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Full Length Research Paper

Foreign exchange exposure and its reflection in corporate finances

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In some periods of history currency volatility has been avoided due to agreements made between countries. From 1973 to fluctuation of currency quotations generated a great deal of economic theories that countries could manage their currencies. Companies with revenues in foreign currencies had to adapt and understand how the exchange rate policy of the country affects the results of organizations. This article is part of the historical context and from the determinants of exchange rate policy, reviews the main models for the determination of prices and their empirical evidence. Are then discussed some emerging models. The article shows that the theories arising in forty years of free floating explain only part of the problem of exchange rate changes and that there are still many unanswered questions. Arising from these uncertainties, the volume of derivative trading has increased worldwide indicating a search for protective mechanisms that minimize the effects of exchange rate variation.

Key words: Cambio, floating, exchange theories, finance.

INTRODUCTION

Up to the year 1973 the Bretton woods agreement used to keep the price of currencies and avoid the oscillation of one currency in relation to the other ones. With the United States decision to abandon the agreement, the market became uncertain and unstable. Thus, the expression foreign exchange volatility assumed importance to the international financial vocabulary. Several studies show the effects on economical performance of countries. Exchange rate fluctuation affects the result of companies in various ways, directly in the case of importers and exporters or indirectly due to the effect of exchange rate on domestic prices. The subject called

risk, so far restricted to the insurance industry or for some specific financial sectors, began to be part of the assessment of the organizations. In academia, several courses involve the discipline called as risk management and organizations begin to address this as necessary for administrative management. The subject is recent and is in extensive discussion, both in academia and corporations, creating more questions than answers.

This review will contemplate economical theories that determine the exchange rate and the empirical results of the main authors who have related the issue. The main research matter is how exchange rate volatility has been

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been addressed and the evolution of its management in corporate environment. Besides this introduction, this review contains five more sections. The next one reports some aspects on historical volatility of the currency and the first studies on the subject. Section 2 presents the main economical theories and models for exchange rate determination. Section 3 describes the main empirical evidence of the models here studied. Section 4 presents the emerging models for exchange rate determination. Section 5 provides an analysis of recent results in the management of enterprises and the volatility, and section 6 summarizes the issues here studied and makes some considerations on issues which may be addressed in future research.

Historical context

The Bretton woods agreement signed in 1944 established a monetary system based on gold standard in which all countries would determine the value of their coins based on metal reserves. In fact, the value was established in relation to dollar which remained the conversion rate of \$35 per ounce. Therefore, each country defined its rate in relation to dollar. The fact that the U.S. currency had been devalued from \$20.67 to \$35 an ounce ten years earlier was not considered as a loss of advantage by the involved ones and did not influence on the decision. According to Eiteman et al. (2002), the participating countries agreed to maintain the value of currencies in parity with 1%, later increased to 2.25% for purchase or sale of foreign currency or gold. Devaluation could not be used as an alternative for commercial competition, but if it were necessary, a devaluation of up to 10% should be authorized by the international monetary fund. (IMF)

This system lasted for 27 years. Arising from divergent monetary policies and internal problems regarding inflation resulted in its weakening. Gold reserves were replaced by the U.S. currency. The U.S. had increasing deficits which required an outflow of capital to finance them, resulting in ability distrust to maintain the commitment to convert dollars into gold.

On August, 1971, the U.S. government suspended the purchase of gold. The exchange rates of most countries fluctuated freely in relation to dollar and, therefore, in relation to gold. At the end of that year, most currencies had appreciated against the dollar. In 1973, the speculative flow of coins struck the fixed exchange rate again. In March, most of the world's largest markets got closed for several weeks. When they were reopened, most currencies were able to fluctuate by forces determined by the markets. From that period on, the exchange rates became more volatile and less predictable.

According to Chesnais (1999), the exchange rate variations had become permanent with these changes, making the conduction of an international transaction without getting exposed to risks almost impossible.

The exchange rate fluctuation of currencies as a risk factor to companies began to worry investors. Hung (2006) calculated that, during the 80s, due to changes in the value of the dollar, the U.S. companies had losses estimated at \$23 billion per year, which is equivalent to 10% of total industrial profits. Westerfield (1977) was the first one to recognize that the fluctuating rate exchange market poses more risks than the fixed rate exchange ones. His studies involved weekly exchange rates from five countries: Canada, England, Germany, Switzerland and the Netherlands, during the period of fixed rates of the 60s and covered the period of fluctuating rates of the 70s. With several statistical formulas to measure the variation of the market price of the present and of the future, he concluded that the symmetrical stable distribution provided the best description of the exchange rates.

In 1978, Rogalski and Vinso resumed Westerfield's studies and with the same samples the authors concluded that the "student t-distribution" better explains the symmetry of currency prices. They concluded that a stochastic process explains the rates in a fixed conversion regime, while the new model is better suited to systems involving fluctuating exchange rates.

Calderon-Rossell and Ben-Horin (1982) analyzed only the free-fluctuation period, from 1974 to 1977, and extended the study sample for 17 major currencies. The reason for this extension was due to the fragmentation of the international monetary system after the end of the Bretton woods agreement and of the different exchange rate policies adopted in each country. The studies that assume that changes in exchange rates form a normal distribution are in serious doubts. The authors concluded that there is not a single distribution that represents the behavior of currencies versus the theories found in literature.

EXCHANGE RATE DETERMINATION

According to Eiteman et al., (2002), there is not a general theory about exchange rate determination. In economics, there are theories about currency parity conditions which attempt to explain exchange rates and their determinants. The main theories start from interest rate parity and purchasing power parity. According to Brealey and Meyers (2005), theories explain the behavior of currencies under certain conditions, but they are not an accurate description of reality. The theories are based on efficient market hypothesis, which, according to Taylor (1995), has the following characteristics: the participants

are gifted with rational expectations; all information is available to all participants and reflects in prices and the investors are neutral to risk. The risk issue can be adjusted to a risk award. According to Garcia and Olivares (2000), however, in currency market the presence of this award in negotiation currency has no consensus in literature and finds no conclusive answers in empirical research.

According to Taylor (1995), foreign exchange market efficiency is a controversial issue. A way of testing market efficiency is through interest rate discovery condition, which is present in most models of exchange rate determination. According to this condition, if markets are efficient and risk-neutral, then the return of a bond must be equal to that of another country, when measured in the same currency. Differences in nominal yields are due to changes in exchange rate.

According to Taylor (1995), foreign exchange market efficiency tests have been applied considering the trajectory of currency markets as a random way. Another test is done in order to apply a filter rule, which involves intervention in the market by buying or selling currency every time the price exceeds the values determined by the filter. Another method is through regression analysis based on spot and forward prices, in which difference in prices reflects in the interest rate and should be equal to the future award. The various tests and the creation of more sophisticated econometrical models generated strong evidence against the efficiency hypothesis without speculative risk award.

Once unconfirmed the simple hypothesis of market efficiency rates, researchers began to search for new alternatives. If market participants are risk-averse, the parity condition interest rates can be distorted by the risk award, confusing research results. Another reason could be a change in expectations. According to Taylor (1995), this can be due to rational bubbles, market learning against changes, inefficient information or "weight problem", which is the market expectation for rate realignment during the sample period. Another investigated possibility was the research data, in which the applied models assumed one of the hypotheses as true. In general, the conclusions of the finding results are that risk aversion and abandonment of rational expectations theory are responsible for the rejection of the efficient market hypothesis.

Other conditions were used to test the foreign exchange market efficiency. The parity covered interest rate and purchasing power parity. The parity covered interest rate states that the interests will be equal to similar assets. If it does not happen, the coin exchange will fit, balancing interest rates and eliminating arbitrage opportunities. The purchasing power parity implies that the exchange rate equals the ratio of the two relevant national price levels, or that the prices of the products

are equal when measured in common currency. Horne (2004) identifies three distinct phases to the condition of purchasing power parity. The first phase is optimistic and ranged from the 20s to the 70s, along with the strong presence of monetarist theories, which made it a much respected approach. The second phase, pessimistic, lasted up to the 80s, when it was abandoned due to the large variability in real exchange rate. More recently there is a re-evaluation, considering it as a consistent long-term anchor. Recent studies have tested the co-integration between exchange rates and relative prices, and the results are insignificant regarding the purchasing power parity. Some authors have questioned the results, arguing that the analyzed period is too short. Other studies have used integration techniques involving data from the nineteenth century and found evidence on purchasing power parity for the long term.

According to Horne (2004), the market efficiency has weak evidence. Even in long-term, the connection between the reflections of interest and purchasing power are not clear enough to say that the currency markets are efficient.

Models of exchange rate determination

The monetary approach to the change of rates emerges from dominant models of exchange rate fluctuations, which began close to the 70s. They started from the beginning of the definition of exchange rate as the relative price of two currencies and attempts to model the relative price in terms of demand and supply for those coins. They are based on the following hypotheses: the prices are flexible, the purchasing power parity exists, internal and external assets are perfectly substitutable and capital mobility is allowed. In this review we will describe the main models of exchange rate determination. Mathematical formulas were not used to explain the methods and the choice of describing the models is in order to make the text more fluent and less bulky. Taylor (1995) provides the following models:

Monetary model with flexible prices

The monetary model with flexible prices is implicitly a clear market and generally balanced model, in which the continuous purchasing power parity among national levels is assumed. The domestic currency stock determines price levels and, hence, the exchange rate is determined by the relative supply of currency. The high volatility during the 70s was gradually disproving the continuous purchasing power parity, leading to the development of two classes of models: monetary model with adherence to the prices and equilibrium model.

Monetary model with adherence to the prices and overcoming (overtake)

In this model, increases in long-term rates over the levels of long-term equilibrium (the overtake effect) are allowed. The results such as "variables jumps" in the system – changes in exchange and interest rates – are offset by adherence on other variables – notably in product prices. In short-term, equilibrium is reached when the expected depreciation rate is balanced with the differential interest rate (discovery interest rate parity). In medium-term, however, domestic prices begin to fall in response to the reduction in money supply. This relieves the pressure on financial markets and interest rates begin to retreat. Then, the exchange rate depreciates slowly for purchasing power parity in long-term.

Equilibrium and liquidity models

These types of models are also called as temporary and began to be developed by Lucas (1982). They analyzed the overall balance of two countries, maximizing the expectation of the present value to the representative utility of an agent which has been subject to budget constraints and restrictions for fund advances. Somehow these models are an extension or a generalization of the monetary model of flexible price, which allows multiple trading products and real shocks among countries. A positive monetary shock in the currency starts to generate a decline in nominal interest rates, the appreciation of domestic currency against foreign currency, in real and nominal terms, raises the outputs (in response to lower real interest rate) up to the moment that the prices and portfolio are in balance again.

The portfolio equilibrium model

The key feature that distinguishes the portfolio equilibrium model is that it assumes imperfect substitution between domestic and foreign assets. The model considers that the net financial wealth of the private sector is divided into three components: cash, domestically issued bonds and foreign bonds denominated in foreign currency and owned by domestic residents. According to Taylor (1995), the model also considers a free market for domestic bond purchase by authorities. To induce agents to hold more cash and fewer bonds, domestic interest rates fall (the price of domestic bonds rises). The agents try to compensate the reduction of profit in their domestic rate portfolios, keeping assets in bonds purchased abroad, the exchange rate depreciates, leading the value of foreign bonds in domestic currency to a greater amount. The

effect of net impact is a lower domestic interest rate and currency depreciation.

FACTORS AFFECTING THE MODELS OF EXCHANGE RATE DETERMINATION

The determination of exchange rate policy is a task of monetary authorities of each country, the adoption of a flexible exchange rate regime is not synonymous with unstable exchange rates. According to Pires (2005), monetary authorities should have appropriate mechanisms to alleviate the necessary adjustments in economic fundamentals. These economic measures may affect the analysis of the results of exchange rate policies and are explained below in the items titled as official intervention and target zones for exchange rates.

Official Intervention

According to Taylor (1995), official intervention in foreign exchange happens when authorities buy or sell currencies, usually against their own currency and in order to affect the exchange rate. Sterilized intervention happens when authorities – simultaneously or with a very short delay – swing into action in order to compensate or "sterilize" the effects of the results of rate changes in the domestic monetary basis assets. The exchange of rate intervention effects – in particular sterilized intervention – has been an issue debated in literature. In the early fluctuation of the 70s, both "clean" and "dirty" administration fluctuation was favored. During this period, the U.S. were criticized for not intervening in the value of the dollar. Around the 80s, the consensus among economists, authorities and participants of foreign trade was that the intervention would have little and transient effects on exchanging the rates. However, in 1985, after the meeting with economic leaders of the G-5, official's sights were that intervening in markets would be useful. From that date on, large and regular interventions in the markets of exchange rates have been happening. According to Taylor (1995), official intervention can influence the exchange rate through two ways: by changing the relative supply of assets and by signaling with policy change intentions.

Target zones for exchange rates

A "target zone" is an extension within which the authorities are committed to maintaining the nominal exchange rate. According to Pires (2005), mechanism of exchange rates of the European monetary system, during the 80s, is an example of a multilateral target zone. This model works on the assumption of rational expectations. The money

supply is a variable policy under the control of the authorities. A fluctuation in the variable trading of currencies is allowed, the authorities do not alter the money supply to compensate for these movements, so that the end result will be the same currency fluctuation. In this model, authorities intervene when the exchange values are near the upper or lower extremities, which alter the level of fundamentals so as to keep the exchange rate within the target zone. This model implies that the relationship between exchange rate and fundamentals have the same curve of behavior. The models for determining the exchange rates used up to this moment and described in this chapter show the difficulties in determining the correct value of one currency in relation to the others, in addition to the price conditions which require perfect replacement of assets and capital mobility. These conditions, in turn, depend on external interference, whether they are economical policies of countries or their economical conditions in relation to international trade. Factors of interference may involve from official intervention to even hidden intervention of public authorities. Thus, it is possible to observe that the model to determine the rate depends equally on both economical conditions and political and economical aims of authorities, subject that will be developed in the next topic.

THE EMPIRICAL EVIDENCE IN EXCHANGE RATE MODELS

The determination of exchange rates depends on political and economical factors within a historical context that includes country needs and their relations with the rest of the world. Some models are sustained for some time, being supplanted by others as financial and economic environment changes occur.

Classic monetary models

Until the 70s, monetary models of price flexibility could support the monetary currency control thesis. From that date on, the model cannot provide good explanations for changes in exchange rates: the estimating equations begin to fail, providing bad suitable data, exhibiting incorrect coefficient signs and failing in general diagnostics equations. Some authors have sought to explain these failures in bad description of econometrics, while others argued that great changes in deficits or surpluses during the analyzed periods generate important effects which are not adequately captured in simple monetary models.

Eiteman et al.(2002) argued that the principle of purchasing power parity is too fragile for the model, since

the goods do not move between countries with zero cost. Likewise, the quality issue reflects the likes and the consumption conditions of the countries. The evidence for the monetary model with adherence to the prices also fails when data analysis are extended beyond the 70s.

According to Taylor (1995), more recently the application of a multivariate co-integration analysis and dynamic models for a number of exchange rates, there is some evidence that supports the monetary model of long-term equilibrium, toward which long-term exchange rates converge. Since all monetary models fail for a long-term monetary equilibrium condition, these tests are unable to discriminate among the various alternatives. The utility suggested by this approach still remains to be demonstrated. The results suggest that there are speculative forces working in the foreign exchange market, which do not reflect in the usual definitions of macroeconomic fundamentals.

Equilibrium and liquidity model

According to Eiteman et al. (2002), models that address the exchange as a market asset suggest the mobility of national and international investments. This model is able to explain the changes in nominal exchange rate and their excesses in relative price changes. Consequently, it explains the variation in real exchange rates, similarly to the model with adherence to the prices. However, there are arguments that the rejection of the non-stationary hypothesis is an evidence against the model with adherence to the prices and in favor for the equilibrium model. On the other hand, this model remains the same when persistent movements of real and nominal rate exchanges occur.

According to Taylor (1995), there is evidence which rejects the simplest equilibrium model. It is probably due to endogenous variables. In other words, the exchange rate regime where countries suffering major disorders are more likely to choose flexible exchange systems. Since it is unlikely that all the conditions are known in practice, there are theories which support the abandonment of these simpler models and that others should be developed with the flexibility of some assumptions. Studies prove that countries with fixed exchange rates tend to introduce trade and capital flow controls to control international reserves. Although empirical evidence rejects the simplest equilibrium models, it is not possible to invalidate all models that use this approach. Financial leverage and its effects on exchange rate fluctuation were analyzed by Tille (2008). The results showed that financial integration can lead to large differences in the results between countries after an economic shock. The effect between countries is related to heritage issues, profit sensitivity and the possibility of substitution

between goods from different countries.

Portfolio equilibrium model

Few empirical studies have been performed with a portfolio equilibrium model approach to the market of exchange rate. According to Taylor (2005), the probable cause is the difficulty of data processing. Reduced versions of the model were applied with poor results: the calculated coefficients are generally insignificant and there are residual autocorrelation problems. The imperfect substitution of domestic and foreign assets, which are assumed in this model, is equivalent to assuming that there is a risk award which separates the expected depreciation of the currency and the interest rate difference between domestic and foreign markets. A few studies are consistent with recent literature on market exchange rate efficiency, which suggests the existence of a significant risk award and of non-rational expectations. But as stated by Garcia and Olivares (2000), the existence of this award is not fully proven.

Bartram et al. (2010) consider that companies can manage their foreign exchange exposure through pricing policies, operational hedge and financial strategy hedge. Using a sample of 1,150 non-financial companies belonging to 16 countries, they showed that the possibility of transfer pricing and operational hedge is important to reduce exposure level. Each one of the used ways can minimize the foreign exchange exposure of companies and the use of the three alternatives can reduce their gross exposure to around 70%.

The foreign exchange exposure can affect companies that operate only in the domestic market. Aggarwal's and Harper's (2010) studies showed that the effects on domestic companies are not significantly different from companies with international operations. They proved that effects of foreign exchange exposure increase with the time used for their measurement and are inversely related to company size, positively related to research and development expenditures and leverage.

Intervention effectiveness

Recent literature has been going through some difficulties to reject the hypothesis that exchange rate intervention has very little effect and is short-lived. Obstfeld (1998) argues that the intervention does not have significant effect results, and that the rate realignments are consequences of macroeconomic coordination. Tests involving the influence of ads produced conflicting results. Due to great uncertainty about the relationship between rate changes and fundamentals, some authors agree that intervention signs can help agents coordinate their

expectations, converging at an exchange rate according to authority expectations. Despite some studies suggest a significant connection between intervention and rate adjustments, their effectiveness is not yet clearly proven.

Target zones effectiveness

The results of the application of this model in various systems, even with the Bretton Woods regime and the gold standard, were rejected. According to Kempa and Nelles (1999), a large number of studies has "explicitly or implicitly rejected the implications of the model with respect to exchange rate" (p. 179). Even graphically the behavior of the exchange rate in relation to fundamentals did not generate an "S" curve, as predicted by the model. Because of this empirical rejection of the model, several authors attempted its rehabilitation by changing some assumptions, such as intra- marginal intervention, adherence to the prices, credibility of authorities, among others. According to Taylor (1995), this could explain why the research found little non-linearity evidence or the characteristics of the S-shaped curve. Even with these changes the results are contradictory. Deriving from the own formulation that implicitly brings the market efficiency model, but supports contrary evidence.

News effect on exchange rate movements

There are some approaches regarding news effect on economic fundamentals that turn into unexpected exchange rate movements. The basic premise is that if the market is efficient, unexpected exchange rate changes may only be due to the news. Thus, there would be a change correlation between the arrival of the news and its effects. Many studies indicate a significant news effect, however these effects are reflected with a certain delay.

Performance prediction through "out-of-sample" analysis

Another way to examine the empirical content of exchange rate theories is to examine the "out-of-sample" data used to predict their performance. The conclusion that emerges from these studies is that no model which uses market resources exceeds the simple random walk. Empirical evidence suggests the existence of market forces in foreign currencies that interfere with macroeconomic fundamentals. Models that seek to establish a currency balance end up finding reflections in trade and capital flow policies. It demonstrates that the currency is just reflex from other policies of a country.

Thus, government intervention has short-term effects. The establishment of goals for quotation of exchange did not find significant results for its efficiency. It directed the studies for the news effects and the verification of "out of sample" purposes. The conclusions are that the news effects make it difficult to establish which period of adjustment between the dissemination of the news and the effects on the currency price is. The results of several studies suggest a relationship of forces between economic agents and exchange policies. As the authorities establish standards, officers will be adjusting themselves. Thus, the effects will end up diluting themselves and the price of the currencies will look more like a random walk.

EMERGING MODELS FOR EXCHANGE RATE DETERMINATION

As stated by Taylor (1995), it has been extensively demonstrated by literature that there are large and persistent movements in exchange rates which apparently are not explained by macroeconomic fundamentals, but by the expectations of the market, a sort of self-fulfilling prophecy. Studies by Allen and Taylor (1990) and Ito (1993) suggest that the expectations of agents may explain the short-term movements. There is an emerging literature on market microstructure which seeks to understand this divergence of fundamentals. Its focus is the behavior of agents and the characteristics of the market instead of the influence of macro fundamentals.

More recent studies seek to evaluate currency behavior by using classical statistical methods, mainly the use of auto regressive vectors (ARV) which address the economic variables as endogenous variables. Despite some satisfactory results, the models are complex and difficult to understand. Another method recently used is the fuzzy model which demonstrates the ability to describe systems similar to human's thought. The application of this modeling shows satisfactory results. However, the variables used for short-term do not present the same performance when used in longer periods. Similarly, variables with good long-term predictions do not repeat the results when used in short-term.

A speculative movement, unrelated to economic fundamentals, can start when agents change their expectations regarding the currency and start buying, rushing to its appreciation, in a movement known as "herd effect" other approaches. Other used by Frankel and Froot (1990) and Allen and Taylor (1990) suggest that the anomalous movements of foreign exchange rates are a result of analysts who do not base their predictions on fundamentals or economic theories, but on the occur-

rence of periodic movements.

Taylor (1995) revealed that some studies show a high proportion of use of this type of analysis, known as "technical" or "chartist", mainly for shorter periods. Eiteman et al. (2002) stated that the long-term technical analysis has become more popular due to recent research findings which indicate the possible existence of long-term "waves" in currency movements under fluctuating foreign exchange rates. Chiarella et al. (2002) emphasized that "traders" utilize technical indicators (oscillators) that point out when the market is over-bought or over-sold, tending to give non-linear movements when small movements in the foreign exchange rate occur, which do not activate the oscillator. The questions for microstructure analysis are often quite different from those applied in macroeconomic studies.

Thus, the researchers' attention begins to turn to microstructure topics, such as buying and selling "spread" determinants, trading and volatility volume, heterogeneity of expectations and processing and use of information. According to Eiteman et al. (2002), predictions can be based on several techniques: econometrics, trend analysis and graphical analysis or on the blend of them because in prediction it is important to approach as much as possible to reality.

Emerging models can be placed into two main lines of thought: the ones who consider the agents' expectations and the ones who reinforce mathematical models. The complexity of the models only partially explains the behavior of the currencies, in addition to understanding difficulties and modeling complexity. Some models include various economic factors in addition to financial aspects. Tsen (2011) elaborated a study having a set of factors to determine the exchange rate. He shows that productivity differences, the price of petroleum and the differences in foreign exchange reserves are important in setting the long-term exchange rate. His study involving several Asian countries shows that the impacts of these factors are different in each country.

Evaluating the economic expectations involves greater understanding of human behavior and all related variables. This requires unlinking the "homo economicus" of classical economics. The challenge is to find a mathematical model that includes behavioral aspects.

REFLECTIONS IN ORGANIZATIONS

Currency exposure may affect companies that operate only in the domestic market. Aggarwal and Harper's (2010) studies show that exchange rate effects on domestic companies are not significantly different from those with international operations. They prove that the effects of foreign exchange exposure increase with the time horizon used for its measurement and which is inversely

related to the company size, positively related to the cost of research and development and to the leverage.

According to Bartram et al. (2010) there is little empirical evidence of the effects of foreign exchange exposure in companies. One of the reasons may be in managing this exposure. With a sample of 1,150 companies from 16 countries, the accounting information and the currency exposure declaration were analyzed. The study investigated that the managers can use pricing policies, operational hedge and financial hedge in order to mitigate the effects of currency fluctuations.

The conclusions are that the companies can reduce exposure to exchange rates to around 70%, and the transfer prices can be reduced by 10 to 15%, the operational hedge accounts for the same percentage and the financial hedge is responsible for the reduction of 37 to 43%.

Their analyzes, suggest that the companies surveyed are aware of the exposure and adjust their activities. Company behavior in relation to foreign exchange exposure in the euro zone was studied by Hutson and O'Driscoll (2010).

With a sample of 1,154 companies from 11 European countries, being seven of them from the euro zone and four of them from outer countries, they show that the companies belonging to the euro zone are as exposed as those of other countries.

Furthermore, they reveal that the direct currency exposure management is routine for most companies. In turn, operations such as loans and foreign currencies and direct investments in order to eliminate the economic exposure are rarely used. They conclude that managers are well-qualified to assess the extent of movements in exchange rates, emphasizing the need for foreign exchange management to have to be accomplished in all levels of the companies.

Chue and Cook (2008) studied the effect of currency depreciation in emerging-country companies. They show that the impact on the stock value of companies varies according to the analyzed period. In a sample of 14 countries it is possible to verify negative impact in the period from 1999 to 2002 and this trend practically disappears in the period from 2002 to 2006. They conclude that the reduction of the negative impact is related to changes in the structure of the government market in those countries, rising inflation-linked debt and reducing foreign exchange.

Therefore, the companies have hedge mechanisms in order to manage foreign exchange exposure.

FINAL CONSIDERATIONS

Foreign exchange exposure of companies is due to currency volatility. Understanding these changes in con-

version rates and how to manage these changes have been a challenge for organizations. This paper reviews exchange rate determination models, their main determinants and empirical evidence of their effects on business performance. As it is shown in this paper, finding a mathematical model to explain currency behavior is a complex task and is still under construction. The challenge involves market participants, policy makers, financial and non-financial institutions and international relation policies. The empirical evidence shows the effects on organizations and how they change over time. The use of financial mechanisms and organizational policies can have their effects changed as a result of environmental changes, whether they are political or economical. The human factor may have to be included in the exchange rate determination models because econometric models have shown to be insufficient in precisely determining the oscillation.

Derivatives are responsible for some major financial problems faced by large financial institutions with reflections in the global economy. Among them we can mention the Orange County bankruptcy, the Barings bank bankruptcy and more recently the problems of sub-prime mortgages. On the other hand, there is evidence that their use as risk transfer mechanisms is important for managers.

The increase in the number of derivative trading may be the indicator that companies are broadening and managing their foreign exchange exposure. The latest report of the BIS - bank for international settlements (2014) indicates a daily turnover with derivatives of 5,345 billion dollars in April/2013, an increase of 250% compared to April/1998 when 1,527 billion dollars were traded daily.

The exchange rate policy of a country directly affects the decisions of the company. In turn, studies show a relationship between the structures of countries and exchange rate policy. As demonstrated by Chue and Cook (2008), the provision of financial instruments allows companies to more safely manage their currency exposure. Decisions about the currency risk exposure of companies involve the knowledge of managers about exposure size and how it can affect the various levels of companies, as posted by Hutson and O'Driscoll (2010).

The importance of this study is to gather economical policies with managerial decisions, showing the relationships between political and managerial decisions if there are many determinants for the exchange rate, as Eiteman et al. (2002) show, there are also many mechanisms that can be used to manage this exposure, as stated by Chue and Cook (2008). The managers' understanding and the establishment of risk policies are required. Consciously, the article questions many things rather than giving answers, since the aim is to think about theory matter rather than point solutions.

Market expectations should be attached to macro economy influences, which, on the other hand, are related to structural factors which may be influenced by the performance of financial institutions. The future holds the challenge of how to measure so many aspects in a single model in order to assist managers in more efficient management of foreign exchange exposure of organizations.

Conflict of interest

The author has not declared any conflict of interest.

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Full Length Research Paper

Participation in the credit market by small scale enterprises in Ghana: Evidence from Wa Municipality

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This study analyses the determinants of small scale enterprises participation in credit market and also examines their choice of credit source in the Wa Municipality of Ghana using 200 small scale enterprises. Primary data were collected with the help of self-administered structured questionnaires. In a departure from much of the existing literature, bivariate probit model is used to account for potential unobserved heterogeneity. The study finds evidence of a positive correlation between the unobserved factors affecting participation and choice of credit sources. The results revealed that entrepreneur's decision to participate in the credit market is significantly influenced by age, household size, education, income and wealth. Also, age and its squared term and education significantly influenced entrepreneurs' preference for formal credit sources. The study recommends that appropriate educational packages both formal and informal such as evening schools and adult literacy programmes should be organised for owners of small scale enterprises. There is also the need for policy measures to increase access to formal financial resources by small-scale enterprises via the establishment of credit insurance scheme to protect the financial institutions against high risks associated with advancing credit to small-scale enterprises.

Key words: Small scale enterprises, bivariate probit, participation, credit market, Ghana.

INTRODUCTION

It is a generally accepted tenet of international development that small scale enterprises play an important role in poverty alleviation especially in Africa. Programmes embarked upon by new partnership for Africa's development (NEPAD), international finance corporation (IFC), united nations industrial development organization (UNIDO), united nations development programme (UNDP) among others in addressing African development have identified private sector development, and in particular small scale enterprises (SSEs) development as a priority

area for action (United Nations, 2009).

Small and medium scale enterprises (SMEs) are seen as the lifeblood of most economies (Gunu, 2004) through the provision of income, savings and the development of entrepreneurial capabilities and indigenous technology which generate employment. It is estimated that SME's employ about 22% of the adult population in developing countries (Daniels and Ngwira, 1994; Fissaeha, 1991) and are particularly important in supporting economic growth and livelihoods in developing countries

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Cobboldet al. (2008) and if all stakeholders are to show serious commitment to the development of the SMEs sub-sector, it would lead to a meaningful transformation and prosperity (Ahiawodzi and Adade, 2012).

Indeed, the need to promote SMEs in developing economies is of paramount importance since it brings about income and wealth redistribution, economic self-dependence, entrepreneurial development and employment creation (example, Aremu M.A., university of Ibadan, Ibadan, Nigeria, paper presentation). Kilby (1975), sees SMEs as a quasi-sponge for urban employment and a provider of inexpensive consumer goods with little or no import content, serving an important pressure-releasing and welfare-augmenting function. SMEs also contribute to long-run industrial growth by producing an increasing number of firms that grow up and out of the small-scale sector.

In Ghana, about 90% of companies registered are micro, small and medium enterprises and these enterprises have been identified as the catalyst for economic growth of the country as they are a major source of income and employment (Mensah, 2004). They provide about 85% of manufacturing employment in Ghana; contribute about 70% to Ghana's gross domestic product (GDP) and account for about 92% of businesses in Ghana (Abor and Quartey, 2010).

Aside from providing opportunities for employment generation, SMEs help to provide effective means of curtailing rural-urban migration and resource utilization. By largely producing intermediate products for use in large scale companies, they contribute to the strengthening of industrial inter-linkages and integration. A vibrant, efficient and effective SMEs sub-sector generates many resultant benefits for stakeholders, employees, customers, employers as well as the entire economy (Ahiawodzi and Adade, 2012).

In spite of the dominant role of the SMEs to economic growth and social development in Ghana, poor access to both formal and informal credit has affected the growth of the sector. Indeed, Mensah (2004) identified the relatively undeveloped financial sector with low levels of intermediation, lack of institutional and legal structures that facilitate the management of SME lending risk, and high borrowing cost and rigidities in interest rates as the main factors that account for lack of finance to small scale enterprises in Ghana. The credit market in Ghana consists of both formal and informal financial lending institutions. Commercial banks and other formal institutions fail to cater for the credit needs of small-holders, mainly due to their lending terms and conditions. It is generally the rules and regulations of the formal financial institutions that have created the myth that the poor are not bankable, and since they cannot afford the required collateral, they are considered not creditworthy (Adera, 1995). No business organization can successfully achieve its organizational objectives without the needed

funds. Small scale enterprises frequently lack access to credit causing them to encounter high financial cost and high failure rate (World bank, 1978).

According to Aryeetey et al. (1994), there are several constraints to the development of small scale enterprises especially ineffective participation in the credit market to get access to financial resources. They face a number of challenges in accessing external finance. The demand for collateral by financial institutions and other money lenders in the provision of loans makes it very difficult for small scale entrepreneurs to access finance. High interest is yet another challenge facing these entrepreneurs in their attempt to participate in the credit market to get access to funding. Although informal credit institutions have proved relatively successful in meeting the credit needs of small enterprises in some countries, their limited resources restrict the extent to which they can effectively and sustainably satisfy the credit needs of these entrepreneurs (Nappoon and Huddleston, 1993).

Access to credit market by entrepreneurs has increasingly been regarded as an important tool for raising funds mainly by mobilizing resources to more productive uses. As development takes place, one question that arises is the extent to which credit can be offered to the entrepreneur to facilitate their taking advantage of the developing entrepreneurial activities. The generation of self-employment by the entrepreneurs requires investment in working capital. However, at low levels of access to credit, the accumulation of such capital may be difficult. Under such circumstances, participation in the credit market can help the entrepreneurs to accumulate their own capital and invest in employment-generating activities (Atieno, 2001). In addition, access to finance allows small scale enterprises to undertake productive investments, expand their business and acquire the latest technologies, thus ensuring their competitiveness and that of the nation in general (UNCTAD, 1995, 2001).

The Government of Ghana, recognising the important contributions of SMEs to national growth and development, established the national board for small-scale industries (NBSSI) in 1985 to promote and develop SMEs. In fulfilling one of its core mandates of provision of credit to SMEs, the board of NBSSI in 2010 facilitated access to credit for about seven hundred and fifty five (755) SMEs in Ghana (Okine, 2011). Government has also introduced various microfinance schemes to support SMEs growth and development and among them are micro finance and small loan centre (MASLOC), venture capital trust fund and export development and investment fund (EDIF) (Mensah, 2004). But, these efforts by government to promote the growth and development of SMEs have not yielded the needed result. Despite these efforts the majority of SMEs still have only limited access to bank services to support their private initiatives (Braverman and Guasch, 1986; VibeGhana.com (2013).

Several studies have been carried out in relation to the problems financing SMEs in Ghana (Example, Aryeetey et al., 1994; Boeh, 1996 etc.). These studies contribute to our knowledge about constraints facing small scale entrepreneurs. On the other hand, investigation on the determinants of small scale enterprises participation in the credit market in Ghana particularly Wa Municipality, is still evolving. It is against this background that this study aims at analysing the determinants of small scale enterprises participation in the credit market. To achieve this, the following questions are to be addressed: What factors determine small scale enterprises' participation in the credit market and what influences their choice of credit sources (that is, formal and informal)?

METHODOLOGY

Study design

The target population involved 500 registered SMEs in the Wa Municipality. These cut across trading activities (buying and selling of goods), manufacturing activities and services. A representative sample size of 200 entrepreneurs was randomly selected using the simple random sampling technique. Primary data were collected using questionnaires. However, for illiterate respondents questions were interpreted to them and the responses recorded.

Methods of data analysis

Small scale enterprises participation in the credit market is usually influenced by a number of factors which can be categorised into personal, household and enterprise characteristics. Entrepreneur's personal characteristics considered here include age, sex and education. Household characteristics considered are household size and wealth while enterprise characteristics are enterprise age, number of employees, income and distance to credit source. These categories of factors are hypothesized to influence enterprise decisions on whether to apply for credit or otherwise.

Previous studies on participation in the credit market employ either a binary logit or probit model (see for example, Aleem, 1990; Porteous, 2003; Okurut, 2006; Mpuga, 2008) whereas multinomial logit is used for entrepreneur's choice of credit source (see for example, Mpuga, 2008; Ajagbe, 2012). This study develops a sequential model using the bivariate probit estimation (biprobit) with sample selection procedure to investigate the determinants of entrepreneur's participation and choice of credit source. The model is applied sequentially in two stages to regress the variables that explain the likelihood of participation and further investigate the variables that explain the probability of choice of credit source. Hence, the entrepreneurs are grouped as 'participants' and 'non-participants' in the first stage of the analysis, and as 'formal credit borrowers' and 'informal credit borrowers' in the second stage for participants of the credit market.

In this study, as in other market participation studies, the choice decision of a given entrepreneur is considered to be discrete so that the choice variable is qualitative in nature. A rational entrepreneur will choose to participate in the credit market if the utility to be enjoyed exceed the utility to be gain when not participating. This approach is based on the linear random utility assumption (Greene, 2008), which is normally given as:

$$\begin{cases} U_{i0} = x'_1\beta_1 + e_1 \\ U_{i1} = x'_2\beta_2 + e_2 \end{cases} \quad (1)$$

Where U_{ij} is a measure of utility derived by entrepreneur i from choosing alternative j (with decision not to participate in the credit market being U_{i0} whereas participating is denoted by U_{i1}); x is a vector of characteristics specific to entrepreneur i as well as attributes associated with alternative j and specific to the i the entrepreneur, β is a vector of unknown parameters, and e_{ij} is random disturbances associated the choice of alternative j by entrepreneur i .

The probability that entrepreneur i choose a particular alternative (i.e. $Y_i = 1$) versus another (i.e. $Y_i = 0$) is associated with the probability distribution of the error differences is the expected utilities from the choices and given by:

$$P_i = \text{Prob}(Y_i = 1|x) = \text{Prob}(Y_i^* > 0|x) = \text{Prob}(e_i > -x'_i\beta|x) = F(x'_i\beta) \quad (2)$$

From equation 2, F is the cumulative distribution function of $e_i (= e_{i1} - e_{i0})$ evaluated at $x'_i\beta$, and $y_i^* (= U_{i1} - U_{i0})$ is a latent variable, since it is unobservable, and is linked to y_i , the observed binary variable, through the relation below:

$$y_i = \begin{cases} 1 & \text{if } y_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (3)$$

The specification of a model to describe the relation between the probability of choosing an alternative and the explanatory variables is dependent on the assumption made regarding the distribution of the error term. The two mostly assumed distributions in the literature are the normal and logistic corresponding to probit and logit models respectively.

Because this is a non-linear model, the effect of the explanatory variable is measured in terms of marginal effect defined as partial change in the probability of the outcome attributable to a change in the variable. If the error term in the utility model is assumed to be normally distributed, the analysis can be carried out using a probit model. From Eq. (2), in the framework of the simple (univariate) probit model, the probability function of choosing an alternative versus another is given by:

$$P_i = \text{Prob}(Y_i = 1|X) = \int_{-\infty}^{x'_i\beta_1} \phi(t)dt = \Phi(x'_i\beta) \quad (4)$$

With $\phi(\cdot) = (2\pi)^{-0.5} \exp(-t^2/2)$ and $\Phi(\cdot)$ being the density and cumulative distribution functions respectively of a standard normal random variable. In the bivariate probit model, the assumption of correlated normally distributed error terms in a two-equation system leads to the equation below:

$$\begin{cases} y_{i1}^* = x'_{i1}\beta_1 + e_{i1}, & Y_{i1} = 1 \text{ if } y_{i1}^* > 0, 0 \text{ otherwise} \\ y_{i2}^* = x'_{i2}\beta_2 + e_{i2}, & Y_{i2} = 1 \text{ if } y_{i2}^* > 0, 0 \text{ otherwise} \end{cases}, \quad (5)$$

where e_{ij} is the normally distributed error term,

$E[e_{i1}|x_{i1}, x_{i2}] = E[e_{i2}|x_{i1}, x_{i2}] = 0$,
 $Var[e_{i1}|x_{i1}, x_{i2}] = Var[e_{i2}|x_{i1}, x_{i2}] = 1$, and
 $Cov[e_{i1}, e_{i2}|x_{i1}, x_{i2}] = \rho$. The bivariate normal cumulative distribution function is given by:

$$Prob(X_i < x_i) = \int_{-\infty}^{x_1\beta_1} \int_{-\infty}^{x_2\beta_2} \phi_2(z_1, z_2, \rho) dz_1 dz_2 = \Phi_2(z_1, z_2, \rho), \tag{6}$$

with the probability density function being $\phi_2(z_1, z_2, \rho) = \frac{e^{-0.5(z_1^2 + z_2^2 - 2\rho z_1 z_2)/(1-\rho^2)}}{2\pi(1-\rho^2)^{0.5}}$. To simplify this to allow for constructing the log-likelihood function, Greene (2008) uses the notation $q_{ij} = 2y_{ij} - 1$ so that $q_{ij} = 1$ or -1 , respectively, if $y_{ij} = 1$ or 0 , for $j = 1, 2$ and $i = 1, \dots, N$; $z_{ij} = x'_{ij}\beta_j$ and $w_{ij} = q_{ij}z_{ij}$, $j = 1, 2$; and $\rho_i^* = q_{i1}q_{i2}\rho$. The probabilities that enter the log-likelihood function then become:

$$Prob(Y_1 = y_{i1}, Y_2 = y_{i2}|x_1, x_2) = \Phi_2(w_{i1}, w_{i2}, \rho_i^*). \tag{7}$$

The subscript 2 in the probability density ϕ_2 and cumulative distribution Φ_2 functions signifies the underlying bivariate normal distribution.

Greene (2008) argue that several 'marginal effects' can be evaluated in the bivariate probit, but an interesting step usually involves examining the derivatives of the conditional mean functions. In the light of this, a basic marginal effect function can be stated as:

$$\frac{\partial E[Y_1|Y_2=1, X]}{\partial X} = \frac{\partial [Prob(Y_1=1|Y_2=1, X)]}{\partial X} = \frac{\partial}{\partial X} \left[\frac{\phi_2(X'Y_1, X'Y_2, \rho)}{\phi(X'Y_2)} \right], \tag{8}$$

where Φ_2 and Φ are, respectively, the bivariate and univariate cumulative distribution functions, Y_j contains all nonzero elements of β_j and likely to also contain some zeros in the positions of variables that appear in only one of the two equations, and $j = 1, 2$. For a dummy explanatory variable, however, the marginal effect is determined by using a modified form of equation (8) which will reflect discrete changes in the predicted probabilities. Maximum likelihood method is employed in estimating the bivariate probit model.

Description and measurement of the variables

In this research, participation in the credit market is defined as the probability that an entrepreneur answered yes to the question, 'Have you borrowed a loan in the last 12 months (before the

survey)'. Therefore, an entrepreneur is considered participant in the credit market if he/she had taken a loan in the last 12 months and non-participants otherwise. Based on this information, entrepreneurs were classified into two categories: participants and non-participants of the credit market. A dummy variable was used to capture participation; we assigned the value 1 for participants and 0 otherwise. Once the response on participation/non-participation is obtained, further investigation was made on choice of credit source, given a positive response on participation. A dummy variable was also used to measure credit source; formal borrowers were assigned the value 1 and 0 for informal borrowers. Age variable is the age of the SSE owner and is performed on entrepreneurs aged 18 years and above. A dummy variable was used to capture sex; here if the owner of SSE is male we assigned the value 1 and 0 otherwise. Household size considered number of people living with SSE owner and whose responsibilities he/she bears. Level of education is measured by the total number of years the entrepreneur spent in receiving formal education. Income is net profit in Ghana Cedi (GHS) generated from the business operations annually¹. Enterprise age is the number of years the enterprise has been operating. Distance is a continuous variable measured in kilometres and refers to the distance (in km) from SSE owner to the nearness credit source. Number of employees is the total number of employees employed by the enterprise. We constructed an asset index using factor analysis to measure wealth. This index captures ownership of physical assets mainly: consumer durables assets including bicycle, refrigerator, electric iron, mobile phone, radio, TV, stove); property (another house), and dwelling characteristics such as the use of electricity, building materials, and toilet facilities.

RESULTS AND DISCUSSION

Of the 200 small scale entrepreneurs surveyed, 115 representing 57.5% did not borrow (non-participants) while 85 constituting 42.5% did borrow (participants) (see Table 1).

Further investigation on the choice of credit source; given that an entrepreneur had participated in the credit market revealed that 31 respondents constituting 36.5% borrowed from formal sources and 54 entrepreneurs representing 63.5% borrowed from informal sources (see Table 2). Table 3 shows the descriptive statistics of the variables used in our estimations.

Table 4 presents the results of the biprobit estimation of the determinants of entrepreneurs' participation and choice of credit source. The Wald test was used as a measure of goodness of fit. The Wald test of the hypothesis that all regression coefficients are jointly equal to zero is rejected. In other words, Wald test result suggests that age, age squared, sex, education, household size, number of employees, enterprise age, distance to credit source, income and wealth jointly influence small scale entrepreneurs' participation in the credit market. Additionally, Table 4 report the results of the likelihood ratio (LR) test for the correlation estimator ρ . The LR test rejects the null hypothesis of independent equations at a 1% level of significance. This suggests

¹ GHS 2.00086 = US Dollar (see, www.exchange-rates.org/history/GHS/USD/T)

Table 1. Participation in the credit market by small scale enterprises.

Participation Status	Frequency	%
Non-Participants	115	57.5
Participants	85	42.5
Total	200	100

Source. Author's field work, 2013.

Table 2. Choice of credit by small scale enterprises

Credit Source	Frequency	%
Formal Borrowers	31	36.5
Informal Borrowers	54	63.5
Total	85	100

Source. Author's field work, 2013.

Table 3. Descriptive statistics of variables used in the model

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Dependent variables					
Participation in the Credit Market*	200	0	1	0.43	0.496
Choice of Credit Source*	85	0	1	0.69	0.869
Independent variables					
Age	200	20	64	33.45	9.122
Age square	200	400	4096	1201.69	689.871
Sex*	200	0	1	0.59	0.493
Household Size	200	1	20	4.28	3.052
Education	200	0	23	8.59	5.702
Enterprise Age	200	1	35	6.1175	5.12825
Distance	200	1	10	4.15	3.067
Number of Employees	200	1	23	3.67	3.841
Income	200	20	1500	268.28	207.836
Wealth	200	2	53	21.59	12.275

* = categorical indicator variable
Source: Author's Field Work, 2013.

that estimating separate univariate probit models is likely to yield biased results; hence bivariate model results are superior to those of the univariate models. Specifically, the positive point estimate of ρ implies that the unobserved factors affecting participation and choice of credit source are positively correlated.

The result shows that among the ten explanatory variables (age, age squared, sex, education, household size, enterprise age, number of employees, distance, income and wealth) considered for the models, probability of small scale entrepreneurs' participation in the credit market is influenced to a great extent by five

namely: age, household size, education, income and wealth. However, only four variables were not significant determinants of small scale entrepreneurs' participation in the credit market in the study. It must be noted that all the variables showed signs that are in tandem with theoretical expectations.

The age of the entrepreneur is a significant determinant of the probability of small scale entrepreneurs' participation in the credit market. The result shows that the age of an entrepreneur is positively related to the probability of participation in the credit market, hence, the probability of participation increases by 5.6% for every

Table 4. Biprobit model estimates for participation and credit source.

Variables	Participation		Credit Source	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Age	0.1460613 [*] (0.079444)	0.0563827	0.1873934 ^{**} (0.0857882)	0.0330031
Age square	-0.001538 (0.0010607)	-0.0005937	-0.0020636 ^{**} (0.0010549)	-0.0003634
Sex	-0.003901 (0.2274736)	-0.001506	0.1218419 (0.269742)	0.021167
Household size	0.1254342 ^{***} (0.0384177)	0.0484202	0.0516532 (0.0525664)	0.009097
Education	0.4117409 ^{***} (0.0912713)	0.1589406	0.3041762 ^{**} (0.1196451)	0.0535705
Enterprise age	-0.0042049 (0.0237784)	-0.0097107	-0.0042049 (0.0237784)	-0.0007405
Distance	-0.0444453 (0.0371174)	-0.0171568	0.0266742 (0.0385479)	0.0046978
Number of Employees	0.0344418 (0.0361574)	0.0132952	-0.0022537 (0.0374388)	0.0132952
Income	0.0019963 ^{***} (0.0007042)	0.0007706	0.0005962 (0.0006116)	0.000105
Wealth	-0.0197881 [*] (0.0115473)	-0.0076386	0.0034669 (0.0137361)	0.0006106
Constant	-4.556197 ^{***} (1.450986)		-6.285965 ^{***} (1.773128)	
ρ	0.9999958 (0.0016616)	Likelihood-ratio test of $\rho \chi^2(1) = 38.7226^{***}$		
Number of observation = 200 Censored observations=115				
Wald $\chi^2(20) = 68.57^{***}$ Log likelihood = -146.75776				

Source. Author's field work, 2013

Notes. Standard errors in parentheses; ^{*}Significant at 10%, ^{**}significant at 5%, ^{***}significant at 1%.

additional year of the entrepreneur age. This implies that as the age of an entrepreneur increases the more likely he/she would participate in the credit market. Therefore, we could conclude that due to the capability of the older entrepreneurs to accumulate assets which are used as collaterals, financial institutions perceive them to be creditworthy; hence, they are more likely to access credit than the younger entrepreneurs. These results are consistent with (examples, Swain RB, Uppsala University, Sweden, Ph.D. dissertation) and Mpuga (2004).

Furthermore, household size was found to be statistically significant indicating that household size is a good predictor of probability of small scale entrepreneurs participating in the credit market. The positive coefficient indicates that larger households are more likely to be borrowers and hence participate in the credit market. An increase in the number of household increases the probability of participation by 4.8%. Perhaps, larger households are better credit risks because they have more relationships with the business community and have more diversified sources of income (Schreiner and

Nagarajan, 1998). This is statistically significant at the 1% level and is consistent with the previous studies (for instance, Jabber et al., 2002; Ho 2004; Simtowe, 2006).

Education of small scale entrepreneurs positively affects their decision to participate in the credit market. This variable is statistically significant at the 1% level. An increase in the years of schooling increases the probability of entrepreneurs' participation by almost 16%. This implies that the more educated a small-scale entrepreneur is, the more likely he/she would seek external funding to support the business. Plausible explanation to this finding could be their ability to keep proper records, higher level of adoption and absorption of credit information provided by money lenders and their better understanding of the dynamics of borrowing. In other words, the higher the educational level of the entrepreneur, the higher lender perceives them to be credit worthy.

Moreover, income levels of small scale entrepreneurs are important component determining their demand for credit and subsequently their participation in the credit market. At 1% level, it is accepted that the decision to

participate in the credit market is highly influenced by income. This finding implies that as income of entrepreneurs increases the more likely they would demand credit and subsequently participate in the credit market. This finding can probably be attributed to the fact that with increased income, the entrepreneur could save more and acquire assets which could be used as collateral for credit. Additionally, increased income would lead to increased savings which could be re-invested leading to increased business activities and a resultant increase in credit demand. This result reflects the pecking order theory which states that firms will first use internal equity financing, followed by external debt financing and finally external equity financing. This result reinforces the findings of Doan et al. (2010) and Messah and Wangai (2011).

However, small-scale entrepreneurs' decision to participate in the credit market is negatively influenced by wealth. Their probability of participation decreases by a percentage point when wealth increases and this was marginally significant. Our finding is contrary to studies by Doan et al. (2010) who noted a positive impact of wealth on credit participation.

With regard to entrepreneur's choice of credit source three variables were statistically significant namely: age, age squared and education. The age of the entrepreneur makes a significant difference in choosing formal credit source. The results reveal a statistically significant positive impact of age on formal credit source. Hence, an increase in age of the entrepreneur by a year increases the probability of choosing formal credit instead of informal credit by 3.3%. In other words, older entrepreneurs tend to borrow more from formal credit market than younger ones, and by implication show greater need for credit from formal source.

However, this relationship has an inverted U shape as indicated by a significantly negative coefficient for the square of the age of the entrepreneur. Alternatively, the probabilities of applying for formal credit significantly increase with higher age of applicant (age), but at a decreasing rate (age squared). This implies that at latter stages the older the entrepreneur the less productive such as individual is in terms of economic activities hence the lesser the ability to pay back the loan. Formal credit institutions will not be willing to extend credit facilities to aged entrepreneurs because of fear of default. These results are consistent with Kimuyu and Omiti (2000) who argue that the positive impact of the entrepreneurs' age on the demand for credit might probably reflect the impact of experience in business, which is closely correlated with age. But this goes contrary to the findings by Zeller (1994).

Similarly, education has a positive influence on the likelihood of small scale entrepreneur's choosing formal credit source and this effect is significant at the 5% level.

The result further revealed that the probability of choosing formal credit increases by 5.4% for every year

of schooling of the entrepreneur as compared with informal credit sources. This result is in agreement with Zeller (1994) who reported a positive and significant relationship between participation in all credit markets and education.

CONCLUSION

This study sought to analyse the determinants of participation of small scale enterprises in the credit market and their choice of credit sources in the Wa Municipality of Ghana. Primary data were collected from the chosen sample of 200 small scale enterprises using a structured questionnaire. The empirical analysis provides important insights into the working of Ghana's credit markets and participation in these markets by small scale enterprises. In a departure from much of the existing literature, bivariate probit model is used to correct for possible selection bias in results. In all, we can state that running the bivariate probit model improved the efficiency of the resulting estimates. The results drawn from the bivariate probit model concluded that entrepreneur's decision to participate in the credit markets is significantly influenced by age, household size, education, income and wealth. Furthermore, their choice of formal credit source is significantly determined by age, education and household size.

Recognising the importance of education in determining small scale enterprises' participation in the credit market, we recommend that appropriate educational packages both formal and informal such as evening schools and adult literacy programmes should be organised for owners of small scale enterprises.

Considering the fact that informal credit has limited financial resources, there is need for policy measures to increase access of small-scale enterprises to formal credit sources.

This could be achieved through the establishment of credit insurance scheme to protect the financial institutions against high risks associated with advancing credit to small-scale enterprises. Also, given that financial statements are prerequisite in sourcing funds from formal credit institutions, owners of small-scale enterprises need to improve their accounting and record keeping systems as these provides insight into their business. Diversification of loan portfolios by formal financial institutions would enable them cater for the different financial needs of small-scale enterprises.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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Full Length Research Paper

The need for cost audit in enhancing reliance in the disclosed operational performance of organisations: The case of Nigeria

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In the present global business environment, cost reduction application has led to enhancing organisational value for many notable firms. However, in Nigeria, the situation is pathetic as companies incur high operational costs, in view of this reason, unit selling prices for most manufacturing outfit, including those of the market leader firms, are considered exorbitant. This work, therefore, focuses on the instrument that can be applied to curb the excessive cost and to enhance organisation value. The research makes use of both primary and secondary sources. In ensuring high validity of the primary data, questionnaire and interview methods were employed. The interviews and questionnaires were directed to some reputable manufacturing organisations in Nigeria, audit firms, retailers and selected investors in the public. The major finding revealed that, cost control system adopted is found not reliable and the conventional external audit assignment is not sufficient to rely on the disclosed operational performance of organisations in Nigeria. Based on this major finding, it is suggested that, there is a need for the government to introduce cost audit task in the public limited liability organisations and those of the government established commercialised and privatised companies in order to improve performance.

Key words: Cost audit, performance audit, propriety audit, operational performance.

INTRODUCTION

Government policies differ from one country to another. These policies have major effects on the performance of organisations that operate in a given particular country. Reliable and stable policies assist in the behavioural aspect of organisations. Ordinarily, cost structure should reflect correct operational performance of notable organi-

sations. The other important considerations are that, achieving an improved performance in an organisation and company engaging high managerial and technical competence staff are catalyst of achieving competitive advantage. The global competitive environment has equally called for high productivity achievement.

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In a weak economy, cost audit programmes need to be introduced in order to assist in improving behavioural aspect of cost awareness.

Review of literature

The audited financial reports are globally regarded to portray reliable financial details of any organisation. The chartered institute of management accountants, London defines audit as systematic examination of the activities and status of an entity, based primarily on investigation and analysis of its systems, controls and records. The audited documents are therefore deemed to reflect operational performance of an organisation. However, there have been conflicting opinions over the acceptability of such vital documents. This is because with the drastic fall in share prices of many organisations, the report of some banks failure, the closure of some manufacturing operations in Nigeria, and the collapse of the American energy giant Enron, investors have lost confidence in financial auditing carried out by the reputable auditing firms in different countries.

Considering the financial crime, which auditors fail to discover during the audit assignment, it is possible to assume auditors are to be held liable for the inability to discover fraud, however, since auditors based their judgment on the information presented before them by the management and on scope of audit assignments, it follows that auditors cannot be held liable for the activities not covered by the audit task. The auditors are not responsible for the information in the financial statement. This is because management prepares the statements. Therefore, management is responsible for the information disclosed in the financial statements. As part of the audit task, the auditors is primarily responsible to perform and obtain reasonable assurance in connection with whether the financial statements are free from material misstatement, and that an audit provides reasonable assurance but not absolute, assurance of detecting material mis-statement of the financial statements (Whittington and Pany, 2004).

The auditor is not to audit beyond the information contained in the financial statements. He should operate within the scope of the tasks assigned to him. In line with this presentation, Messier et al. (2006) are of the view that the auditor has no responsibility beyond the financial information contained in the report, and he or she has no obligation to perform any audit procedures to corroborate the other information. He however pointed further that, the auditor is required to read the other information and consider whether such information is consistent with the information contained in the financial statements.

One of the means by which a firm can be improving its operational performance from time to time is to establish a reliable cost management system. Thus, a firm that is inefficient in its resources utilisation will be producing at an unfavourable cost. Efficient firm therefore should

establish an adequate control in its operational systems. One instrument, by which a firm can determine its level of efficiency of resources utilisation in fraudulent and weak legal systems, is to regularly carry out cost audit. This type of audit work has remained popular in India for a long time, and has proved beneficial to the economy in terms of relying on cost data presented by the manufacturing firms. It also paves the way for achieving both operational efficiency and keen competition

The management accounting official terminology (2005) defines cost audit as "The verification of cost records and accounts and a check on the adherence to prescribed cost accounting procedures and the continuing relevance." The institute of cost and works accountants of India (ICWAI) identifies cost audit to be an audit of efficiency of minute details of expenditure while the work is in progress and not a post-mortem examination.

From the definition, the attributes of a cost audit where reliable cost accounting procedures are already designed for the firm are given below:

1. Verifying that cost records are in line with the prescribed cost accounting procedures for the firm
2. Detecting of errors and prevention of frauds.
3. Reporting on finding on the outcome of the cost audit carried out and to give suggestions where necessary.
4. Examining the relevance of the costing procedures designed for the organisation in order to determine whether there is a need to further improve such procedures in line with the organisational changes and development that have taken place.
5. Assists in cost-plus contracts.

The form of the report as specified in the cost audit (Report) rules in India, as amended in 2001, States that:

1. Every cost auditor who conducts an audit of the cost accounting records of the company shall submit a report in triplicate to the Central Government.
2. Every cost auditor, who submits a report, shall also give clarifications, if any, required by the central government on the cost audit report submitted by him, within thirty days of receipt of the communication addressed to him calling for such clarifications.

The requirement of submission of cost audit report to federal government reduces manipulation of cost items by the management. For a cost audit task to be effectively carried out, a firm should engage the services of a cost consultant in designing its cost accounting procedures or give the responsibility to the firm's cost accountant to execute the same.

Sikka (2003) points out the objectives of cost audit to include the following:

1. Verify that cost accounting records are accurate.
2. Certify that costing principles have been fully adhered

to in maintaining cost accounts.

3. Disclose the deficiencies or inefficiencies in the use of materials, labour, and machines, with a view to assist the management.

4. Check whether each item of expenditure involved into the relevant components of goods manufactured has been properly incurred.

Cost audit as a continuous process

Unlike financial audit that is concerned with the audit of past operations and covered a specified period, cost audit in its own case is carried out to audit the current operations and to compare the results with the past cost audit results. The cost audit task is executed on a continuous basis. The continuous audit of current operations carried out by cost auditors assists the firm to control cost and embark on cost reduction where possible.

Forms of cost audit

The two forms of cost audit are;

- (1) Performance or efficiency audit
- (2) Propriety audit

Performance audit: This form of cost audit is also known as efficiency audit: Its main objective focuses on whether the plan has been efficiently executed. It goes further to find out the extent to which the actual performance conforms to plan, which either results to favourable variance or unfavourable variance. The important consideration of efficiency audit is that it assists resources to be directed to the right channel thereby ensuring return on capital employed (ROI), is optimised. The assignment of efficiency audit commences from trying to study the plan. During the course of an investigation, the efficiency audit tries to identify whether labour remuneration including the incentive scheme designed for the firm is justified with the productivity put up by workers. It also tries to check the efficiency of material utilisation in the producing unit. Because of these foregoing tasks, efficiency audit is equally termed as profitability audit.

Propriety audit: This aspect of audit pertains to investigation of certain plans and actions taking by the management regarding the finances and expenditure of an organisation in order to be sure that such plans are not faulty and the actions taken are in the interest of the organisation for achieving optimum returns. The bone of contention in property audit is that expenditure incurred by the management in line with the approved plan is not

a condition to assume that right decision has been executed unless the plan itself is considered appropriate. Because of the complex nature of property audit in determining whether correct plan was approved and right action was also taken, it is important that cost auditor finds out the extent to which:

1. Each approved expenditure would bring an optimum benefit to the firm
2. The approved plan is in line with the organisational goal
3. An alternative is considered more superior than the approved plan.
4. The expenditure approved and incurred is considered to be excessive.

Major diversities between financial audit and cost audit

In Nigeria, companies act is concerned with statutory audit w. This is different from the audit of cost accounts by internal or external persons appointed by the management. The major diversities between financial audit and cost audit are summarised below:

1. Audit of financial accounts is carried out on the past records to ensure expenditure incurred and sales generated were properly recorded. For this reason, financial audit is considered as a post- mortem check. On the other hand, cost audit is conducted on current operations, and compile the past audit results.
2. Financial audit is conducted on a specified past period agreed upon whereas no time limit for conducting cost audit assignments since its operations are continuous.
3. Financial audit is concerned with correct recording of expenditure and income to ensure they were not under or over recorded. However, cost audit emphasises on efficiency of executing plan and ascertain whether the plan approved by the management are in the interest of the organisation and go further to find out whether optimum returns have been achieved from the plans executed. It also finds out whether alternative plan would have been better off.
4. Financial audit is concerned with verification of financial records while cost audit tries to verify cost accounting records.
5. The assignment of cost audit extends to determining what should be the correct production and total cost whereas financial audit does not extends to such vital area.

Designing a cost audit programme

A cost auditor needs to design a cost audit programme for the organisation that is to be audited if he intends to

carry out a reliable and comprehensive cost audit assignment. A cost audit programme designed for a particular organisation may need to be updated or adjusted if it will be used to audit another organisation. Moreover, the complexity of an audit programme depends on the nature of the organisation to be audited, size, method of operations, types and numbers of products turned out, the effectiveness of internal control designed and used. A cost auditor must ensure that the scope of cost audit programme designed covers efficiency and propriety audit. It is significant to note that cost audit programme designed should be flexible to take care of likely changes or new operational tasks that management introduces from time to time.

A good cost audit programme should:

1. Cover relevant costing areas.
2. Provide a scientific procedure of recording the task performed.
3. Be able to identify the likely operational inefficiency that exists.
4. Be cost efficient and be able to reduce cost audit time.
5. Provide a good methodological approach in carrying out a cost audit task.
6. Be drawn in such a manner that will be possible to determine the significance of each cost item and will be able to compare the actual expenditure with the budgeted figures and be able to identify variances that exist.
7. Be able to avoid or minimise the possibility of omitting the significant cost audit test being carry out.

Cost audit programme designed should incorporate fraud prevention at each of the hierarchical structures otherwise, the goal of achieving a desirable unit cost that high level of performance will be difficult to achieve. Albrecht et al. (2008) are of the view that taking steps to create and maintain a culture of honesty and high ethics are part of the fundamental activities of fraud prevention.

Important areas of focus in cost audit programme

Even though requirements of a cost audit assignment differ from one organisation to another, it is mandatory that a cost auditor should identify and examine the following areas of focus in his cost audit programme:

1. The cost accounting system designed for organisation, and its degree of suitability or adequacy.
2. The frequency of cost audit required in each year of operation. This definitely depends on some factors such as size and methods of operations, nature and different types of product turned out.
3. Regularly reviewing of innovation introduced to the management plan and cost accounting system.
4. The nature and objective of cost audit to be carried out.

5. The cost control introduced to the entire operational system.
6. The effectiveness of the internal control system.
7. The scope of planning and maintenance units.
8. The organisation charts and manuals.

METHODOLOGY

Data utilised for this research were from both primary and secondary sources. In ensuring high validity of the primary data, questionnaire and interview methods were employed. The interviews conducted in the selected firms were directed to the managers in the relevant departments of some selected reputable manufacturing organisations in Nigeria, which include engineering unit, quality assurance unit, planning unit, purchasing unit, factory section and accounting unit. The questionnaires were mainly distributed to both the foremen in the factory and the factory workers. The secondary source makes use of available price lists of raw materials from major suppliers and as well find out the competitive remuneration packages payable in different types of manufacturing industries. The other categories were the selected investors in the public, retailers and the final consumers. Interviews were the only means of source of data collected for the three latter categories. The primary data collected were descriptively analysed. On the other hand, data gathered through secondary source were analysed through description, comparing with the competitors products quality, costs and pricing strategy, management capability, number of employee, technological innovation introduced, goals achieved.

Period of the research: The research covers a period of three years, commencing from year 2010 and ending year 2013

Findings

Generally speaking, in preparing financial statements, it is assumed that directors are deemed to be honest in their dealings that are associated with managing the business on behalf of the shareholders. But how far this assumption has remained reliable in Nigeria? Unfortunately, it is often observed that financial statements prepared by the company's directors are misleading and are found not reliable simply because of errors of principles committed by the so called directors. The distortion of financial statement arises as a result of manipulation of records of transactions carried out by the firm. The degree of financial statement fraud differs in different organisation. The outcome of investigation conducted clearly indicates that the shareholders and the general public in Nigeria no longer trust the records of financial transactions published in form of financial reporting or annual reports.

Cost accounting focuses on operational efficiency of the firm, by trying to estimate reliable operational cost in advance of production and thereafter establishes cost control by comparing the actual operational results with the estimated figures (Iwarere 2004). In arriving at the estimated operational figures, cost accounting takes into consideration only normal cost and exclude completely

abnormal cost. Thus, the excessive costs incurred are written off to profit and loss account as against charging them to work in progress control account and finally transferred to finished goods control account when the goods are produced in the factory. Cost audit is concerned with the propriety and efficiency audit, unlike financial audit, cost audit tries to audit management plan and ensure no excessive cost is built into the plan figures.

The finding from the interview conducted with the companies' managers revealed that companies keep reliable transaction records. Hence, the view of the companies' managers is that company's financial statements are reliable. In spite of the foregoing findings some of the managers express that even though financial statements are reliable. It is still possible to identify errors committed because of large daily transactions carried out by the companies and the associated human problems identified. Managers in charge of internal control built into the system pave the way for a reliable financial statement, but insufficient statements generally lead to involvement of suspense accounts that may be corrected in the later period. Some of the managers operating outside accounting units agreed that they are not sufficiently knowledgeable about the information disclosed in the financial statements and that they were non familiar with few of the terms used in the financial statements. However, purchasing managers denounced the possibility of overstatement of expenditure in the financial statements because all expenses to be incurred and any payment to be made must pass through expenditure control procedure. Hence, existence of fraud is always kept minimum if at all exist.

The internal auditors as well as other departments in charge of the preparation of financial statements are of the view that cost audit will only lead to duplication of audit assignment and that it will further lead to delay and augment cost spending. Thus, by assessing the views of the manager employed in the organisations, it is evident that fear of not losing their jobs could not enable them to be independent of expressing any possibility of fraud. They expressed that the establishment of a reliable internal control system in the organisations assists in achieving high operational performance.

However, the interview conducted to the factory workers produced contrary result as they were dissatisfied with the manner in which organisations are been managed. Most focus on job insecurity, low pay and high level of embezzlement. They expressed that financial statements are produced by the management, and the auditors are also appointed by the management hence it is not possible to rely on the information disclosed by the management in Nigeria.

The interview conducted to the retailers and consumers brought out different views, but majority views are in line with what the view of the factory workers and other junior

staff of organisations visited. The retailers expresses that demand is not encouraging because of high level of poverty in the country. Approximately 25% of the retailers interviewed claimed that since they have some reasonable knowledgeable about price list of raw materials, it appears the price list of the manufactured goods are excessive. Majority of the retailers could not comment on the information disclosed in the financial statements but at the same time express dissatisfaction on the insufficient market demand.

The interview conducted to the consumers at the point of purchases which were mostly directed to the educated elites expresses that in spite of the auditor's reports presented on a yearly basis, there is still a high level of corruption, and that, since corruption is widely spread in the country and has become a way of life, introducing any other form of audit, whether involving cost audit or other form will not help in removing misstatement of financial statement. Approximately 60% of the consumer interviewed expressed that most directors operating in both public and private sectors are politicians, some of them cited example of the directors or their equivalent in both private and public sectors that are actively involved in politics and those that have been given high portfolio position after their retirement from office. The consumers equally expressed that even those that are yet to become directors will behave in similar corrupted manners if they get there because of high level of corruption in the country and high poverty rate. Their view is that leaders in the country use illegal wealth acquired to oppress the poor. Finally, approximately 90% of the consumers interviewed regretted that no economic theory work in Nigeria because of leadership problem.

The outcome of the interview conducted with the investors in the general public indicates that most organisations have not been paying cash dividend. They expressed that the high market price they purchased company shares before the outcome of share crash is a major disaster to them. Thus, by implication, stock exchange is to be held liable for the overprice market share. The investors also expressed that reports of the misappropriation of funds committed by the Nigerian directors are high and many directors of the public liability companies have big businesses on their own and this account for their extravagant spending. They at the same time expressed that in spite of the reports from the independent corrupt practices commission (ICPC), economic and financial crimes commission (EFCC), media houses that revealed their mismanagement and excessive private spending nothing serious happen. Since the investors were selected from the general public, their views focus more on the continuous bank failure. Thus, the respondents are of the view that introducing cost audit will not change the system because there is high level of corruption in both private and public establishment.

DISCUSSION

The financial statement prepared by the directors ordinarily should reflect correct operational performance in notable organisations whether private or public. There are records of internal control system introduced by all the large organisations, including those of public sectors organisations, but in spite of this control, there are records of mismanagement in different sectors of the economy.

There exist rapid financial institutional and manufacturing failures in the last two decades. Most of these misfortunes are attributed to the policy makers in both private and public sectors. For instance, most of the records of bank failure in Nigeria are always traced to the illegal transfer of huge funds out of the bank to personal use. In spite of mergers that takes place from time to time and increase in capitalisation of bank. Many middle managers put up their best in terms of efficiency, but the key policy makers which may either be the managing director or combination of key personnel have been identified to continually destroying the organisations. There seems to be complete lack of trust in the manner in which organisations are being managed. This same ugly situation is not limited to the financial institutions alone but equally widespread in the manufacturing and other sectors of the economy. The most disturbing aspect is the corrupt practices that are rampant in the public sector of the economy and the policy makers for the country are not helping situation as well.

The external auditors operate within the scope of information presented to them by the management. The internal auditors are insiders to the organisations. There is a weak legal system in the country because the court is not functioning independently. This pave the way for high economic mismanagement that accounts for high level of corruption in the country. The low current and constant power failure in the country is not the only factor responsible for the reduction in the capacity utilisation in the public limited companies owned by foreign firms, but the high level of corruption of: the indigenous directors, other management personnel, and other categories of staff form major reason for deciding to transfer some production activities to the neighbouring country.

Cost audit aims to address the issue of mismanagement of the company's funds. It tries to achieve the costing objectives of high level of operational efficiency though establishing adequate cost control systems into the organisation. Unlike the external audit that is backward oriented in nature. Cost audit is concerned with engaging on daily audit of operational activities when the operations are in progress and not later. Moreover, in cost audit, there is no limit to areas of coverage as applicable to the external audit, which depends on the information presented to the auditors by the management. Thus, cost audit carried out both

performance and propriety audit. To what extent can the goal of cost audit be achieved towards accelerating economic development in a highly corrupt environment, where there is a weak legal system in the country? Unless there is faithfulness on the part of the governments and their agents, it is not likely that the unfaithfulness practices in both the public and private sectors can be checked. This is because in any country, authority flows from the government to the lower levels, which are the public and private sectors establishments. However, the unfaithfulness attitude has become a conventional practice in Nigeria.

There is high level of improper placement in different organisations and promotional policy adopted in many occasion is not based on merit. Unless a particular staff belongs to the core group or has a god father, even though the person is highly efficient and satisfies other promotional criteria, after getting to certain level, promotion becomes difficult. Also, the possibility of unjustifiable retrenchment exercise carried out from time to time without payment of compensation become eminent. Considering the high level of poverty and unemployment in the country majority of workers in different organisations including those working in the public sector organisations decide to padlock their mouth in order to safeguard their jobs. Company performs badly where personal interests of any of its top, middle and lower managers conflicts with the organisational objectives and that the extent to which this negative attitude affects the organisational performance strongly depends on the position held by thee affected individual. Iwarere (2009) expressed that:

Management should consider skill, educational background, efficiency, innovative ability and experience for placement and promotional exercise.

He stretches further that it is worthwhile for leaders to adopt promotion policy that leads to the improvement of productivity. This is because promotion of empty brains affects development of an organisation in that when such personnel get to the top, they uplift other incompetent personnel and as well find means of impairing the efforts of the competent and efficient personnel because of the possible threat to the inefficient leaders. The foregoing should generally be the characteristics of private sector organisations, which was noticed in the past in Nigeria, but with the economic hardship, together with high level of corruption that spread across the country, the situation has completely changed. Many published financial reports are window dressed.

Thus, in view of the improper leadership style in the country and in different organisations within the country, there seems to be difficulty in introducing any other type of audit that will lead to the organisations performing to expectation without first revisiting, and as well, change

the leadership style mentioned in the foregoing. If government decides to eventually recommend cost audit for both public limited companies and government establishments, the government should ensure the following requirements are satisfied:

1. A qualified cost auditor should be appointed by a particular public liability company to carry out the cost audit task.
2. The audit assignment must cover efficiency and propriety audits.
3. Management must be mandated to release necessary documents to the cost audit task and will be made liable for withholding required information.
4. The cost auditor so appointed should operate independently from the management.
5. Every Cost Auditor who conducts an audit of the cost accounting records of the company as well as those relating government establishments is to be mandated to submit a report in duplicate to the federal government of Nigeria.
6. There should be federal government publications on cost audit reports, twice a year.
Each company, where cost audit task is carried out, should equally publish its cost audit report, separately in a well circulated newspaper in the country.
7. Cost auditor is to be made liable with adequate penalty for the reports generated by him.

Based on this major discussion in the above, it is suggested that, there is a need for the government to introduce cost audit task to cover both the public sector and the public limited companies in the country in order to improve performance.

Conflict of interest

The author has not declared any conflict of interest.

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Full Length Research Paper

Modeling the marketing effect and establishment decision of experience stores

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Methods of contacting customers are constantly evolving. An increasing number of manufacturers have established experience stores, plazas or centers that provide marketing, education and trade functions to enhance business performance. This paper develops integer programming models to analyze the experience store establishment decision. Demand functions, cost parameters and firm learning curves that impact on the experience store decision are also examined. In addition, this paper provides two case studies to validate the proposed experience store establishment models. Three proposed models can assist managers in developing marketing strategies related to the experience store establishment.

Key words: Experience stores, integer programming, marketing.

INTRODUCTION

More companies are spending less of their marketing budgets on traditional media, preferring to employ other marketing tools instead. One new marketing tool that many firms have used is the "experience store". These stores are designed to teach consumers how to use merchandises, or let consumers experience manufacturing process and business philosophy. For example, Amway, a global leader in multi-level marketing, has combined the functions of the logistics center, production process and customer experiential service to establish experience centers worldwide. Similarly, AT&T experience stores offer consumers a one-stop shop for all their information technology and entertainment connectivity needs. In this study, the definition or function of an experience store include a general showroom supplying the product information, and is also a place where the

shopper can experience and buy the products. Experience stores not only benefit manufacturers' consumer experience programs, but also enhance trade and exhibition functions and the branding image of firms.

Related to the issue of the experience store establishment is the retail location decision. Numerous scholars have developed retail location theories and models to help managers decide on the retail location.

In particular, the gravity model and retail attraction theory with many consumers and suppliers have been studied (Huff, 1964; Roy and Thill, 2004; Santos et al., 2007); they are used to explain the behavior of these groups, and are thus appropriate as a partial theory base for the experience store establishment decision. Moreover, scholars have derived some marketing or advertising models which indicate that marketing activities

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have an important effect on sales, especially through media choices (Kaufman and Rangan, 1990; Schneider et al., 1998; Farias et al., 2014). Though, consumers learn more about products in an experience store, the advertising concept and marketing effect are similar to those media such as television or newspaper ads. Finally, the mathematical optimization models have been used in the retail location analysis. In particular, the non-linearity assumption and/or zero-one variables are often employed (Reilly, 1931). In this study, we apply integer programming to formulate the experience store establishment decision.

The objective of this study is to use integer programming to investigate the experience store establishment decision and allow manufacturers to evaluate its marketing effect. This study will contribute to the marketing literature through the proposed experience store establishment models. This paper is organized as follows. Section 2 discusses the development and application of location models and the marketing perspectives on experience stores. Section 3 states the model assumptions and notations, and derives three integer programming models. Section 4 provides two case studies. Finally, section 5 concludes this paper.

THEORETICAL BACKGROUND AND APPLICATION

The retail location theories and marketing perspectives on experience stores are relevant to this study. We provide a brief literature review below.

Retail location theories and models

It is important for a firm to think of the location strategy for its long-term development. Important retail location theories and models discussed by scholars include the land value theory (Haig, 1926), the spatial interaction theory (Roy and Thill, 2004), and the market area model (Dasci and Laporte, 2005). In short, these retail location theories emphasize the importance of specific sites, market area size, space, nature, population, distance and attractiveness in the retail location decision. There are also construction methods for location decision which include the gravity model (Reilly, 1931; Huff, 1964), the portfolio location model (Mahajan et al., 1985), regression methods and location-allocation models (Timor and Sipahi, 2005). Another method, the judgmental approach (Blattberg and Hoch, 1990), has been successfully applied to location decision, advertising budget allocation and marketing mix planning (Urban, 1970; Durvasula et al., 1992; Küçükaydin et al., 2011).

Of the above location theories and models, we consider the gravity model as being appropriate for planning the establishment of experience stores for a manufacturing firm. In Reilly's model (1931), consumers shopped a retail

store closer to home without knowing any advantage of other alternative stores. Huff (1964), Bell et al. (1998) and Taylor et al. (2006) further examined some additional attraction factors that can induce consumers to travel further. In Huff's (1964) and Santos-Peñate et al.'s model (2007), attraction a_{ij} perceived by customers located at node v_i towards a facility sited at x_j , is inversely proportional to a power of the distance between v_i and x_j . Spatial interaction models, which can be grouped under the generic heading "gravity models," concern the process whereby entities at different points in physical space make contact, make demand/supply decisions, or make location choices (Roy et al., 2004). Aboolian et al. (2007) considered a spatial interaction model for locating a set of new facilities that compete for customer demand with each other. The contribution of their work is the study of a discrete facility location problem with concave (non-decreasing) demand and presence of market expansion, and the development of efficient solution techniques which are applicable to a class of linear separable integer programming problems.

In this study, experience stores built by a firm, which provide full-line branding products, are considered to have higher attractiveness to consumers in comparison to general retailer stores. Also, once experience store attractiveness is determined, it can be used in the model. The above gravity models and retail attraction theory reviewed provide a partial theoretical basis for a firm to analyze its experience store establishment decision.

Marketing perspectives on experience stores

In addition to acting as a marketing medium like general retail stores, experience stores can provide experiential marketing and values. Pine and Gilmore (1999), and Petkus (2004) outlined six key steps of experience marketing and Mathwick et al. (2002) suggested that experiential value perceptions are based upon interactions involving either direct usage or distanced appreciation of goods and services. Educational and knowledge transmission features are the major experiential values of experience stores. Firms usually use advanced information technologies and interactive services in experience stores to elaborate on the history of the company, introduce the usage methods of products, exhibit the manufacturing process, and solve consumer queries with professional product knowledge. In this way they obtain consumer confidence or product testing interest, and thereby increase sales and profits.

An experience store can carry multiple distinct product lines, while advertising usually promotes either a small number of product lines or an overall brand image. In practice, experience stores not only play a sales role, but are also expected to be an effective advertising medium and marketing promotion tool. The best location will maximize the firms' financial performance net of the

additional investment in advertising (Schneider et al., 1998). A good location with vivid features creates a “brand demand” effect, as well as “system attractiveness or relative preference for the brand” (Kaufman and Rangan, 1990). Moreover, brand trust and brand effect leads to more brand outcomes, such as a higher sales-to-advertising ratio (Chaudhuri and Holbrook, 2002). In academia, Ghosh et al. (1995) discussed computational difficulties associated with competitive location problems under the assumption of discrete demand. Vilcassim et al. (1999), assuming a linear and separable demand function, built a demand-cost model with production and advertising costs, and discussed the nature of firm interaction with customers through some conduct parameters.

The most commonly used function for representing a downward-sloping price (p) versus demand (d) relationship is of the linear form ($d = a - bp$). This function is introduced in many standard economics textbooks. Tellis (1988) conducted a meta-analysis study of models estimating the price elasticity of demand for various products and found that the mean price elasticity of demand is significantly negative. Also, Brodie and Kluyver (1984), Ghosh et al. (1984), Naert and Weverbergh (1981) and Gaur and Fisher (2005) investigated price elasticity issues using different datasets and pricing models. Besides cost-based and market-based pricing methods, market experiments can serve as useful scientific tools for firms to get a better understanding of consumer response to the use of marketing activities such as pricing and promotions, as well as new demand functions after the establishment of experience stores.

Therefore, based on the gravity model, retail attraction theory and marketing perspectives, we suggest a decision variable, the “number of experience stores established by a manufacturing firm,” in our models. We suppose that the establishment of experience stores will have the marketing effect of attracting potential consumers. The demand curve of a firm incorporated with the decision variable of the number of experience stores established is a concave function. If firms can estimate their demand functions and the effect of experience stores on sales, and solve the proposed models, then the maximum profit may be obtained.

Our models also take into account the learning curve associated with the cost of operating an experience store. The original use of learning curves was to help predict the reduction in costs as the number of units produced rose (Chamber and Johnston, 2000). By combining the effect of various factors (example, labor learning and efficiency), managers can decrease unit cost and thereby reduce prices. As such, in this study, we assume that the greater the number of experience stores established, the greater the accumulation of management experiences, and the greater the cost reduction for subsequent store operations.

MODELS AND NOTATIONS

We make two assumptions before developing models. First, firms can estimate the demand function of a product that is assumed to be linear (before the establishment of experience stores) and additive in the number of experience stores (considering the attractive and marketing effects). Second, too many experience stores will decrease the marginal utility of the marketing effect, thus causing a limited increase on sales volume. Hence, the additional sale volume created via experience stores will be expressed using a concave function (as described in Table 1). The notations used in the models are as follows.

Model 1

In our study, model 1 is a simple model that does not incorporate the effect of learning curves. Before developing the experience store establishment model, a firm can obtain D_{0ij} based on, for example, market surveys, which equals $b_{1ij} - b_{2ij} * P_{ij}$, i.e.,

$$D_{0ij}(P_{ij}) = \begin{cases} b_{1ij} - b_{2ij} P_{ij} & \text{if } P_{ij} \leq \frac{b_{1ij}}{b_{2ij}} \\ 0 & \text{otherwise} \end{cases}$$

The D_{aij} , demand after building experience stores, equals $b_{1ij} - b_{2ij} * P_{ij} + c_{1ij} * X_i - c_{2ij} * (X_i)^2$, which is nonlinear (concave) in the number of experience stores. This is due to the above assumptions. Also, as experience stores may enhance the brand image, we treat product prices as decision variables (though, in our case studies, product prices are fixed as suggested by firms). Hence, we can model the decision problem of how many experience stores to establish as follows:

$$\text{Maximize } \pi = \sum_{i=1}^m \sum_{j=1}^n [P_{ij} D_{aij} - UC_j * D_{aij}] - \sum_{i=1}^m TFC_i * X_i$$

Subject to:

$$D_{aij} = b_{1ij} - b_{2ij} P_{ij} + c_{1ij} X_i - c_{2ij} (X_i)^2 \quad j = 1, \dots, n; \quad i = 1, \dots, m$$

$$X_i \leq r_i \quad i = 1, \dots, m$$

$$X_i \geq 0, \text{ integer}, \quad \forall i$$

$$\text{Maximize } \pi = \sum_{i=1}^m \sum_{j=1}^n [P_{ij} D_{aj} - UC_j * D_{aj}] - \sum_{i=1}^m TFC_i * X_i$$

Subject to:

$$D_{aj} = b_{1ij} - b_{2ij} P_{ij} + c_{1ij} X_i - c_{2ij} (X_i)^2 \quad j = 1, \dots, n; \quad i = 1, \dots, m$$

$$X_i \leq r_i \quad i = 1, \dots, m$$

$$X_i \geq 0, \text{ integer}, \quad \forall i$$

Model 2

Model 2 is a decision model for establishing experience stores incorporating the learning effect. Lieberman (1987) defined the learning effect: $y = ax^{-b}$ where

- y Cost of producing the X^{th} unit.
- a Cost of producing the first unit.
- x Cumulative number of units produced.
- b Parameter measuring the effect of learning as output increases.

As explained in Section 1, we observe that the cost of establishing an additional experience store may decrease as more stores are built. Hence, we apply the above learning concept to model the experience store establishment. The TFC_{ik} , estimated cost of establishing k^{th} experience store in region i , will decrease as an increasing number of experience stores are established in a region. The values of α_i and β_i in the first constraint are estimated by a firm. The second constraint is due to the fact that if a firm does not build k^{th} experience store in region i , it will not build $(k + 1)^{\text{th}}$ experience store in that region. Accordingly, model 2 is given by

$$\text{Maximize } \pi = \sum_{i=1}^m \sum_{j=1}^n [P_{ij} D_{aij} - UC_j * D_{aij}] - \sum_{i=1}^m \sum_{k=1}^{r_i} TFC_{ik} * Y_{ik}$$

Subject to:

$$TFC_{ik} = \alpha_i (kY_{ik})^{-\beta_i} \quad k = 1, \dots, r_i$$

$$Y_{i(k+1)} \leq Y_{ik} \quad k = 1, \dots, r_i, i = 1, \dots, m$$

$$D_{aij} = b_{1ij} - b_{2ij} P_{ij} + c_{1ij} X_i - c_{2ij} (X_i)^2 \quad j = 1, \dots, n; i = 1, \dots, m$$

$$X_i = \sum_{k=1}^{r_i} Y_{ik} \quad i = 1, \dots, m$$

$$X_i \geq 0, \text{ integer}, \forall i$$

$$Y_{ik} \in \{0, 1\}, \forall i, k$$

$$\text{Maximize } \pi = \sum_{i=1}^m \sum_{j=1}^n [P_{ij} D_{aij} - UC_j * D_{aij}] - \sum_{i=1}^m \sum_{k=1}^{r_i} TFC_{ik} * Y_{ik}$$

Subject to:

$$TFC_{ik} = \alpha_i (kY_{ik})^{-\beta_i} \quad k = 1, \dots, r_i$$

$$Y_{i(k+1)} \leq Y_{ik} \quad k = 1, \dots, r_i, i = 1, \dots, m$$

$$D_{aij} = b_{1ij} - b_{2ij} P_{ij} + c_{1ij} X_i - c_{2ij} (X_i)^2 \quad j = 1, \dots, n; i = 1, \dots, m$$

$$X_i = \sum_{k=1}^{r_i} Y_{ik} \quad i = 1, \dots, m$$

$$X_i \geq 0, \text{ integer}, \forall i$$

$$Y_{ik} \in \{0, 1\}, \forall i, k$$

Model 3

It is possible that a firm establishes at most one experience store in each region. Model 3 considers this case. Now, $Y_{ik} = 1$ if an experience store at instant (order) k is open in region i , and TFC_i is divided into two components: TFC_i and ETC_i . In practice, the various costs of experience store establishment include land and building costs (rented or purchased), interior design costs (high quality decoration with high material costs), education and training costs, and employee costs. TFC_i is now defined as the cost (such as land, building and rental cost) of establishing an experience store in region i , which is difficult to reduce (due to traffic convenience and a large space required). However, the store design, interior cost, and education and training cost in region i , which comprise ETC_i , may be reduced through a comprehensive education system and specific guidelines. ETC_i suitably describes the learning effect and may be thought of as the cost of operating an experience store in

$$ETC_i = \alpha_i \left(\sum_{1 \leq k \leq m} kY_{ik} \right)^{-\beta_i}$$

region i , i.e., α_i is the cost of establishing the first experience store in region i , while β_i measures the rate of the decrease in ETC_i as an experience store in other regions is built. ETC is the sum of ETC_i . Moreover, we need to impose two additional constraints below: constraints (1) mean that only one experience store can be open at instant k . Constraints (2) imply that at most one experience store can be open at any region. Thus, the number of experience stores built in

$$X_i = \sum_{1 \leq k \leq m} Y_{ik}$$

region i is X_i . Hence, model 3 can be expressed by

$$\text{Maximize } \pi = \sum_{i=1}^m \sum_{j=1}^n [P_{ij} D_{aij} - UC_j * D_{aij}] - \sum_{i=1}^m (TFC_i * X_i) + ETC$$

Subject to:

$$ETC_i = \alpha_i \left(\sum_{1 \leq k \leq m} kY_{ik} \right)^{-\beta_i} \quad i = 1, \dots, m$$

$$ETC = \sum_{i=1}^m ETC_i$$

$$X_i = \sum_{1 \leq k \leq m} Y_{ik}$$

$$D_{aij} = b_{1ij} - b_{2ij} P_{ij} + c_{1ij} X_i - c_{2ij} (X_i)^2 \quad j = 1, \dots, n; i = 1, \dots, m$$

$$X_i \geq 0, \text{ integer}, \forall i$$

$$\sum_{1 \leq i \leq m} Y_{ik} \leq 1, \quad k = 1, \dots, m \quad (1)$$

$$\sum_{1 \leq k \leq m} Y_{ik} \leq 1, \quad i = 1, \dots, m \quad (2)$$

Table 1.

Model Parameters	
D_{0ij}	Estimated original demand volume of branding product j in region i .
D_{aij}	Estimated demand volume of branding product j after setting experience stores in region i .
TFC_i	Estimated cost of establishing one experience store in region i .
TFC_{ik}	Estimated cost of establishing k^{th} experience store in region i .
ETC_i	The store design, interior cost, and education and training costs in region i .
UC_j	Unit cost of branding product j of a firm.
α_i	Cost of establishing the first experience store in region i .
β_i	Parameter measuring the rate of the decrease in establishment cost as more experience stores are built in region i .
b_{1ij}, b_{2ij}	Demand function coefficients of branding product j in region i measured by a firm. b_{1ij} and b_{2ij} are assumed to be greater than zero.
c_{1ij}, c_{2ij}	Coefficients for the number of experience stores in D_{aij} , which are measured by a firm. c_{1ij} and c_{2ij} are assumed to be greater than zero.
r_i	The largest possible number of experience stores established for branding products in region i . r_i is equal to the integral part of the minimum value of $c_{1ij}/2c_{2ij}$ (over j) in region i .
m	Number of regions considered by a firm.
n	Number of branding products provided for sales by a firm.
Decision variables	
P_{ij}	Product price of branding product j in region i .
X_i	Total number of experiences stores set for branding products in region i .
Y_{ik}	The decision to set ($Y_{ik} = 1$) or not set ($Y_{ik} = 0$) k^{th} experience store in region i .

$$\text{Maximize } \pi = \sum_{i=1}^m \sum_{j=1}^n [P_j D_{aij} - UC_j * D_{aij}] - \sum_{i=1}^m (TFC_i * X_i) + ETC$$

Subject to:

$$ETC_i = \alpha_i \left(\sum_{1 \leq k \leq m} k Y_{ik} \right)^{-\beta_i} \quad i = 1, \dots, m$$

$$ETC = \sum_{i=1}^m ETC_i$$

$$X_i = \sum_{1 \leq k \leq m} Y_{ik}$$

$$D_{aij} = b_{1ij} - b_{2ij} P_j + c_{1ij} X_i - c_{2ij} (X_i)^2 \quad j = 1, \dots, n; i = 1, \dots, m$$

$$X_i \geq 0, \text{ integer}, \forall i$$

$$\sum_{1 \leq i \leq m} Y_{ik} \leq 1, \quad k = 1, \dots, m \quad (1)$$

$$\sum_{1 \leq k \leq m} Y_{ik} \leq 1, \quad i = 1, \dots, m \quad (2)$$

In our study, model 2 involves a sequential establishment process (as indicated by the second constraint) where the learning effect is shown as a reduction in the establishment cost, while model 1 represents a situation equivalent to the simultaneous establishment of facilities. In model 3, a firm establishes, at most, one experience store in a region. Hence, depending on the situation faced when establishing experience stores, a firm can use model 1, model 2 or model 3 for its establishment

decision. The proposed model architecture is depicted in Figure 1.

CASE STUDIES

The current trend of Taiwan manufacturers is to build experience stores to enhance the marketing effect and business performance. Taiwan industry examples of experience stores established include farm producers, staple goods producers (example, soy-bean sauce) and traditional and consumer-end industries. The decision-making process associated with Taiwan manufacturers for building experience stores is often managed by an investment or marketing team, and then approved by the chief of the firms. To validate experience store establishment models, interviews were conducted with the general manager of BlueApple (GroundJay Digi-Tec: Apple Taiwan agency) and with the distribution director of Amway Taiwan company Limited. The two cases are very different. In the Apple case, the stores play both the function of selling and experience. Thus, analyzing the marketing effect of experience stores is very important. In the Amway case, the main selling channel is through recruitments. Hence, the main goal of Amway for building experience stores is to increase new recruits.

Case A

The Apple store is a chain of retail stores owned and

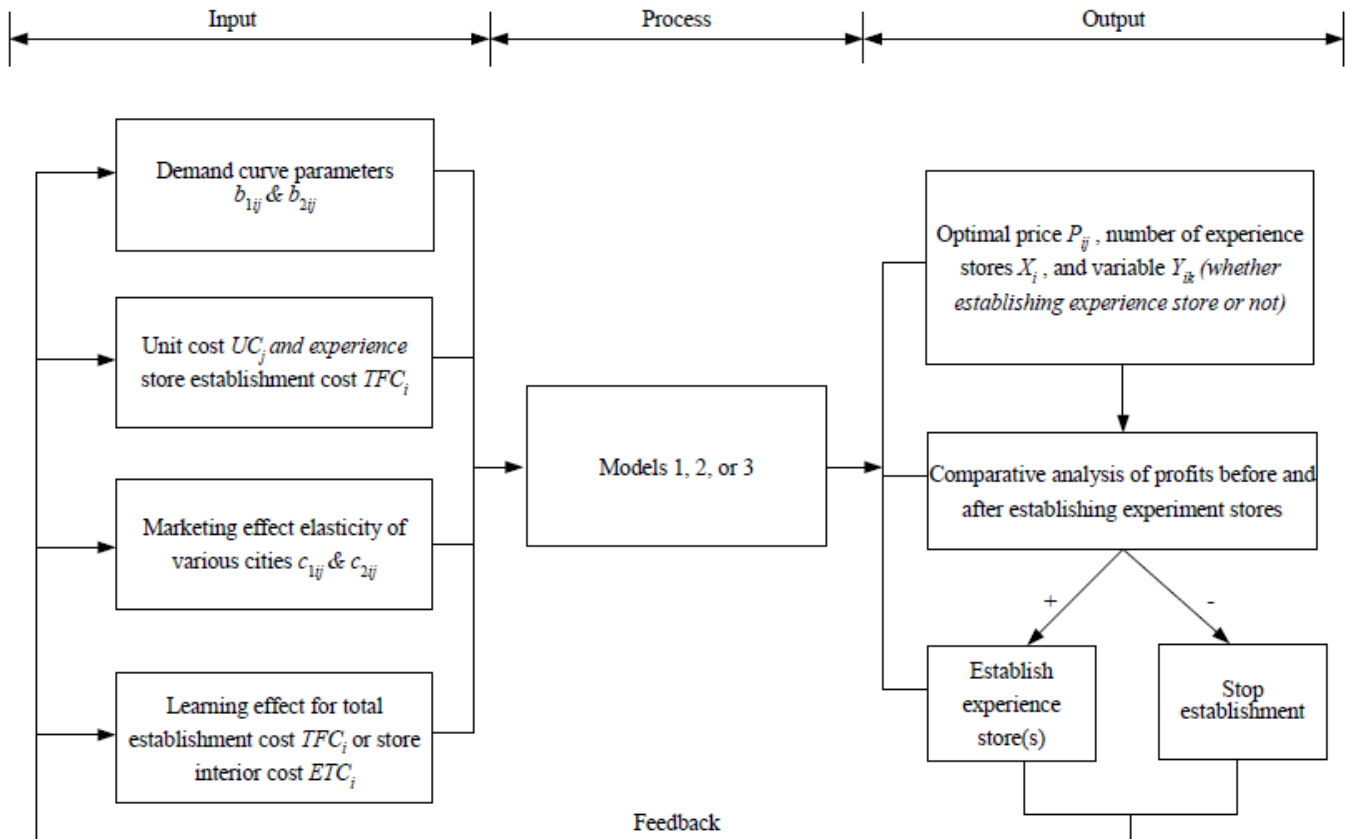


Figure 1. Proposed models' architecture.

operated by Apple Inc., dealing in computers and consumer electronics. Beginning in 2000, BlueApple became the first agency to directly import Apple computer products for sale in Taiwan. Later, as BlueApple recognized that letting consumers touch, experience and learn how to operate Apple computer products would be helpful, it started to establish "Apple Centers" in order to increase profits. The general manager of BlueApple, Mr. Zhang, has expressed that the establishment of experience stores was originally a "trial and error" process (Zhang, 2009), which is in large part due to the fact that Apple computers have professional features – in the past, only prosumers (professional consumers) bought Apple computer products. BlueApple established Apple experience stores that followed the Apple guidelines about store design and merchandise placement. After the experience of the establishment process accumulated and the operation of Apple Centers improved, the building schedule and establishment decision of an Apple Center can be done quickly (Zhang, 2009).

There are 25 major cities in Taiwan, and in general, northern Taiwan is wealthier than southern Taiwan. BlueApple originally established ten experience stores in Taiwan, including four in Taipei, one in Hsinchu, one in Taichung, two in Tainan, and two in Kaohsiung. These cities were chosen based on their large populations.

BlueApple earns fixed gross profits from sales of Apple products. Regarding the proposed models, Mr. Zhang suggested fixing product prices (P_{ij}). BlueApple also adjusted the experience store establishment based on profit performance. If the monthly sales volume did not exceed NT\$ 3 million dollars (the break-even point), then BlueApple withdrew from that market and closed the experience store. After several years of operation, there are now several Apple centers in Taiwan. Table 2 shows the current demand distribution of Apple branding products in the Taiwan market, as suggested by Mr. Zhang and compiled by the authors.

Table 3 lists the optimal solution derived for BlueApple experience stores via model 1. The various store rental costs and operating costs determine the values of TFC_i . Rents in Taipei are expensive, but are relatively lower in cities like Taichung, Tainan and Kaohsiung. Therefore, we set various values of TFC_i in order to find the X_i solution. Considering the learning effect, Mr. Zhang agreed that the first experience store in a given city often did not attain economic efficiency; but, as the number of experience stores increased, the costs associated with employee training, store establishment, design, and interior design decreased.

Table 4 gives the optimal solution based on model 2, and suggests that BlueApple could establish one more

Table 2. Demand situations of the BlueApple branding products in Taiwan (unit: NT\$)

Region	Brand	City features/ Consumer features	Demand situation 1		Demand situation 2	
			P_1	D_1	P_2	D_2
Taipei	iMac	High income	33,000	7,500	3,6000	6,000
	iPod	Prosumer and consumer	8,000	20,000	9,000	16,000
Hsinchu	iMac	High income	33,000	4,500	36,000	3,500
	iPod	Prosumer and consumer	8,000	8,000	9,000	5,500
Taichung	iMac	Middle income	33,000	5,000	36,000	4,250
	iPod	Prosumer and consumer	8,000	8,000	9,000	7,000
Tainan	iMac	Middle income	33,000	3,500	36,000	3,000
	iPod	Prosumer and consumer	8,000	6,500	9,000	5,000
Kaohsiung	iMac	Middle income	33,000	3,000	36,000	2,250
	iPod	Prosumer and consumer	8,000	6,500	9,000	5,000

Note. Data were taken from the interview with the general manager of BlueApple Company Limited.

Table 3. Optimal solution derived for BlueApple using Excel software (unit: NT\$)

Region	Coefficients of demand function					$UC_1=30,000; UC_2=7,000$					
	Brand _j	b_{1ij}	b_{2ij}	c_{1ij}	c_{2ij}	D_{0ij}	D_{aij}	TFC_i	X_i	r_i	
Taipei	iMac	24,000	0.50	3,000	300	6,000	13,500	2,600,000	5	7	
	iPod	52,000	4.00	2,800	200	16,000	25,000				
Hsinchu	iMac	15,500	0.33	2,200	500	3,500	5,200	2,200,000	1	2	
	iPod	28,000	2.50	1,200	400	5,500	6,300				
Taichung	iMac	13,250	0.25	2,000	500	4,250	5,750	2,000,000	1	2	
	iPod	16,000	1.00	1,200	400	7,000	7,800				
Tainan	iMac	9,000	0.17	1,000	600	3,000	3,000	1,600,000	0	1	
	iPod	18,500	1.50	1,200	500	5,000	5,000				
Kaohsiung	iMac	11,250	0.25	1,200	500	2,250	2,950	1,800,000	1	1	
	iPod	18,500	1.50	1,400	400	5,000	6,000				
Sum (iMac/iPod)						19,000/38,500	30,400/50,100	19,000,000*	8		
P_{ij} (iMac/iPod)						36,000/9,000					
Maximum Profit						191,000,000	263,600,000				

Note. Data were given by Mr. Zhang and compiled by the authors. * = $\Sigma(TFC_i * X_i)$.

experience store in Hsinchu and Taichung, respectively, and one experience store in Tainan. Apple has built a unique version of the store design, operating courses, and employee education system. While the guidelines and employee education courses are provided by the parent firm, adjusting them to local conditions in various cities is important.

Experience stores usually can be up and running in a short period of time, once the right establishment decisions are made.

Case B

Established in November 1982, Taiwan Amway is one of the leading direct sales corporations in Taiwan, offering products through its island-wide network of over 200,000 distributors. Annual sales of Taiwan Amway reached NT\$6.6 billion for the fiscal year ending 31 August, 2005. The Taoyuan logistics center of Taiwan Amway was a pick-up center focusing on products prior to 2001. From 2001 to 2004, it was remodeled as a service center. After

Table 4. Optimal solution derived for BlueApple using Lingo and Excel software (unit: NT\$)

Region	Cost coefficients		$UC_1=30,000; UC_2=7,000$					
	α_i	β_i	Brand _j	D_{oij}	D_{aij}	$\Sigma(TFC_{ik})$	X_i	r_i
Taipei	2,600,000	0.1	iMac	6,000	13,500	11,832,293	5	7
			iPod	16,000	25,000			
Hsinchu	2,200,000	0.1	iMac	3,500	5,900	4,252,673	2	2
			iPod	5,500	6,300			
Taichung	2,000,000	0.1	iMac	4,250	6,250	3,866,066	2	2
			iPod	7,000	7,800			
Tainan	1,600,000	0.1	iMac	3,000	3,400	1,600,000	1	1
			iPod	5,000	5,700			
Kaohsiung	1,800,000	0.1	iMac	2,250	2,950	1,800,000	1	1
			iPod	5,000	6,000			
Sum (iMac/iPod)				19,000/38,500	25,880/46,700	2,335,1032	11	
P_{ij} (iMac/iPod)				36,000/9,000				
Maximum Profit				191,000,000	231,247,707			

Note. Based on model 2, the maximum profit and experience store establishment costs are computed using the values of X_i

2004, Taiwan Amway repositioned the Taoyuan center as an experience center. Distribution director Huang (2007) said that the Taoyuan center was the first to apply an experiential marketing strategy in the Taiwan logistics industry. It combined experiential marketing, logistics, and warehouse functions into one experience plaza. In this plaza, automated logistics equipment replaced human logistics workers who were transferred to other service departments, such as the call center and the coffee bar. After the success of the Taoyuan center, other Taiwan Amway experience plazas were established in remodeled facilities or new locations.

Taiwan Amway is committed to supporting their direct distributors. Main activities of Taiwan Amway experience plazas include: increasing recruits, supporting brand reputation and improving service quality. Interior design of experience plazas focuses on success stories, brand reputation (showrooms, product stores, historical halls, and business opportunity sections) and experience sharing places such as R & J coffee. These experience plazas enable distributors to introduce the Amway history, philosophy and products easily and confidently. The major function of experience plazas is to attract recruits instead of final customers. Director Huang said that there was a 41% growth in recruitment, and that total sales nearly doubled after the establishment of the Taoyuan, Taipei, and Kaohsiung experience plazas. For our models, since Taiwan Amway is guided by American Amway, Director Huang suggested that the product price P_j be fixed. She expressed that Taiwan Amway only establishes one experience center in each region; thus, model 3 is more appropriate to apply in Amway case. She also provided the current demand distribution of two Amway brand products (Espring-diverter and Girdle-long) in the

Taiwan market, as shown in Table 5. For model simplification, we assume that more recruits mean more sales, denoted by D_{aij} (thus, we do not need a new variable to represent recruits).

Table 6 gives the optimal solution derived for Taiwan Amway experience plazas. The total sales of Taiwan Amway increased dramatically after the establishment of experience plazas. However, because of its commitment to a multi-level marketing role, Taiwan Amway discourages the development of retail stores invested and built by distributors. Since experience plazas only play an intermediary and marketing support role for distributors, channel conflicts between Taiwan Amway and its distributors have not occurred. On the other hand, Taiwan Amway has strengthened the loyalty of distributors by implementing an experiential marketing strategy. With the establishment of experience plazas, Taiwan Amway successfully improved consumer trust and favor on its products.

DISCUSSION

Location-based and strategic scope decision making by managers are frequently two of the most poorly understood and articulated processes. This dynamic notion of investment potential fits with the everyday experiences of retail organizations (Clarke et al., 1997). In this paper, we clarify the specific characteristics of experience stores as compared to traditional retail stores and use integer programming to model the experience store establishment decision. Two case studies provided have helped to clarify the concepts underlying our models, though the purpose and operation environment of experience stores

Table 5. Demand situations of Taiwan Amway branding products in Taiwan (unit: NT\$)

Region	Product Brand	City features/ Consumer features	Demand situation 1		Demand situation 2	
			P_1	D_1	P_2	D_2
Taipei	ESPRING	High income	28,000	7,500	31,000	6,000
	GIRDLE	Distributors and members	2,800	20,000	3,300	16,000
Taichung	ESPRING	High income	28,000	4,500	31,000	3,500
	GIRDLE	Distributors and members	2,800	8,000	3,300	5,500
Tainan	ESPRING	Middle income	28,000	4,000	31,000	3,250
	GIRDLE	Distributors and members	2,800	6,000	3,300	4,000
Kaohsiung	ESPRING	Middle income	28,000	3,500	31,000	3,000
	GIRDLE	Distributors and members	2,800	6,500	3,300	5,000
Taitung	ESPRING	Low income	28,000	600	31,000	1,200
	GIRDLE	Distributors and members	2,800	1000	3,300	2,000

Note. Data were from the interview with the distribution division director of Amway Taiwan Company Limited. P_{ij} , D_{aij} , and TFC_{ik} . Also, we obtain from the value of α_i and β_i that $TFC_{11}=2,600,000$; $TFC_{12}=2,425,886$; $TFC_{13}=2,329,492$; $TFC_{14}=2,263,431$; $TFC_{15}=2,213,484$; $TFC_{21}=2,200,000$; $TFC_{22}=2,052,673$; $TFC_{31}=2,000,000$; $TFC_{32}=1,866,066$; $TFC_{41}=1,600,000$; $TFC_{51}=1,800,000$.

Table 6. Optimal solution derived for Taiwan Amway using Excel (unit: NT\$)

Region	$UC_1=10,000$; $UC_2=1,000$						TFC		
	TFC_i	ETC_i		Brand _j	D_{oij}	D_{aij}	TFC_i	X_i	ETC (X)
		α_i	β_i						
Taipei	5,000,000	1,000,000	0.1	ESPRING	6,000	13,000	5,000,000	1	
				GIRDLE	16,000	24,000			
Taichung	3,000,000	1,000,000	0.1	ESPRING	3,500	8,500	3,000,000	1	
				GIRDLE	5,500	11,500			
Tainan	2,000,000	1,000,000	0.1	ESPRING	3,250	3,250	2,000,000	1	3,699,542 (4)
				GIRDLE	4,000	7,000			
Kaohsiung	2,000,000	1,000,000	0.1	ESPRING	3,000	3,500	2,000,000	1	
				GIRDLE	5,000	10,000			
Taitung	1,000,000	1,000,000	0.1	ESPRING	1,200	1,200	1,000,000	0	
				GIRDLE	2,000	2,000			
Sum (ESPRING/GIRDLE)					17,450/32,500	29,450/54,500	15,699,542*		
P_{ij} (ESPRING/GIRDLE)					31,000/3,300				
Maximum Profit					430,700,000	724,525,881			

Note. Based on model 3, the maximum profit and the establishment costs of experience stores are computed using the value of X_i , P_{ij} , D_{aij} , TFC_i and ETC_i . The ETC costs of experience stores in five cities are obtained as follows: $ETC_1=1,000,000$; $ETC_2=933,033$; $ETC_3=895,959$; $ETC_4=870,550$. * = $\sum TFC_i + ETC$.

established by Apple and Amway are different. The case studies showed that the experience values and investment purposes of experience stores for the various markets associated with these two firms are quite different. Apple is well known for its industry-changing innovations and attractive designs, and has a clear idea of what people's experiences with its products should consist of (Gelder, 2005). Compared to Taiwan Amway, which is supported by its parent company, BlueApple is operating with high operating costs (without its parent company's support).

However, thanks to large sales volumes originating from

successful experience stores and vivid branding image, BlueApple has generated greater profits. Another aspect, Taiwan Amway has also increased both sales and recruits via the establishment of experience plazas, and avoided channel conflicts among its multi-level distributors, while establishing membership and reward systems to support its distributors.

Conflict of Interests

The author(s) have not declared any conflict of interests.

CONCLUSION

From the results of this paper, we may summarize the conclusions as follows. First, experience stores can be a marketing tool for promoting a firm's products and image, though its position compared to general retail stores needs to be clarified. Second, the design and operation of experience stores should be carefully planned to ensure service quality and cost reductions. The learning curve concept (including employee learning and training) may be used to drive down the costs of establishing and operating experience stores. Third, understanding consumer characteristics and city features is helpful when choosing store allocation. Fourth, paying attention to agencies and dealers to reduce channel conflicts is necessary. Through the promotion and marketing effect of experience stores, performance of other distribution channels may be also improved.

The limitation of this paper is that some elements of the proposed models are really simplified. For example, it is assumed that the impact of the number of experience stores on demand is independent of sales prices. Also, if several experience stores are to be built in the same region, it is assumed that they will be quite dispersed geographically to attain the marketing effect (they certainly will not be located side by side); the issue of the specific location of experience stores is not examined in this paper. Nevertheless, the proposed models still provide some important marketing concepts and implications for manufacturers, could be a significant contribution to existing research on retail store location. The two cases considered also may be used to test different or improved versions of the models. Future research is welcome to further clarify the model elements and strengthen their applicability to experience store establishment decision.

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