same accounting chart as the one from the socialist period, approved in 1984, slightly updated to the present requirements (Nistor et al, 2008).

In the first stage of accounting reform, which starts in '90s and ends in year 2001, the accounting system in banking sector had strong origin in the continental system, being influenced by French rules regarding both the chart of accounts and the financial statements format.

Beginning with the year 2001, an infusion of Anglo-Saxon concepts and practices took place in Romanian accounting system as a whole.

The transition towards the accrual accounting system for public institutions imposed a series of preparation measures. These have brought major changes in comparison with the existing accounting technique, in addition to the cash basis accounting system, typical of the public institutions. So, in second period, stands the adoption of new treatments, regarding fixed assets, such as: material assets revaluation, fixed assets depreciation, provisions for material assets depreciation.

This influence left its mark on banking sector, too, by the first regulation issued by the National Bank of Romania and harmonized with European Standards through the conceptual framework elaborated by IASC retrieved inside it.

The year 2006 (third period) marks at a national level the implementation of the accrual based accounting system in all Romanian public institutions (Order no. 1917/2005). The main characteristics of the new accounting system can be resumed as follows (Nistor et al, 2008): harmonization of the public institutions' Accounts Chart with the economic entities' one developing and keeping some of their features; presenting the financial statements in a similar way as far as structure and content with the ones of the economic entities; the statement of earnings shows the financial performance of public entities, both for their own need and related to other governmental institutions, suppliers, creditors, clients and other users; the result of the exercise is a patrimonial result that contains engagements and obligations that are not yet paid; the evaluation methods of assets and liabilities are similar to the one of economic entities.

The process of harmonization with international standards and practices followed its third stage (2006 – 2008), when accounting regulations approved were conforming to the European Directives. During this stage, starting with the financial year 2007, all credit institutions were required to apply IFRS in their consolidated financial statements for prudential supervision purposes, irrespective of their listing status (Order no. 6/2007). This requirement became mandatory at individual level, too, in the next stage (2009 – 2011). Thus, beginning with year 2009, informative annual financial statement in accordance with IFRS provisions were required by the National Bank of Romania for all banking institutions (Order

no. 15/2009). This measure was taken for assessing the ability of banking system to apply IFRS as the basis of accounting, the final decision being taken the following year by Order no. 9/2010 regarding the adoption of IFRS beginning with the year 2012.

Also, a comprehensive review followed by proper updates of reporting framework (Order no. 1/2011 regarding consolidated financial reporting and Order no. 3/2011 regarding individual financial reporting, respectively Order no. 2/2011 for statistical reporting applicable to branches of banking institutions from UE member states) and prudential regulations were made during this stage, too.

Currently, the Romanian public sector and banking system is still going through the continuous process of harmonization with international rules and practices in order to increase transparency and ensure comparability of information, through relevant and adequate assessments across the entire public/banking sector.

Thus, in banking sector beginning with the year 2012, accounting regulations conforming to the International Financial Reporting Standards (IFRS) became applicable to all credit institutions from Romanian banking system.

4.2. Financial Reporting Environment – a "Mirror" of Accounting Harmonization

The financial statements are the main vehicle of information available for all users (Muniain, 2003). Whether discussing the public or private interest, the accountability is a requirement of New Public Management (NPM) postulates. The financial statements are considered a key accountability tool for different users.

Increasing relevance of financial statements is due to the existence of evidence of limited financial resources whose use must take into account social needs, the interest of stakeholders, the citizen rights, the quality and efficiency of the public services.

Given that public institutions are increasingly approaching the status of business entities, the harmonization process must lead the financial reports to a higher degree of comparability (Wolk and Heaston, 1992). Thus, harmonization represents the effort undertaken by legislators and accounting standards setters in order to reduce the diversity of accounting treatments used to reflect economic reality.

Brusca and Condor (2002) shows that in disclosure degree appreciation of financial reports, there are differences given by a number of factors such as: legal system, principal users of financial reporting, the organization of the public/private sector, specific objectives of public/private financial reporting. Based on this assessment, the study correlates acceptance of high disclosure with Anglo-Saxon accounting system and low disclosure with the continental one.

Thus, the present study uses in assessing formal harmonization, the financial statement of public/banking sector according to national rules, as the basis for comparison with international reference (IPSAS/IFRS).

5. Empirical Study on Formal Accounting Harmonization in Romania – Public vs. Banking Sector

5.1. Research Design

The purpose of our study is to empirically measure and compare the levels and progress of formal accounting harmonization in Romania in public vs. banking sector focusing on financial reporting. The reason of choosing IAS 1 and IAS 7, respectively IPSAS 1 and IPSAS 2 for assessing the extent of convergence derives from the general acceptance that financial reporting is "the best mirror" of accounting harmonization.

The research methodology of our study comprises both a static and a dynamic analysis, being aimed to provide a comprehensive overview of the evolution of accounting harmonization along time, as well as the level reached by now in both sectors. Thus, for performing our analysis we considered four stages of accounting system development, beginning with the year 2001, which were detailed in Table 1.

The statistical tools used for assessing the degree of convergence between national and international referential were appropriate to the type of analysis performed. Thus, while for the static analysis we considered *Jaccard's and Spearman coefficients*, the dynamic analysis was performed using the *Euclidian distance*. The use of SPSS statistical software for reaching the final results ensures transparency and relevance to our results, while data processing is accurate and controllable.

The aspects selected for performing the empirical analysis were structured in nine topics comprising issues related to form (Financial reporting structure; Basis of reporting; Assets ordering by liquidity; Liabilities ordering by chargeability; Financial performances; Cash-flow methods; Statement of responsibilities; Additional information; Qualitative characteristics) and six topics comprising issues related to content (Impairment; Reevaluation; Depreciation methods; Measurements for inventories (Input and Output); Measurements for financial assets / liabilities). Starting from these topics, we proceeded to compare the national referential for public and banking sector with the corresponding international accounting standard. Thus, we have allocated the 1 or 0 value for each possible and/or existent requirement within at least one of the considered regulation, where the 1 value shows that the requirement exists within that framework, and 0 value is given for the situation when the requirement is not found within the considered framework.

In Table 2 there is presented a sample of 1 and 0 values that have been allocated for both public and banking sectors for issues related to form, namely Qualitative characteristics.

Table 2 Exemplification of the analysis method used for the considered topics

	IPSAS	IFRS	2001-2005		2006-2008		2009-2011		present	
			PS	BS	PS	BS	PS	BS	PS	BS
Issues related to form										
Qualitative characteristics										
- relevance	1	1	0	1	1	1	1	1	1	1
- reliability	1	1	0	1	0	1	0	1	0	1
- comparability	1	1	0	0	1	0	1	1	1	1
- credibility	1	0	0	0	1	0	1	0	1	0

Source: Own projection

Considering the main aim of our study – to provide a comprehensive image of accounting harmonization level with international standards along time for both public and banking sector – we stated the following hypotheses:

> *H1: Financial reporting for public sector is in accordance with IPSAS from "form" point of view.*

> *H2: Financial reporting for banking sector is in accordance with IFRS from "form" point of view.*

> *H3: Financial reporting for public sector is in accordance with IPSAS from "content" point of view.*

> *H4: Financial reporting for banking sector is in accordance with IFRS from "content" point of view.*

On the basis of the elements identified in the previous period, and by analysing the intensity of the changes we want to determine which is their meaning. Many times, the frequent changes transpose uncertainty and instability, whereas the lack of these may mean coherence and certainty.

5.2. Empirical Findings

For accepting or rejecting our hypotheses we proceeded at determining the degree of similarity and dissimilitude between Romanian accounting rules for both public and banking sector and corresponding international referential. A synthesis of results reached by processing data collected into SPSS software is presented in details in Table 3, followed by an analysis of values calculated.

Table 3 Comparison analysis based on Euclidian distance, Jaccard's and Spearman's coefficients

	2001-2005		2006-2008		2009-2011		present	
	PS	BS	PS	BS	PS	BS	PS	BS
Issues related to form								
Euclidian distance	4.243	1.414	3.000	1.414	3.000	1.000	3.000	1.000
Jaccard's coefficient	0.143	0.889	0.609	0.889	0.609	0.944	0.609	0.944
Spearman's coefficients	0.143	0.816	0.000	0.816	0.000	0.900	0.000	0.900
Issues related to content								
Euclidian distance	3.317	2.236	2.000	2.000	2.000	2.000	2.000	1.414
Jaccard's coefficient	0.154	0.643	0.692	0.714	0.692	0.714	0.692	0.857
Spearman's coefficients	0.113	0.175	0.372	0.145	0.372	0.145	0.372	0.077

Source: Own results using SPSS version 16

We can notice that between 2001 and 2005 we did not find elements of accrual accounting because the rules for public sectors were elaborated on cash basis, irrespective of banking system, which was organized since the beginning on accrual basis. This statement is supported by the values of similarity and dissimilitude coefficients presented in Table 3. Thus, we can notice the difference between their values for both "form" and "content" issues (e.g. 0,154 for public sector, respectively 0,643 for banking sector in case of Jaccard's coefficient for "content" analysis), which reveals a low level of financial reporting harmonization to international standards especially for public sector.

However, we have to mention that during this period there were 13 public institutions which applied with experimental purpose the accrual accounting at the same time with cash principles. The results reached by these institutions stood as a basis of adopting accrual basis accounting since the year 2006. Consequently, we can notice an improvement in both form and content requirements also revealed by the values evolution of coefficients determined (e.g. 0,154 for previous period vs. 0,692 for current period). Actually, this is the result of a new public accounting regulation on accrual basis with IPSAS influences.

As regards the banking sector, our results also reveal an improvement in case of financial reporting "content" requirements (e.g. 0,643 for previous period vs. 0,714 for current period, sustained by fair value approach).

The next decades (beginning with the year 2009 up to present) the accounting system for public sector is characterized by continuity, being based on the same regulation with minor changes without IPSAS implications. In case of banking system, we can notice a continuous trend for accepting international standards for

both form and content requirement for financial reporting (e.g. 0,889 vs. 0,944 for form analysis, respectively 0,714 vs. 0,857 for content analysis, sustained by adjustments for impairment and amortized cost concepts). This is mainly due to the requirement of preparing informative annual financial statements in accordance with IFRS provisions, which became mandatory beginning with the year 2012.

6. Conclusions and Perspectives

Accounting harmonization in Romania proved to be a difficult process with major implications in theoretical and practical approach. Financial reporting provides the best image of this process, often being considered as the mirror of accounting system.

This is the main reason why we focused our research on the degree of juxtaposition between financial reporting in Romanian public and banking system according to national rules and international standards (IPSAS and IFRS). Thus, we analyzed both form and content requirements for financial reporting between 2001 and 2012, issues formulated into our research hypotheses.

According to our empirical findings, even if harmonization in public sector started later, between 2001 and 2005 the accounting system being based on cash principles, we can stated that beginning with the year 2006 there are significant influences of IPSAS referential. Consequently, we can assert that financial reporting analyzed by both form and content point of view are based on IPSAS 1 and IPSAS 2 requirements, thus two of our hypotheses (H1 and H3) being accepted.

Applying IFRS in Romanian banking system is considered "a big step ahead". Thus, it not only complies with the request of the International Monetary Fund and the European Union, as part of the financing agreements concluded with the Romanian authorities, but also ensures comparability between banks, thus creating consistency in supervision (individual vs. consolidated) and providing relevant and reliable information to general users by eliminating confusions. These statements are also confirmed by our empirical findings, which reveal a continuous trend of harmonization to international standards, thus the rest of our hypotheses (H2 and H4) being accepted, too.

However, IFRS adoption will also create many challenges, the transition to an approach based on professional judgment being the most exciting. Banks have to be aware as well of the costs incurred by IT solutions and to pay attention to the training of staff involved in this process.

Like any other research study, our analysis has limitations, too, which are mainly coming from the sample of issues considered for the analysis and the research technique used. But, these limitations offer us outlooks for future research, by

extending the sample of issues required by IAS 1 and IAS 7, respectively IPSAS 1 and IPSAS 2 included in analysis, even by considering other international referential. Also, the research methodology might be improved by using other comprehensive statistical methods for testing the degree of similarity / dissimilitude between accounting systems considered, which gives us outlooks for future research.

Anyway, through the conclusions reached, our paper could be considered as valuable for a wide range of users: academics, researchers, practitioners for both public and banking sector.

7. Acknowledgment

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Mathematical and Quantitative Methods

Aspects of Price Discrimination in the Monopoly

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Abstract: The analysis allowed the determination in general of the consumer's surplus or of the manufacturer's surpluss in the case of monopoly and the determination of the allocative inefficiency in relation to the situation of perfect competition. Also, we broached the price discrimination of third order, analyzing, in terms of goods elasticities, the opportunity to separate prices in the conditions of differences existing between groups of firms.

Keywords consumer; demand; monopoly; discrimination; manufacturer

JEL Classification: D01

1. Introduction

Monopoly is a market situation where there is a single bidder of an unsubstituted good and a sufficient number of consumers.

The existence of monopoly imply absence of competition between production companies, the only ones who can influence a lesser or greater price being the buyers.

We list some main categories of monopoly, namely:

- **natural monopoly** – as a result of the realization of inventions or possession of scarce resources or prohibitive for other potential competitors. Usually, such a monopoly has not a very long life because on the one hand, technological progress can give birth to new inventions to cancel the advantage of generating monopoly or, on the other hand, reallocation of resources for various reasons. In this type of monopoly, the long-term average cost is a decreasing function, contrary to the situation encountered in the perfect competition.

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- **public monopoly** – represented by state-owned companies, generated mostly by controlling prices or monitoring of hazardous activities. We meet such a monopoly, usually within companies providing essential services to society, such as railway companies and/or air, distribution companies (electric, gas, nuclear, wind etc.). , water distribution companies and/or heat etc.

- **monopoly as a final result of the competition** – when, one by one, competitors are removed from the market.

In the market monopoly, the price set will not follows the equilibrium law, the monopolist having the possibility of relatively unilaterally adjust to maximize its profits. On the other hand, an excessive increase in price implies a decline in production due to its sale entirely impossible.

The uninterchangeably of the product is essential, because if there is another product that could replace the original one, the buyers will move the request to this, the monopolistic company thus reducing the market outlet.

2. An Overview of Monopoly

Before beginning our analysis on the price of a good sold under monopoly situation, let recall the main costs of production, where we have noted Cm – the marginal cost, CT – the total cost, CTM – the average total cost.
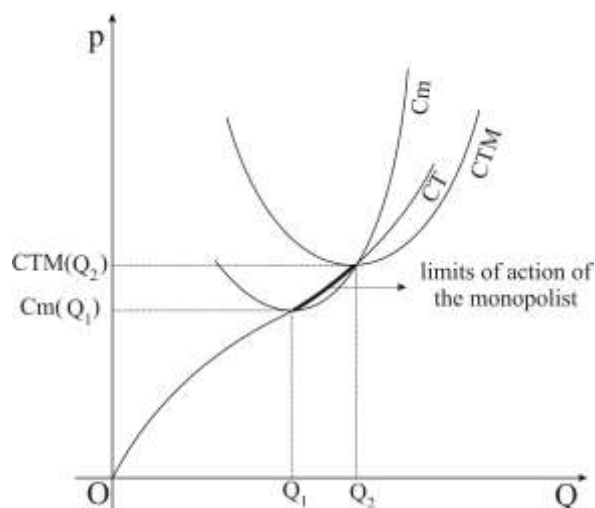

Figure 1. Long-term costs

The action of monopolist is so effective for $Q \in [Q_1, Q_2]$ (Q_1 – the minimum point of Cm, Q_2 – the CTM's minimum point) therefore on the part where the marginal cost is increasing, but the average total is decreasing.

We know that at a sale price of output Q, we have: $\Pi(Q) = p(Q) \cdot Q - CT(Q)$ where, from the condition of extreme profit ($\Pi'(Q) = 0$) implies:

$$Cm(Q) = p(Q)\left(1 + \frac{1}{\varepsilon_{Q,p}}\right)$$

where $\varepsilon_{Q,p} = \frac{dQ}{dp} \cdot \frac{p}{Q}$ is the coefficient of elasticity of demand in relation to price.

We will assume that the good is normal, so $\varepsilon_{Q,p} < 0$.

On the other hand, we know that the marginal income $Vm(Q) = p(Q)\left(1 + \frac{1}{\varepsilon_{Q,p}}\right)$.

If $1 + \frac{1}{\varepsilon_{Q,p}} < 0 \Leftrightarrow \varepsilon_{Q,p} > -1$ then $Vm(Q) < 0$. How any company production is at a positive marginal cost we have that $Vm(Q) = Cm(Q) > 0$ so contradiction.

If $\varepsilon_{Q,p} \leq -1$ then $1 + \frac{1}{\varepsilon_{Q,p}} \geq 0$ having $Vm(Q) \geq 0$. If the equation $Cm(Q) = Vm(Q)$ has the solution Q_0 then $Q = Q_0$ is the output at which the monopolist will maximize its profit, the price of production being $p_0 = Cm(Q_0)$. Therefore, to maximize its profit, the monopolist will run as long as the elasticity of production is less than -1, so the demand is elastic.

Also, as $Vm = p'(Q) \cdot Q + p(Q) < p(Q)$ (for a normal good $p'(Q) < 0$) we obtain that $p^* = p(Q_0) > p_0$, so the price that consumers are willing to offer is greater than those of production. As a result, the revenue of monopolist are $V = p^* Q_0$. At a such level of production, the average total cost $CTM(Q_0)$ is greater than p_0 because the production zone is under its minimum and less than p^*. The monopolist profit is therefore:
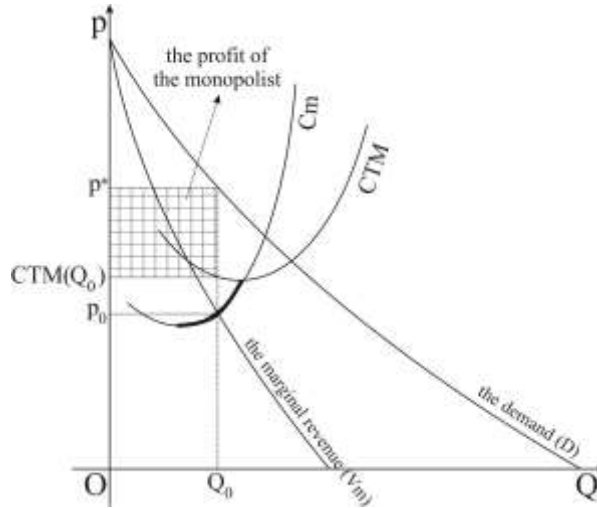
$$\Pi(Q_0) = (p^* - CTM(Q_0)) \cdot Q_0$$

Figure 2. The profit of the monopolist

Let us note now $Pp(Q)= \dfrac{p(Q)}{Cm(Q)}$ - the market power of the company

corresponding to the production Q. We note that a value higher than one of Pp is a price that exceeds the marginal cost and thus is providing additional profit. But we

have: $Pp(Q)= \dfrac{\varepsilon_{Q,p}}{\varepsilon_{Q,p}+1}$.

Considering the function f:$(-\infty,-1)\cup(-1,0]\rightarrow$**R**, $f(x)= \dfrac{x}{x+1}$ we have $f'(x)= \dfrac{1}{(x+1)^2}$

>0 therefore f is strictly increasing. As $\lim\limits_{x\to-\infty} f(x)=1$, $\lim\limits_{\substack{x\to-1\\x<-1}} f(x)=\infty$, $\lim\limits_{\substack{x\to-1\\x>-1}} f(x)=-\infty$,

f(0)=0, follows that f(x)$\in(1,\infty)$ $\forall x\in(-\infty,-1)$ and f(x)$\in(-\infty,0)$

$\forall x\in(-1,0]$. In particular, for $x=\varepsilon_{Q,p}$ we have that Pp(Q)$\in(1,\infty)$ $\forall \varepsilon_{Q,p} \in(-\infty,-1)$ and

Pp(Q)$\in(-\infty,0)$ $\forall \varepsilon_{Q,p} \in(-1,0]$.

Following these considerations, it result that for a demand increasingly more elastic, the monopolist can raise price increasing more than the marginal cost of production.

Similarly, we define the firm's pricing power (*the Lerner index*), corresponding to

the production Q, as: $L(Q)= \dfrac{p(Q)-Cm(Q)}{p(Q)}$. We have:

$$L(Q) = \frac{p(Q) - Cm(Q)}{p(Q)} = 1 - \frac{Cm(Q)}{p(Q)} = 1 - \frac{1}{Pp(Q)} = -\frac{1}{\varepsilon_{Q,p}}$$

The power price is the price relative deviation of the price monopoly in relation to the those coming from perfect competition ($Cm(Q)$). Notice that at a demand becoming more elastic ($\varepsilon_{Q,p} < -1$) L tends to zero.

In the monopolistic market, the production Q_0 where the monopolist will maximize its profit, is thus a solution of the equation $Cm(Q) = Vm(Q)$, the output price being $p_0 = Cm(Q_0)$. The selling price of the product is $p^* = p(Q_0)$. As $V(Q) = p(Q) \cdot Q$ we have that $V_m(Q) = p'(Q) \cdot Q + p(Q)$ therefore Q_0 satisfy the equality: $Cm(Q_0) = p'(Q_0) \cdot Q_0 + p(Q_0)$.

In this case, the consumer surplus (in the case of monopoly) is the curvilinear triangle area FAp^* i.e.:

$$S_{d,m} = \int_0^{Q_0} p(Q)dQ - p^* Q_0$$

Similarly, the excess of the monopolist (in the case of monopoly) is the curvilinear quadrilateral area p^*ACD:
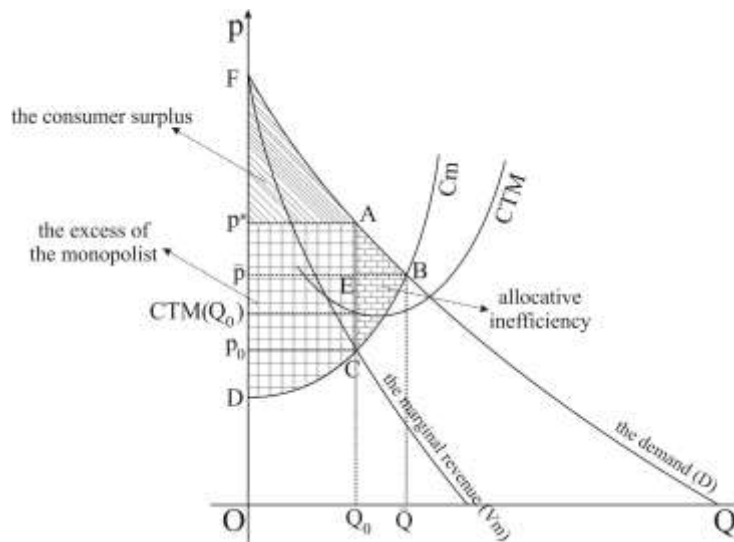
$$S_{s,m} = p^* Q_0 - \int_0^{Q_0} Cm(Q)dQ$$

Figure 3. Allocative inefficiency

The total surplus (in the case of monopoly) is the sum of the two surpluses, namely:

$$S_m = S_{d,m} + S_{s,m} = \int_0^{Q_0} \big(p(Q) - Cm(Q)\big)dQ$$

As $L(Q) = \dfrac{p(Q) - Cm(Q)}{p(Q)}$ follows that $p(Q)-Cm(Q)=L(Q)p(Q)=-\dfrac{p(Q)}{\varepsilon_{Q,p}}$.

The total surplus can be written thus:

$$S_m = -\int_0^{Q_0} \frac{p(Q)}{\varepsilon_{Q,p}}dQ$$

If the manufacturer would operate under perfect competition, the equilibrium production would satisfy the relationship $Cm(Q)=p(Q)$. Let $\overline{Q}$ and $\overline{p}$ - the production and the price equilibrium in this case.

The consumer surplus (in case of perfect competition) is the curvilinear triangle area FB $\overline{p}$, namely:

$$S_{d,c} = \int_0^{\overline{Q}} p(Q)dQ - \overline{p}\,\overline{Q}$$

Similarly, the excess monopolist (in case of perfect competition) is the curvilinear triangle area $\overline{p}$ BD:

$$S_{s,c} = \overline{p}\,\overline{Q} - \int_0^{\overline{Q}} Cm(Q)dQ$$

The total surplus (in case of perfect competition) is the sum of the two surpluses, namely:

$$S_c = S_{d,c} + S_{s,c} = \int_0^{\overline{Q}} \big(p(Q) - Cm(Q)\big)dQ$$

Let notice now that since the optimum in monopoly conditions is performed on the descending curve of the CTM and in the perfect competition on the increase, resulting: $Q_0 < \overline{Q}$.

The area of the curvilinear triangle ABC is called allocative inefficiency and we have:

$$I_a= \int\limits_{Q_0}^{\overline{Q}}\big(p(Q)-Cm(Q)\big)dQ =S_c\text{-}S_m$$

Because on the action area of the manufacturer: $p(Q)\geq Cm(Q)$ we have that $I_a\geq 0$ therefore: $S_c\geq S_m$. From these facts, the total surplus under monopoly is smaller or equal than in the case of perfect competition. Also, let note that:

$$\Delta S_s=S_{s,m}\text{-}S_{s,c}=$$

$$\left(p^*Q_0 - \int\limits_{0}^{Q_0}Cm(Q)dQ\right)-\left(\overline{p}\overline{Q} - \int\limits_{0}^{\overline{Q}}Cm(Q)dQ\right)=p^*Q_0 - \overline{p}\overline{Q} + \int\limits_{Q_0}^{\overline{Q}}Cm(Q)dQ$$

is the difference of producer's surplus at the transition from perfect competition at the monopolistic competition.

On the other hand, $p(\overline{Q})=\overline{p}=Cm(\overline{Q})$, and $p^*=p(Q_0)$ where Q_0 satisfy: $Cm(Q_0)=p'(Q_0)\cdot Q_0+p(Q_0)$. We get so:

$$\Delta S_s= p(Q_0)Q_0 - p(\overline{Q})\overline{Q} + \int\limits_{Q_0}^{\overline{Q}}Cm(Q)dQ= p(Q_0)Q_0 - p(\overline{Q})\overline{Q} + \int\limits_{Q_0}^{\overline{Q}}CT'(Q)dQ =$$

$$p(Q_0)Q_0 - p(\overline{Q})\overline{Q} + CT(\overline{Q}) - CT(Q_0) =\big(CT(\overline{Q}) - CT(Q_0)\big)\left(1 - \frac{\overline{Q}p(\overline{Q}) - Q_0p(Q_0)}{CT(\overline{Q}) - CT(Q_0)}\right)$$

From the Cauchy's theorem of finite increases, it follows that $\exists Q^{**}\in\big(Q_0,\overline{Q}\big)$ so that:

$$\frac{\overline{Q}p(\overline{Q}) - Q_0p(Q_0)}{CT(\overline{Q}) - CT(Q_0)} = \frac{\big(Q\cdot p(Q)\big)'}{CT'(Q)}\bigg|_{Q=Q^{**}} = \frac{p(Q^{**}) + Q^{**}\cdot p'(Q^{**})}{Cm(Q^{**})} = \frac{Vm(Q^{**})}{Cm(Q^{**})}$$

Following these considerations, it follows:

$$\Delta S_s=\big(CT(\overline{Q}) - CT(Q_0)\big)\left(1 - \frac{Vm(Q^{**})}{Cm(Q^{**})}\right)=$$

$$\frac{\big(CT(\overline{Q}) - CT(Q_0)\big)\big(Cm(Q^{**}) - Vm(Q^{**})\big)}{Cm(Q^{**})}\geq 0$$

because the total cost is increasing, $Cm\geq Vm$ on the range $\big(Q_0,\overline{Q}\big)$ and Cm is positive. Therefore, the shift to a monopoly, will increase the producer surplus.

Analogously:

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$$\Delta S_d = S_{d,m} - S_{d,c} = \left(\int_0^{Q_0} p(Q)dQ - p^*Q_0 \right) - \left(\int_0^{\overline{Q}} p(Q)dQ - \overline{p}\,\overline{Q} \right) = \overline{p}\,\overline{Q} - p^*Q_0 - \int_{Q_0}^{\overline{Q}} p(Q)dQ$$

represents the difference of consumer's surplus is at the transition from perfect competition at those monopolistic.

We therefore have:

$$\Delta S_d = \overline{p}\,\overline{Q} - p^*Q_0 - \int_{Q_0}^{\overline{Q}} p(Q)dQ = p(\overline{Q})\overline{Q} - p(Q_0)Q_0 - \int_{Q_0}^{\overline{Q}} p(Q)dQ$$

Let P be a primitive of p. We get:

$$\Delta S_d = p(\overline{Q})\overline{Q} - p(Q_0)Q_0 - \int_{Q_0}^{\overline{Q}} P'(Q)dQ = p(\overline{Q})\overline{Q} - p(Q_0)Q_0 - P(\overline{Q}) + P(Q_0) =$$

$$\left(P(\overline{Q}) - P(Q_0) \right)\left(\frac{\overline{Q}p(\overline{Q}) - Q_0 p(Q_0)}{P(\overline{Q}) - P(Q_0)} - 1 \right).$$

From Cauchy's theorem of finite increases, it follows that $\exists Q^{***} \in \left(Q_0, \overline{Q} \right)$ so that:

$$\frac{\overline{Q}p(\overline{Q}) - Q_0 p(Q_0)}{P(\overline{Q}) - P(Q_0)} = \frac{(Q \cdot p(Q))'}{p(Q)}\bigg|_{Q=Q^{***}} = \frac{p(Q^{***}) + Q^{***} \cdot p'(Q^{***})}{p(Q^{***})} = \frac{Vm(Q^{***})}{p(Q^{***})}$$

Finally:

$$\Delta S_d = \left(P(\overline{Q}) - P(Q_0) \right)\left(\frac{Vm(Q^{***})}{p(Q^{***})} - 1 \right) = \frac{\left(P(\overline{Q}) - P(Q_0) \right)\left(Vm(Q^{***}) - p(Q^{***}) \right)}{p(Q^{***})} \leq 0$$

because the demand function being convex (*for normal goods*) it follows P'=p''≥0 therefore $P(\overline{Q}) \geq P(Q_0)$ and $p(Q^{***}) \geq Vm(Q^{***})$.

Therefore, the shift to a monopoly will reduce consumer surplus.

3. Price Discriminations

In the monopoly situation, we saw that, unlike in the case of perfect competition, the monopoly does not produce at full capacity (marginal cost equal to the inverse function of the demand) phenomenon that leads to inefficiency allowance.

What happens when the sale takes place at different prices to different quantities? We call such a situation by price discrimination.

3.1. Discrimination of first order

In this case (also called perfect discrimination), the monopolist sells each buyer at the maximum price that he can bear it. Production will rise so that the marginal cost is equal to the opposite level of the demand.

If the sale price would be strictly higher than marginal cost, then (as it is increasing) the monopolist will produce until additional amount will satisfy the above condition. Following these findings, the monopolist will sell the last unit produced (those corresponding to the maximum marginal cost) to the buyer which offers the highest price, the penultimate to the second (in decreasing order of price offered) and so further.

3.2. Discrimination of second order

In this type of discrimination, the monopolist practice different prices depending on the amount requested. In this case, the price equals the marginal cost of the last units purchased (which has the highest marginal cost), on the grounds that if the next unit of product would be priced lower than the previous one, then the buyer will prefer to buy the additional unit increasing the surplus.

3.3. Discrimination of third order

In this type of discrimination, the monopolist use distinct prices for different groups of consumers.

Let consider the situation where a monopolist operate on a number of "n" consumer groups, selling the quantities $Q_1,...,Q_n$ at prices $p_1(Q_1),...,p_n(Q_n)$ where $Q_1+...+Q_n=Q$ is the total production achieved.

In this case, the monopolist profit is:

$$\Pi(Q_1,...,Q_n) = \sum_{i=1}^{n} p_i(Q_i) \cdot Q_i - CT(Q_1 + ... + Q_n)$$

The extreme condition requires like necessary the cancellation of first order partial derivatives: $\dfrac{\partial \Pi}{\partial Q_i} = 0 \ \forall i = \overline{1,n}$ therefore:

$$p_i^{'}(Q_i) \cdot Q_i + p_i(Q_i) - Cm(Q) = 0 \ \forall i = \overline{1,n}$$

Considering now the coefficient of elasticity of demand for the group "i" in relation to the price p_i: $\varepsilon_{Q_i,p_i} = \dfrac{dQ_i}{dp_i} \cdot \dfrac{p_i}{Q_i} = \dfrac{p_i(Q_i)}{p_i^{'}(Q_i)Q_i}$ we get:

$$Cm(Q) = p_i(Q_i)\left(1 + \frac{1}{\varepsilon_{Q_i,p_i}}\right) \quad \forall i = \overline{1,n}$$

Therefore, the necessary condition to maximize profit will be reduced to the condition of marginal revenue equal marginal cost for each group of the entire production. Also, from the above relationship, it provided compatibility groups namely:

$$p_1(Q_1)\left(1 + \frac{1}{\varepsilon_{Q_1,p_1}}\right) = \ldots = p_n(Q_n)\left(1 + \frac{1}{\varepsilon_{Q_n,p_n}}\right)$$

Considering two arbitrary groups "i" and "j" we have first:

$$\frac{p_i(Q_i)}{p_j(Q_j)} = \frac{1 + \dfrac{1}{\varepsilon_{Q_j,p_j}}}{1 + \dfrac{1}{\varepsilon_{Q_i,p_i}}}$$

and after:

$$\frac{p_i(Q_i) - p_j(Q_j)}{p_j(Q_j)} = \frac{\varepsilon_{Q_i,p_i} - \varepsilon_{Q_j,p_j}}{\varepsilon_{Q_i,p_i}\varepsilon_{Q_j,p_j}\left(1 + \dfrac{1}{\varepsilon_{Q_i,p_i}}\right)}$$

Because the monopolist acts only in the zone of elasticity of demand in relation to price, we have $1 + \dfrac{1}{\varepsilon_{Q_i,p_i}}$ and $\varepsilon_{Q_i,p_i}, \varepsilon_{Q_j,p_j} < 0$.

We have therefore: $\left(p_i(Q_i) - p_j(Q_j)\right)\left(\varepsilon_{Q_i,p_i} - \varepsilon_{Q_j,p_j}\right) > 0$. If (*taking into account the fact that elasticities are negative*) $\varepsilon_{Q_i,p_i} > \varepsilon_{Q_j,p_j}$ then $p_i(Q_i) > p_j(Q_j)$ so the monopolist must sell at a higher price to the group "i". Conversely, if $\varepsilon_{Q_i,p_i} < \varepsilon_{Q_j,p_j}$ then $p_i(Q_i) < p_j(Q_j)$ so the monopolist must sell at a lower price to the group "i". It is obvious that at equal elasticities will correspond to equal prices.

Following these considerations, it follows that if (*after a possible renumbering*) $\varepsilon_{Q_1,p_1} \geq \varepsilon_{Q_2,p_2} \geq \ldots \geq \varepsilon_{Q_n,p_n}$ then: $p_1(Q_1) \geq p_2(Q_2) \geq \ldots \geq p_n(Q_n)$.

We intend now to study the decision of the monopolist to sell at the same price to the "n" groups compared with the application of differentiated pricing.

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We have seen that: $Cm(Q) = p(Q)\left(1 + \dfrac{1}{\varepsilon_{Q,p}}\right)$ where $Q = Q_1 + ... + Q_n$ and for

differentiated prices: $Cm(Q) = p_i(Q_i)\left(1 + \dfrac{1}{\varepsilon_{Q_i,p_i}}\right)$ $\forall i = \overline{1,n}$.

From above, we get:

$$p_i(Q_i)\left(1 + \frac{1}{\varepsilon_{Q_i,p_i}}\right) = p(Q)\left(1 + \frac{1}{\varepsilon_{Q,p}}\right)$$

from where:

$$p_i(Q_i) = p(Q)\frac{1 + \dfrac{1}{\varepsilon_{Q,p}}}{1 + \dfrac{1}{\varepsilon_{Q_i,p_i}}} \quad \forall i = \overline{1,n}$$

The monopolist profit is therefore:

$$\Pi_n = \Pi(Q_1,...,Q_n) = \sum_{i=1}^{n} p_i(Q_i) \cdot Q_i - CT(Q) = \sum_{i=1}^{n} p(Q)\frac{1 + \dfrac{1}{\varepsilon_{Q,p}}}{1 + \dfrac{1}{\varepsilon_{Q_i,p_i}}} \cdot Q_i - CT(Q)$$

For a single price, we have:

$$\Pi = \Pi(Q) = p(Q) \cdot Q - CT(Q)$$

Calculating the difference between the two profits, results:

$$\Pi_n - \Pi = \sum_{i=1}^{n} p(Q)\frac{1 + \dfrac{1}{\varepsilon_{Q,p}}}{1 + \dfrac{1}{\varepsilon_{Q_i,p_i}}} \cdot Q_i - CT(Q) \ -(p(Q) \cdot Q - CT(Q)) =$$

$$\sum_{i=1}^{n}\left(p(Q)\frac{1 + \dfrac{1}{\varepsilon_{Q,p}}}{1 + \dfrac{1}{\varepsilon_{Q_i,p_i}}} \cdot Q_i - p(Q) \cdot Q_i \right) = p(Q)\sum_{i=1}^{n} Q_i \frac{\varepsilon_{Q_i,p_i} - \varepsilon_{Q,p}}{\varepsilon_{Q,p}\left(\varepsilon_{Q_i,p_i} + 1\right)} .$$

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Let $f(x) = \dfrac{x - \varepsilon_{Q,p}}{\varepsilon_{Q,p}(x+1)}$. We have $f'(x) = \dfrac{\varepsilon_{Q,p} + 1}{\varepsilon_{Q,p}(x+1)^2} > 0$ so f is strictly increasing. We

have $\lim\limits_{x \to -\infty} f(x) = \dfrac{1}{\varepsilon_{Q,p}}$, $\lim\limits_{\substack{x \to -1 \\ x < -1}} f(x) = \infty$, $f(x) = 0 \Rightarrow x = \varepsilon_{Q,p}$, $\lim\limits_{\substack{x \to -1 \\ x > -1}} f(x) = -\infty$, $f(0) = -1$.

For $x = \varepsilon_{Q_i,p_i} < -1$, it follows: $f(\varepsilon_{Q_i,p_i}) < 0$ if $\varepsilon_{Q_i,p_i} < \varepsilon_{Q,p}$ and $f(\varepsilon_{Q_i,p_i}) > 0$ if $\varepsilon_{Q_i,p_i} > \varepsilon_{Q,p}$. If $\varepsilon_{Q_i,p_i} = \varepsilon_{Q,p}$ then $f(\varepsilon_{Q_i,p_i}) = 0$.

Let $I = \left\{ i = \overline{1,n} \, \middle| \, \varepsilon_{Q_i,p_i} < \varepsilon_{Q,p} \right\}$, $J = \left\{ j = \overline{1,n} \, \middle| \, \varepsilon_{Q_j,p_j} > \varepsilon_{Q,p} \right\}$. With these notations, we have:

$$\Pi_n - \Pi = p(Q) \sum_{i \in I} Q_i \frac{\varepsilon_{Q_i,p_i} - \varepsilon_{Q,p}}{\varepsilon_{Q,p}\left(\varepsilon_{Q_i,p_i} + 1\right)} + p(Q) \sum_{j \in J} Q_j \frac{\varepsilon_{Q_j,p_j} - \varepsilon_{Q,p}}{\varepsilon_{Q,p}\left(\varepsilon_{Q_j,p_j} + 1\right)}$$

From the above, it follows that the first sum is strictly negative and the second strictly positive.

We summarize those obtained as follows: if the loss of profit on groups where the elasticity is less than the overall is less than plus achieved by the groups where the elasticity is greater than the global then the monopolist will agree separate selling prices. Similarly, if the loss of profit on groups where the elasticity is less than the overall is greater than the plus achieved by the groups where the elasticity is greater than the overall, then the monopolist would prefer selling its product at a single price.

5. Conclusion

The above analysis allowed the determination in general of the consumer's surplus or of the manufacturer's surplus in the case of monopoly and the determination of the allocative inefficiency in relation to the situation of perfect competition.

In the second part, we broached the price discrimination of third order, analyzing, in terms of goods elasticities, the opportunity to separate prices in the conditions of differences existing between groups of firms.

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General Considerations on the Oligopoly

Catalin Angelo Ioan[1], Gina Ioan[2]

Abstract: In this paper we analyzed the main aspects of oligopoly, in the case of n firms. The analysis has made, as a rule, for arbitrary marginal costs, each time, however, by considering these costs constant recovering well known results of the models presented: the Stackelberg model, the case of more production leaders, the price leader, the Cournot equilibrium for duopoly, the Cournot equilibrium for oligopoly or in the case of perfect competition and cartels. We also treat the problems above for the general case of cost function, again customizing the overall results for linear functions and obtaining the corresponding classical relations.

1. Introduction

The oligopoly is a market situation where there is a small number of suppliers (at least two) of a good unsubstituted and a sufficient number of consumers. The oligopoly composed of two producers called duopoly.

Considering below, two competitors A and B which produce the same normal good, we propose analyzing their activity in response to the work of each other company.

Each of them when it set the production level and the selling price will cover the production and price of other companies. If one of the two firms will set price or quantity produced first, the other adjusting for it, it will be called price leader or leader of production respectively, the second company called the satellite price, or satellite production respectively.

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2. The Production Leader (The Stackelberg Model)

Consider that the company is a leader of production. If it will produce Q_A units of a good, then the company B will adjust production after A, producing $Q_B = f(Q_A)$ units of good (f being called the reaction function). The selling price depends on the total quantity of products reached the market. Be so: $p = p(Q_A + Q_B)$ – the price per unit of good.

The company A must establish a level of production depending on the reaction of firm B, because it will determine through the production realized the selling price of the product. Similarly, the company B will adjust its production levels according to A, because at a higher or lower level, the price will change and therefore profit of the company.

Let therefore, the profit of the production leader:

$$\Pi_A(Q_A) = p(Q_A + Q_B)Q_A - CT_A(Q_A)$$

Since $Q_B = f(Q_A)$ we have:

$$\Pi_A(Q_A) = p(Q_A + f(Q_A))Q_A - CT_A(Q_A)$$

Consider also the profit of the satellite:

$$\Pi_B(Q_B) = p(Q_A + Q_B)Q_B - CT_B(Q_B)$$

The extreme condition for the profit of A is:

$$\frac{\partial \Pi_A(Q_A)}{\partial Q_A} = p'(Q_A + f(Q_A))(1 + f'(Q_A))Q_A + p(Q_A + f(Q_A)) - Cm_A(Q_A) = 0$$

and one for satellite B:

$$\frac{\partial \Pi_B(Q_B)}{\partial Q_B} = p'(Q_A + Q_B)Q_B + p(Q_A + Q_B) - Cm_B(Q_B) = 0$$

Considering the leader production Q_A as given, it follows that the satellite meets the condition:

$$p'(Q_A + Q_B)Q_B + p(Q_A + Q_B) - Cm_B(Q_B) = 0$$

Ranging the production Q_A we have: $Q_B = f(Q_A)$ therefore the problem of leader profit's maximizing becomes:

$$p'(Q_A + f(Q_A))(1 + f'(Q_A))Q_A + p(Q_A + f(Q_A)) - Cm_A(Q_A) = 0$$

with f determined above.

In particular, for a function of price (*the inverse function of the demand*) of the form: p(Q)=a-bQ, a,b>0 we obtain for the satellite company B:

$$-bQ_B + a - b(Q_A + Q_B) - Cm_B(Q_B) = 0$$

from where:

$$Q_B = \frac{a - bQ_A - Cm_B(Q_B)}{2b}$$

Let note that in this relationship, is purely formal Q_B's determination, requiring the knowledge of B's total cost and thus, implicitly, its marginal cost. Substituting the above expression of Q_B in the profit maximization condition of leader A, results for $f(Q_A) = \dfrac{a - bQ_A - Cm_B(Q_B)}{2b}$:

$$-b\left(1 + \frac{-b - \dfrac{\partial Cm_B(Q_B)}{\partial Q_A}}{2b}\right)Q_A + a - b\left(Q_A + \frac{a - bQ_A - Cm_B(Q_B)}{2b}\right) - Cm_A(Q_A) = 0$$

from where:

$$\left(\frac{1}{2}\frac{\partial Cm_B(Q_B)}{\partial Q_A} - b\right)Q_A = -\frac{a}{2} + Cm_A(Q_A) - \frac{Cm_B(Q_B)}{2}$$

or otherwise:

$$Q_A = \frac{a - 2Cm_A(Q_A) + Cm_B(Q_B)}{2b - \dfrac{\partial Cm_B(Q_B)}{\partial Q_A}}$$

Noting with Q_A^* - the solution of the above equation, we get:

$$Q_B^* = \frac{a - bQ_A^* - Cm_B(Q_B^*)}{2b} =$$

$$\frac{ab - a\dfrac{\partial Cm_B(Q_B)}{\partial Q_A} + 2bCm_A(Q_A^*) - 3bCm_B(Q_B^*) + \dfrac{\partial Cm_B(Q_B)}{\partial Q_A}Cm_B(Q_B^*)}{2b\left(2b - \dfrac{\partial Cm_B(Q_B)}{\partial Q_A}\right)}$$

where all partial derivatives are calculated in Q_A^* and Q_B^*.

The condition that the leader has a higher production than the satellite is: $Q_A^* > Q_B^*$ which is equivalent to:

$$\frac{ab + a\dfrac{\partial Cm_B(Q_B)}{\partial Q_A} - 6bCm_A(Q_A^*) + 5bCm_B(Q_B^*) - \dfrac{\partial Cm_B(Q_B)}{\partial Q_A}Cm_B(Q_B^*)}{2b\left(2b - \dfrac{\partial Cm_B(Q_B)}{\partial Q_A}\right)} > 0$$

With the additional assumption that the two marginal costs of A and B are constant (*on short term, marginal cost variations being very small, the assumption is not absurd*), we obtain for $Cm_A=\alpha$ and $Cm_B=\beta$:

$$Q_A^* = \frac{a - 2\alpha + \beta}{2b}, \ Q_B^* = \frac{a + 2\alpha - 3\beta}{4b}, \ Q_A^* - Q_B^* = \frac{a - 6\alpha + 5\beta}{4b}$$

If $a > 6\alpha - 5\beta$, it follows that the leader will have an output greater than that of the satellite. From the fact that $Cm_A=\alpha$ and $Cm_B=\beta$, results after a simple integration:

$$CT_A(Q)=\alpha Q+\gamma, \ CT_B(Q)=\beta Q+\delta, \ \alpha,\beta,\gamma,\delta \geq 0$$

Returning to the profits of both firms A and B we have:

$$\Pi_A(Q_A) = p(Q_A + Q_B)Q_A - CT_A(Q_A) = aQ_A - b(Q_A + Q_B)Q_A - \alpha Q_A - \gamma =$$

$$-bQ_A^2 - (bQ_B - a + \alpha)Q_A - \gamma$$

respectively:

$$\Pi_B(Q_B) = p(Q_A + Q_B)Q_B - CT_B(Q_B) = aQ_B - b(Q_A + Q_B)Q_B - \beta Q_B - \delta =$$

$$-bQ_B^2 - (bQ_A - a + \beta)Q_B - \delta.$$

Considering $\Pi_A(Q_A)=\pi_1=$constant, respectively $\Pi_B(Q_B)=\pi_2=$constant, we obtain the two isoprofit curves in the system axis Q_A-Q-Q_B:

$$-bQ_A^2 - (bQ_B - a + \alpha)Q_A - \gamma = \pi_A - \text{for A}$$

$$-bQ_B^2 - (bQ_A - a + \beta)Q_B - \delta = \pi_B - \text{for B}$$

For a graphical representation of the isoprofit curve of A, from the equation it follows:

$$Q_B = \frac{-bQ_A^2 + (a - \alpha)Q_A - \pi_A - \gamma}{bQ_A}$$

Let $g(x) = \dfrac{-bx^2 + (a-\alpha)x - \pi_A - \gamma}{bx}$. We have:

$$g'(x) = \frac{-bx^2 + \pi_A + \gamma}{bx^2} = 0$$

hence, the stationary point of the function g is $x_d = \sqrt{\dfrac{\pi_A + \gamma}{b}}$. Therefore, $g'(x) > 0$ $\forall x \in (0, x_d)$ and $g'(x) < 0$ $\forall x \in (x_d, \infty)$. Also:

$$g(x_d) = \frac{(a-\alpha) - 2\sqrt{b(\pi_A + \gamma)}}{b}$$

As $g(x) = 0$ implies: $-bx^2 + (a-\alpha)x - \pi_A - \gamma = 0$ we get the two real roots:

$$x_{\text{rad 1,rad 2}} = \frac{(a-\alpha) \pm \sqrt{(a-\alpha)^2 - 4b(\pi_A + \gamma)}}{2b}$$

for π_A small enough so that: $(a-\alpha)^2 - 4b(\pi_A + \gamma) > 0$.

With the observation that $\lim_{\substack{x \to 0 \\ x > 0}} g(x) = -\infty$, $\lim_{x \to \infty} g(x) = -\infty$, we obtain that the isoprofit curve will be assessed on the range:

$$D = \left[\frac{(a-\alpha) - \sqrt{(a-\alpha)^2 - 4b(\pi_A + \gamma)}}{2b}, \frac{(a-\alpha) + \sqrt{(a-\alpha)^2 - 4b(\pi_A + \gamma)}}{2b} \right]$$

Considering now the reaction function of B to A: $Q_B = \dfrac{a - \beta - bQ_A}{2b}$, let the difference between this and the corresponding point of the isoprofit curve. We therefore:

$$h(Q_A, \pi_1) = \frac{bQ_A^2 + (-a - \beta + 2\alpha)Q_A + 2(\pi_A + \gamma)}{2bQ_A}$$

The minimum difference will be obtain by canceling the first order partial derivative: $\dfrac{\partial h}{\partial Q_A} = \dfrac{bQ_A^2 - 2(\pi_A + \gamma)}{2bQ_A^2} = 0$, from where:

$$\overline{Q}_A = \sqrt{\frac{2(\pi_A + \gamma)}{b}}$$

The minimum distance between the two curves is obtained for:

$$0 = h(\overline{Q}_A, \pi_A) = \frac{(-a - \beta + 2\alpha) + 2\sqrt{b}\sqrt{2(\pi_A + \gamma)}}{2b}$$

from where:

$$\sqrt{2(\pi_A + \gamma)} = \frac{a + \beta - 2\alpha}{2\sqrt{b}}$$

Substituting in the expression of $\overline{Q}_A$, we get:

$$\overline{Q}_A = \frac{a + \beta - 2\alpha}{2b} = Q_A^*$$

Therefore, the steady production of the leader is the point of tangency of the reaction function of B relative to A at the family of isoprofit curves of A.

For the satellite company B will done analogously.

The general situation in which marginal costs are not constant, involves a series of additional assumptions. Thus, from the relation $Q_B = \dfrac{a - bQ_A - Cm_B(Q_B)}{2b}$ follows: $\left(Cm_B + 2b \cdot 1_B\right)Q_B = a - bQ_A$ where 1_B is the identical function. If the function $Cm_B + 2b \cdot 1_B$ is invertible, then:

$$Q_B = f(Q_A) = \left(Cm_B + 2b \cdot 1_B\right)^{-1}\left(a - bQ_A\right)$$

With the expression of f thus obtained, from the equation:

$$-b\left(1 + f'(Q_A)\right)Q_A + a - b\left(Q_A + f(Q_A)\right) - Cm_A(Q_A) = 0$$

will be determine Q_A^* and after $Q_B^* = f(Q_A^*)$.

3. The Case of more Production Leaders

Let consider that companies $A_1, ..., A_n$ leaders of production. If they produce $Q_{A_1}, ..., Q_{A_n}$ units of good, then the company B will adjust its production as they, producing $Q_B = f\left(Q_{A_1}, ..., Q_{A_n}\right)$ (*f being called the reaction function*). The selling price depends on the total quantity of products reached the market. Be so:

$$p = p\left(\sum_{k=1}^{n} Q_{A_k} + Q_B\right)$$

the price per unit of product. The firms $A_1,...,A_n$ must establish a level of production depending on the reaction of the firm B, because it will determine through the production realized, the selling price of the product. Similarly, the company B will adjust its production level, according to $A_1,...,A_n$, because at a higher or lower level, the price will change and therefore the profit of the company.

Let therefore the profit of the leader "i":

$$\Pi_{A_i}(Q_{A_i}) = p\left(\sum_{k=1}^{n} Q_{A_k} + Q_B\right)Q_{A_i} - CT_{A_i}(Q_{A_i})$$

Because $Q_B = f\left(Q_{A_1},...,Q_{A_n}\right)$ we have:

$$\Pi_{A_i}(Q_{A_i}) = p\left(\sum_{k=1}^{n} Q_{A_k} + f\left(Q_{A_1},...,Q_{A_n}\right)\right)Q_{A_i} - CT_{A_i}(Q_{A_i})$$

Consider also the profit of the satellite:

$$\Pi_B(Q_B) = p\left(\sum_{k=1}^{n} Q_{A_k} + Q_B\right)Q_B - CT_B(Q_B)$$

The extreme condition for the profit of A_i is:

$$\frac{\partial \Pi_{A_i}(Q_{A_i})}{\partial Q_{A_i}} = p'\left(\sum_{k=1}^{n} Q_{A_k} + f\left(Q_{A_1},...,Q_{A_n}\right)\right)\left(1 + \frac{\partial f}{\partial Q_{A_i}}\right)Q_{A_i} +$$

$$p\left(\sum_{k=1}^{n} Q_{A_k} + f\left(Q_{A_1},...,Q_{A_n}\right)\right) - Cm_{A_i}(Q_{A_i}) = 0$$

and the one for satellite B:

$$\frac{\partial \Pi_B(Q_B)}{\partial Q_B} = p'\left(\sum_{k=1}^{n} Q_{A_k} + Q_B\right)Q_B + p\left(\sum_{k=1}^{n} Q_{A_k} + Q_B\right) - Cm_B(Q_B) = 0$$

Considering the productions of the leaders $Q_{A_1},...,Q_{A_n}$ as given, it follows that the satellite will satisfy the condition:

$$p'\left(\sum_{k=1}^{n} Q_{A_k} + Q_B\right)Q_B + p\left(\sum_{k=1}^{n} Q_{A_k} + Q_B\right) - Cm_B(Q_B) = 0$$

Varying now the production Q_A we will have that $Q_B = f\left(Q_{A_1},...,Q_{A_n}\right)$ from where, the problem of maximizing the leader's profit becoming:

$$p'\left(\sum_{k=1}^{n}Q_{A_k}+f\left(Q_{A_1},...,Q_{A_n}\right)\right)\left(1+\frac{\partial f}{\partial Q_{A_i}}\right)Q_{A_i}+p\left(\sum_{k=1}^{n}Q_{A_k}+f\left(Q_{A_1},...,Q_{A_n}\right)\right)-Cm_{A_i}(Q_{A_i})=0$$

with f determined above.

In particular, for a function of price (*the inverse function of the demand*) of the form: p(Q)=a-bQ, a,b>0, we obtain for the satellite company B:

$$-bQ_B+a-b\left(\sum_{k=1}^{n}Q_{A_k}+Q_B\right)-Cm_B(Q_B)=0$$

from where:

$$Q_B=\frac{a-b\sum_{k=1}^{n}Q_{A_k}-Cm_B(Q_B)}{2b}$$

Let note that, in this relationship, the determination of Q_B is purely formal, because it requires the knowledge of B's total cost and thus, implicitly, its marginal cost.

Substituting the above expression of Q_B in the condition of maximizing the leader's

A profit, results for $f\left(Q_{A_1},...,Q_{A_n}\right)=\dfrac{a-b\sum_{k=1}^{n}Q_{A_k}-Cm_B(Q_B)}{2b}$:

$$-b\left(1+\frac{-b-\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_i}}}{2b}\right)Q_{A_i}+a-b\left(\sum_{k=1}^{n}Q_{A_k}+\frac{a-b\sum_{k=1}^{n}Q_{A_k}-Cm_B(Q_B)}{2b}\right)-Cm_{A_i}(Q_{A_i})=0$$

from where:

$$\left(\frac{-b+\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_i}}}{2}\right)Q_{A_i}-Cm_{A_i}(Q_{A_i})=\frac{-a+b\sum_{k=1}^{n}Q_{A_k}-Cm_B(Q_B)}{2}$$

Because the right side does not depend on the amount of i explicit, it follows the condition of compatibility $\forall i,j=\overline{1,n}$:

$$\left(\frac{-b + \dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_i}}}{2} \right) Q_{A_i} - Cm_{A_i}(Q_{A_i}) = \left(\frac{-b + \dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_j}}}{2} \right) Q_{A_j} - Cm_{A_j}(Q_{A_j})$$

Returning, we get:

$$\left(\frac{1}{2} \frac{\partial Cm_B(Q_B)}{\partial Q_{A_i}} - b \right) Q_{A_i} - \frac{b}{2} \sum_{\substack{k=1 \\ k \neq i}}^{n} Q_{A_k} = Cm_{A_i}(Q_{A_i}) - \frac{a}{2} - \frac{Cm_B(Q_B)}{2}$$

In a matrix form, the system writes:

$$\begin{pmatrix} \frac{1}{2} \frac{\partial Cm_B(Q_B)}{\partial Q_{A_1}} - b & -\frac{b}{2} & \dots & -\frac{b}{2} \\ -\frac{b}{2} & \frac{1}{2} \frac{\partial Cm_B(Q_B)}{\partial Q_{A_2}} - b & \dots & -\frac{b}{2} \\ \dots & \dots & \dots & \dots \\ -\frac{b}{2} & -\frac{b}{2} & \dots & \frac{1}{2} \frac{\partial Cm_B(Q_B)}{\partial Q_{A_n}} - b \end{pmatrix} \begin{pmatrix} Q_{A_1} \\ Q_{A_2} \\ \dots \\ Q_{A_n} \end{pmatrix} = \begin{pmatrix} Cm_{A_1}(Q_{A_1}) - \frac{a}{2} - \frac{Cm_B(Q_B)}{2} \\ Cm_{A_2}(Q_{A_2}) - \frac{a}{2} - \frac{Cm_B(Q_B)}{2} \\ \dots \\ Cm_{A_n}(Q_{A_n}) - \frac{a}{2} - \frac{Cm_B(Q_B)}{2} \end{pmatrix}$$

Let $M_2 = \begin{pmatrix} \frac{1}{2} \frac{\partial Cm_B(Q_B)}{\partial Q_{A_1}} - b & -\frac{b}{2} & \dots & -\frac{b}{2} \\ -\frac{b}{2} & \frac{1}{2} \frac{\partial Cm_B(Q_B)}{\partial Q_{A_2}} - b & \dots & -\frac{b}{2} \\ \dots & \dots & \dots & \dots \\ -\frac{b}{2} & -\frac{b}{2} & \dots & \frac{1}{2} \frac{\partial Cm_B(Q_B)}{\partial Q_{A_n}} - b \end{pmatrix}$.

Now consider a matrix $M_1 = (a_{ij})$ and $M_2 = (b_{ij})$ where $b_{ij} = a_{ij} + \delta$. We have:

$$\det M_2 = \det M_1 + \delta \sum_{i,j=1}^{n} \Gamma_{ij}$$

where Γ_{ij} is the algebraic complement of a_{ij} in M_1. In this case, considering the matrix:

$$M_1 = \begin{pmatrix} \dfrac{1}{2}\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_1}} - \dfrac{b}{2} & 0 & ... & 0 \\ 0 & \dfrac{1}{2}\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_2}} - \dfrac{b}{2} & ... & 0 \\ ... & ... & ... & \dfrac{1}{2}\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_n}} - \dfrac{b}{2} \\ 0 & 0 & ... & \dfrac{1}{2}\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_n}} - \dfrac{b}{2} \end{pmatrix}$$

and $\delta = -\dfrac{b}{2}$ in the above relation, we get:

$$\det M_2 = \prod_{k=1}^{n}\left(\dfrac{1}{2}\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_k}} - \dfrac{b}{2}\right) - \dfrac{b}{2}\sum_{i=1}^{n}\prod_{\substack{k=1 \\ k\neq i}}^{n}\left(\dfrac{1}{2}\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_k}} - \dfrac{b}{2}\right) =$$

$$\prod_{k=1}^{n}\left(\dfrac{1}{2}\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_k}} - \dfrac{b}{2}\right) - \dfrac{b}{2}\sum_{i=1}^{n}\dfrac{\prod_{k=1}^{n}\left(\dfrac{1}{2}\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_k}} - \dfrac{b}{2}\right)}{\dfrac{1}{2}\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_i}} - \dfrac{b}{2}} =$$

$$\left(1 - \dfrac{b}{2}\sum_{i=1}^{n}\dfrac{1}{\dfrac{1}{2}\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_i}} - \dfrac{b}{2}}\right)\prod_{k=1}^{n}\left(\dfrac{1}{2}\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_k}} - \dfrac{b}{2}\right).$$

Also, for the matrix (*corresponding to column i*):

$$M_{4,i} = \begin{pmatrix} \dfrac{1}{2}\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_1}} - b & -\dfrac{b}{2} & ... & Cm_{A_1}(Q_{A_1}) - \dfrac{a}{2} - \dfrac{Cm_B(Q_B)}{2} & ... & -\dfrac{b}{2} \\ -\dfrac{b}{2} & \dfrac{1}{2}\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_2}} - b & ... & Cm_{A_2}(Q_{A_2}) - \dfrac{a}{2} - \dfrac{Cm_B(Q_B)}{2} & ... & -\dfrac{b}{2} \\ ... & ... & ... & ... & ... & ... \\ -\dfrac{b}{2} & -\dfrac{b}{2} & ... & Cm_{A_n}(Q_{A_n}) - \dfrac{a}{2} - \dfrac{Cm_B(Q_B)}{2} & ... & \dfrac{1}{2}\dfrac{\partial Cm_B(Q_B)}{\partial Q_{A_n}} - b \end{pmatrix}$$

considering:

$$M_{3,i} = \begin{pmatrix} \frac{1}{2}\frac{\partial Cm_B(Q_B)}{\partial Q_{A_1}} - \frac{b}{2} & 0 & ... & Cm_{A_1}(Q_{A_1}) - \frac{Cm_B(Q_B)}{2} + \frac{b-a}{2} & ... & 0 \\ 0 & \frac{1}{2}\frac{\partial Cm_B(Q_B)}{\partial Q_{A_2}} - \frac{b}{2} & ... & Cm_{A_2}(Q_{A_2}) - \frac{Cm_B(Q_B)}{2} + \frac{b-a}{2} & ... & 0 \\ ... & ... & ... & & ... & \\ 0 & 0 & ... & Cm_{A_n}(Q_{A_n}) - \frac{Cm_B(Q_B)}{2} + \frac{b-a}{2} & ... & \frac{1}{2}\frac{\partial Cm_B(Q_B)}{\partial Q_{A_n}} - \frac{b}{2} \end{pmatrix}$$

we obtain:

$$\det M_{3,i} = \left(Cm_{A_i}(Q_{A_i}) - \frac{Cm_B(Q_B)}{2} + \frac{b-a}{2} \right) \prod_{\substack{k=1 \\ k \neq i}}^{n} \left(\frac{1}{2}\frac{\partial Cm_B(Q_B)}{\partial Q_{A_k}} - \frac{b}{2} \right).$$

We have therefore:

$$\det M_{4,i} = \det M_{3,i} -$$

$$\frac{b}{2}\sum_{\substack{p=1 \\ p \neq i}}^{n} \left(Cm_{A_i}(Q_{A_i}) - \frac{Cm_B(Q_B)}{2} + \frac{b-a}{2} \right) \prod_{\substack{k=1 \\ k \neq i,p}}^{n} \left(\frac{1}{2}\frac{\partial Cm_B(Q_B)}{\partial Q_{A_k}} - \frac{b}{2} \right) -$$

$$\frac{b}{2}\prod_{\substack{k=1 \\ k \neq i}}^{n} \left(\frac{1}{2}\frac{\partial Cm_B(Q_B)}{\partial Q_{A_k}} - \frac{b}{2} \right) =$$

$$\left(Cm_{A_i}(Q_{A_i}) - \frac{Cm_B(Q_B)}{2} + \frac{b-a}{2} \right) \prod_{\substack{k=1 \\ k \neq i}}^{n} \left(\frac{1}{2}\frac{\partial Cm_B(Q_B)}{\partial Q_{A_k}} - \frac{b}{2} \right) -$$

$$\frac{b}{2}\sum_{\substack{p=1 \\ p \neq i}}^{n} \left(Cm_{A_i}(Q_{A_i}) - \frac{Cm_B(Q_B)}{2} + \frac{b-a}{2} \right) \prod_{\substack{k=1 \\ k \neq i,p}}^{n} \left(\frac{1}{2}\frac{\partial Cm_B(Q_B)}{\partial Q_{A_k}} - \frac{b}{2} \right) -$$

$$\frac{b}{2}\prod_{\substack{k=1 \\ k \neq i}}^{n} \left(\frac{1}{2}\frac{\partial Cm_B(Q_B)}{\partial Q_{A_k}} - \frac{b}{2} \right)$$

Finally:

$$Q_{A_i}^* = \frac{\det M_{4,i}}{\det M_2}, \, i = \overline{1,n}$$

Suppose now that all the marginal costs of A_i, $i = \overline{1,n}$, and B respectively, are constant (*on short term, the marginal cost variations are very small, the assumption being not absurd*). If therefore $Cm_{A_i} = \alpha_i$ and $Cm_B = \beta$ we obtain:

$$\det M_2 = \left(1 - \frac{b}{2}\sum_{i=1}^{n}\frac{1}{-\frac{b}{2}}\right)\prod_{k=1}^{n}\left(-\frac{b}{2}\right) = (-1)^n\frac{(n+1)b^n}{2^n} \; ;$$

$$\det M_{4,i} = \left(\alpha_i - \frac{\beta}{2} + \frac{b-a}{2}\right)\prod_{\substack{k=1\\k\neq i}}^{n}\left(-\frac{b}{2}\right) - \frac{b}{2}\sum_{\substack{p=1\\p\neq i}}^{n}\left(\alpha_i - \frac{\beta}{2} + \frac{b-a}{2}\right)\prod_{\substack{k=1\\k\neq i,p}}^{n}\left(-\frac{b}{2}\right) -$$

$$\frac{b}{2}\prod_{\substack{k=1\\k\neq i}}^{n}\left(-\frac{b}{2}\right) = (-1)^{n-1}\frac{b^{n-1}}{2^{n-1}}\left(n\alpha_i - \frac{n\beta}{2} - \frac{na}{2} + \frac{(n-1)b}{2}\right)$$

from where:

$$Q_{A_i}^* = \frac{\left(na + n\beta - 2n\alpha_i - (n-1)b\right)}{(n+1)b} \; ;$$

$$Q_B^* = \frac{a - b\sum_{k=1}^{n}Q_{A_k}^* - \beta}{2b} = -\frac{(n^2-n-1)a}{2(n+1)b} - \frac{(n^2+n+1)\beta}{2(n+1)b} + \frac{n(n-1)}{2(n+1)} + \frac{n}{(n+1)b}\sum_{k=1}^{n}\alpha_k$$

On the other hand, the compatibility condition leads to:

$$\alpha_j - \alpha_i = \frac{b}{2}\left(Q_{A_i}^* - Q_{A_j}^*\right) \; \forall i,j = \overline{1,n}$$

therefore:

$$\alpha_j = \alpha_i \; \; \forall i,j = \overline{1,n}$$

Following these considerations, it follows that the problem has solution only if marginal costs are equal to leader firms. As a first conclusion, that detach, the n firms behave as leaders such as one that produces a common marginal cost.

Thus we obtain for $\alpha_i = \alpha$, $i = \overline{1,n}$:

$$Q_{A_i}^* = \frac{\left(na + n\beta - 2n\alpha - (n-1)b\right)}{(n+1)b} ,$$

$$Q_B^* = -\frac{(n^2-n-1)a}{2(n+1)b} - \frac{(n^2+n+1)\beta}{2(n+1)b} + \frac{n(n-1)}{2(n+1)} + \frac{n^2\alpha}{(n+1)b}$$

The B's reaction function is:

$$Q_B = f\left(Q_{A_1}, ..., Q_{A_n}\right) = \frac{a-\beta}{2b} - \frac{1}{2}\sum_{k=1}^{n}Q_{A_k}$$

so in $\mathbf{R}^n$ ($O - Q_{A_1} - ... - Q_{A_n} - Q_B$) will be the equation of a hyperplane.

From the fact that $Cm_{A_i} = \alpha$ and $Cm_B = \beta$, we obtain after integration: $CT_{A_i}(Q)$ $= \alpha Q + \gamma_i$, $i = \overline{1, n}$ and $CT_B(Q) = \beta Q + \delta$ respectively $\alpha, \beta, \gamma_i, \delta \geq 0$.

Considering now the cumulative profit of the n leader firms:

$$\Pi = \sum_{i=1}^{n}\Pi_{A_i}(Q_{A_i}) = p\left(\sum_{i=1}^{n}Q_{A_i} + Q_B\right)\sum_{i=1}^{n}Q_{A_i} - \sum_{i=1}^{n}CT_{A_i}(Q_{A_i}) = \pi = \text{constant}$$

we obtain the equation of isoprofit hypersurfaces:

$$a - b\left(\sum_{i=1}^{n}Q_{A_i} + Q_B\right)\sum_{i=1}^{n}Q_{A_i} - n\alpha - \sum_{i=1}^{n}\gamma_i = \pi$$

or otherwise:

$$Q_B = \frac{a - \pi - n\alpha - \sum_{i=1}^{n}\gamma_i}{b\sum_{i=1}^{n}Q_{A_i}} - \sum_{i=1}^{n}Q_{A_i}$$

The condition of equilibrium will be reduced therefore to the tangent hyperplane of reaction of B to the n firms at the isoprofit hypersurface of the n firms.

4. The Price Leader

Consider now that the company A is a leader of price, in the sense that it sets the selling price. It is obvious that, regardless of the satellite firm behavior, the final sale price will be the same for the two companies, otherwise the demand being moving to the company with the lowest price.

Let Q_A – the production of the leader and Q_B – the satellite production, the price being $p > 0$. We assume also the B's marginal cost as being an invertible function. The profit functions of the two companies are therefore:

$$\Pi_A(Q_A) = pQ_A - CT_A(Q_A)$$

$$\Pi_B(Q_B) = pQ_B - CT_B(Q_B)$$

The profit maximization condition of B is:

$$\frac{\partial \Pi_B}{\partial Q_B} = p - Cm_B(Q_B) = 0$$

from where: $p = Cm_B(Q_B)$. The production of B will therefore be:

$$Q_B = Cm_B^{-1}(p)$$

Meanwhile, the company leadership is aware that setting a selling price p will lead a production Q_B of the satellite firm, so in terms of a demand curve $Q = Q(p)$ its offer will be restricted to $Q_A = Q - Q_B = Q(p) - Cm_B^{-1}(p)$. Its profit function becomes:

$$\Pi_A(p) = pQ_A - CT_A(Q_A) = p\big(Q(p) - Cm_B^{-1}(p)\big) - CT_A\big(Q(p) - Cm_B^{-1}(p)\big)$$

The profit maximization condition of A is therefore:

$$\frac{\partial \Pi_A}{\partial p} = Cm_A\big(Q(p) - Cm_B^{-1}(p)\big)\big(Q'(p) - \big(Cm_B^{-1}\big)'(p)\big) = 0$$

from where:

$$Q(p) - Cm_B^{-1}(p) + p\left(Q'(p) - \frac{1}{Cm_B'(Cm_B^{-1}(p))}\right) -$$

$$Cm_A\big(Q(p) - Cm_B^{-1}(p)\big)\left(Q'(p) - \frac{1}{Cm_B'(Cm_B^{-1}(p))}\right) = 0$$

If the equation has the solution $p^* > 0$ we obtain the allocation of production:

$$Q_A^* = Q(p^*) - Cm_B^{-1}(p^*), \ Q_B^* = Cm_B^{-1}(p^*)$$

In particular, for the demand and cost functions:

$$Q(p) = a - bp, \ a,b > 0, \ CT_A(Q) = \alpha Q + \beta, \ CT_B(Q) = \gamma Q^2 + \delta Q + \varepsilon, \ \alpha,\beta,\gamma,\delta,\varepsilon > 0$$

we have: $Cm_A(Q) = \alpha$, $Cm_B = 2\gamma Q + \delta$, $Cm_B'(Cm_B^{-1}(p)) = 2\gamma$.

The above equation becomes:

$$a - bp - \frac{p - \delta}{2\gamma} + p\left(-b - \frac{1}{2\gamma}\right) - \alpha\left(-b - \frac{1}{2\gamma}\right) = 0$$

from where:

$$p^* = \frac{2\gamma(a + \alpha b) + \alpha + \delta}{2(2b\gamma + 1)}$$

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$$Q_A^* = Q(p^*) - Cm_B^{-1}(p^*) = a - bp^* - \frac{p^* - \delta}{2\gamma} = \frac{2a\gamma + \delta - 2\gamma\alpha b - \alpha}{4\gamma}$$

$$Q_B^* = Cm_B^{-1}(p^*) = \frac{p^* - \delta}{2\gamma} = \frac{2\gamma(a + \alpha b) + \alpha - \delta - 4b\delta\gamma}{4\gamma(2b\gamma + 1)}$$

5. The Cournot Equilibrium for Duopoly

The Cournot duopoly model involves a successive adjustment yields the two companies by assuming leadership at a time.

Be so, at some time $t \in \mathbf{N}$, the production of the firm A based on the previous of the firm B:

$$Q_{A,t} = f(Q_{B,t-1}) \ \forall t \geq 1$$

and the production of the company B based on the previous firm A:

$$Q_{B,t} = g(Q_{A,t-1}) \ \forall t \geq 1$$

where f and g are continuous functions. The function $Q_A = f(Q_B)$ is called the A's firm reaction curve relative to B, and $Q_B = g(Q_A)$ – the B's firm reaction curve relative to A.

If $\exists \lim_{t \to \infty} Q_{A,t} = Q_A^*$, $\lim_{t \to \infty} Q_{B,t} = Q_B^*$ then from the above relations, it follows:

$$Q_A^* = f(Q_B^*), \ Q_B^* = g(Q_A^*)$$

The pair production $\left(Q_A^*, Q_B^*\right)$ is called Cournot equilibrium and it obtains like intersection of reaction curves of the two companies.

In the following we will consider a function of price of the form:

$$p(Q) = a - BQ, \ a, b > 0 \text{ same for both companies.}$$

Suppose now that at time t, firm A has a production $Q_{A,t}$. The company B is in a position of a satellite company and at time t+1 will have a production, in order that maximize its profit:

$$Q_{B,t+1} = \frac{a - bQ_{A,t} - Cm_B(Q_{B,t})}{2b}$$

Analogously, at the same time t, the firm A considers B as a leader and adjusts its output to:

$$Q_{A,t+1} = \frac{a - bQ_{B,t} - Cm_A(Q_{A,t})}{2b}$$

Suppose now that $Cm_A = \alpha$ and $Cm_B = \beta$. We obtain the recurrence relations:

$$Q_{B,t+1} = \frac{a - \beta - bQ_{A,t}}{2b}$$

$$Q_{A,t+1} = \frac{a - \alpha - bQ_{B,t}}{2b}$$

In a matrix writing, the relations become:

$$\begin{pmatrix} Q_{A,t+1} \\ Q_{B,t+1} \end{pmatrix} = \begin{pmatrix} 0 & -\dfrac{1}{2} \\ -\dfrac{1}{2} & 0 \end{pmatrix} \begin{pmatrix} Q_{A,t} \\ Q_{B,t} \end{pmatrix} + \begin{pmatrix} \dfrac{a - \alpha}{2b} \\ \dfrac{a - \beta}{2b} \end{pmatrix}$$

If we note $Q_t = \begin{pmatrix} Q_{A,t} \\ Q_{B,t} \end{pmatrix}$, $C = \begin{pmatrix} \dfrac{a - \alpha}{2b} \\ \dfrac{a - \beta}{2b} \end{pmatrix}$ and $A = \begin{pmatrix} 0 & -\dfrac{1}{2} \\ -\dfrac{1}{2} & 0 \end{pmatrix}$, we can write the above

relations as:

$$Q_{t+1} = AQ_t + C$$

After induction, we obviously have:

$$Q_{t+n} = A^n Q_t + (A^{n-1} + ... + A + I_2)C, \quad n \geq 1$$

where I_2 is the unit matrix.

In particular, for $t = 0$, we obtain:

$$Q_n = A^n Q_0 + (A^{n-1} + ... + A + I_2)C$$

On the other hand, we can see (again induction) that:

$$A^{2k} = \frac{1}{2^{2k}} I_2 \text{ and } A^{2k+1} = \frac{1}{2^{2k}} A, \quad \forall k \in \mathbf{N}$$

and also:

$$A^{n-1} + ... + A + I_2 = (A - I_2)^{-1}(A^n - I_2)$$

Because A-I_2=$\begin{pmatrix} -1 & -\dfrac{1}{2} \\ -\dfrac{1}{2} & -1 \end{pmatrix}$ it follows that: $(A-I_2)^{-1}$=$\begin{pmatrix} -\dfrac{4}{3} & \dfrac{2}{3} \\ \dfrac{2}{3} & -\dfrac{4}{3} \end{pmatrix}$ and with the fact

that $\lim A^n=0_2$ we will have:

$$\lim (A^{n+1}+...+A+I_2)=\lim (A-I_2)^{-1}(A^n-I_2)=-(A-I_2)^{-1}=\begin{pmatrix} \dfrac{4}{3} & -\dfrac{2}{3} \\ -\dfrac{2}{3} & \dfrac{4}{3} \end{pmatrix}$$

From these facts, we obtain:

$$\lim Q_n=\begin{pmatrix} \dfrac{4}{3} & -\dfrac{2}{3} \\ -\dfrac{2}{3} & \dfrac{4}{3} \end{pmatrix}C=\begin{pmatrix} \dfrac{a-2\alpha+\beta}{3b} \\ \dfrac{a-2\beta+\alpha}{3b} \end{pmatrix}$$

The limit quantities of the two companies at equilibrium are therefore:

$$Q_A^* = \frac{a-2\alpha+\beta}{3b}, \ Q_B^* = \frac{a-2\beta+\alpha}{3b}$$

the selling price being:

$$p^*=a-b\,(Q_A^* + Q_B^*) = \frac{a+\alpha+\beta}{3}$$

6. The Cournot Equilibrium for Oligopoly or in the Case of Perfect Competition

Let now consider a number of n firms whose productions are $Q_1,...,Q_n$. The selling price will be the same for all firms (*otherwise, the buyer choosing the lowest price*) and will depend on total production.

The corresponding profit function of the firm "k" is then:

$$\Pi_k(Q_k) = p\left(\sum_{i=1}^{n}Q_i\right)Q_k - CT_k(Q_k)$$

where CT_k is the total cost accordingly.

The profit maximization condition implies:

$$\frac{\partial \Pi_k}{\partial Q_k} = p'\left(\sum_{i=1}^{n} Q_i\right) Q_k + p\left(\sum_{i=1}^{n} Q_i\right) - Cm_k(Q_k) = 0$$

where Cm_k is the the marginal cost appropriate to the firm "k".

Considering now the coefficient of elasticity of demand in relation to the price: $\varepsilon_{Q,p} = \frac{dQ}{dp} \cdot \frac{p}{Q}$ follows: $\frac{dp}{dQ} = \frac{p}{Q} \frac{1}{\varepsilon_{Q,p}}$ and for $Q = \sum_{i=1}^{n} Q_i$ we obtain:

$$p'\left(\sum_{i=1}^{n} Q_i\right) = \frac{p\left(\sum_{i=1}^{n} Q_i\right)}{\sum_{i=1}^{n} Q_i} \frac{1}{\varepsilon_{Q,p}}$$

Substituting in the profit maximization condition, results:

$$p\left(\sum_{i=1}^{n} Q_i\right)\left(1 + \frac{Q_k}{\sum_{i=1}^{n} Q_i} \frac{1}{\varepsilon_{Q,p}}\right) = Cm_k(Q_k)$$

Noting now $v_k = \frac{Q_k}{\sum_{i=1}^{n} Q_i}$, $k = \overline{1,n}$ - the share of "k" in all companies, we have:

$$p\left(\sum_{i=1}^{n} Q_i\right)\left(1 + \frac{v_k}{\varepsilon_{Q,p}}\right) = Cm_k(Q_k)$$

From this relationship, it follows that for n=1 that $v_1=1$ and we have:

$$p(Q_1)\left(1 + \frac{1}{\varepsilon_{Q,p}}\right) = Cm_1(Q_1)$$

so just state of monopoly.

On the other hand, if it exist a large number of companies on market whose share as a whole is negligible, we have: $v_k \approx 0$ $\forall k = \overline{1,n}$ and: $p\left(\sum_{i=1}^{n} Q_i\right) = Cm_k(Q_k)$ $\forall k = \overline{1,n}$ so the price equals the marginal cost of each firm, the market equilibrium being specific to the perfect competition.

7. Cartels

Considering any number of firms, the cartel is a situation where they collaborate to establish production that will maximize total profit, and then reverse them to divide it between them.

Let therefore be a number of $n \geq 2$ firms whose productions are $Q_1,...,Q_n$, the selling price depending on total production, the asset sold being normal.

The cartel's profit function has the following expression:

$$\Pi(Q_1,...,Q_n) = p\left(\sum_{i=1}^{n} Q_i\right)\sum_{i=1}^{n} Q_i - \sum_{i=1}^{n} CT_i(Q_i)$$

where CT_i is the total cost appropriate of the firm "i".

The profit maximization condition involves determining $Q_1,...,Q_n$ such that $\Pi(Q_1,...,Q_n)$ =maximum. We therefore have:

$$\frac{\partial \Pi}{\partial Q_k} = p'\left(\sum_{i=1}^{n} Q_i\right)\sum_{i=1}^{n} Q_i + p\left(\sum_{i=1}^{n} Q_i\right) - Cm_k(Q_k) = 0 \text{ , } k=\overline{1,n}$$

where Cm_k is the marginal cost of the firm "k".

From the relationship above, it follows:

$$Cm_1(Q_1)=...=Cm_n(Q_n)$$

so at optimum, the marginal costs of the n firms must be equal. If one of the companies will have a higher marginal cost than the other, then their production will be increased to equal marginal costs at the dominant firm.

Consider now the optimal production of the n companies as: $Q_1^*,...,Q_n^*$. From the optimal relationship above, we have seen that:

$$p'\left(\sum_{i=1}^{n} Q_i^*\right)\sum_{i=1}^{n} Q_i^* + p\left(\sum_{i=1}^{n} Q_i^*\right) - Cm_k(Q_k^*) = 0 \text{ , } k=\overline{1,n}$$

or:

$$p\left(\sum_{i=1}^{n} Q_i^*\right) - Cm_k(Q_k^*) = -p'\left(\sum_{i=1}^{n} Q_i^*\right)\sum_{i=1}^{n} Q_i^* \text{ , } k=\overline{1,n}$$

For some firm "j" the profit is:

$$\Pi_j(Q_1,...,Q_n) = p\left(\sum_{i=1}^{n} Q_i\right)Q_j - CT_j(Q_j)$$

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from where:

$$\frac{\partial \Pi_j}{\partial Q_j} = p'\left(\sum_{i=1}^n Q_i\right)Q_j + p\left(\sum_{i=1}^n Q_i\right) - Cm_j(Q_j)$$

Adding the individual variations in profit for all companies involved in cartel result:

$$\sum_{j=1}^n \frac{\partial \Pi_j}{\partial Q_j} = \sum_{j=1}^n p'\left(\sum_{i=1}^n Q_i\right)Q_j + \sum_{j=1}^n p\left(\sum_{i=1}^n Q_i\right) - \sum_{j=1}^n Cm_j(Q_j) =$$

$$p'\left(\sum_{i=1}^n Q_i\right)\sum_{j=1}^n Q_j + np\left(\sum_{i=1}^n Q_i\right) - \sum_{j=1}^n Cm_j(Q_j)$$

In the optimum point:

$$\sum_{j=1}^n \frac{\partial \Pi_j}{\partial Q_j} = p'\left(\sum_{i=1}^n Q_i^*\right)\sum_{j=1}^n Q_j^* + np\left(\sum_{i=1}^n Q_i^*\right) - \sum_{j=1}^n Cm_j(Q_j^*) =$$

$$p'\left(\sum_{i=1}^n Q_i^*\right)\sum_{j=1}^n Q_j^* + \sum_{j=1}^n \left(p\left(\sum_{i=1}^n Q_i^*\right) - Cm_j(Q_j^*)\right) =$$

$$p'\left(\sum_{i=1}^n Q_i^*\right)\sum_{j=1}^n Q_j^* - \sum_{j=1}^n \left(p'\left(\sum_{i=1}^n Q_i^*\right)\sum_{i=1}^n Q_i^*\right) =$$

$$p'\left(\sum_{i=1}^n Q_i^*\right)\sum_{j=1}^n Q_j^* - np'\left(\sum_{i=1}^n Q_i^*\right)\sum_{j=1}^n Q_j^* = -(n-1)p'\left(\sum_{i=1}^n Q_i^*\right)\sum_{j=1}^n Q_j^* > 0$$

because good being normal: $p'<0$.

If the firm "j" believes that all other firms will follow the terms of the cartel agreement and production will not change, so: $\frac{\partial \Pi_k}{\partial Q_k} = 0 \ \forall k = \overline{1, n}$, k≠j then from the above relationship follows: $\frac{\partial \Pi_j}{\partial Q_j} > 0$ so the firm "j" will be tempted to unilaterally increase its production to increase profit.

On the other hand, from the above relationship follows:

$$\frac{\partial \Pi_j}{\partial Q_j} = -(n-1)p'\left(\sum_{i=1}^n Q_i^*\right)\sum_{j=1}^n Q_j^* - \sum_{\substack{k=1 \\ k \neq j}}^n \frac{\partial \Pi_k}{\partial Q_k}$$

If the firm "j" believes that at least one of the companies do not comply with the cartel agreement and produce more, we have:

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$$\frac{\partial \Pi_j}{\partial Q_j} = -(n-1)p'\left(\sum_{i=1}^{n} Q_i^*\right)\sum_{j=1}^{n} Q_j^* - \sum_{k \in I}\frac{\partial \Pi_k}{\partial Q_k} - \sum_{k \in J}\frac{\partial \Pi_k}{\partial Q_k} =$$

$$-(n-1)p'\left(\sum_{i=1}^{n} Q_i^*\right)\sum_{j=1}^{n} Q_j^* - \sum_{k \in I}\frac{\partial \Pi_k}{\partial Q_k}$$

where we denoted by I=$\left\{k = \overline{1,n}\left|\frac{\partial \Pi_k}{\partial Q_k} > 0\right.\right\}$ - the set of companies that violate the

understanding and J=$\left\{k = \overline{1,n}\left|\frac{\partial \Pi_k}{\partial Q_k} = 0\right.\right\}$ - the companies that set the conditions cartel.

From optimal relationship, $\sum_{i=1}^{n} Q_i^*$ =constant thus $\frac{\partial \Pi_j}{\partial Q_j}$ varies in reverse with

$\sum_{k \in I}\frac{\partial \Pi_k}{\partial Q_k}$ >0. Therefore at a breach of agreement by the other companies, the firm "j" will reduce the profit. As a result of this suspicion, the company will increase its production before this happens.

We see therefore that in the absence of strict regulations and a strict control, any firm in the cartel is tempted to increase production to achieve an increase in profit.

As a special case, let consider the case of two companies A and B that records constant marginal costs: Cm$_A$=α și Cm$_B$=β, the price function being of the form: p(Q)=a-bQ, a>α,b>0 - the same for the two companies.

We have:

$$\Pi(Q_A, Q_B) = \left(a - b(Q_A + Q_B)\right)\left(Q_A + Q_B\right) - CT_A(Q_A) - CT_B(Q_B)$$

and the profit maximizing conditions:

$$\frac{\partial \Pi}{\partial Q_A} = a - 2b(Q_A + Q_B) - \alpha = 0$$

$$\frac{\partial \Pi}{\partial Q_B} = a - 2b(Q_A + Q_B) - \beta = 0$$

We saw above that for the existence of optimal production, we have: α=β and from the above system:

$$Q_A^* + Q_B^* = \frac{a - \alpha}{2b}$$

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the selling price being:

$$p^* = a - b\frac{a - \alpha}{2b} = \frac{a + \alpha}{2}$$

In the case of Cournot equilibrium, we have:

$$Q^*_{A,c} = \frac{a - 2\alpha + \beta}{3b} = \frac{a - \alpha}{3b}, \; Q^*_{B,c} = \frac{a - 2\beta + \alpha}{3b} = \frac{a - \alpha}{3b}$$

from where:

$$Q^*_{A,c} + Q^*_{B,c} = \frac{2(a - \alpha)}{3b}$$

The selling price is:

$$p^*_c = a - b\,(Q^*_{A,c} + Q^*_{B,c}) = \frac{a + 2\alpha}{3}$$

We now have:

$$\left(Q^*_A + Q^*_B\right) - \left(Q^*_{A,c} + Q^*_{B,c}\right) = \frac{a - \alpha}{2b} - \frac{2(a - \alpha)}{3b} = -\frac{(a - \alpha)}{6b} < 0$$

$$p^* - p^*_c = \frac{a - \alpha}{3} > 0$$

Following these considerations, it follows that if the cartel's total production is less than that resulting in oligopolistic competition, the selling price increases.

8. Conclusion

In this paper we analyzed the main aspects of oligopoly, in the case of n firms. The analysis has made, as a rule, for arbitrary marginal costs, each time, however, by considering these costs constant recovering well known results of the models presented.

We also treat the problems above for the general case of cost function, again customizing the overall results for linear functions and obtaining the corresponding classical relations.

9. References

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