World Conference on Supply Chain Management and Business

(WCSCMB-18)

Bangkok, Thailand

12th November, 2018

IARF Conference

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Editorial:

We cordially invite you to attend the World Conference on Supply Chain Management and Business (WCSCMB-18), which will be held in Bangkok, Thailand on 12th November 2018. The main objective of WCSCMB-18 is to provide a platform for researchers, engineers, academicians as well as industrial professionals from all over the world to present their research results and development activities in Supply Chain Management and Business. This conference provides opportunities for the delegates to exchange new ideas and experience face to face, to establish business or research relations and to find global partners for future collaboration.

These proceedings collect the up-to-date, comprehensive and worldwide state-of-art knowledge on Supply Chain Management and Business. All accepted papers were subjected to strict peer-reviewing by 2-4 expert referees. The papers have been selected for these proceedings because of their quality and the relevance to the conference. We hope these proceedings will not only provide the readers a broad overview of the latest research results on Supply Chain Management and Business but also provide the readers a valuable summary and reference in these fields.

The conference is supported by many universities and research institutes. Many professors played an important role in the successful holding of the conference, so we would like to take this opportunity to express our sincere gratitude and highest respects to them. They have worked very hard in reviewing papers and making valuable suggestions for the authors to improve their work. We also would like to express our gratitude to the external reviewers, for providing extra help in the review process, and to the authors for contributing their research result to the conference.

Since September 2018, the Organizing Committees have received more than 30 manuscript papers, and the papers cover all the aspects in Supply Chain Management and Business. Finally, after review, about 10 papers were included to the proceedings of WCSCMB-2018.

We would like to extend our appreciation to all participants in the conference for their great contribution to the success of International Conference 2018. We would like to thank the keynote and individual speakers and all participating authors for their hard work and time. We also sincerely appreciate the work by the technical program committee and all reviewers, whose contributions make this conference possible. We would like to extend our thanks to all the referees for their constructive comments on all papers; especially, we would like to thank to organizing committee for their hard work.


**Acknowledgement**

IARF is hosting the World Conference on Supply Chain Management and Business this year in month of November. International Conference on Supply Chain Management and Business will provide a forum for students, professional engineers, academician, and scientist engaged in research and development to convene and present their latest scholarly work and application in the industry. The primary goal of the conference is to promote research and developmental activities in World Conference on Supply Chain Management and Business and to promote scientific information interchange between researchers, developers, engineers, students, and practitioners working in and around the world. The aim of the Conference is to provide a platform to the researchers and practitioners from both academia as well as industry to meet the share cutting-edge development in the field.

I express my hearty gratitude to all my Colleagues, Staffs, Professors, Reviewers and Members of organizing committee for their hearty and dedicated support to make this conference successful. I am also thankful to all our delegates for their pain staking effort to travel such a long distance to attain this conference.

*Dr. Simpson Rodricks*

President

IARF Conference (IARF)
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Financial Performance of Initial Public Offerings: Companies listed on Dar es Salaam Stock Exchange

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Abstract: The purpose of this study it to examine the difference in financial performance before and after Initial Public Offerings (IPOs) in companies listed on Dar es Salaam Stock Exchange (DSE) in Tanzania. The company financial performance is measured by using financial performance ratios. Hypothesis of difference between pre-IPOs and post-IPOs financial performance is tested by using significance test on the difference between the mean score of the pre-IPOs and the mean score of the post-IPOs financial performance. The findings indicate there is significant difference between pre-IPOs and post-IPOs financial performance. Specifically, the findings indicate there is significant increase of post-IPOs financial performance. At least, the study indicates there is no significant evidence that pre-IPOs performance is higher than post-IPOs performance. However, the study indicates the results depend on measurements of performance used in the data analysis. The study is of value to various stakeholders who are interested in the financial performance of listed companies in developing countries in Sub-Saharan Africa and Tanzania in particular. These findings are useful to current and potential investors in stock exchanges in developing countries in general and DSE in particular. The findings have policy implication for roles of the regulators of stock market, shareholders monitoring and governance of listed companies, as results indicate at least performance of listed companies do not deteriorate after IPOs. This has implication for attraction of investment from both domestic and foreign investors because indicators of better performance after IPOs increase the confidence of investors as they become more optimistic on future financial performance of IPOs.

Keywords: Financial performance; Initial public offerings; Working capital

INTRODUCTION

Initial Public Offering (IPO) involves the issuing of the securities to the public for the first time. It happens when company engages in offering of shares to the public and listed on stock exchange for the first time. IPO allows company to raise funds from the general public for the first time. IPO is considered as an important event for some entrepreneurs, executives, board members and shareholders because it is an achievement that demonstrates their success in building a strong business and creating value for owners, employees and customers [1]. IPO is an entrance into a new stage life as public company that possesses not only its own unique opportunities but also risks and challenges [1]. Some of those opportunities are such as opening door to liquidity for investors and general public, who can invest their money in company by buying shares in stock exchange markets [1]. Company can use capital generated from IPO for common company purposes, such as working capital, research and development, retiring existing indebtedness and acquiring other companies or businesses which in turns may have significance implication for future performance of company. In the other hand, there are some challenges during the process of issuing shares such as exposing company’s information to public and more seriously to competitors [1]. This is because an IPO company must present its prospectus, which contains key inside information about company, to the public as part of requirements of issuing shares to the public. By providing this information to the public, albeit with good intention to abide to requirements of listing, company may expose important strategic information such as intellectual property, compensation, financial status and projections, material agreements and business plans. This can provide opportunity to competitors to imitate company’s strategies and accelerate implementation of similar strategies or counterattack strategies in advance of listing company [1,2]. In the other words, competitors may use this information to know about strategies of listing company and formulate or adjust their own strategies to become more competitive at expense of listing company [2]. Additionally, when involved in IPO process, listing company incurs some costs such as compliance cost and management time spent in IPO process. Company may outsource some professionals such as lawyers and accountants who may charge significant amount of fees. Top management must their use valuable time to engage in IPO process activities such as planning and meeting potential and significant investors and regulatory bodies [1]. This may distract their attention from core mission of business; as a result, performance of company may decline after IPO exercise is completed.
Existence of both advantages and disadvantages of IPO suggests that listing of company on stock market can have positive and/or negative effects on financial performance. The positive and negative effects may improve and weaken after IPO performance respectively which creates uncertainty about future performance of listing company. The uncertainty on performance after IPO, suggests that before engaging in IPO; management of company must critically analyze all relevant circumstances by considering not only its own strengths and weaknesses but also opportunities and threats that exist in the external environment. In the other words, management of listing company must carefully weigh both advantages and disadvantages of public listing before implementing final decision to initiate IPO process and finally list shares on stock exchange.

In addition to general benefits and costs associated with IPO, there are some other factors which can lead to change in pre-listing performance. Previous studies have identified at least three potential factors which can cause decline of company financial performance [3-8]. First, companies tend to go public at the peak of their long-run performance, which they know cannot be sustained in the future [3]. Second, the dilution of shares of company when company goes public is likely to give rise to agency problem [5] which in turns, may cause poor financial performance in the future. Third, managers may attempt to window-dress accounting information before listing by using earnings management techniques [8], which may overstates pre-IPO performance while understating post-IPO performance. This is more likely to happen when managers can use accrual accounting to borrow future profits [6,7]. The earnings management and borrowing of future profit just before IPO aim to portray artificial good performance to attract members of public to invest in shares.

Given the existence of uncertainty in the process of IPO, it is obvious that the process is likely to have either negative or positive effects on company’s future financial performance. In this respect, this study examines the change in company’s financial performance between pre-IPO and post-IPO. Specifically, the study examines whether pre-IPO financial performance is significantly different from post-IPO financial performance. This study contributes to understanding of reliability of pre-listing financial performance as indicators of future financial performance of companies listed in Dar es Salaam Stock Exchange. The indicators of financial performance are one of the most important factors used by investors to make decisions of either or not to invest in IPOs. Since most investors are likely to be attracted by good financial performance they are likely to make decision based on wrong information if listing company intentionally is deceptive in relation to its indicators of financial performance. The findings are useful to stock market regulators who receive and evaluate applications of companies seeking public listing. Furthermore, the findings are useful to accounting profession and stock market policy makers who are concerned with financial information presented by companies where they are going public.

**Initial Public Offering and Stock Exchange Markets**

The history of IPO goes back when the earliest form of company which issued public shares during the Roman Republic. Dutch East India Company is believed to be the first modern company to issue public shares in the beginning of 17th century. In developed countries many large companies are listed in stock exchanges. The New York Stock Exchange (NYSE) is the biggest equity market in the world with a market capitalization of about $21 trillion in year 2015. Generally, stock exchange is one of major sources of capital finance in the world [9]. However, in most African countries, specifically in Sub-Saharan Africa, stock exchanges opened in the 1990s, except in the cases of Kenya and Nigeria, where stock exchanges started in the year 1954 and the year 1960 respectively [10]. In addition, many countries in Sub-Saharan Africa have not yet established stock exchanges and many of those which have been established are not very active [10].

In Tanzania, shares are listed on and traded at Dar es Salaam Stock Exchange (DSE). The formation of the DSE followed the enactment of the Capital Markets and Securities Act, in the year 1994 and the establishment of the Capital Markets and Securities Authority (CMSA) which is the agency of Tanzania Government established to promote and regulate securities business in the country [11]. DSE was incorporated in the year 1996 and began trading operations in the year 1998. DSE is the only formal trading place for securities in Tanzania. Both local and foreign investors are allowed to participate in DSE. Foreign investors were not allowed until recently when the Tanzania government issue the capital markets and securities (foreign investors) regulation in the year 2014 [12]. The participation of foreign investors is significant achievement as it allows companies listed in the exchange to attract capital from foreign market. According to recently market reports from DSE, foreign investors are major buyers of shares traded at DSE as about seventy percent of all shares purchases at DSE during the period from July 2014 to August 2015 were done by foreign investors [13]. The participation of foreign investors exposes the exchange and listed companies to
global financial market; therefore, more analysis is likely to be done by foreign investors who have more skills, knowledge and experience than domestic investors in stock exchange dealings.

CMSA licenses and regulates investments intermediaries and deals with the issuance and trade of securities, approves all companies wishing to be listed at the DSE. According to daily market reports issued by DSE, total market capitalization of DSE as of 12th August 2015 was Tshs 22,601.29 billion which is equivalent to USD 10,796.76 million [13]. Although the DSE commenced operation about seventeen years ago the historical records indicate that the speed of companies to list is going at a very low pace because until August 2015 there were only twenty one companies which were listed on DSE [13]. Moreover, out of these listed companies, fourteen companies were primary listed and the remaining companies were cross listed predominantly from the Nairobi Stock Exchange in Kenya. This low pace may be due to several factors. Although, this is not the aim of this study, but one of reasons may be the fact that many companies put more weights on disadvantages rather than on advantages that are associated with public listing; so as result, they become reluctant to list shares on stock exchange.

Since DSE started its operations, one company, National Investment Company Limited, was delisted because of presentation of misleading accounting information in their annual report. Additionally, according to DSE daily market reports for the year 2014/2015, three companies which are TOL Gases Ltd, Tatapa Company Ltd, and Precision Air Services Plc, their shares had been relatively inactive in trading for a very long period. These listings are examples of non-performing IPOs which received public money but have not performed as were expected by many investors who participated in these IPOs. The factors which could contribute to poor performance may not be very clear but one thing which investors should be aware of is investment in IPOs is a risk business which needs careful assessment before making the final decision to invest [14,15]. Some IPOs may portray a very promising future which may attract a lot of attention and positive interest from several investors. However, these IPOs may turn out to be just window dressing or projections based on weak assumptions [16]. Investors can only obtain the expected returns if IPOs can at least maintain pre-IPO performance for a reasonable time in the future. Therefore, it is important to study trend of IPOs performance in order to understand whether there is a significant difference between pre-IPO performance and post-IPO performance.

In addition to general benefits and costs associated with IPO, there are some other factors which can lead to change in pre-listing performance. Previous studies have identified at least three potential factors which can cause decline of company financial performance [3-8]. First, companies tend to go public at the peak of their long-run performance, which they know cannot be sustained in the future [3]. Second, the dilution of shares of company when company goes public is likely to give rise to agency problem [5] which in turns, may cause poor financial performance in the future. Third, managers may attempt to window-dress accounting information before listing by using earnings management techniques [8], which may overstates pre-IPO performance while understating post-IPO performance. This is more likely to happen when managers can use accrual accounting to borrow future profits [6,7]. The earnings management and borrowing of future profit just before IPO aim to portray artificial good performance to attract members of public to invest in shares.

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DATA AND METHODOLOGY

Data used in this study was manually collected from the annual reports of the companies listed on DSE. A sample includes companies which are primary listed on DSE. A list of all listed companies was obtained from the website of DSE. This list indicates among other things the name and the year in which company was listed on DSE. The list has twenty one companies, out of these companies, fourteen are primary listed and the rest are secondary listed. This study focuses only on the primary listed companies because they are more relevant to IPO events studies because these
companies were widely exposed to the public for the first time when engaged in IPOs rather than secondary listed companies which have already endured storms of post IPO events in stock exchange where they are primary listed. The final sample includes ten companies that were possible to collect data both before and after IPO. Data were collected for five years before IPO and after IPO period from annual reports which were obtained from either respective companies’ websites or offices and DSE’s website or office. However, a size of sub-sample of before IPO is smaller than that of sub-sample of after IPO. This is because of unavailability of reports for some of previous years.

The analysis focuses on assessing whether there is significant difference on company financial performance before and after IPO events. Financial performance can be measured in different ways, however, the most common measures are accounting performance and stock market price performance. This study uses accounting performance to measure company performance because accounting performance is a better measurement of performance than stock price measurement especially in developing countries stock markets. The stock market developing countries, like Tanzania, are characterized by a high degree of inefficiency, high illiquidity and stock prices which do not reflect available information [3,10,17]. In this environment the stock market information may not reflect a reasonable market value of the shares as it might be the case in stock markets in developed countries. The financial performance is measured by some accounting performance ratios which are return on assets (ROA), return on equity (ROE), return on capital employed (ROCE) and sales to assets (SA).

DEFINITION AND MEASURES OF VARIABLE

Return on Assets
Return on Assets (ROA) is an indicator of profitability of company in relation to its operating asset. It is computed by dividing operating profit before tax by total operating assets. ROA gives an idea as to how efficient management is at using its assets to generate profit. It shows ability of company to generate returns from its operating profit.

Return on Equity
Return on Equity ratio (ROE) is a profitability ratio that measures the ability of company to generate profits from its shareholders equity. ROE is expressed as a percentage of net income to shareholder's Equity. Return on equity measures ability of company to generate returns on shareholders equity.

Return on Capital Employed
Return on Capital Employed (ROCE) is the ratio of net operating profit to capital employed. It measures the profitability of company by expressing its operating profit as a percentage of its capital employed. Capital employed is the sum of stockholders' equity and long-term finance. Alternatively, capital employed can be calculated as the difference between total assets and current liabilities. A higher ROCE indicates more efficient use of capital.

Sales to Assets
Sales to Asset ratio (SA) is an efficiency ratio that measures ability of company to generate sales from its assets by comparing net sales with average total assets. In the other words, this ratio shows how efficiently company can use its assets to generate sales. This is computed by dividing net sales by total operating assets. Table 1 provides information on the descriptive statistics before and after IPO.

Table 1: Summary statistics of performance variable

<table>
<thead>
<tr>
<th>Variable</th>
<th>Observations</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
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<tr>
<td>ROA</td>
<td>33</td>
<td>-0.121</td>
<td>0.516</td>
<td>0.122</td>
<td>0.185</td>
</tr>
<tr>
<td>ROE</td>
<td>33</td>
<td>-1.312</td>
<td>0.59</td>
<td>0.24</td>
<td>0.331</td>
</tr>
<tr>
<td>ROCE</td>
<td>33</td>
<td>-0.183</td>
<td>0.524</td>
<td>0.161</td>
<td>0.17</td>
</tr>
<tr>
<td>SA</td>
<td>33</td>
<td>0.056</td>
<td>3.098</td>
<td>0.989</td>
<td>0.895</td>
</tr>
</tbody>
</table>

Table 1 indicates that ROA marginally increased from 12.2 percent before IPO to 13 percent after IPO. This suggests that the performance of companies as measured by return on assets improved marginally by 0.8 percent. This indicates that after IPO the rate of utilization of assets to generate operating profit increase by 0.8 percent. In the other hand, there is high decrease of ROE as it is only 12.2 percent after IPO compared to 24 percent before IPO. This change is a decrease of about one hundred percent. This may be explained by change in size of equity values of some companies after issue of shares. Issue of new shares may increase both a number of shares and amount of equity.
while the operating profit may remain almost at the same level as it was before an IPO’s event.

From Table 1, the ROCE ratio was 16.1 percent before IPO but it decreased to 15.5 percent after IPO. This is decline of 0.6 percent which implies that companies did not employ their capital effectively and is not generating good value to shareholders after the IPO. Moreover, SA ratio indicates that the ability of companies to generate revenue out of total assets increased from 0.989 times before IPO’s event to 1.53 times after IPO’s event.

**Two Sample means difference between Pre-IPO and Post-IPO Financial Performance**

This study examines whether the mean difference between pre-IPO and post-IPO financial performance is significant by carry out two-sample t-test with the null hypothesis that the mean difference between pre-IPO and post-IPO financial performance is zero. Table 2 presents the results of two samples means differences.

<table>
<thead>
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<th>Variables</th>
<th>Pre-IPO</th>
<th>Post-IPO</th>
<th>t-Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROA</td>
<td>0.122</td>
<td>0.130</td>
<td>0.846</td>
</tr>
<tr>
<td>ROE</td>
<td>0.240</td>
<td>0.120</td>
<td>0.279*</td>
</tr>
<tr>
<td>ROCE</td>
<td>0.161</td>
<td>0.155</td>
<td>0.934**</td>
</tr>
<tr>
<td>SA</td>
<td>0.989</td>
<td>0.528</td>
<td>0.013***</td>
</tr>
</tbody>
</table>

**Table 2: Result of test of two sample mean differences**

The results show that when measure of performance is ROA, post-IPO performance is higher than pre-IPO performance; however, the difference is not significant. As for ROE and ROCE measurements, the results indicate that financial performance increased after IPO, but the difference is not significant. Therefore, based on these results, there is no a sufficient evidence to reject the null hypothesis when financial performance is measured by ROA, ROE or ROCE. In the other hand, the results indicate when financial performance is measured by Sales to Assets ratio, the post-IPO performance is higher than pre-IPO performance and the difference is statistically significant (p<0.01). In this case there is a sufficient evidence to reject the null hypothesis.

**CONCLUSIONS AND IMPLICATIONS**

Stock exchange markets play major role in mobilization of capital finance from general members of public who when considered individually may have a very little amount of capital but which may be significant when aggregated in one basket [9]. Due to possibility of existence of significant amount investment capital from general public the stock exchanges is one of good sources where companies which are looking for capital can issue financial instruments such as shares and bonds to general public to raise more capital funds. Investors can use stock exchange to buy shares and become shareholders of listed companies with expectation of obtaining benefit from these investments through future dividends and capital gains by increase in value of shares. However, investors can only obtain these benefits if the listed company performs better after IPO.

Listed company might fail to perform if management either fails to make appropriate analysis of internal and external environment or make wrong conclusion about future performance of company. Furthermore, some companies may deliberately mislead investors by window dressing or dishonestly utilize the existence asymmetric information to exploit investors [7]. This may lead to poor company performance in the future because good performance reported before IPO will not be sustainable since it was based on false assumption. This problem can affect many investors in underdeveloped stock exchanges like DSE where many investors do not have sufficient skills, knowledge and experience about stock market and dealing with securities. In the other hand, listed company can make appropriate analysis and arrive at correct and positive conclusion about future company performance. Also, management may present a true and fair view about company performance which may indicate actual good performance. If information presented before IPO indicates company performance is good based on true and fair view, there is a high probability that company may continue to perform either at same level or even better given that other factors remain constant. However, because of existence of uncertainty about the accuracy of information presented by company, there is no clear indication of direction in which company performance may take after listing. Principally, there are three possible changes on future performance of company after IPO. The performance after IPO may
increase, remain constant or decline relative to performance before IPO. Therefore, this study examines the difference in accounting performance before and after IPOs.

In general the findings indicate there is difference between pre-IPO and post-IPO accounting performance. However, the significance of the difference depends on measurement of performance used in the analysis. Specifically, the findings indicate post-IPO is high than pre-IPO when performance is measured by Sales to Assets ratio. The findings of this study contradict the findings of other studies such as Kim et al. [5], Wang [4] and Wong [18] which indicated the performance declines after IPO. This is implies there is no consistency in findings in IPO’s events studies. This makes difficult for researchers and practitioners to reach a general conclusion on whether companies perform better after IPO or otherwise. The lack of conclusive results may be due to a number of factors such as selection of variables and their measurements, timing of data collection and contexts of studies. For example, this study uses three different measures of financial performance and only one measure indicates there is significant difference between post-IPO and pre-IPO performance. This implies that measurement of financial performance can influence the final results in these types of studies.

Results of this study have implication for policy makers, investors and future research. The findings have policy implication for roles of regulators of stock market, shareholders monitoring and governance of listed companies. This is because the results indicate at least the performance of listed companies does not deteriorate after IPOs. The findings of this study have implication for investors in IPOs, particularly in DSE where both local and foreign investors participate in trading shares. Specifically, the results indicate that it is important to make analysis of performance of listing company both before and after investment decision. Also, it is equally important to be aware not every measurement of performance may provide appropriate information about company performance. The study also has important implication for the future research on IPO performance. Specifically, the results indicate that conclusion drawn on performance of IPO should be interpreted cautiously because the result may be affected by measurement of company performance. Moreover, the context of study may affect the findings as it may explain to a certain extent the current situation of lack of consensus in IPOs performance research.

ACKNOWLEDGMENT

The acknowledgement goes to a group of students of Bachelor of Accounting and Finance at Ardhi University in the year 2015 who participated in the preliminary stages of this study.

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Efficiency in the Economics of Management and Ways to improve it

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Abstract: The paper presented the analyses of one of the enigmas as set forth by the managerial economics. In analysing it, the paper formulated ways of resolving the enigma. The paper developed the theorem, which uncovered the essence of the two-dimensional measuring the indicators of the balanced economic growth in a developing economy. The outcomes of the analyses, carried out by the study, are expected to put a halt to the ineffective and inefficient use of natural material, capital and labour resources in any given developing economy. To that end, the results of the analyses will help open up the path leading to the effective green economy and will help maximize on the cost saving in the use of natural resources. The findings of the analyses will contribute to the development of the managerial economics and will be essential assets in measuring the balanced economic growth in developing countries. The novice of the paper is that the solution to the problem set as explained in this paper has ever been uncovered before.

Keywords: Two-dimensional measurement; Balanced growth; Resources; Cost efficiency

INTRODUCTION

Solving of the Baye enigma
In his book titled Managerial Economics and Business Strategy, Michael R. Baye configured the subject matter of his research in the light of the following developments: in the late 20th century, a member of government of Japan characterized American workers as ‘lazy and unproductive’ [1]. Such outright description of the then American workers productivity entailed from the timing spent by a Japanese Honda company worker in manufacturing a Civic model car, which equalled to 10.9 hours while at the same time an American worker of Ford company spent 16 hours to produce an Escort model car. Such obvious disproportion raised serious concerns amongst stakeholders of the giant car manufacturing corporations, including General Motors, Ford, and Chrysler. Furthermore, the situation was aggravated with the fact that in the early 90s the big three suffered from dramatic losses. To that end, shareholders figured that the low worker productivity was the main cause of companies’ losses.

Methodological principles suggested by American corporations as applied to the solution of the Baye problem set
The managers of the American corporations eventually made stakeholder concerns on the inefficiency of the American automobile industry sooth down, – noted M. R. Baye in his article published in the Automotive News Journal. The article quoted an hourly pay to an American worker, which was 2 dollars less compared to the 18 dollars per hour payment received by a Japanese worker. Thus, the American hold on the above-quoted payments differences threw the light on the essence of labour productivity that stemmed from the compensation of the labour spent for manufacturing a unit of production, not the labour costs.

Methodological principles as applied to the solution of the Baye problem set on the suggestion of Japan (according to M. Baye)

Let us re-iterate to the issue of just a positioning of the productivity of the American and Japanese workers, – wrote M. R. Baye. Thus, the Japanese Honda company spent 10.9 hours to manufacture a car while the American Ford company 16. Those figures were obtained by dividing the total amount of workers time spent by the company’s workers (labour units) by the total amount of cars manufactured (volume of production). From today’s perspectives, it is obvious that the resulting figures are, in fact, the reverse values of the average productivity of the American and Japanese workers in the automobile industry. To be more specific, those relate to the average productivity of the two car manufacturing corporations. If we recalculate these figures in the reverse order, we will obtain the average productivity of a Japanese worker to be: 1/10.9=0.09 while that of his American counterpart will equal to: 1/16=0.06. In my opinion, Michael R. Baye unveiled the inner essence of the methodological principles that had been applied by Japan. It was done by means of the assessment of the labour productivity through the direct labour intensity of production.
In fact, the first model does not take into account the fiscal-and-technological ‘layer’ of the innovations. The second model does not account for the technical-and-technological ‘layer’ of the innovations. Besides, one of them derives from the methodological principles of the short-term development of commodity markets, while the other – on financial markets. Removal of the above-noted deficiencies of existing models of market equilibrium requires resolving the following tasks.

The first task relates to the necessity of assessing the input made by the scientific and technological potential in the sustainable development of an economy Resolving the first task by definition of true costs of goods and services ensures market equilibrium between the indicators at the macroeconomic level and those at the microeconomic level:

\[ t \times X = T \times Y \]  

(A)

The main outcome obtained from applying formula (A) is in defining the function of the scientific and technological potential (STP) in its dependence from the efficiency in the use of material, labour, capital and natural resources \( c = \mu / (1 + \mu) \).

In the first instance, the function of the STP is \( c = \mu / (1 + \mu) \) that in the course of growth of production of intermediate products \( \mu \) (Figure

1. line a) acquires the value within the range of 0.08 to 9.0 along the ascending line, which at point \( \mu = 2.0 \) acquires value about 0.7 and, at point \( \mu \) equals to \( \mu = 8.0 – 0.89 \).

In the second instance, which is ideal for us, where the function of the STP \( c = \mu / (1 + \mu) \) that in the course of production the intermediate product \( \mu \) (Figure 1. line b) acquires values from 0 to 9.0. We assume that it will move along the descending line, which at point \( \mu = 0 \) acquires value 0.89 and at point \( \mu = 9.0 – 0.7 \).

The other two potentially viable instances have been marked in Figure 1 by the lines that go parallel to the axis, which indicates the productivity of the product of intermediate consumption \( \mu \). The first of those two lines characterize the real time situation in developing markets given that the STP coefficient remains stable. Thus, the
instance where $c=0.6$ for any $\mu$ has been reflected in Figure 1, line k. The second line, which is parallel to the axis of the productivity of the product of intermediate consumption, transcends the crossing points of both of the curves. Above that line, the parameters of the balanced growth of advanced markets are reflected as line d.

The second task is linked to the necessity of defining the function of true costs of goods and services

The second task of defining the function of true costs of goods and services $(pc)$, as the reverse value of the purchasing power of national currency units $(pp)$: $pc=F(pp)=pb/c$. It is based on the two dimensional measurement of capital, in its money form, and capital, in its commodity form.

Owing to the two-dimensional measurement of the indicators of economic development, there emerges an opportunity to effectively manage limited resources in any given individual country. It can be realized by using not only the Leontief model, which was expressed in the monetary form, but also, the new law that helps to balance supply and demand at the macroeconomic level [3]:

$$FUGP=pp*NGDP=c*RGDP \ (B)$$

where $FUGP$, $NGDP$ and $RGDP$ are the actual consumed final product, the nominal GDP and the real GDP, and $c=pb/pc$ is the rate of growth of the scientific and technological potential while $1/c=T/t$ denotes the level of clustering of the goods and services markets, $pc=1/pp=pb/c$: the rate of growth of true costs of goods and services is defined in its direct correlation to the GDP deflator. It is reversely correlated to the rate of growth of the scientific and technological potential of any given individual country. Assessment of the American and Japanese methodological principles using the methods of the precise definition of the three 'layer' innovation: for simple instances, the test calculations may be carried out on the basis of the input data pertaining to the Baye problem set. In this, one can find immediate answers to all quests posted by this research. This can be done by using the Nazarbayev theorem of the three layered innovation.

Thus, since the product releases in the US and Japan were measured by the use of labour productivity, we may take them as the ones that are equal to one another:

$$X(A)=X(J)=1(C)$$

Let the direct labour intensity of manufacturing of one car in the US be $t(A)=16$ and in Japan $t(J)=10.9$ man-hours. The size of the hourly worker pay is $16$ in the US and $18$ in Japan. Here, we may derive the compensation of the 16 hour labour of 1 worker in US to be equal to $t*1=16*16=$256. The same indicator for Japan will equal to $t*1=10.9*18=$196.2.

The annual income for the period 1995-1997, which corresponds to the time series as mentioned in the Baye-quoted example, stood at the annual average of 36%. Accordingly, given the income of $Y=0.36X$, full expenditures in the US equalled to $T=256/0.36=711.1$ at the $16$ hourly rate. Accordingly, in Japan, the same indicator equalled to $T=196.2/0.38=516.3$.

**Correlations, deriving from formula (A) in the Leontief-Dmitriev input-output model**

The company income on every car manufactured equalled to $711.1$ in the US vs. $516.3$ in Japan while a worker’s labour compensation in the US made $256$ vs. $196.2$ in Japan.

For the US, the quantitative supply and demand model derived on the basis on of the macro-and-microeconomic indicators has been defined by the following equation: $256*1=711*0.36$. For Japan, the corresponding model, using the macro-and-microeconomic indicators, has been defined as follows: $196.2*1=516.3*0.38$.

For both the countries, the target STP coefficients for the period 1995-1997 equalled to $c$ (US)=$0.55$. In Japan, it equalled to $c$ (Japan)=$0.531$ in the proportions of full labour costs.

Taking the STP coefficient $c$(Japan)=$100.0\%$ as the basis, we may define the scientific and technological potential as follows: $c$(US)=$0.55/0.531*100=103.6\%$.

Likewise, the corresponding GDP deflator will equal to $pb=103.5\%$ in the US and in Japan it will equal to $pb=102.3\%$.

**Balancing of the real and financial sectors in the US and Japanese economies based on true costs of goods and services**

The purchasing power of the US and Japan’s national currency units equalled in the US: $pp=c/pb=103.6/103.5*100=100\%$. The same indicator in Japan equalled to: $pp=c/pb=100/102.3*100=97.8\%$. The reverse values of costs of national currencies, price indices on goods and services in the US decreased by 0.1%. On the contrary, those in Japan increased by 2.3% - $pc=102.3\% \ (100/97.8*100)$.

The final supply and demand market equilibrium has stabilized in the US under:

$$pp=100.1 \text{ and } c=100.6: 100.1^* \ NGDP=103.6^* \ RGDP(D)$$

The corresponding market balance in Japan has been stable at
Recommendation No: 2

The methodological governance guide relating to the regulation of the development of the financial market should be vested upon a central or national bank. As applied to Kazakhstan's realities, the National Bank of Kazakhstan (NBK) shall interact with the Government. The prerequisite for this recommendation has been outlined in the Message of the President of Kazakhstan to the people of Kazakhstan of 31 January 2017.

Recommendation No: 3

The functions of monitoring the real economy, namely, in its financial sector, are being recommended herewith to be via the generic model of the precise definition of true costs of goods and services. The methodological governance guide relating to the sustainable development of a national economy should be vested upon public associations under relevant ministries and state agencies. Similarly, these public associations may function under the coordination of a country's parliament and/or public chamber. As applied to Kazakhstan's specific realities, such function shall be assigned after the Association of Public Council.

Recommendation No: 4

In his article entitled "The Clues to Crises", which was published in the “Russian Newspaper” in February 2009, President of the Republic of Kazakhstan N.A. Nazarbayev noted that “the current order of emissions and turnovers of world’s currencies does not meet the criteria of the rule of law, democracy, competitiveness, efficiency, and control on the side of end users.” [4]. The article entitled “The Fifth Path” outlined the concrete ways of defining true costs of goods and services. Following its recommendations, sustainability in managing the national economy will be ensured: first, by the equilibrium of aggregate expenditures (natural, material, capital, and labour) and of final use outcomes of production in the real sector of an economy. Second, by the equilibrium of the rate of the development of the real sector, reflecting the rates of growth of the technical and technological ‘layer’ of innovations, and financial sector, which reflects the growth rates in the fiscal and monetary ‘layers’ of innovations, and thirdly, by the equilibrium of the rate of development of the socio-political ‘layer’ of innovations, and the rate of growth in the final use GDP. Thus, the methodology of defining true costs of goods and services is fully aligned with the principles as formulated in the Fifth Path. It reveals the above-noted costs that had been noted by Keynes, the purchasing power theory and national currencies valuation and quantitative theory of money [5]. By using the above described methodology, it becomes possible to put a halt to ineffective use of natural, material, capital and labour resources. Thus, the right path has been paved to the development of the green economy and saving of natural resources.
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Forecasting Performance of GARCH Family Models in the Indian Commodity Markets


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Abstract: The present paper examines the forecasting ability of the GARCH family models with reference to the Indian commodity markets. The study uses four futures indices of the Multi Commodity Exchange of India (MCX) which represent the commodities across sectors such as agriculture, energy and metals. MCX also maintains a composite index MCXCOMDEX that encompasses the other futures indices MCXAGRI, MCXENERGY and MCXMETAL. The symmetric GARCH model and three asymmetric EGARCH, TARCH and PARCH variants have been used to test the forecasting efficiency of these models. The mixed results indicate that any single model’s claim to forecasting efficiency across the four indices is not justified.

Index Terms—GARCH, Commodities, Futures, Forecast

I. INTRODUCTION

Commodities are regarded as the fourth asset class after equity, fixed income instruments and money market instruments. Constitution of the Chicago Board of Trade (CBOT) in 1848 marked the beginning of organized commodity trading on an exchange [1]. Organized commodities trading in India began in the year 1875 with the establishment of Bombay Cotton Trade Association. In 1900, futures trading in oilseeds was introduced with the setting up of the Gujarati Vyapari Mandali. Since then, India has had a rich history of trading in commodity futures till mid-1960s when it was discontinued due to war, natural calamities and ensuing shortage of commodities. Since 2003, trading in commodities has seen a phenomenal growth in India.

The Forward Contracts (Regulation) Act of 1952 laid the foundation stone for the governance of commodities futures contracts and all the commodity exchanges were regulated by the Forward Markets Commission (FMC) under the Ministry of Consumer Affairs, Food and Public Distribution, Government of India. Though the FMC was overseeing the operations in the Indian commodities markets for over 60 years, its powers were limited which is thought to be the cause for fluctuations and irregularities in the market. To streamline the regulations, curb speculations and promote growth, it was decided that the FMC would merge with SEBI (Securities and Exchange Board of India). This announcement was made by the Finance Minister in his budget speech in February 2015. This merger aims to “increase economies of scope and economies of scale for the government, exchanges, financial firms and stakeholders”.

Commodity markets perform four important functions: Price Discovery, Price Risk Management, Improve competitiveness in the Imports and Exports, and provide Benefit for farmers and agriculturists[2]. To meet food and raw material requirements and manage supply-demand scenarios, forward contracting in commodities was carried out in India for a long time. But forward contracts give rise to price risk and hence, the need for this price risk management. This can be done effectively through futures contracts. A Commodity futures contract is an agreement to buy (or sell) a specified quantity of a commodity at a future date, at an agreed price when entering into the contract. While futures contracts as an investment product exists for a variety of financial instruments, its uniqueness as a commodity derivative makes it an attractive investment product.

Commodity futures allow producers to insure themselves against unfavorable variations in commodity prices. The markets allow non-producer investors to receive a return for bearing a risk on commodity price fluctuations. Through organized exchanges, these risks are borne by a large number of investors/speculators for a premium. This leads to efficient price discovery since a large number of participants bring in variety of expectations and opinions on the behavior of the underlying assets. While some commodities are storable, some are not; the use of each product in production stage varies; quality differs. These features of the underlying commodities make it much more complicated for organized exchanges as it becomes...
difficult to handle and commands a vast amount of resources and infrastructure.

India presently has 17 commodity exchanges of which six are national level commodity exchanges. Of these, the most important ones are Multi Commodity Exchange of India Limited (MCX) National Commodity and Derivative Exchange (NCDEX) National Multi Commodity Exchange of India Ltd (NMCE). According to the Forward Markets Commission’s 2013-2014 Annual Report, MCX contributed 85% of FMC’s revenues and is the largest commodities exchange in India followed by NCDEX, Mumbai (11.30 %), NMCE, Ahmedabad (1.51 %), ICEX, Mumbai (0.84 %), ACE Mumbai (0.46%) and UCX, Navi Mumbai (0.72%). MCX offers trading in over 50 commodities. In addition, it maintains four Commodity Futures Indices (MCXCOMDEX, MCXMETAL, MCXAGRI and MCXENERGY), four Commodity Spot Indices (MCXSCOMDEX, MCXSMETAL, MCXSAGRI and MCXSENERGY) and three Rainfall Indices (RAINEXIDR, RAINDEXMUM and RAINDEXJAI).

Commodities’ trading in India has seen phenomenal growth in the recent past as evidenced in Figure 1. It is also infamous for wild price fluctuations which is generally attributed to speculative participants[3]–[5].

Given the nature of the underlying and its relation to the Indian economy, it is of utmost importance that this market needs to be thoroughly analyzed. This paper is an attempt to capture and model the volatility in the Indian Commodity Markets using the GARCH family of models. Trading in Indian commodity markets has been a topic of much debate for producers, consumers, researchers and policy makers. While some researchers believe that commodity derivatives have increased speculative activity and volatility, some others have shown that these products have reduced volatility thereby improving stability.

Indian agricultural commodities futures markets are not yet mature and efficient [12]. But Indian Commodity markets exhibit an efficient price discovery in place [2], [6]. When Granger Causality, Co-integration and Vector Error Correction Models are applied in the process of process of price discovery on pepper prices, it was found that there is unidirectional causality from futures to spot prices in the futures market [6]. Price discovery role of futures market might be affected by liquidity and market size [13].

For agricultural commodities such as maize, chickpea, black lentil, pepper, castor seed, soybean and sugar, it has been found that the futures and spot prices are cointegrated in the long term[14]. The study also revealed a short-term relationship between the two markets and that the futures market had the ability to predict spot prices for some of the commodities and the relationship was bi-directional for a few others.

An empirical analysis of the efficiency of spot and futures markets using Johansen cointegration techniques has found that the futures market is unable to fully incorporate information which confirmed the inefficiency of the market. The study focused on the daily futures and comparable ready prices of five commodities across six Indian commodity exchanges. Hence the Indian agricultural commodities futures markets are not yet mature and efficient [12].

An examination of the lead-lag relationship between the spot price of commodities and the associated futures contract in the Indian market scenario concluded that information first appears in futures market and then is transmitted down to the spot market. Hence, futures market enjoys greater leverage which attracts speculators. Also, speculative activity provides liquidity to the market and helps in price discovery [8]. Data for that particular study consisted of daily cash closing prices, daily futures settlement prices, total futures trading volume, and total futures open interest for the agricultural commodities barley, maize, mustard seed and pepper traded on National Commodity Exchange (NCDEX) in India.

Commodity price volatility exhibits a leptokurtic behaviour [15]. It makes futures prices difficult to forecast because futures price becomes wider. Since the accuracy of forecasting is decreased, it makes it difficult for both
Forecasting Performance of GARCH Family Models in the Indian Commodity Markets

producers and consumers to protect their welfare [16]. In addition, supply/demand, weather conditions, change in trading volumes, terms of trade shocks and exchange rates also caused an increase in price volatility [15]. These studies also establish the need for hedging commodity prices [15]. The studies on Indian commodity markets have recommended the strengthening and autonomy of the Forwards Market Commission and also the need for well-developed warehousing and market linkages to make them more efficient [2]. Literature on Indian commodity markets has mainly focused on agricultural commodities [17]–[26] or is limited to few commodities traded on national exchanges.

This study contributes to the existing literature on the Indian commodities markets by studying the Indices being maintained by Multi Commodities Exchange of India Limited (MCX) viz. MCXCOMDEX, MCXMETAL, MCXAGRI and MCXENERGY. Commodity indices capture the broad market sentiments and studying these instruments gives a macro view of the markets as compared to the micro view by studying an individual commodity. As with other markets, volatility of futures prices is a concern and there is a need to develop a model to efficiently forecast the futures prices in order to better understand the behavior of these markets. The GARCH family models have been very popular in literature for studying and modelling volatility. The usefulness of these models in studying the Indian commodity markets will provide deeper insight into the concealed behavior that these markets exhibit.

III. DATA AND METHODOLOGY

This study employs futures data of four commodity indices actively traded on the Multi Commodity Exchange (MCX) – MCXCOMDEX, MCXMETAL, MCXENERGY and MCXAGRI. The MCXCOMDEX is a composite index comprising of MCXMETAL (40%), MCXENERGY (40%) and MCXAGRI (20%). The daily closing price of the four indices has been considered for this study. MCX considers only the near month active contract price for index computation.

As with equity indices, Indian commodity market indices encompass all the commodities available for derivative trading in the market and provide a good overall sense of the commodity markets. Indices also give a macro perspective which is helpful in understanding the volatility of the market. Table I lists the four indices being maintained by the Multi Commodity Exchange of India and their components.

| Table I: List of MCX indices and their components |
|-----------------|-----------------|-----------------|
| Index           | Components      | Weight          |
| MCXCOMDEX       | MCXMETAL Index  | 40.00%          |
|                 | MCXENERGY Index | 40.00%          |
|                 | MCXAGRI Index   | 20.00%          |
| Gold            | 38.03%          |
| Silver          | 24.13%          |
| Copper          | 17.83%          |
| Zinc            | 5.00%           |
| Aluminium       | 5.00%           |
| Nickel          | 5.00%           |
| Lead            | 5.00%           |
| MCXMETAL Index  | Crude Oil       | 85.53%          |
|                 | Natural Gas     | 11.48%          |
|                 | Ref. Soy Oil    | 19.55%          |
|                 | Potato          | 23.80%          |
|                 | Chana           | 20.70%          |
| MCXENERGY Index | Crude Palm Oil  | 15.95%          |
|                 | Kapsakhali      | 10.00%          |
|                 | Mentha Oil      | 10.00%          |

A. GARCH Family models

The GARCH model is effective in capturing the time-varying nature of volatility and models it as conditional variance. It expresses the conditional variance of the error term as a linear function of the lagged squared residuals and the lagged residual conditional variance. GARCH also captures volatility clustering found to be highly evident in financial data. The GARCH approach is a common and simple way to use historical data to study volatility as it is designed to track variations in volatility through time. The GARCH model is symmetric in nature i.e., it treats both good news and bad news with equal importance. Since Leverage Effect is very common in financial data, this symmetric nature of GARCH model may prove to be a limitation. To overcome this, variants of GARCH such as TGARCH, EGARCH etc. were developed which are asymmetric in nature and capture the Leverage Effect more effectively.

B. The GARCH (1,1) model

In a GARCH (p,q) model given by [27], p represents the order of the moving average ARCH terms and q represents the order of autoregressive GARCH terms. $Y_t = \omega + \alpha_t X_t + \epsilon_t$ Where $\epsilon_t \sim N (0, \sigma_t^2)$

$\sigma_t^2 = \omega + \sum_{i=1}^{p} \alpha_i \epsilon_{t-i}^2 + \sum_{j=1}^{q} \beta_j \sigma_{t-j}^2$ \hspace{1cm} (2)

Where

Equation (1) represents the conditional term
Equation (2) is the conditional variance equation. In both the above equations ω is a constant. In Equation (2), $\varepsilon_{t-1}^2$ is the ARCH term which represents the volatility from the previous period and is measured as the lag of the squared residual form the mean equation. $\sigma_{t-j}^2$ is the GARCH term which represents the forecast variance of the previous period.

The GARCH (1,1) model refers to the presence of a first order moving average ARCH term and a first order autoregressive GARCH term. The mean and the variance equations for the GARCH (1,1) model are as follows:

$$Y_t = \omega + \alpha_1 Y_{t-1} + \epsilon_t \quad \text{...} \quad (3)$$

$$\sigma_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \beta \sigma_{t-j}^2 \quad \text{...} \quad (4)$$

C. The Threshold GARCH (TARCH) Model

The TARCH model was introduced by both [28] and [29] independently. It is an asymmetric GARCH model factors in the ‘leverage effect’ and good news and bad news have differential effect on the model. An additional term $\varepsilon_{t-k}$ is added to the GARCH equation to account for possible asymmetries. As with GARCH(1,1), $\varepsilon_{t-1}^2$ is the ARCH term which represents the volatility from the previous period and $\sigma_{t-j}^2$ is the GARCH term which represents the forecast variance of the previous period.

$$\sigma_t^2 = \sum_{r=1}^p \alpha_j \varepsilon_{t-1}^2 + \sum_{j=1}^q \beta_j \sigma_{t-j}^2 + \sum_{k=1}^r \gamma_k \varepsilon_{t-k}^2 I_{t-k} \quad \text{...} \quad (5)$$

In Equation (5), $I_t = 1$ if $\epsilon_t < 0$ and 0 otherwise. Good news is represented by $\epsilon_{t-1} > 0$ and has an impact of $a_t$ while bad news is represented by $\epsilon_{t-1} < 0$ and has in impact of $a_t + \gamma_t$.

$\gamma_t 
eq 0$ implies that the impact of news (good or bad) is asymmetric. $\gamma_t > 0$ implies evidence of leverage effect and that bad news increases volatility.

D. The Exponential GARCH (EGARCH) Model

Nelson [30] proposed the EGARCH model which is specified by the conditional variance equation

$$\log(\sigma_t^2) = \sum_{r=1}^p \alpha_j \log(\sigma_{t-1}^2) + \sum_{j=1}^q \beta_j \log(\sigma_{t-j-1}^2) + \sum_{k=1}^r \gamma_k \varepsilon_{t-k}^2 \sigma_{t-k}^2 \quad \text{...} \quad (6)$$

The EGARCH model implies that the conditional variance is exponential (hence log), rather than quadratic as implied by the other GARCH variants. As with GARCH(1,1), $\varepsilon_{t-1}^2$ is the ARCH term which represents the volatility from the previous period and $\sigma_{t-j}^2$ is the GARCH term which represents the forecast variance of the previous period.

While $\alpha$ represents the symmetric effect of the model and $\beta$ represents the persistence in conditional volatility, $\gamma$ in Equation (6) is a measure of the asymmetry or leverage effect.

$\gamma = 0$ denotes that the model is symmetric. $\gamma < 0$ indicates that positive news generates less volatility than negative news. Conversely, $\gamma > 0$ indicates that negative shocks have a higher impact than positive news.

E. The Power GARCH (PARCH) Model

The PARCH model proposed by Taylor [31], the standard deviation is modelled rather than the variance with the estimation of the power parameter $\delta$. As with GARCH(1,1), $\varepsilon_{t-1}^2$ is the ARCH term which represents the volatility from the previous period and $\sigma_{t-j}^2$ is the GARCH term which represents the forecast variance of the previous period. The optional $\gamma$ parameter is included to capture the asymmetry. The PARCH model estimates the variance as:

$$\sigma_t^2 = \omega + \sum_{r=1}^p \alpha_t (|\varepsilon_{t-1}| - \gamma_t \varepsilon_{t-1})^\delta + \sum_{j=1}^q \beta_t \sigma_{t-j}^2 \quad \text{...} \quad (7)$$

Where $\delta > 0$, $|\gamma_t| \leq 1$ for $i=1, \ldots, r$, $\gamma_t = 0$ for all $i > r$ and $r \leq p$.

IV. EMPIRICAL ANALYSIS

The period of study is from May 2006 to March 2016. Daily closing data of MCXCOMDEX, MCXMETAL, MCXENERGY and MCXAGRI gives us 2921 observations. The entire sample is divided into two parts: observations for model building and hold-out-sample observations for validating the model. Data from May 2006 to December 2015, which comprises of 2858 observations is used to estimate the models. Data from January 2016 to March 2016 has been reserved as the hold-out sample for out-of-sample forecasting. Table II displays key descriptive statistics of the four indices.

Preliminary investigation verify the stationarity of data by employing Augmented Dickey-Fuller test [32] and Philips-Perron test reveals that the raw price data is not stationary. GARCH family models assume stationary of the data series. Hence, to achieve stationarity, the returns series is used. It is calculated as

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}}$$
Table II: Summary Statistics of Daily Closing Prices

<table>
<thead>
<tr>
<th></th>
<th>MCXCOMDEX</th>
<th>MCXAGRI</th>
<th>MCXENERGY</th>
<th>MCXMETAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>3319.296</td>
<td>2434.445</td>
<td>3183.103</td>
<td>4288.806</td>
</tr>
<tr>
<td>Median</td>
<td>3516.54</td>
<td>2342.01</td>
<td>3189.14</td>
<td>4293.91</td>
</tr>
<tr>
<td>Maximum</td>
<td>4683.6</td>
<td>3716.38</td>
<td>5137.1</td>
<td>5741.31</td>
</tr>
<tr>
<td>Minimum</td>
<td>1756.14</td>
<td>1776.77</td>
<td>1479.18</td>
<td>2096.66</td>
</tr>
<tr>
<td>Std. Dev</td>
<td>625.2015</td>
<td>418.6217</td>
<td>726.3934</td>
<td>871.229</td>
</tr>
<tr>
<td>Skewness</td>
<td>-0.64861</td>
<td>0.74028</td>
<td>0.14559</td>
<td>-0.08457</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>3.388079</td>
<td>3.252345</td>
<td>2.343843</td>
<td>2.222381</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>163.3632</td>
<td>200.3022</td>
<td>408.4559</td>
<td>232.8559</td>
</tr>
</tbody>
</table>

The skewness and kurtosis statistics clearly indicate the presence of fat tails and extreme values. Kurtosis > 3 also indicates that the right tails are extreme.

To model the data for GARCH, EGARCH, PARCH and TARCH, 2855 daily observations are used. Models are estimated by the method of maximum likelihood and errors are studies for three types of conditional distributions - Gaussian, Student’s t and Generalized Error Distribution(GED). Three statistics –Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) and Hannan-Quinn Criterion (HQC) are used to rank the models. Lower the value of the statistic, better is the model.

The table below displays the ranks of the models for each of the indices – MCXCOMDEX, MCXAGRI, MCXENERGY and MCXMETAL.

Individual rank of each model for the three assumptions of error distribution is indicated below the respective statistic. The last row indicates the sum of the individual ranks and the definitive rank in parenthesis.

V. RESULTS AND DISCUSSION

The results of the various tests along with test statistics have been discussed below.

Table III: Statistical verification and ranking of models for MCXAGRI

<table>
<thead>
<tr>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIC</td>
<td>SIC</td>
<td>HQC</td>
<td>AIC</td>
</tr>
</tbody>
</table>

The AIC, SIC and HQC for the four models across the three error distributions for MCXAGRI index have been displayed in Table (III). All three statistics strongly favour PARCH(1,1) model and Student’s t distribution. The asymmetric models PARCH, TARCH are shown to be better suited for MCXAGRI than the symmetric GARCH model.

Table IV: Statistical verification and ranking of models for MCXENERGY

<table>
<thead>
<tr>
<th>AIC</th>
<th>SIC</th>
<th>HQC</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.26102</td>
<td>4.26102</td>
<td>4.26102</td>
</tr>
<tr>
<td>4.26102</td>
<td>4.26102</td>
<td>4.26102</td>
</tr>
<tr>
<td>4.26102</td>
<td>4.26102</td>
<td>4.26102</td>
</tr>
<tr>
<td>4.26102</td>
<td>4.26102</td>
<td>4.26102</td>
</tr>
</tbody>
</table>

Table (IV) discusses the efficiency of models for MCXENERGY. The symmetric GARCH(1,1) model with GED clearly ranking above the rest. The GED distribution is better suited for this index than the other error distributions.

Table V: Statistical verification and ranking of models for MCXMETAL

<table>
<thead>
<tr>
<th>AIC</th>
<th>SIC</th>
<th>HQC</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.03458</td>
<td>4.03458</td>
<td>4.03458</td>
</tr>
<tr>
<td>4.03458</td>
<td>4.03458</td>
<td>4.03458</td>
</tr>
<tr>
<td>4.03458</td>
<td>4.03458</td>
<td>4.03458</td>
</tr>
<tr>
<td>4.03458</td>
<td>4.03458</td>
<td>4.03458</td>
</tr>
</tbody>
</table>

Table (V) discusses the statistics for MCXMETAL index. All three comparison statistics indicate that the GED is a better assumption for error distribution. It also shows the preference for GARCH(1,1) model over the rest. It should also be noted that the difference in the actual statistics for any model under the GED distribution is minimal.

Table VI: Statistical verification and ranking of models for MCXCOMDEX

<table>
<thead>
<tr>
<th>AIC</th>
<th>SIC</th>
<th>HQC</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.04852</td>
<td>4.04852</td>
<td>4.04852</td>
</tr>
<tr>
<td>4.04852</td>
<td>4.04852</td>
<td>4.04852</td>
</tr>
<tr>
<td>4.04852</td>
<td>4.04852</td>
<td>4.04852</td>
</tr>
<tr>
<td>4.04852</td>
<td>4.04852</td>
<td>4.04852</td>
</tr>
</tbody>
</table>

Table (VI) displays the model ranking for MCXCOMDEX index. The GED assumption is favoured along with extremely little difference in the statistics across the models. However, GARCH(1,1) is marginally better ranked than the other three.

Three (MCXENERGY, MCXMETAL and MCXCOMDEX) out of four indices show a strong affinity towards the symmetric GARCH(1,1) model. The GED
error distribution assumption holds good for MCXENERGY, MCXMETAL and MCXCOMDEX. Although MCXAGRI has ranked PARCH(1,1) under the Student’s t distribution as the highest, the symmetric GARCH(1,1) is also shown to be not far behind. The model specifications thus tested across AIC, SIC and HQC have not shown the effectiveness of asymmetric models over the symmetric models. All four indices have rejected the assumption of a normal error distribution. Hence, it can be deduced that the usual assumption of normal distribution which is frequently adopted in studying financial data is not justified.

**Forecasting and performance evaluation**

Forecasting performance is evaluated using the coefficients given by the forecasts output viz. Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), Mean Absolute Percentage Error (MAPE) and Theil Inequality Coefficient (Theil U). The various models and assumptions of error distributions are measured for out-of-sample dynamic forecasting performance across the four error coefficients. The forecasting ability of the four models crossed with the three error distributions is tested against the reserved test sample of 63 observations.

Individual forecasting performance rank of each model for the three assumptions of error distribution is indicated below the respective statistic. The last row indicates the sum of the individual ranks and the definitive rank in parenthesis.

A common observation across the four indices is that any single model fails to establish its predictive supremacy over the rest. There is also a disagreement regarding the error distribution assumption across the indices.

**Table IVII: Forecast performance of models for MCXAGRI**

<table>
<thead>
<tr>
<th>Model</th>
<th>GARCH(1,1)</th>
<th>SARCH(1,1)</th>
<th>PARCH(1,1)</th>
<th>TARCH(1,1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMSE</td>
<td>0.0056</td>
<td>0.0047</td>
<td>0.0040</td>
<td>0.0037</td>
</tr>
<tr>
<td>MAE</td>
<td>0.0044</td>
<td>0.0041</td>
<td>0.0039</td>
<td>0.0038</td>
</tr>
<tr>
<td>MAPE</td>
<td>0.8008</td>
<td>0.6907</td>
<td>0.6206</td>
<td>0.5495</td>
</tr>
<tr>
<td>TUE</td>
<td>0.0040</td>
<td>0.0039</td>
<td>0.0038</td>
<td>0.0037</td>
</tr>
</tbody>
</table>

Table (VII) displays the performance of various models in forecasting the returns for the MCXAGRI index. The GARCH(1,1) model outranks the other three models in the forecasting accuracy with Student’s t distribution showing better performance irrespective of the model.

**Table VII: Forecast performance of models for MCXENERGY**

<table>
<thead>
<tr>
<th>Model</th>
<th>GARCH(1,1)</th>
<th>SARCH(1,1)</th>
<th>PARCH(1,1)</th>
<th>TARCH(1,1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMSE</td>
<td>0.0037</td>
<td>0.0039</td>
<td>0.0036</td>
<td>0.0035</td>
</tr>
<tr>
<td>MAE</td>
<td>0.0038</td>
<td>0.0036</td>
<td>0.0034</td>
<td>0.0033</td>
</tr>
<tr>
<td>MAPE</td>
<td>0.9042</td>
<td>0.8230</td>
<td>0.7645</td>
<td>0.7227</td>
</tr>
<tr>
<td>TUE</td>
<td>0.0040</td>
<td>0.0039</td>
<td>0.0038</td>
<td>0.0037</td>
</tr>
</tbody>
</table>

Table (VIII) discusses the MCXENERGY index. The assumption of Student’s t distribution shows a better performance than the normal distribution for any model. PARCH(1,1) , TARCH(1,1) and EGARCH(1,1) model show better forecast performance that GARCH(1,1) indicating that asymmetric models better suited for forecasting the MCXENERGY index.

**Table IX: Forecast performance of models for MCXMETAL**

<table>
<thead>
<tr>
<th>Model</th>
<th>GARCH(1,1)</th>
<th>SARCH(1,1)</th>
<th>PARCH(1,1)</th>
<th>TARCH(1,1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMSE</td>
<td>0.0048</td>
<td>0.0047</td>
<td>0.0046</td>
<td>0.0045</td>
</tr>
<tr>
<td>MAE</td>
<td>0.0046</td>
<td>0.0045</td>
<td>0.0044</td>
<td>0.0043</td>
</tr>
<tr>
<td>MAPE</td>
<td>0.9132</td>
<td>0.8333</td>
<td>0.7737</td>
<td>0.7334</td>
</tr>
<tr>
<td>TUE</td>
<td>0.0041</td>
<td>0.0040</td>
<td>0.0039</td>
<td>0.0038</td>
</tr>
</tbody>
</table>

The forecasting performance of the four models for MCXMETAL index is discussed in Table (IX). All the four models are ranked equally here, under the assumption of the GED. The forecast ability of the various models under the normal distribution is clearly not preferred.

**Table X: Forecast performance of models for MCXCOMDEX**

<table>
<thead>
<tr>
<th>Model</th>
<th>GARCH(1,1)</th>
<th>SARCH(1,1)</th>
<th>PARCH(1,1)</th>
<th>TARCH(1,1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMSE</td>
<td>0.0059</td>
<td>0.0057</td>
<td>0.0055</td>
<td>0.0054</td>
</tr>
<tr>
<td>MAE</td>
<td>0.0057</td>
<td>0.0055</td>
<td>0.0053</td>
<td>0.0052</td>
</tr>
<tr>
<td>MAPE</td>
<td>0.9132</td>
<td>0.8333</td>
<td>0.7737</td>
<td>0.7334</td>
</tr>
<tr>
<td>TUE</td>
<td>0.0042</td>
<td>0.0041</td>
<td>0.0040</td>
<td>0.0039</td>
</tr>
</tbody>
</table>

Table (X) discusses the ranking of various models for forecasting performance for the MCXCOMDEX index. The asymmetric EGARCH(1,1) has outperformed the other models followed by PARCH(1,1) and GARCH(1,1). The results are strongly in favour of asymmetric distributions under the GED assumption for MCXCOMDEX.
Out-of-sample forecasting of the 63 samples tested against the various models under the three assumptions of conditional error distributions show that all the four indices prefer non-normal error distributions which capture the fat-tails of the data series. While MCXENERGY and MCXCOMDEX show better forecasts with asymmetric models, MCXAGRI shows a better performance under GARCH(1,1). MCXMETAL ranks all the models equally but with the assumption of non-normal error distribution.

VI. DISCUSSION

The GARCH family models are employed to capture, model and forecast volatility for the four commodity indices (MCXAGRI, MCXENERGY, MCXMETAL and MCXCOMDEX). The efficiency of the models has been tested with both in-sample forecasts and out-of-sample forecasts. Ideally, the best fit model should also be the best forecasting model. The statistics indicate that for the MCXAGRI index, while PARCH(1,1) is a better fit, GARCH(1,1) gives better forecasting performance as found in other studies also.[14], [16] and [4]

The symmetric GARCH model in its lowest order (1,1) is a better fit for MCXENERGY, MCXMETAL and MCXCOMDEX. MCXENERGY has a better forecasting performance with GARCH(1,1) for in-sample forecast and PARCH(1,1) for out-of-sample forecast. Similarly, MCXMETAL shows TARCH(1,1) as a better forecasting model for in-sample data and GARCH(1,1) for out-of-sample data. No single model establishes its superiority over the others in the sample of commodity indices used for this study, as evidenced in some other studies.[33]

It should also be noted that for every index and every model, the assumption of a non-normal conditional error distribution is evident.[33]

VII. CONCLUDING COMMENTS

This paper has attempted to examine the forecasting performance of the popular GARCH family models in the Indian Commodity Markets. It makes use of the four commodity indices maintained by Multi Commodities Exchange of India (MCX) – MCXCOMDEX, MCXAGRI, MCXENERGY and MCXMETAL. As evident from the statistics obtained, the results are mixed regarding the best fit model and the two types of forecast for the four commodity indices. The ability of a model to cope with the asymmetry, which appears prominently in the data set, also has no bearing on the forecast performance of the model. This could also be due to the inherent parameter instability of the long data set being used for the study. In such a situation, it is difficult to arrive at a definitive conclusion regarding a single model which is ranked high for both model specification and forecasting performance. This however, does not undermine the usefulness of the GARCH models in studying time series data. Adding more specifications to the model’s variance equation may better capture the essence of volatility and thereby, improve forecast ability. Also, commodities in general and agricultural commodities in particular, have been traditionally known to be influenced by exogenous variables which distort the volatility levels and make it more difficult to model than equity instruments.

REFERENCES

Forecasting Performance of GARCH Family Models in the Indian Commodity Markets

Potential of Soya Beans Seasoning With Garlic and Ginger for Sustainable Health

Aishatu Ibrahim, Eldah Ephraim Buba
Department Of Leisure And Tourism Management Federal Polytechnic Bauchi

Abstract: This study assessed the use of soya bean in enhancing ginger and garlic seasoning in food production for healthy eating. The objectives of the research was to; produce soya bean seasoning enhanced with ginger and garlic, to produce dishes using enhanced soya bean seasonings for sensory evaluation to taste for acceptability and to review the health benefits of soya bean seasoning with garlic and ginger. The study adopted both survey and experimental research using a purposive random sampling in getting the data. The population of the study was made of the sensory evaluators drawn from among the staff and students of Federal Polytechnic Bauchi, and chefs from selected hotels in Bauchi, Bauchi State. A stratified random sampling was used where fifty (50) sensory evaluators were selected, comprising 25 persons from the polytechnic community and 25 men and women from the hotels as respondents. The study used dried soya beans, ginger, and garlic as sample A, B, and C respectively. Both descriptive statistics and One – Way Analysis of Variance (ANOVA) were used to analyze the data. The result of the study indicated that soya bean – garlic seasoning differs from soya bean – garlic and soya bean – ginger – garlic seasonings at P = 0.717 and 0.148 > 0.05 but soya bean – garlic seasoning shows no significant difference from soya bean – ginger – garlic seasoning at P = 0.024 < 0.05. The study has opened up more avenues for exploiting the numerous health benefits of soya bean, ginger and garlic therefore recommend that; families and commercial hospitality enterprises should adopt and incorporate soya bean enhanced seasonings into their exquisite cuisine and processing of these seasonings should be done under good hygienic condition to avoid contamination because they easily attract germs.

Index Terms— Soyabean Potential Ginger Sustainable Health

I. INTRODUCTION

Seasoning is the process of adding herbs, salt, or spices to food, seasoning include herbs and spices which are themselves frequently referred to as seasoning soya beans is widely cultivated all over the world. Garlic grows in many parts of the world and is popular ingredients in cooing due to its strong smell and delicious taste. Leech (2015) explains that garlic is among the healthiest (and most delicious) spices on the planet. Soya beans are traditional part of diet in china, Japan, Korea, Nigeria countries etc. and are currently grown in countries across the world including brazil, Argentina, India unit states and Nigeria. Barnes (2010) discovered that small and unique peptides in soya beans include defacing glycines, Conglycinins and lanansin and all are known to provide us with health benefits, including benefits in the area of improved blood pressure regulation, better control of sugar levels and improved immune function. Fermented soya beans powder or mold have been used in various houses in the Northern Nigeria as local seasoning which gives taste and flavor to food. Likewise the herb and spices garlic and ginger has served as flavoring since earliest time of mankind history. Despite the way garlic and ginger are widely used in Nigeria and it’s proved nutritional value to man, it is observed that it has not gained general acceptance by the public. The limited evidence of soya beans seasoning enhanced with ginger and garlic or with other spices is part of the reasons that prompted this study. Personal observation has shown chemical contents in most of the seasoning used for cooking. Numerous studies have shown the negative effect of consuming chemicals to one’s health. The advocating for the consumption of natural food substances is a pressing need for healthy eating and living. It is of this reasons the study seek to carry out this research work in order to promote the healthy eating of local women and low income earner, and to gain general acceptability by the public. Bolla (2015), explain that Soya beans foods have become more familiar to consume worldwide and have become a popular choice of many health conscious valued for their Versatility, Taste, Nutritional Content, Environmental Advantages and Health Benefits. Soya available in Boiled Soybeans, Soy Flour, Soy Oil, Soy Sauce, Soy Milk, Soy Tofu, Soy Curd, Fried Soy Curd, Fortified Soy Products for Infants & Women, Fermented Soybeans and other. Soy is used for High Cholesterol, High Blood Pressure. When the pressing needs to alleviate poverty and malnutrition and to improve the welfare of poor people are considered, issues relating to high quality protein food, greater income opportunities for male and female are of paramount importance. Protein content is approximately 40% and fat...
20% (Glami, 2002) with considerable variations depending on the cultivars.

II. SOYA BEAN

Morton (2015) observed that heart attack, cancer and stroke are leading sicknesses worldwide. While it is impossible to avoid risk factors such as age, sex and family history, there is plenty we can do to protect our bodies against their life threatening diseases. Science has shown that more of healthy foods is the way to keep the body health and happy. Soya bean is regarded as equal in protein to animal foods. It has been found to be excellent for a number of different conditions such as high blood pressure, diabetes – related diseases and many others (WHF, 2004). Osho and Dashiell (1998) reported that soyabean which has less purchase cost has about 40% protein, 30% carbohydrates, 20% oil and 10% mineral. It is very useful in improving the menu of malnourished children and revitalizing heart and breast cancer patients and has no cholesterol.

Studies by Faryna (1987) and Enwere (1998) soyabean can be as a nutritional supplement for pregnant women, lactating mothers and children. The household use of soyabean is targeted to suit local dishes for Nigerians and communities all over the country. About 140 soyabean products are now available (Enwere, 1998; Osho and Dashiell, 1998; Okoruwa, 2002).

A key problem associated with soyabean is that it contains some anti-nutritional factors, which inhibit the availability of the desirable elements such as protein (Lewis, 2015). Fortunately most of these anti-nutritional factors can be destroyed through processing and boiling (Loo, 1978; NAERLS, 1989; Enwere, 1998; Osho and Dashiell, 1998). Major processing of these products includes cleaning, soaking, dehusking, milling, sieving, boiling, roasting and fermentation. Further processing depends on the type of products to be produced, Owolabi and Iita (2002).

However, soyabean is said to cause allergy, trigger such symptoms as vomiting and diarrhea in children, cause Phytoestrogen in men, cause tumour or breast cancer in women, cause pancreatic cancer and prostate cancer (Mitchell, Cawood, Kinniburgh, Provan, Collins, Irvine 2001).

A. Nutritional Benefits

Soybeans contain all the three macronutrients required for good nutrition, as well as fiber, vitamins, minerals. Soybean protein provides all the essential amino acids in the amounts needed for human health. Almost 40 per cent of the calories from soybeans are derived from protein, making soybeans higher in protein than any other legumes and many animal products. Protein in just 250

B. Garlic

Food beverage venture (2015) states that garlic has been used to treat a wide variety of illness. Garlic has been used to treat seizure, joint pain, parasite infection, for wood dressing etc. Other health benefits of garlic include lowering cholesterol, athletic performance, building strong bones, detoxing heavy metals, and building strong bone and building immunity. Garlic is anti-fugal, antibacterial it has shown that garlic can build immunity, and speed recovery from the cold and flu (Lewis, 2015).

C. Ginger

Food beverage ventures (2015) identified the benefits of ginger as an antibiotic with anti-inflammatory, antibiotic and anti-viral properties. It protects the kidney and liner from damage, with its array of anti-oxidants and other therapeutic actions. It promotes blood circulation, a condition necessary for efficient for kidney function, ginger also contains an enzyme which helps you digest animal protein that many build up area and weaken the kidneys.

Ginger contains volatile oil, resins and protein digesting enzymes, which neutralize acid and toxins in the digestive tract that harm the kidney. Adel and Prakash (2010) further buttresses this point by describing that Ginger root is the main part of the spice of ginger which contains a number of essential minerals that kills bacteria and small micro-organisms. Yamahara et al., (2011), if there is any patient who is treated with cytotoxic compounds, ginger is recommended basically for the reduction of vomiting, in Related to this, Kraft and Hobbs, (2004) and Adame & Adame, (2001) wrote that ginger root in a suitable recipe form can enhance and stimulate appetite and accelerate digestion and act as ant flatulent for the reduction of bloating and gas.

Ahmed and Sherma (1997) and Surh et al., (1998) find out that, the vitro and animal trials with ginger and ginger root have emphasized that it possesses powerful antioxidant ability and thereby empower with sufficient protective effect against free radical damage. In addition to this, ginger root by products release anti-tumor effects in vitro on particular cells under Epstein-Barr virus stage of infection as well as antioxidant effects that prevent the human body not to be affected in certain types of cancer. Finally, this scientific experiment has shown how ginger root has applicable principles to protect human nerve system and even it may have bright hope in the treatment of Alzheimer’s disease. The crude aqueous extract of ginger had been used commonly in tenderizing the tough meats.

III. METHODOLOGY

This paper explains the methodology for the study, the research design, target population, sample and sampling technique, data collection instrument, validation of research,
procedure for data collection and the method of data analysis.

The study is a mixed design. It is the combination of survey and experimental research, likewise secondary and primary study. The study is survey because it entails using survey questionnaire to collect some amount of data (Saunders, Lewis & Thornhill, 2012). Survey study is explained by Veal (2012) as a research that collects sample opinions, attitudes of feeling in order to estimate the total or overall situation. Survey researches could be used to test the acceptability of certain educational innovations. An experimental research uses apparatus and materials, and follows a basic procedure for establishing a position from the results obtained. Secondary data are data used for a study that was originally collected for different purpose (Saunders et al., 2009), while primary data are data collected from direct involvement of the researcher or someone assigned by the researcher for the study (Finnegan, 1996). Secondary data is economical; secondary data reduces cost and time for the researcher. (Bryman, 2012, Saunders et al., 2009), in contrast, Saunders et al., (2009) observed that primary data collection can take time and resource of the researcher. Secondary data is extensive; it can be used for longitudinal design allowing researchers to examine the changes (Hammersley, 2004).

A survey questionnaire was used for the study to assess the sensory evaluation of the three products produced from suya beans, ginger and garlic. The practical production in this research was conducted in the hospitality laboratory kitchen and restaurant.

The population for this study which was made of the sensory evaluators was drawn from among hospitality professionals, nutritionist, and chefs from selected hotels in Bauchi, Bauchi State. This is to enable them give a better judgment on the products used for the sensory evaluation. Sample is the segment of a population that is selected in a research; it is the subset of the population (Saunders et al., 2009; Bryman, 2009). The non-probability sampling was chosen based on the researcher’s judgment regarding the population characteristics (Johnson and Clark, 2006). The population characteristics are those features used in identifying the population (Travers, 2001). Purposive sampling is a form of non-probability sampling which a researcher samples cases in a tactical way so that they units are relevant to the research questions. Fifty (50) sensory evaluators, comprising 25 persons from the polytechnic community and 25 men and women from the hotels and general public formed the body of respondents. The taste panelists evaluated the dishes produced from the soya bean enhanced seasoning on the basis of taste, colour, aroma and texture using a likert scale.

A. Data Collection Procedures

The first stage was the production of the soya seasoning which was used in producing local delicacies to determine the level of acceptability of the products. Nine different dishes were produced using the three different seasonings produced on fish pepper soup, Joll of rice and mixed vegetable and pounded yam. The panelists tasted the dishes produced with soya beans seasoning enhanced with garlic and ginger and then rated them based on their judgment. The sensory evaluation was carried out by the respondents in the Federal Polytechnic Bauchi demonstration restaurant. This is because of the facilities available for production and service of the dishes to the group of panelists. All samples produced were documented on a CD.

The method of data analysis employed by the researchers includes descriptive statistics and One-Way Analysis of Variance (ANOVA). A brief analytical description was included for each statistical presentation in order to aid clarification and to justify findings from the respondents about the variables based on the taste, flavor and appearance of dishes prepared. For the third objective of the study which entails secondary data; data analysis of secondary data analysis is the analysis of data by researchers who will probably not have been involved in the collection of those data, for purposes that in all likelihood were not envisage by those responsible for the data collection.

IV. DATA PRESENTATION, DATA ANALYSIS AND DISCUSSION

This paper consists of the data collected for the study which includes data presentation, data analysis, data interpretation and discussions. A total of forty-five respondents randomly selected from among the hospitality lecturers, students and industry practitioners participated in the taste panel for this research. Three sampled dishes prepared with Soya bean - ginger seasoning, soya bean – garlic seasoning and Soya bean – ginger- garlic seasoning were produced and served to the panelists respectively. The products were evaluated against taste, aroma, appearance and general acceptability on a 5-point scale ranging from very poor to very good. The cumulative mean rating on taste, aroma, appearance and general acceptability of the panelists was determined as follows: 5= Very good, 4= Good, 3= Fair, 2= poor and 1= very poor. The data collected are analyzed below:

<table>
<thead>
<tr>
<th>Table 1: Sample A1 Pepper Soup seasoned with soya beans and ginger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
</tr>
<tr>
<td>Taste</td>
</tr>
<tr>
<td>Aroma</td>
</tr>
<tr>
<td>Appearance</td>
</tr>
<tr>
<td>General acceptability</td>
</tr>
</tbody>
</table>

Source: Sensory Evaluation (2016)

The table above shows data from the taste of the fish pepper soup seasoned with soya bean and ginger. The result shows
the taste is considered very good with average mean score of responses of 4.53. Aroma has an average mean score of 4.33 which is good while appearance and general acceptability have mean score of 4.33, and 4.44. The data above shows that the seasoning of soya beans and ginger is generally accepted.

**Table 2: Sample A2, Pepper Soup Seasoned with Soya Beans and Garlic**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Average mean</th>
<th>Total Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taste</td>
<td>3.27</td>
<td>45</td>
</tr>
<tr>
<td>Aroma</td>
<td>4.33</td>
<td>45</td>
</tr>
</tbody>
</table>

Source: Sensory Evaluation (2016)

Data shown on the above table on the taste of the pepper soup using soya beans and garlic has average mean score of 3.27 which rates as poor. The aroma has 4.33 which is good. The appearance of the meal has a mean of 4.47 which is good. General acceptability is good with average mean score of 4.01.

**Table 11: ANOVA (LIKENESS)**

<table>
<thead>
<tr>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1.234</td>
<td>2</td>
<td>.617</td>
<td>3.736</td>
</tr>
<tr>
<td>Within Groups</td>
<td>21.806</td>
<td>132</td>
<td>.165</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>23.040</td>
<td>134</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Sensory Evaluation 2016

Table 8 above shows the results of One-Way ANOVA performed to test the relative acceptability of the three products from Soya Bean Composite seasonings. At α = 0.05, F (3.736) P=0.026<0.05. Hence, the null hypothesis is rejected and the alternate is accepted. There is statistically significant difference among the three products from soya bean composite seasonings. The detailed explanation for this result is seen in the Multiple Comparisons in table .K..

**Table 12: Multiple Comparisons**

<table>
<thead>
<tr>
<th>(I) Samples</th>
<th>(J) Samples</th>
<th>Mean Difference (I-J)</th>
<th>Std Error</th>
<th>Sig.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soya bean + ginger Pepper soup</td>
<td>Soya bean + ginger Pepper soup</td>
<td>-.06667</td>
<td>.08</td>
<td>.717</td>
<td>-.2698, .1364</td>
</tr>
<tr>
<td>Soya bean + garlic jollof rice</td>
<td>Soya bean + garlic jollof rice</td>
<td>.16111</td>
<td>.08</td>
<td>.148</td>
<td>-.0420, .3642</td>
</tr>
<tr>
<td>Soya bean + garlic jollof rice</td>
<td>Soya bean + garlic jollof rice</td>
<td>.06667</td>
<td>.08</td>
<td>.717</td>
<td>-.1364, .2698</td>
</tr>
<tr>
<td>Soya bean + garlic mixed vegetables</td>
<td>Soya bean + garlic mixed vegetables</td>
<td>.22778</td>
<td>.08</td>
<td>.024</td>
<td>.0247, .4309</td>
</tr>
<tr>
<td>Soya bean + garlic mixed vegetables</td>
<td>Soya bean + garlic mixed vegetables</td>
<td>-.16111</td>
<td>.08</td>
<td>.148</td>
<td>-.3642, .0420</td>
</tr>
</tbody>
</table>

* The mean difference is significant at the 0.05 level.
From this table, it is noticed that the seasoning used in Soya bean + ginger Pepper soup differs from Soya bean + ginger pepper soup. Likewise suya beans + ginger pepper soup differs with Soya bean + ginger + garlic pepper soup at P = 0.717 and 0.148 > 0.05. Soya bean + garlic jollof rice seasoning shows no significant difference from soya bean – ginger – garlic at P = 0.024 < 0.05. Soya bean+ ginger + garlic mixed vegetables and Soya bean + ginger mixed vegetables differs at P=0.148 while Soya bean+ ginger + garlic mixed vegetables and Soya bean + garlic mixed vegetables has no significant difference with P = 0.024 < 0.05.

Table 13, Uses and benefits of Suya beans, Ginger and Garlic to health

<table>
<thead>
<tr>
<th>Suya Beans</th>
<th>Ginger</th>
<th>Garlic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer prevention, and</td>
<td>Antibiotic and anti-viral properties</td>
<td>Wound dressing etc.</td>
</tr>
<tr>
<td>Cholesterol reduction,</td>
<td>It promotes blood circulation,</td>
<td>Flavour in meals</td>
</tr>
<tr>
<td>Combating osteoporosis</td>
<td>Efficient for kidney function,</td>
<td>Lowering high blood pressure (BP)</td>
</tr>
<tr>
<td>Menopause regulation</td>
<td>Neutralize acid and toxins in the digestive tract that harm the kidney.</td>
<td>Lowering cholesterol</td>
</tr>
<tr>
<td>Useful for treating menstrual symptoms in females</td>
<td>Treatment of nausea, common cold, anemia, toothaches, and hemorrhages.</td>
<td>Treatment for the common cold and flu</td>
</tr>
<tr>
<td>Nutritional supplement for pregnant women</td>
<td>Treatment of blood pressure,</td>
<td>treat seizure, joint pain, parasite infection</td>
</tr>
<tr>
<td>Supplement for lactating mothers and children</td>
<td>Treatment of Alzheimer’s disease.</td>
<td>Anti-fugal and antibacterial</td>
</tr>
<tr>
<td>Lowers high blood pressure</td>
<td>Stimulate appetite and accelerate digestion.</td>
<td>Increases athletic performance,</td>
</tr>
<tr>
<td>Lowers cholesterol</td>
<td>Act as flatulent for the reduction of bloating and gas</td>
<td>building strong bones,</td>
</tr>
<tr>
<td></td>
<td>Tenderizing the tough meats.</td>
<td>it has shown that garlic can build immunity,</td>
</tr>
</tbody>
</table>


The table above has the various uses and benefits of suya beans, ginger and garlic. The study identified findings of different authors on this. Suya beans, garlic and ginger are used for treatment and control of diseases, cooking of meals, dressing of wounds, nutritional supplements, menopause regulation and flavor in meals.

V. DISCUSSIONS

Findings of the study show favourable results on the three products produced. The study produced nine dishes seasoned by the products. Findings on the fish pepper soup which has three dishes made from suya beans and garlic, suya beans and ginger and suya beans, ginger and garlic gained acceptability. The taste of the meal with suya beans and ginger, likewise that of suya beans, ginger and garlic were rated high which shows the product is accepted. The second meal which is jollofrice cooked by the same products shows the taste of all the three samples accepted. The third meal which was mixed vegetable soup with pounded yam has the seasoning of suya beans and ginger, suya beans, ginger and garlic all rated very good and good respectively, however the seasoning with suya beans and garlic has a fair acceptance of taste. Though the taste of the meal with suya beans and garlic season shows fair rating, the result still shows acceptability.

Many have feeling of food being fresh due to its smell and they discovered it was fresher (Kivela and Crotts, 2006). The aroma derived from food is a motivation for eating of the particular food. Seasoning tends to contribute to food aroma and adds to choice of some certain types of seasoning used for cooking. The aroma of the pepper soup, jollof rice and the mixed vegetable soup were all accepted. Though the aroma for suya beans seasoning and garlic on the vegetable soup was rated fair. On the appearance of the dishes, the fish pepper soup, jollofrice and the mixed vegetable soup with pounded yam all have good appearances. The general acceptability of the three types of seasoning on the three dishes shows that all dishes cooked with the soya bean enhanced seasoning were generally good and accepted. The taste, aroma and appearance of the dishes compare favorably as can be seen from tables 1 to 9. Considering the composition of the sensory evaluation panel drawn from the industry and institution, the implication of this finding is that soya bean seasoning enhanced with ginger and garlic could offer an excellent choice among the condiments in Nigerian cuisine.

This supports the findings by Furst et al. (1996) which identified that sensory perceptions can play a crucial physiological and psychological part in appreciation of food. They further mentioned that sensory perceptions
represent the considerations that people develop related to their taste in eating and drinking. In addition, taste can be a key consideration for most people in nearly all food and drinking settings. Furthermore, Kivela and Crotts (2006) emphasized that tasting local food and beverages are a kind of pleasurable sensory experience.

The relative acceptability of the three products from Soya Bean Composite seasonings are at $\alpha = 0.05$, F (3.736) P=0.026<0.05. Hence, the null hypothesis is rejected and the alternate is accepted. There is statistically significant difference among the three products from soya bean composite seasonings. Comparison of the three products on nine different dishes shows seasoning used in Soya bean + ginger Pepper soup differs from Soya bean + ginger pepper soup. Likewise suya beans + ginger pepper soup differs with Soya bean + ginger + garlic pepper soup at P = 0.717 and 0.148 > 0.05. Soya bean + garlic jollof rice differs with Soya bean + ginger jollof rice with P= 717>0.05. However soya beans + ginger jollof rice and Soya bean + ginger + garlic jollof rice seasoning shows no significant difference from soya bean – ginger – garlic seasoning at P = 0.024 < 0.05. Soya bean+ ginger + garlic mixed vegetables and Soya bean + ginger mixed vegetables differs at P=0.148 while Soya bean+ ginger + garlic mixed vegetables and Soya bean + garlic mixed vegetables has no significant difference with P = 0.024 < 0.05. Lewis, 2015; Rakasi, 2011)

VI. CONCLUSION AND RECOMMENDATION

The purpose of this study is to determine the acceptability of enhanced seasonings produced from soya bean, using ginger and garlic as the composites. The results of the sensory evaluation reveal that the seasonings were rated good and accepted as seasonings that could be used in the commercial hospitality industry. The outcome of this study and its significance coincide with many other previous researches conducted to determine the uses of ginger and garlic both for nutritional and medicinal purposes.

Soya bean, ginger and garlic can be used in various forms in cookery. They can be used as spices, condiments or seasonings. In this study they were processed and used as seasonings enhanced with ginger and garlic.

A. Recommendation

The acceptability of the ginger and garlic used in enhancing suya beans seasoning is a finding that is of benefit to numerous individuals and organizations. The study therefore recommends that:

- Families and hospitality enterprises should adopt and incorporate soya bean enhanced seasonings into their exquisite cuisine.
- Those into healthy or natural dieting can replace the different seasonings used which contain chemicals with this natural and healthy product.

B. Recommendation for Further Research

This study recommends the following areas for further studies:

- Further research should be conducted to determine the shelf life of soya bean seasoning enhanced with ginger and garlic.

REFERENCE


Comparative study of relationship between income inequality and economic growth in China with India

[1][2][3] Faculty of Economics, Chiang Mai University, Chiang Mai, Thailand

Abstract: This paper applies the Engle-Granger two-step ECM approach to estimate the long-term and short-term relationships between inequality and economic growth for China and India. Our estimation results support the S-shaped curve hypothesis relating GDP per capita to inequality with different starting points for the two countries. We find a positive causal relationship for China, showing that increased income inequality spurred economic growth. Furthermore, we find the same results that the trade openness increased inequality in China and India. As for redistribution, fiscal redistributive measures show a negative effect in China and India. In the inequality-GDP per capita relationship, export show a negative effect in China and had no significant effect in India.

Index Terms—Income inequality, Economic growth, Redistribution, S-shaped curve

I. INTRODUCTION

Economic inequality is rising in emerging economies across the world. The World Economic Forum's 2016 Global Risk Report found that 'serious income disparities' will be one of the greatest risks to global risk in the next decade. In Asia, China has one of the most rapidly growing economies in the world, income inequality is still a major challenge. In India, it has become one of the world's most unequal states headlines. Some economists worry that increased inequality itself may weaken economic growth.[1] The others are concerned that sustained unbalanced sharing of dividends will undermine public support for growth policies and lead to political instability.

There are theoretical and political paths that economic growth may affect income inequality and vice versa. We suggest contributing to this document by: (1) conducting time-series analysis of individual countries, and (2) by examining the bilateral relationship between growth and inequality. We first build a baseline error-correction model (ECM) suitable for all countries to examine the long-run equilibrium relationship between income inequality and economic growth. We also analyze the short-run impulse responses of the variables. Our survey is aimed at China and India.

As for the effect of inequality on economic growth, Forbes (2000)[6] showed that the inequality has positive impact on short-term economic growth. Halter et al. (2014)[7], however, found that in the long-term, greater inequality causes slower growth. Shin (2012)[8] points out that, the country in the early stage of development, the impact of inequality on economic growth is negative; however, it is positive in the mature stage of development. According to Cingano (2014)[9] and Neves et al. (2012)[10], inequality has positive influences on economic growth in panel datasets and negative impacts in cross-sectional datasets. From the above, most studies use cross-sectional or panel data to estimate the bi-directional causal relationship between economic growth and income inequality. A few previous studies adopted a time-series methods, Kang (2015)[11] and Bahmani-Oskooee et al. (2008)[12] included fiscal redistribution and trade openness, respectively, in their estimations but ignored the effect of other possible determinants. So, our research employs time-series analysis to capture the heterogeneity of individual countries and to examine the bidirectional

II. LITERATURE REVIEW

The discussion in the theoretical and empirical literature thus far has suggested different channels for the relationship between inequality and economic growth. Much of the literature on the effects of economic growth on inequality has focused on the inverted U-shaped curve of the notable Kuznets (1955).[2] The curve indicates that inequality increased early in the industrialization process and then further declined. By using the semiparametric method, Chambers (2010)[3] showed that economic growth reduces inequality in not balance dimensionally. If you must use mixed units, clearly state the units for each quantity in an equation. developing countries but has the opposite effect in developed countries in terms of the long-run effect. As for the short-term and medium-term impact, economic growth increases income inequality for all countries. Considering trade openness and human capital as determinants of inequality, Wahiba and El Weriemimi (2014) [4] demonstrated that in Tunisia, economic growth is positively associated with inequality. Nissim (2007)[5] found that as economic growth occurs, workers mobilize to the jobs associated with higher incomes, which beneficial to reduce income inequality. As can be seen from the above, the impact of economic growth on income inequality is still no clear answer.
causality between economic growth and income inequality while including other explanatory variables.

III. METHODOLOGY

We employ country-level time-series analysis and use an error-correction model (ECM). Following Engle and Granger's two-step approach, we first test for a cointegrating relationship between output level and inequality. By using augmented Dickey-Fuller statistics, each time-series variable is examined in isolation for its non-stationarity. Then, after estimating the cointegrating regression, the regression residuals were retrieved and tested for stationarity. If the residual term is stationary, then the time-series variables are cointegrated and the long-run relationship among variables can be established.

We use GDP per capita to measure average income level and the Gini coefficient to measure income inequality. The link between average income level and income inequality is discussed bilaterally. In our time-series study, we model income inequality in the long run as a function of the average income level and other determinants as follows:

\[
Gini_t = g_0 + g_1(Δln GDP per capita_{t-1}) + g_2 Δln GDP per capita_{t-1}^2 + g_3 Δln GDP per capita_{t-1}^3 + \sum\lambda_i \epsilon_{i,t-1} + \epsilon_t,
\]

(1)

where \( \lambda_{i,t} \) indicates all other explanatory variables, and \( \epsilon_t \) is the regression residual. Similarly, we adopt the following formulation to estimate the effect of income inequality and other determinants on output level in the long run:

\[
ln GDP per capita_{t} = b_0 + b_1 Gini_t + \sum\pi_i \epsilon_{i,t} + \epsilon_t,
\]

(2)

where \( Y_{i,t} \) are all explanatory variables but \( Gini_t \) for determining the effect on \( ln GDP per capita_t \), and \( \epsilon_t \) is the regression residual.

In the second step, we try to capture the short-run effect of each variable on inequality and output level, respectively. A similar equation is used to capture the short-term effects of each variable on GDP per capita. The respective error correction models to Eqs. (1) and (2) are shown as follows:

\[
ΔGini_t = c_0 + c_1(Δln GDP per capita_{t-1}) + c_2(Δln GDP per capita_{t-1})^2 + c_3(Δln GDP per capita_{t-1})^3 + \sum\xi_i \Delta\lambda_i + \epsilon_i, \quad (3)
\]

\[
Δln GDP per capita_t = d_0 + d_1ΔGini_t + \sum\nu_i \epsilon_i + \epsilon_t, \quad (4)
\]

where \( \Delta \) indicates the change of variables, \( \epsilon_t \) and \( \pi_t \) are the residuals. Among the coefficients, \( c_A \) and \( d_2 \) are the adjustment rates of speed and are expected to be negative and significant. In addition, the Durbin–Watson test is used to check if the serial correlation problem exists and the Praš–Winsten correction is applied if necessary.

The dataset this analysis used is mainly from the Standardized World Income Inequality Database 6.0 (SWIID) and World Development Indicators (WDI). The variables used in the regression are listed and explained in Figure 1.

IV. SUMMARIZES RESULTS

Table 1: The effect of economic growth on inequality: country model

<table>
<thead>
<tr>
<th>Dependent variable: Gini</th>
<th>CHN CR coefficients</th>
<th>IND CR coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln GDP per capita</td>
<td>-370.7654***</td>
<td>-173.9462***</td>
</tr>
<tr>
<td></td>
<td>(56.28712)</td>
<td>(46.05784)</td>
</tr>
<tr>
<td>(ln GDP per capita)⁰</td>
<td>52.84029***</td>
<td>27.77734***</td>
</tr>
<tr>
<td></td>
<td>(8.092991)</td>
<td>(6.932966)</td>
</tr>
<tr>
<td>(ln GDP per capita)²</td>
<td>-2.44919***</td>
<td>-1.450073***</td>
</tr>
<tr>
<td></td>
<td>(0.308523)</td>
<td>(0.346016)</td>
</tr>
<tr>
<td>(ln GDP per capita)³</td>
<td>0.041690</td>
<td>-0.004937</td>
</tr>
<tr>
<td></td>
<td>(0.072796)</td>
<td>(0.068310)</td>
</tr>
<tr>
<td>Redistribution</td>
<td>-12.51423***</td>
<td>-23.14775***</td>
</tr>
<tr>
<td></td>
<td>(3.223880)</td>
<td>(1.366849)</td>
</tr>
<tr>
<td>Redis*Gini_mkt</td>
<td>0.267500***</td>
<td>0.476416***</td>
</tr>
<tr>
<td></td>
<td>(0.077853)</td>
<td>(0.029163)</td>
</tr>
<tr>
<td>Constant</td>
<td>886.673***</td>
<td>402.7415***</td>
</tr>
<tr>
<td></td>
<td>(128.6144)</td>
<td>(101.6062)</td>
</tr>
<tr>
<td>N</td>
<td>39</td>
<td>41</td>
</tr>
<tr>
<td>r²</td>
<td>0.990141</td>
<td>0.998966</td>
</tr>
<tr>
<td>r²_a</td>
<td>0.988292</td>
<td>0.998784</td>
</tr>
<tr>
<td>rmse</td>
<td>0.840084</td>
<td>0.089884</td>
</tr>
<tr>
<td>Res.ADF test</td>
<td>1(0)</td>
<td>1(0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dependent variable:D.Gini</th>
<th>CHN ECM coefficients</th>
<th>IND ECM coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.In GDP per capita</td>
<td>-366.2981**</td>
<td>-443.6721***</td>
</tr>
<tr>
<td></td>
<td>(177.1554)</td>
<td>(145.4213)</td>
</tr>
<tr>
<td>D.(ln GDP per capita)²</td>
<td>52.78604**</td>
<td>67.84987***</td>
</tr>
<tr>
<td></td>
<td>(24.68257)</td>
<td>(21.99390)</td>
</tr>
<tr>
<td>D.(ln GDP per capita)³</td>
<td>-2.502033**</td>
<td>-3.443627***</td>
</tr>
<tr>
<td></td>
<td>(1.140081)</td>
<td>(1.103220)</td>
</tr>
<tr>
<td>D.Trade</td>
<td>-0.017693</td>
<td>-0.000769</td>
</tr>
<tr>
<td></td>
<td>(0.039934)</td>
<td>(0.010531)</td>
</tr>
<tr>
<td>D.Redistribution</td>
<td>-8.096018</td>
<td>-2.942750</td>
</tr>
<tr>
<td></td>
<td>(6.029521)</td>
<td>(3.676010)</td>
</tr>
<tr>
<td>D.Redis*Gini_mkt</td>
<td>0.163778</td>
<td>0.049812</td>
</tr>
<tr>
<td></td>
<td>(0.144604)</td>
<td>(0.074625)</td>
</tr>
<tr>
<td>Error correction</td>
<td>-0.433206*</td>
<td>0.321474</td>
</tr>
</tbody>
</table>

Figure1: Variables' name of the research

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In Table 1, we summarize the estimation results for each individual country. For China and India, the three GDP per capita coefficients are all significant at the 1% level in the cointegrating regression. The first term is negative, the second term is positive, and the third term is negative, which is consistent with the S-curve hypothesis[14]. While, it starts with the back portion of inverted U-shaped curve. Among them, redistribution * Gini _mkt is an interactive term reflecting the impact of government redistribution on income inequality, which may depend on the level of income inequality before government intervention. For other factors, redistribution has a negative impact on income inequality as expected. On the other hand, the interaction term of Redis * Gini _mkt has a positive influence, which shows that the redistributive effect of government taxes and transfer rely on the level of income inequality prior to government interventions. The negative impact of the government's income inequality policy is clearly offset by the original state of income distribution.

As for short-run dynamic effects, all determinants, expect the Redistribution * Gini _mkt and Redistribution, in change form have significant effect on income inequality in China. However, for India, three GDP per capita terms on income inequality are all statistically significant at the 1% level. The sign of the first term is negative, second term is positive, and third term is negative.

Table 2: The effect of inequality on economic growth

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>CHN CR coefficients</th>
<th>IND CR coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gini</td>
<td>0.000163</td>
<td>-0.045108*</td>
</tr>
<tr>
<td>Labor force</td>
<td>0.069144***</td>
<td>0.145183***</td>
</tr>
</tbody>
</table>

a. ***,*** indicate 10, 5, 1 percent level of significant respectively.

b. Numbers in parentheses are the standard error.

c. The sample period for the China is 1978–2016, and for India is 1975-2016.
We summarize the estimated results for each country in Table 3. For China, Gini has a positive effect on GDP per capita but it is not statistically significant. The labor force variable and primary variable have positive impact on GDP per capita at the 1% significance level. In addition, we find that the fertility and redistribution shows the negative impact on GDP per capita. However, fiscal redistribution policies increase per capita output. Finally, the long run effects of government expenditure is negative but insignificant for China. With respect to the short-run responses, we estimate a negative effect of the change in Gini on GDP per capita growth but it is not statistically significant. Among other determinants, only the changes of investment and primary variable are statistically significant determinants of output growth in the short-run dynamics.

Compare with China, the gini has a negative impact on GDP per capita at the 10% significance level. This suggests that income inequality has been harmful to economic development from the experience of India. In addition, we find labor force, investment and primary have positive effects on real per capita output. However, the fertility rate have negative effects. The other variables did not produce significant coefficients. From the results estimated by the ECM equation, changes in income inequality have a negative but insignificant effect on GDP per capita growth. The labor force has a positive impact on per capita output in short run. Also, the effects of other determinants, on GDP per capita growth are all statistically insignificant.

V. BRIEF ANALYTICAL COMPARISONS AND DISCUSSIONS

Using beta weights, we can compare the contribution of each variable to growth and income gap between each country or in different countries. We find that per capita GDP is the most important determinant of the income gap between the two countries. For the inequality of income growth, the labor force is the most important variable. The S-curve relationship between output level and inequality for each individual country is projected and showed in Fig. 2. The two countries all experienced rapid growth and huge inequality.

The reality of the various bidirectional relationships between economic growth and income inequality found in our study fall into four possible scenarios, as shown in Fig.3. Case I shows that if the signs of the bidirectional relationship are both negative, it means that lower inequality further increases economic growth and economic growth lessens inequality. Cases II and III indicate cases of interchanging equilibrium outcomes when the bidirectional relationship involves one positive and one negative effect. Finally, in Case IV, we have the classic “Trade-off” problem when both causal effects are positive. If we want to achieve higher growth, we must take the higher inequality at the cost. Where to put higher priority between growth and equality poses a great challenge to policy-makers in this case.

<table>
<thead>
<tr>
<th>From inequality to growth (1st)</th>
<th>From growth to inequality (2nd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Low growth with low inequality (Virtuous Cycle)</td>
<td>High growth with low inequality and low inequality (Virtuous Cycle and Interchange)</td>
</tr>
<tr>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Low growth with low inequality</td>
<td>High growth with low inequality and low inequality (Virtuous Cycle and Interchange)</td>
</tr>
<tr>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Low growth with low inequality</td>
<td>High growth with low inequality and low inequality (Virtuous Cycle and Interchange)</td>
</tr>
</tbody>
</table>

**Figure 3: Four possible scenarios of the relationships between economic growth and income inequality**

CONCLUSION

As found in our study, all countries experience the S-curve in the economic development process, for the economic growth-inequality relationship. This clearly demonstrates that each individual country has the opportunity to experience both positive and negative causal links from growth to inequality throughout the development process. However, for the inequality-economic growth relationship, we found positive links for China, and negative impact for India. As a result, India may have benefited from the Virtuous cycle relationship with high growth and low inequality during some parts of its development over our study period.

REFERENCES


Comparative study of relationship between income inequality and economic growth in China with India.


To Study the Impact of Mediating Role of the Learning Strategies between the Knowledge Characteristics of a Job and Employee Innovation Process

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Abstract: This study explains conceptual model that elucidates how work based learning strategies are playing mediating role between the knowledge characteristics of a job and employee innovation process. Knowledge characteristics of job are playing role as independent variable and the key component of this variable is problem solving. The work based learning strategies is mediating variable and the key factor of this variable is cognitive learning strategies. The dependent variable is innovation process. A survey methodology is adapted for this research. Population frame is the software engineers. Simple random sampling technique is used. The questionnaire is used as a research instrument. For analyzing the data, apart from descriptive statistics, the regression analysis is conducted for testing hypotheses. The result shows that problem solving has positive impact on the innovation process during direct relationship. The problem solving also has positive impact on the innovation process through the mediation of cognitive learning strategies.

Index Terms— Performance; Learning strategies; Organization.

I. INTRODUCTION

The research in the domain of Job Design is trying to develop the mechanisms through which knowledge characteristics of a job has positively effect on the output of the employees in the form of innovative behavior, well-being and performance. The work based learning strategies has been suggested as one type of mechanism [1]. The knowledge characteristics of a job and work based learning strategies mechanism encourages the employees to learn about the job and enable them to perform effectively and efficiently. The previous studies findings support that the employee outcomes are task performance [2] and well-being [3,4] due to the mechanism between the job design and work based learning strategies. This mechanism also helps the employee in the idea generation, promotion and implementation within the organizations [5]. The job design represents the characteristics of the job. Knowledge characteristic of a job is a part of job design. It is important to identify the effect of knowledge characteristics on the innovation process via direct or through mediating role of work based learning strategies. After the identification of this affect, the organizations can improve or promote the employee innovation process by coalescing knowledge characteristics with interference to enhance work based learning strategies. The previous studies support directly the relationship of problem solving [6] and skill variety with the employee learning. The employee learning is directly associated with innovation [7]. The results of these studies did not elaborate the mechanism through which job design affect the employee innovation process. This article proposes a mechanism; it explains the knowledge characteristics effect on the innovation through work based learning strategies. The key component of the knowledge characteristics of a job is problem solving. Problem solving engrosses innovating idea, generating idea, solving non routine problems, and preventing from error [8]. The key component of the work based learning strategies is cognitive learning strategy and behavioral learning strategy. The employee uses this learning strategy to get and organize the knowledge [9]. Cognitive learning strategies elaborate the new information in the light of existing information and originate the principal, creating scheme and key issues. The employee innovation process consists of three different categories. First is idea generation, the concept of idea generation is similar with the concept of creativity. The idea generation in the innovation process should reflect newness and originality. The next in innovation process is idea promotion. This stage proposes the new ideas to employees and organization and getting the support of the idea. The final stage of the innovation process is idea implementation. In this stage new ideas are amalgamated within the organizational process (Figure 1).
To Study the Impact of Mediating Role of the Learning Strategies between the Knowledge Characteristics of a Job and Employee Innovation Process.

Theory and Hypotheses Development

The problem solving effect on cognitive learning strategies and innovation

Knowledge characteristics are the part of job design. The first part of conceptual model explains the relationship between the knowledge characteristics and work based learning strategies. This model proposes that problem solving will recognize the use of cognitive work based learning strategies. The problems are obstacles for employees to attain goals and task performance. Due to this, the employees deploy the different skills and problem solving techniques through work based learning strategies. The work based learning strategies did not provide surety of the solution of problem. Problem solving is commonly regarded as most significant cognitive activity in the professional context. The familiar educational settings are required for learning to solve the problems [10]. The employees learn from the past precedence’s, events, situations and happenings when an employee’s identify similarities of the current problem with the previous ones. The old problem gives the solution pattern of the new problem. This sort of solution guides the individual’s to creativity [11]. Psychological theory explains that problem solving leads to students for gaining knowledge and learns about thinking strategies. The learning due to the problem solving assists the students for developing learning strategies. The problem solving inventing theory explains knowledge base, practical methodology, technology according to model and tool sets for problem solving and developing new ideas. This theory consists of first, specific problems convert into general problem, second is finding the typical solution of general problems and third is get the solution of specific problem from converting the typical solution into specific solution [12]. This theory examines the challenges about the problems where innovation is needed. This theory applied in different categories of industries, including process development [13,14], eco-innovation [15], and service innovation (Table 1) [16]

H1: Problem solving has positive impact on the Innovation

The cognitive learning strategies effect on innovation

The learning strategies encourage knowledge acquisition for job context and task. The cognitive learning strategies assume dual procedure models of cognition. One is Intentional mode and second is analytical mode of cognition. These modes motivate to learn the new rules, facts and knowledge of organization [17,18]. Cognitive work based learning strategies is considered as example of premeditated and intentional approaches of thoughts in which effort and time deliberately spent on topic. The cognitive work based learning strategies encourage the employees to knowledge acquisition and elaborate new information by investigating the implications of novel information from the existing knowledge. The consequences of cognitive work based learning strategies on knowledge gaining have considered in the circumstances of everyday work. Knowledge acquisition in workplace setting and training has been linked with experimental application strategies [19]. The theoretical and experimental evidence proposes that cognitive work based learning strategies endorse the knowledge acquisition or gaining. It is suggested that knowledge acquisition through work based learning strategies develops potential to generate and create novel and useful ideas [20]. Many theoretical perceptions encourage this idea. Amabile’s [21] componential theory explains knowledge acquisition is a fundamental element to develop new ideas and increase potential of peoples or employees to amalgamate information for generating new different ways. The potential of the peoples or employees intensify by organized knowledge according to common principles comparatively unrelated information [22]. An insinuation from cognitive load theory explains that the enhancement in knowledge helps to decrease the burden on working memory when present situation demonstrated as problem solving and learning. This theory can be applied to relevant cognitive activities, such as find solution of problem or create a new idea [23]. Both theories suggest that the relevant domain knowledge acquisition has positive relationship between the creativity. The results of empirical studies show that expert employees (higher level of knowledge) are more innovative and create

Table 1: Model summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.499</td>
<td>0.249</td>
<td>0.236</td>
<td>0.52731</td>
</tr>
<tr>
<td>2</td>
<td>0.552</td>
<td>0.305</td>
<td>0.281</td>
<td>0.51155</td>
</tr>
</tbody>
</table>

aPredictors: (Constant), PS.

bPredictors: (Constant), PS, CLS.
new ideas than employees who have less knowledge [24]. The researcher argued in this study that job characteristics manipulate cognitive work based learning strategies. The cognitive work based learning strategies effect on the innovation process. The job design has effect on the innovation. Pervious results of empirical studies show that the job design has relation with task performance. The skill utilization plays a mediating role between the relationship of job design and well-being of employees.

H2: Problem solving has positive impact on the Innovation through mediation role of cognitive learning strategies.

**Research Methodology**

The research approach is quantitative. Quantitative research is essential about collecting numerical data to explain a particular phenomenon. A survey methodology is adapted for this research. Population frame is the software engineers. Simple random sampling technique is used and unit of analysis is individual. The sample size is calculated with the help of statistical formula. The data for this research will be gathered using a questionnaire. For analyzing the data, apart from descriptive statistics, the traditional statistic for testing hypotheses will be used.

**Measures**

The developed scale of Barkman and Machtmes [25] is used to measure the problem solving. The total items of the scale are 24. The response point of scale consists of five points used (1=Never, 5=Always). The developed scale of Holman et al. [26] is used to measure the Cognitive learning strategies. The total items of the scale are 8. The response point of scale consists of five points used (1=Not a lot, 5=A great deal). The developed scale of Holman et al. is used to measure the Innovation. The total items of the scale are 9. The response point of scale consists of five points used (1=Not a lot, 5=A great deal).

**Demographic statistics**

In the gender statistics it can be observed that both male and female participated as respondents. Male and female respondents are 49 and 11 out of total 60 valid responses i.e. 81.7% and 18.3% respectively. The reflection of male dominance is visible from the statistics. Both married and single respondents participated in the survey. Married and single respondents are 12 and 48 out of total 60 valid responses i.e. 20% and 80% respectively. The reflection of single dominance is visible from the statistics. The respondent’s age divided in the four groups; first group falls between the 21-30 years old, second group falls between the 31-40 years old, the third group falls between the 41-50 years old and lastly greater than 50 years old. The age of 50 respondents fall between the 21-30 years old which is 83.3% of the total respondents. The age of 7 respondents fall between the 31-40 years old which is 11.7% of total respondents. The age of 3 respondents fall between the 31-40 years old which is 5% of total respondents. The result shows that majority of respondent’s falls in 21-30 years old group. The respondent’s qualification divided in the two groups; first group has 16 years education and second group has above 16 years education. The 39 respondents have 16 years education which is 65% of the total respondents. The 21 respondents have above 16 years education which is 35% of total respondents. The majority of respondents have 16 years education. The respondents were categorized into five categories on the basis of salary. First category was less than 20, second category is 21-40, third was 41-60, fourth was 61-80 and 81-100 thousands rupees salary of respondents. The majority of respondents get less than 20 thousand salaries. This survey envisaged on a sample of people having different length of experiences. It was important to analyze the data from view point of experience of respondents. The majority of respondents have up to five years’ experience.

**Testing assumptions of regression**

The regression analysis is based on specific assumptions. The assumptions of regression are linearity, multi co-linearity, normality and homoscedasticity. The assumption of normality examined through the graphical technique by histogram. The assumptions of linearity and homoscedasticity examined through scatter plots diagram. The assumption of the multi co-linearity examined through the correlation matrix.

**Regression analysis**

The purpose of regression analysis is to check the relationship between the independent variables with dependent variable. In the regression analysis examined the individual impact of the independent variable on the dependent variable, quality of the goodness of the model, significance of the model and strength of the relationship between the independent variables and dependent variable.

- The $R^2=0.25$ of model 1 indicates that the problem solving predictor explains 25% variance in Innovation.
- The $R^2=0.305$ of model 2 indicates that the problem solving predictor explains 30.5% variance in Innovation.
- The $p<0.05$ shows that at least one variable plays significant role in the both model.

The $p$ value for PS$<0.05$ which shows significant relationship between PS and IN and is interpretable. It means significant positive relationship exists between PS and IN ($\beta=0.428$, $p<0.05$) showing IN will increase by
To Study the Impact of Mediating Role of the Learning Strategies between the Knowledge Characteristics of a Job and Employee Innovation Process.

0.428 units for every one unit increase in PS, keeping all other predictors constant in model 1. The p value for PS<0.05 which shows significant relationship between PS and IN and is interpretable. It means significant positive relationship exists between PS and IN (β=0.359, p<0.05) showing IN will increase by 0.359 units for every one unit increase in PS, keeping all other predictors constant in model 2. The p value for CLS<0.05 which shows significant relationship between CLS and IN and is interpretable. It means significant positive relationship exists between PS and IN (β=0.223, p<0.05) showing IN will increase by 0.223 units for every one unit increase in PS, keeping all other predictors constant in model 2 (Tables 2 and 3).

II. CONCLUSION

This research tested a conceptual model of the knowledge characteristics (problem solving) learning mechanism (cognitive learning strategies) in relation to innovation. The result shows that problem solving has positive impact on the innovation process during direct relationship. The problem solving also has positive impact on the innovation process through the mediation of cognitive learning strategies. This model confirms the mediating relationship of cognitive learning strategies between the problem solving and innovation. This conceptual model can guide future research in this particular area, which could focus on the wider set of variables related to the knowledge characteristics for improving innovation in organization.

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
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<td>533.0</td>
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<td>0.004</td>
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<tr>
<td></td>
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<td>155.7</td>
<td>39</td>
<td>4.079</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>688.7</td>
<td>39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2: Regression</td>
<td>431.1</td>
<td>2</td>
<td>215.6</td>
<td>12.8</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
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<td>37</td>
<td>4.026</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>580.2</td>
<td>37</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: ANOVAc


Table 3: Coefficientsa.
To Study the Impact of Mediating Role of the Learning Strategies between the Knowledge Characteristics of a Job and Employee Innovation Process.


Innovations in Engineered Mesoporous Material for Energy Conversion and Storage Applications

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Keywords — Energy; Porous material; Storage; Conversion; Applications

I. INTRODUCTION

Today, Earth’s population stands at more than seven billions [1]. Along with a constantly growing human population, the living standards are also increasing. Energy is the initial driving force for achieving advancement in human living [2]. As a result of that, the worldwide energy consumption is expected to double within the next 35 years [3]. Fossil fuels such as coal, oil and natural gas have generated most of the energy consumed globally for over a century [4]. But fossil fuels are responsible for a significant amount of land, water and air pollution beyond their carbon dioxide production [5]. Due to large production of carbon dioxide from energy generation, along with emission from vehicles, the earth temperature rises by approximately 2-3°C and it is expected that the same will go up further [1]. This may result into geographical as well as environmental imbalance. To solve these problems, there has been recently a trend towards the increase in the utilization of various renewable energy resources [4]. In this respect, wind power, solar energy, hydrogen geothermal energy, biomass and bio-fuels are extensively investigated for a few decades both from the scientific/academic and industrial/societal viewpoints [6,7].

Figure 1: Renewable energy outlook [8].

Among all the renewable energy resources (Figure 1), wind and solar energy received great attention, as they essentially not required water to operate and thus do not pollute water resources [9]. Solar energy has the most potential, as sun provides the earth with approximately 1,00,000 TW which is almost 10,000 times more than the current energy consumption [10]. Thus abundance of energy makes sun energy very popular for electricity production and hence enhanced their commercialization. Direct utilization of solar radiation to produce electricity is not only way to utilize the nature’s renewable energy flow via photovoltaic cells but also power can be generated a the users place. Mesoporous materials have attracted great interest in current years because of the unusual mechanical, electrical and optical properties endowed by confining the dimensions of such materials and because of the combination of bulk and surface properties to the overall behaviour. One needs only the consideration of the staggering developments in microelectronics to appreciate the potential of materials with reduced dimensions. Mesoporous materials are becoming increasingly important for electrochemical energy storage and generation [10,11]. Mesoporous materials are used in many energy applications, because of their owning ability to interact and absorb with guest species on their surfaces, and in the pore spaces [12,13]. The porous materials are classified into three categories according to their pore sizes: mesoporous (2-50 nm), microporous (<2 nm) and macroporous (>50 nm). Since the first report of mesoporous silica [14], many mesoporous materials synthesized under a wide range of pore size PHs from highly basic to strongly acidic conditions, various of shape using non-ionic, cationic, neutral and anionic surfactants [15,16]. These materials have good characteristics such as high surface area, narrow pore size, uniform pore structure etc. The mesoporous materials having large pore volumes, shown promise in the loading of guest species and in the accommodation of the expansion and strain relaxation during repeated electrochemical energy storage processes (Figure 2).
Moreover, it has high surface areas should provide a large number of reaction or interaction sites for surface processes such as catalysis, adsorption, energy storage and separation. These above features are particularly advantageous for applications in energy conversion and storage [17-19]. The ordered mesoporous materials developed using various templating materials have attracted increasing interest from the electrochemists community due to their plenty of unique properties and functionalities that can be effectively exploited in optoelectronic devices. Mesoporous materials are excellent opportunities in energy storage and energy conversion applications having to their extraordinarily high surface areas and large pore size. These properties may enhance the performance of porous materials in terms of lifetime and stability, energy and power density.

REFERENCES


Improving Access to Quality Diagnostic Tools in Low and Middle Income Countries (LMICs) Through Social Innovation-Lessons Learnt

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[3] Institute of Tropical Medicine, Antwerp, Belgium

Keywords — Public health; Infectious diseases; Social innovation; Low and middle income countries

I. INTRODUCTION

In vitro diagnostics are essential for the successful delivery of healthcare; conducting routine public health surveillance; rapid detection and containment of infectious diseases [1], responding to health emergencies, and dealing with the growing problem of antimicrobial resistance, and detecting and managing the communicable and rapidly growing problem of non-communicable diseases in Low-and Middle-Income Countries (LMICs) [2]. However, there is still a lack of effective tools that are affordable and appropriate for resource constraint settings and even if suitable diagnostic tests are available, they are often not accessible to poor populations [3]. One approach to improve access to products or services in LMICs is the use of social innovation [4]. While we acknowledge that multiple interpretations and definitions exist, we define social innovation as an approach to the implementation of healthcare delivery interventions by cross sectoral actors in response to needs expressed by the community. Crucially, it empowers people at the local level.

Quality Diagnostics

To promote how to improve access to quality diagnostics in LMICs using social innovation in LMICs settings, a workshop was held in April 2016 in Geneva, Switzerland during the Geneva Health Forum 2016 (GHF). The aims of the workshop were [1] to learn from examples of the social innovators, and to see how they can be applied to diagnostics; [2] to identify key factors of successful social innovations and how to scale up these models; [3] to identify the obstacles and limitations and how they can be addressed; and [4] promote new collaborations and engage academia in social innovations. Participants working with social innovations in their capacity participated in a workshop. Participants included social innovators and representatives from academia, international organizations and NGOs. The workshop consisted of 6 teleconferences over 6 months followed by a closed meeting and an open workshop along with the participants of the GHF.

II. LITERATURE REVIEW

Literature review was performed and the lessons learnt from social innovations were weighed up during the teleconferences to note key factors from the innovations. During the workshop at the GHF the social innovators participating in the workshop presented their work, the types of innovation models they use and the setbacks they have faced during the planning and implementation of their innovations. Four case studies working in different settings and following different models were presented. The four cases were: Operation ASHA-(INDIA), e-health for TB detection and drug compliance; Embryo (INDIA), local innovations such as a drug adherence monitoring system; Learner Treatment Kit (Malawi), detection and treatment of malaria in primary school children by teachers; and project HOPE (Peru), detection of cervical cancer by self-testing promoted by local volunteer women [5]. Four main learning outcomes were identified that form the pillars of the innovations: Feasibility, Replicability, Sustainability and Scalability. It was noted that for social innovations to be feasible, leveraging of existing resources to delivery in hard-to-reach populations, using community members to implement the innovation and centering the innovation around end user needs are key. There were examples of innovation, which used integrated school-based health service delivery by teachers to provide malaria case management to school children, and women from the community trained to help women for cervical screening, as example of using community participation in social innovations.

For replicability, standard operating procedures (SOPs) allow the use of innovations in different settings and in this technology-driven world; technology is playing a significant
role in social innovations. An example of the use of technology to track adherence to medicines or keeping record of the patients at the local level was presented. Simple models and continuing market analysis are crucial for scalability of the innovations. As the innovations must have minimal costs per patient, government support, co-funding, and co-ownership with government buy in; resource pooling and allocation are identified as important factors in the sustainability of social innovations which demonstrates the role of the government as vital.

III. CONCLUSION

The conclusions of the workshop were that social innovation in diagnostics can be a solution to improve access to diagnostic tools and services for marginalized and hard-to-reach populations but the innovation should address unmet needs (cost/clinical) with context appropriateness. Support and involvement from the community and local governments for such initiatives are vital. Business models can be adapted for the social innovations. The innovations should be adapted to the region, affordable and acceptable to the culture. Finally, more research and seed funds are required to further advance the field of social innovation.

This workshop highlighted the features that make a social innovation successful. The findings of the workshop will be useful for other groups that advocate, fund, and develop social innovation initiatives to improve health care in low-resource settings. More information is available at [http://socialinnovationinhealth.org/].

REFERENCES


An Analysis of Gobi Corporations Marketing Strategy And It’s Consumer Perceptions

Da Yeh University, International Business Management and Business Administration Department

Abstract: Every war and every competition have their own strategies. If you cannot define your suitable strategy, you will be listed one of the unsuccessful company. Therefore, every company needs to define good marketing strategy. Our research findings indicate that Gobi corporations’ marketing strategy. The Gobi corporation is one of the top cashmere producing company in Mongolia. We collected 311 participations from Mongolian consumers and analyzed by competitive marketing strategy.

Index Terms—Marketing strategy, SWOT, PEST, product life cycle

I. INTRODUCTION

Mongolia, is the last land of the nomads which live in the traditional house, wearing natural processing clothes and eating bio natural foods. Our country almost 2000 years has been part of the human history. Therefore, our ancestors were wearing badge, cashmeres and other leather clothes. Thenceforth every famous historian said that Mongolian cashmere processing history has begun 2000 years before. In our paper to introduce Mongolian cashmere products marketing situation. The marketing is the newest thing of our market. Because, Mongolian People's Republic was eventually moved to democratic present Mongolia in the 1990 and wrote new constitution. Since this revolution, market economy was reformed and transitioned to free market from centrally planned economy by slowly. Cashmere wool is the main domestic product of Mongolia. But only one company can successfully enter in the Global market, because the Mongolian business marketing has been developing only for past 2 decades. Recently, marketing tools of Mongolian companies are rapidly developing. Many of them are still using traditional marketing tools such as Advertising and Promotion. But most companies cannot control the whole market. Only Advertising cannot help a brand to become famous. Each brand has its own image and personality. Also, this paper divided by three parts. First part that introducing Mongolian cashmere market situation and Mongolian cashmere markets history. Second part presenting that some required literatures. Last part presenting that results of consumer survey, SWOT, PEST of Mongolian cashmere sector and defining some Marketing strategies.

1.1. Background of Important Factors, Affecting Mongolian Cashmere Sector

Service quality Mongolian cashmere market service is unsatisfied now. See graph 1 below. In 2017, We researched 311 customer’s satisfaction of cashmere sector service quality. The results of the research are shown as Graph 1 below.

Product price
Cashmere products are special products made from 100% natural raw materials. That is why, cashmere products always have been highly priced. In the Mongolian cashmere sector, their price wouldn’t be medium or low for Mongolian people. Medium price is 300 000 – 800 000 MNT (about 3000 - 10.000 NTD) (Mongolian marketing consulting group Cashmere sector survey, 2015). Mongolian average wage of Mongolian citizens is 700 000 – 880 000 MNT (NTD 9800 – 11,000) for women and 1 100 000 MNT (13,000 NTD) for men (Office, 2016). The cashmere product price is half of an average wage of Mongolian citizens.
customers. Though Mongolia has 60 million livestock, camels and goats make only a half of it; so, cashmere products cannot sell for the fair price to customers. Because of the high prices, Mongolian companies cannot become global companies.

Product Quality
Mongolian cashmere product quality is excellent. The report of the Mongolian domestic product customer satisfaction research (Group, 2015) published in 2015, showed the Mongolian cashmere product high quality. 90% of the customers, who bought the Gobi LLC products were highly satisfied with them (Group, 2015).

1.1. Company Situation

Competitors

In the Mongolian cashmere sector, 7 big manufactures are producing (Industry, 2015). The GOBI Corporation is one of the best and biggest share of a cashmere sector. Its biggest competitor is the GOYO Corporation that also produces cashmere products. In 2016, GOBI LLC market share was 66%, and the GOYO LLC market share was 13%. But it is on the international market. On the local market, the GOBI Corporation market share constituted 38% and the GOYO Corporation market share was 30% of the local market place (Gobi, 2016).

Suppliers of the Gobi Corporation

The main supplier of the company is 500 thousand of Mongolian herders. Goats now comprise almost half of Mongolia’s total livestock population, and the population explosion has caused environmental stress, evidenced by overgrazing, pastureland degradation and desertification. At the same time, volatile international cashmere prices have pushed many herders to keep larger flocks as a hedge against falling prices. Last year, prices dropped 29 percent to 50,000 tugriks (about $37) per kilo (Industry, 2015).

Company Target Market

The cashmere is one of the high-end product of the world. The GOBI company is targeting to heighten the revenue of Mongolian people and their life-cycle, like in Europe (Group M. M., 2016).

Company Segmentation

Many Gobi Corporation branch stores are in Zaisan, where businessmen, popular singers, top models, politicians, CEO’s live, and the main street of Ulaanbaatar (capital city of Mongolia). It is segmenting high value customers (Group M. M., 2016)

Product Prices

Below, the price scale of the GOBI corporation products is presented. GOBI’s average price is focusing on high revenue customers of the Mongolian market (Group M. M., 2016).

<table>
<thead>
<tr>
<th>№</th>
<th>Male</th>
<th>Female</th>
<th>Children</th>
<th>Accessors</th>
</tr>
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<tbody>
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<td>Sweaters (1870ntd-3800ntd)</td>
<td>Sweaters (1500ntd-3500ntd)</td>
<td>Sweaters (2000-3000ntd)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Pants (1500ntd-4500ntd)</td>
<td>Pants (1200-3500 ndt)</td>
<td>Pants (1500-3500 ndt)</td>
<td>Scarfs (1000-8000ntd)</td>
</tr>
<tr>
<td>3</td>
<td>Overcoats /(5000ntd-14000ntd)</td>
<td>Skirts (700-1500ntd)</td>
<td>Hats and scarfs (1800-2600ntd)</td>
<td>Bags (4000-10000ntd)</td>
</tr>
<tr>
<td>4</td>
<td>Hats and scarfs (800ntd-1500ntd)</td>
<td>Overcoats (4500-15000ntd)</td>
<td></td>
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<tr>
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<td>Gloves (100ntd-500 ntd)</td>
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<td>Gloves (100ntd-500 ntd)</td>
<td>Gloves (100ntd-500 ntd)</td>
</tr>
</tbody>
</table>

Table 1. The Gobi Corporation Products’ Price List

II. LITERATURES

Many industries contain one firm that is the acknowledged market leader. This firm has the largest market share in the relevant product market. It usually leads the other firms in price changes, new-product introductions, distribution coverage, and promotional intensity.

Choosing a specific attack strategy

The challenger must go beyond the five broad strategies and develop more specific strategies (Porter):

- Price discount: The challenger can offer a comparable product at a lower price. This is the strategy of discount retailers. Three conditions must be fulfilled. First, the challenger must convince buyers that its product and service are comparable to the leader’s. Second, buyers must be price-sensitive. Third, the market leader must refuse to cut its price in spite of the competitor’s attack.
- Cheaper goods: The challenger can offer an average- or low-quality product at a much lower price. Little Debbie snack cakes are lower in quality than Drake’s but sell at less than half the price. Firms that establish themselves through this strategy, however, can be attacked by firms whose prices are even lower.
- Prestige goods: A market challenger can launch a higher-quality product and charge a higher price than the leader. Mercedes gained on Cadillac in the U.S. market by offering a car of higher quality at a higher price.
• Product proliferation: The challenger can attack the leader by launching a larger product variety, thus giving buyers more choice. Baskin-Robbins achieved its growth in the ice cream business by promoting more flavors—31—than its larger competitors.

• Product innovation: The challenger can pursue product innovation. 3M typically enters new markets by introducing a product improvement or breakthrough.

• Improved services: The challenger can offer new or better services to customers. Avis’s famous attack on Hertz, “We’re only second. We try harder,” was based on promising and delivering cleaner cars and faster service than Hertz.

• Distribution innovation: A challenger might develop a new channel of distribution. Avon became a major cosmetics company by perfecting door-to-door selling instead of battling other cosmetic firms in conventional stores.

• Manufacturing cost reduction: The challenger might achieve lower manufacturing costs than its competitors through more efficient purchasing, lower labor costs, and/or more modern production equipment.

• Intensive advertising promotion: Some challengers attack the leader by increasing expenditures on advertising and promotion. A challenger rarely improves its market share by relying on only one strategy. Its success depends on combining several strategies to improve its position over time.

Product life cycles
Most product life cycles are portrayed as bell-shaped curves, typically divided into four stages: introduction, growth, maturity and decline (Kotler, 2000)

Marketing strategies: Growth stage
The growth stage is marked by a rapid climb in sales. Early adopters like the product, and additional consumers start buying it. New competitors enter, attracted by the opportunities. They introduce new product features and expand distribution. Prices stabilize or fall slightly, depending on how fast demand increases (Bartels, 1965). Companies maintain marketing expenditures or raise them slightly to meet competition and continue to educate the market. Sales rise much faster than marketing expenditures, causing a welcome decline in the marketing-to-sales ratio. Profits increase as marketing costs are spread over a larger volume, and unit manufacturing costs fall faster than price declines, owing to the producer-learning effect. Firms must watch for a change to a decelerating rate of growth in order to prepare new strategies (Cravens, 19991).

To sustain rapid market share growth now, the firm:
• Improves product quality and adds new features and improved styling
• Adds new models and flanker products (of different sizes, flavors, and so forth) to protect the main product
• Enters new market segments
• Increases its distribution coverage and enters new distribution channels
• Shifts from awareness and trial communications to preference and loyalty communications
• Lowers prices to attract the next layer of price-sensitive buyers

Marketing strategies: Maturity stage
At some point, the rate of sales growth will slow, and the product will enter a stage of relative maturity. Most products are in this stage of the life cycle, which normally lasts longer than the preceding ones (Kotler, 2000). The maturity stage divides into three phases: growth, stable, and decaying maturity. In the first, sales growth starts to slow. There are no new distribution channels to fill. New competitive forces emerge. In the second phase, sales per capita flatten because of market saturation. Most potential consumers have tried the product and, future sales depend on population growth and replacement demand. In the third phase, decaying maturity, the absolute level of sales starts to decline, and customers begin switching to other products (Kotler, 2000).

Marketing strategies: Decline stage
Sales decline for a number of reasons, including technological advances, shifts in consumer tastes, and increased domestic and foreign competition. All can lead to overcapacity, increased price cutting, and profit erosion. The decline might be slow, as for sewing machines and newspapers, or rapid, as it was for 5.25 floppy disks and eight-track cartridges. Sales may plunge to zero or petrify at a low level. These structural changes are different from a short-term decline resulting from a marketing crisis of some sort. “Marketing memo: Managing a marketing crisis” describes for a brand in temporary trouble. As sales and profits decline, some firms withdraw. Those remaining may reduce the number of products they offer, exiting smaller segments and weaker trade channels, cutting marketing budgets, and reducing prices further. Unless strong reasons
for retention exist, carrying a weak product is often very costly.

### III. METHODOLOGY

This research designed by core marketing concepts. Specially we defined companies market environment as SWOT and PEST, and defined marketing strategy by their product life cycle.

Research questions
1) What is the Gobi’s main strategy?
2) What is the Gobi’s position on product life cycle?
3) Who are the Gobi LLC consumers?
4) Where do they use cashmere products?

Hypotheses
In our research has 2 main analysis. First one is aims to describe Gobi’s marketing strategy using by SWOT, PEST and Competitive marketing strategies theory, second analyze is to find their consumer perception of Gobi’s brand image. It gives two big information that Gobi’s marketing strategy and Brand image. However, marketing strategy is being our big part of the paper.

A company’s positioning and differentiation strategy must change as its product, market, and competitors change over the product life cycle. To say a product has a life cycle is to assert four things:
1. Product have a limited life.
2. Product sales pass through distinct stage, each posing different challenges, opportunities, and problems to the seller.
3. Profits rise and fall at different stages of the product life cycle.
4. Products require different marketing, financial, manufacturing, purchasing, and human resource strategies in each life-cycle stage.

Most product life cycle are portrayed as bell-shaped curves, typically divided into four stages: Introduction, Growth, Maturity and Decline
1. **Introduction** – A period of slow sales growth as the product is introduced in the market. Profits are nonexistent because of the heavy expenses of product introduction.
2. **Growth** – A period of rapid market acceptance and substantial profit improvement.
3. **Maturity** – A slowdown in sales growth because the product has achieved acceptance by most potential buyers. Profits stabilize or decline because of increased competitions.
4. **Decline** – Sales show a downward drift and profits erode.

However, we created following hypotheses from last chapter of literature review

**H1:** The Gobi’s product life cycle is locating on growth stage. Therefore, Gobi is may need to be use Competitive marketing strategies.

**H2:** The Gobi’s product life cycle is locating on maturity stage. Therefore, Gobi is may need to be use Market modification or Product modification.

**H3:** The Gobi’s product life cycle is locating decline stage. Therefore, Gobi is may use to be Eliminate weak products and Harvesting and Divesting

### IV. RESULTS AND ANALYSIS

#### 4.1. SWOT analysis

**Strength**
Main strength of Gobi Cashmere and wool product, it is made out of 100% natural raw textile. 80 % of the Gobi Kashmir is considered patronage good ness Cashmere with 16.5 micrometer and 35-37 mm duration. Compared to Cashmere of other companies which supplies most of world’s cashmere, Gobi cashmere is slightly midst, however, longer. This is briny senior high caliber of Mongolic cashmere.

- No negative affect to human sound box, 100% natural
- Senior high quality and durable
- Good design and colorful, can change design according to client’s request • Relatively cheaper than similar products in the world market
- Wool, cashmere and knitted products have /GSP+/ preferential terms of tax in the EU.
- Gobi company’s equipment and technology to produce cashmere products reached world standard
- Can offer discounts to large orders • Have representative offices and sales agents abroad and through them doings promotional campaigns.
- Pays good attention on grooming.

**Weakness**
Gobi produces the commodities according to counterfeit of trade and this minimizes risks. In plebe way, unfavorable stand point of this control is become absent-minded Gobi equipment their trade to intermediaries for utterly cheap price. Mongolian funds are very up to snuff to wintry germaneto and assets command up wool read someone the riot act is durable and can easily be refreshed.

- Carpet and carpet products are not competitive in the world market in terms of color, quality. These products have many stitches.
- Knitted products do not enjoy preferential tax terms of EU.
- After-sales services are not good.
- Dependent on cashmere and wool yarins
- High production cost
An Analysis of Gobi Corporations Marketing Strategy And It’s Consumer Perceptions

- Does not put forward plan and goals
- Equipment and machineries of the carpet factories are lagging behind world standards
- Quality of raw materials is inconsistent.
- Lacks systematic information about target market
- Financially, it is difficult to conduct survey and analysis of the foreign markets
- Few sales channels
- Transportation cost of products that are transported across land is high and transit transport tax is high.

Opportunities
World over, consumers are abnegation actinic articles and adopt to blot ecologically authentic products. This is abundant befalling for not alone cashmere and woolen articles but as well for accomplished Mongolia. Use of “natural” products, abnormally cashmere articles tend to access in boiling and aligid North America and Western European countries. Through conception of new sales channels in adopted markets, it is accessible to access sales. In apple market, consumers adopt cashmere affection and cloths over cashmere knitted products. Cashmere cottons are produced out of aphotic cashmere. About 60% of the cashmere able by Gobi is dark. Gobi JSC was awarded all-embracing accepted affidavit for its articles in 1996 and this shows that is it absolutely accessible to get acceptance in this area for Mongolian products.

World demand for natural products is increasing.
- Markets of Western European and Scandinavian countries for wool, cashmere products can be expanded due to their climate, living standards etc.
- Can open new sales channels and expand existing sales channels.
- Interest to use cashmere products and cashmere cotton products are increasing in the world market.

Threats
Natural disasters could cause curtailment of raw abstracts and advance of assorted livestock beastly ache and can bind consign of articles originated from animals. Herdsmen are growing herds of goats added due to accumulation and assets of cashmere. They pay added absorption to the weight of cashmere and these approaches access abnormally in the cashmere quality.

Quality of raw materials is deteriorating every year.
- Herd composition is lost.
- Price hike of raw materials and supplies
- Customs tax and Transit transport tax of Russian federation is high
- Far from major carpet markets

4.2. PEST Analysis

Political environment: Politics of Mongolia takes place in a framework of a semi-presidential representative democratic republic, and of a multi-party system. Executive power is exercised by the government. Legislative power is vested in both the government and parliament. The United States values Mongolia's contribution to stability in a volatile part of the world, as well as its positive example in promoting economic reform and democracy. Mongolia stands well across several governance indicators. The Economist political stability index suggests that Mongolia fares above average in the world.

The cashmere industry has less threat to the political sector. As the industry is making the most out of it, the political noises are not getting into it.

Economic Environment: World cashmere market can be generally divided into raw cashmere and finished cashmere product segments. In the world market of raw cashmere, the main players are China supplying about 67% (10,000 tons) and Mongolia with about 21% (3,000 tons), and countries such as Iran, Afghanistan etc. supply about 12% of the annual output (SECO Sector Consulting). Size of micron and color of Chinese cashmere is far the best, which is one of the biggest strengths of Chinese industry; however the length of fiber in Mongolian cashmere is longer and considered to be most suitable for spinning.

Social environment: The majority of the population in Mongolia follows Tibetan Buddhism as their religion, and the majority of the state's citizens are of Mongol ethnicity, although Kazakhs, Tuvans, and other minorities also live in the country, especially in the west. As many of the people are related with the cashmere industry, so the social environment is in a good condition. The employees are interrelated and know each other. The gradual international involvement is also appreciable in making social contacts.

Gobi has completely changed the management board with all intelligent people and successfully turned around the whole company since 2008. Currently Gobi’s P/E ratio is 13%, and it’s the best time to invest. As a suggestion, don’t pay attention to the past performance, but pay attention to who takes over the company and pay attention to the management team. Gobi Corporation strives to do environmental friendly practices in our operations and will promote care for societies and environment as a whole.

Technological Environment: In Mongolia, it is obvious that scientific and technological activities need to be changed with other sectors in order develop them in front of other countries. Although Mongolia has a comparatively strong
An Analysis of Gobi Corporations Marketing Strategy And It’s Consumer Perceptions

science and technology base, including human resources and institutions, its scientific capacity is largely centralized in the capital. In addition, as the economic transition progresses to a more advanced stage, such resources are in danger of being underutilized, dissipated or even lost.

4.3. Product Life cycle
We analyzed that Gobi’s sales income. The cashmere product is seasonally using product. Therefore, Gobi’s sales is decreasing from 5 to 9th month of each years. But look at the graph below.

In 2017, Gobi is introducing new collection and enter the Global market such as China and Russia. The sales revenue is constantly increasing. The Gobi’s new collection is locating on the Growth market stage and they need to be use competitive marketing strategies.

V. RECOMMENDATIONS AND CONCLUSIONS
5.1. Recommendations
Ecological balance is a worldwide pressing issue and there are approaches to decrease production and consumption of chemical products. This tendency contains great opportunities of the development for woolen and cashmere garments of Mongolia. It is necessary to open the door to utilize these opportunities. At that time wool and cashmere processing sector which will be an export face and Mongolia can be internationally recognized and can prosper and develop. But besides this issue, overgrazing of pastureland and desertification have been pressing and difficult issues for Mongolia. Particularly, herds of goats, source of the world-famous qualified cashmere are one of the main factors of desertification. Therefore, the state needs to pay special attention to how to increase the proper ratio of herd structure, numbers of livestock and yield. There have following complications in the export activities of the wool and cashmere processing industries.

1. Yield of livestock animal husbandry and quality of herd structure of Mongolia have been deteriorating. Micron of the world-famous cashmere of Mongolia has been widening and its length has been shorter, content of fleece has increased, and cashmere quality has been worsening.
2. Domestic wool and cashmere processing industries work on the raw material preparation mobilizing all the power every year, but they have been losing raw materials to Chinese procurers. To collect raw materials is really a difficult and complicated issue for domestic industries competing with Chinese procurers who take special concession and support from their Government.
3. It is more difficult to get familiar and expand the foreign market, and find clients and partners in the foreign market. Lack of financing, human resources of Mongolian small factories is the root cause of this.
4. Transportation issue is very problematic for producers. Cashmere products are light, unit price is more expensive and so the products are transported by air cargo. Size of woolen products is bigger, and these ones are comparatively cheaper and so it is possible to transport them overland and waterway. Therefore, transportation cost of woolen products is higher and in addition, customs tax and transit transportation cost of the Russian Federation are higher. Due to these reasons the opportunities to deliver products to the main markets of European Union and sell products in the market rate are very restricted.

From Government of Mongolia: It is impossible that just an organization or industry solves above mentioned complicated issues and all the counterparts of the market should cooperate to solve these problems and the government should implement definite policy on it. In order to solve all these complicated issues there are needs of support and assistance as follows:
1. There are needs to determine state policy on protecting of yield of livestock, herd structure under the state protection of Mongolia and conduct activities to achieve the definite effects. Particularly, it includes maintaining number of goats, tax and incentives, geographical issue, producing of new products and felt made heat-isolating materials.
2. To render assistance to create the procurement system of raw materials. To control the quality, improve and develop kinds of raw materials through price policy.
3. It is necessary to make negotiation to decrease customs tax of the Russian Federation and People’s Republic of China and transit transportation tax. In this way it is possible that our woolen and cashmere garments are valued in the market price in the market of Western Europe.
4. To improve domestic and foreign control of the industries, pay tax as less as possible in cooperation with foreign investors and partners, find activities to eliminate negative things including undervalue employees and raw material suppliers.

VI. CONCLUSION

Gobi has completely changed the management board with all intelligent people and successfully turned around the whole company since 2008. Currently Gobi’s P/E ratio is 13%, and it’s the best time to invest. As a suggestion, don’t pay attention to the past performance, but pay attention to who takes over the company and pay attention to the management team. Gobi, already a part of Mongolian culture, has always been synonymous with quality and elegance. Established in 1981 by the Mongolian government, we are the first Mongolian luxury knitwear brand to break into European, Japanese and the US market during the last century. Since then Gobi has been consistently earning more recognition in luxury knitwear and fashion industry than ever before. After almost 30 years as a government owned company Gobi started a fresh chapter in July 2007. Its government owned stocks were sold and started operating under private owners. A new campaign was set out, with a vision dedicated to introducing the brand on new grounds and to continue the tradition of innovation, authenticity and glamour. Our manufacturing methods based on latest technologies and our continuously inspiring quality and design give us an edge over the competition. Under the same campaign the Gobi Corporation will keep leading the way in luxury knitwear industry and inspire many competitors to improvement.

REFERENCES

Collaborative Framework for Cassava Chip Supply Chain in Thailand

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Abstract— Cassava-chip is considered one of Thailand’s most important economic crops and Thailand is the world’s largest cassava products exporter. Thai government is prioritizing the cassava production in their “Mega farm” strategy in support of agricultural economic and collaboration between farmer, public and private sectors. One of the methods is by using the collaborative supply chain model which comprises all the aspects of production, including the procurement of raw materials, productions and processes, logistics, and sales. The model is an integrated supply chain that manages the synergy of multiple sectors. Moreover, implementing the collaborative supply chain has been used to improve overall performance of the entire supply chain so as to actualize close coordination and seamless connection of sectors. The study aims to review existing literature on collaborative model and critical success factors in the agriculture supply chain context during 2008-2018 and the 20-year agriculture and cooperatives strategy (2017-2036). The fifteen key collaborative success factors are identified: Information Technology, Top Management Commitment, Partnership, Service Quality, Process, Resource Capability, Government Intervention, Skilled Employee, Trust, Industry Focus, Open Communication, Market Competence, Image/Reputation, Cost Minimization, Planning and Implementation. Factors in collaborative framework will be provided in detail. The framework will later be used to provide more appropriate third-party system to enhance the collaborative cassava chip supply chain in Thailand.

Index Terms— Collaborative Model, Conceptual Framework, Cassava-Chip Supply Chain

I. INTRODUCTION

Agricultural products have an important role in the today’s world economy. In particular, products derived from crops serve various customer demands, e.g., food and biofuel. Furthermore, the supply chain of agricultural products has become a hot issue because the public is increasingly aware of and concerned about the availability and safety of the foods being consumed. At present, the consumers of agricultural products demand to have more information not only on the availability of a product in supermarkets but also on its farming, marketing, distribution, transportation, and processing activities [1][35][13]. Besides, consumer behavior as such involves issues related to public health, which is influenced by existing cases on contaminated products [8].

With an abundance of natural resources, Thailand has solidified its reputation as the leading global supplier of agricultural products. Cassava, an agro-industrial crop with a well-developed industry and market in the country, is considered one of Thailand’s most important economic crops [21]. Supplying around 67% of the global market, Thailand was ranked as the world’s largest cassava products exporter with annual production of 33 million tons in 2016 [26]. The industrialization of cassava processing in Thailand extends from chips and pellets as primary products to starch, which is further processed into high value-added starch derivatives products. Furthermore, if the increasing demand of a cassava product is not supported by a good post-harvest handling, cassava waste would be a problem. Cassava wastes are possible to produce from harvest wastes. Those wastes might be potentially important resources if handled properly [9][22][16]. The wastes are convertible into heat, steam, charcoal, methanol, ethanol, or biodiesel. Coordination among supply chain members may utilize and reduce cassava waste, and may have a significant impact in increasing farmers’ revenue. Production cost could be reduced by utilizing buyers’ resources. Therefore, interorganizational collaboration in a cassava supply chain should be increased.

This paper is structured into four sections. In the second section, a review of the existing background literature on collaborative supply chain and cassava chip industry in Thailand are presented. In the third section, a proposed framework is presented. Finally, the last section concludes with research summary and proposed future research.
II. LITERATURE REVIEW

Collaborative Supply Chain
A collaborative supply chain simply means that two or more independent companies work jointly to plan and execute supply chain operations with greater success than when acting in isolation. Many researchers have proposed equivalent definitions to the collaborative supply chain. Lambert, et al. (2004) suggest a particular degree of relationship among chain members as a means to share risks and rewards that result in higher business performance than would be achieved by the firms individually. Bowersox (1990) reports that logistics alliances offer opportunities to dramatically improve customer service and at the same time lower distribution and storage operating costs. Narus and Anderson (1996) define a collaborative supply chain as the cooperation among independent but related firms to share resources and capabilities to meet their customers’ most extraordinary needs.

Supply chain collaboration (SCC) is increasingly important in organizations because of its contributions to success of supply chain management and organization competitiveness in the global economy. In supply chain, partnerships allow members of the system to achieve the set out objectives and meet the expectations of the consumers in the end [29][20]. In reality, the establishment of a perspective on partnerships is a strategic decision by the common goals. Moreover, the coordination of the process of product supply is the prerequisite to develop between the owner of the resources as well as the efforts of the relationship. Perspectives of cooperation in relation to exchange are one of the effective means to develop and control or reduce the competitiveness among the subject. Furthermore, the partnership provides members in the distributed system with efforts to achieve the firm objectives, improvement of efficiency in the relations and improve the ability to provide and serve the customers [34][13].

Collaboration in supply chain also results in performance improvement in the supply chain [5][33][34]. In demand chain management, the supply chain structure when aligned as per the needs of the customer would result in better performance. Hence there is a need to have tight integration of supplier and customer to make a supply chain successful [34][35]. In addition, firms should build collaborative relationships with their supply chain partners in order to achieve efficiencies, flexibility, and sustainable competitive advantage [14][25].

III. CASSAVA CHIP INDUSTRY IN THAILAND
Cassava chip factories are small-scale enterprises which belong to farmers or small businessmen and are located in close proximity to the growing area. The chipping factories are installed with simple equipment, consisting mainly of a chopper. Roots are loaded into the hopper of the chopper machine by a tracker; after chopping into small pieces, the chips are sun-dried on a cement floor. The final moisture content of chips should be below 14% and the sand content should not exceed 3%. Normally it takes 2.00-2.50 kg of fresh roots (with 25% starch content) to produce 1 kg of chips (14% moisture content). Chips are sold to pelletizing manufacturers who either directly export the chips/pellets or sell to traders. In most cases, the small chip factories sell their products to large factories that in turn sell a consolidated consignment to pellet manufacturers. Some portions of cassava chips are used locally for animal feed, as well as feedstock for producing bioethanol, an environmentally friendly, alternative energy for liquid fuel use as a blend with gasoline, i.e. gasohol in the transportation sector. In addition, the biofuel program being established in some countries, in particular China, has driven a marked increase in the export volume of cassava chips. As the high starch content of cassava chips is of value for biotechnological conversion, the demand for chips for this industry is still very promising [27].

Recently, the demand of cassava chips in Thailand has increased dramatically as a result of the national policy of bioethanol production for fuel uses [21]. To produce ethanol from cassava, the starch is initially converted to fermentable sugars, mainly glucose by enzyme or acid process. The sugars are then fermented to ethanol by yeast. To produce 1 liter of anhydrous ethanol, around 2.5 kg of dried chips (65% starch content, wb) are required; the conversion ratio, however, varies depending on processing efficiency; the most widely used process is Simultaneous Saccharification and Fermentation [31]. For production, Thailand’s average growth rate of cassava planted area, harvested area and production from 2012-2017 reaching to 0.45, 0.36 and 0.95 % respectively [26]. Moreover, in 2017 Thailand has about 322 drying yards (cassava chip producer), and most of Thai manufacturers have high experience, knowledge including hi-tech machineries, and from market side, Thailand exports more than 85% of cassava chips while the rest is consumed domestically in ethanol, chemical and animal feed industry. Furthermore, according to Global Trade Atlas (2018), in 2018, Thailand is the biggest cassava exporter in the world with 53 percent of market share, and it has the highest exporting cassava chip value in the world with proportion of 90.52%. Thai cassava chip is mostly exported to China in 99.35% also. Therefore, the export of cassava chip plays the important role in Thailand especially to China [32].

Collaborative Supply Chain Framework

Previous literature reveals that there are various perspectives being used to describe a Collaborative Supply Chain Framework (Table 1). Some perspectives in one model are overlapped with others.
### Table 1: Literature Review on Collaborative Supply Chain Framework

<table>
<thead>
<tr>
<th>Perspectives</th>
<th>Factors</th>
<th>Literature review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Technology</td>
<td>Computer-based technology; Technology utilization; Reliability of hardware and software; Effective use of ERP and MRP system; Eprocurement system compatibility with other system; Technology capacity; Quality of IT system; Information quality; Application of information technology; Technological capability; ICT; IT strategy orientation; Strategic use of IT; Investment in information system; World wide web</td>
<td>[2][4][5][11][14][15][16][19][22][23][30][33][35][36]</td>
</tr>
<tr>
<td>Top Management Commitment</td>
<td>Participative management style; Corporate culture; Organizational commitment; Management support; Organizational involvement; Decentralized task management; Management capability; Role of organization; Top management support managerial understanding; Quality leadership; Managerial initiatives</td>
<td>[4][5][7][11][12][13][14][15][16][19][20][30][33][35][36]</td>
</tr>
<tr>
<td>Partnership</td>
<td>Supplier relation; Partnership with suppliers; Embracement of supplier; Customer-supplier relationship; Channel relationship; Inter-firm collaboration; Supplier management; Service relationship elements; Business IT partnership; Collaboration with partners; Standardizing and integration; Relationship with 3PLs; Interdependent cooperation; Supply chain partnership selection; Supply chain integration; Project collaboration</td>
<td>[2][5][10][11][12][13][14][15][19][20][22][23][33]</td>
</tr>
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</table>

| Service Quality | On-time delivery; Superior product quality; System quality; Information quality; Service quality; Work performance quality; Service quality; Ease of use; System quality; Quality management capability; Quality improvement; Service quality; Primary customer loyalty; Data quality; Customer support | [4][11][30][36][13][18][20] |

| Process             | Just-in-Time (JIT) methodology; Outsourcing non-core activities; Customer complaint management; Automation of authorization workflow; Redesign of the procurement process; Re-engineering material flow; Product recycling; life cycle management; Material flow management; Comprehensiveness flexibility; Key business process reengineering | [2][5][12][13][16][30][33] |

| Resource Capability | Resource management; Price response capability; Delivery capability; Flexible capability; Financial capability; Breath of service; Operational elements; Performance elements; Extensive services range | [16][22][23][36] |

| Government Intervention | Government policy; Perceived usefulness; Support activation; Policies; Regulation | [11][13][16][23] |

| Skilled Employee       | Skilled logisticians; Skilled professionals; Training and education; Teamwork; Formation of a project team; Committed employee | [7][10][13][22][23][30] |

| Trust                 | Trust, Mutual trust, Confidence, Transparency | [2][4][13][14][19][35] |
Collaborative Framework for Cassava Chip Supply Chain in Thailand

<table>
<thead>
<tr>
<th>Industry Focus</th>
<th>Clear goals, Customer focus, Compatible goals</th>
<th>[13][15][22][23]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Communication</td>
<td>Communication, Cross-organization communication, Openness, Constant communication</td>
<td>[2][5][7][13]</td>
</tr>
<tr>
<td>Market Competence</td>
<td>Market competence; Pressure from competitors; Competitive nature</td>
<td>[10][20][35]</td>
</tr>
<tr>
<td>Image/Reputation</td>
<td>Commercial image; Reputation</td>
<td>[18][36]</td>
</tr>
<tr>
<td>Cost Minimization</td>
<td>Cost reduction; Cost saving</td>
<td>[11][18]</td>
</tr>
<tr>
<td>Planning and Implementation</td>
<td>Planning; Project implementation strategy</td>
<td>[2][13][14]</td>
</tr>
</tbody>
</table>

IV. PROPOSED COLLABORATIVE SUPPLY CHAIN FRAMEWORK

In order to come up with a proposed framework, two major steps are carried out.

Step 1: Review the existing status and progress of collaborative supply chain which focuses on the collaborative supply chain representation and availability based on the open data principles.

Step 2: Search different collaborative supply chain perspectives using the following keywords: “collaborative supply chain, supply chain collaboration, cassava chip supply chain, agriculture”. The searching process is limited to general academic databases such as Scopus, SpringerLink and ScienceDirect.

From a review research published on collaborative supply chain in the agriculture context between 2008 and 2018, 21 research studies were found. Similarity and difference between perspectives in previous literature are determined in order to conclude what perspectives will be suitable to the context of Thailand. In the given below figure (Figure 1), a new collaborative supply chain framework is proposed with fifteen perspectives as follows: Information Technology, Top Management Commitment, Partnership, Service Quality, Process, Resource Capability, Government Intervention, Skilled Employee, Trust, Industry Focus, Open Communication, Market Competence, Image/Reputation, Cost Minimization, Planning and Implementation. The perspectives are described below (Table 2).

![Collaborative Supply Chain Model](image)

Table 2: Collaborative Supply Chain Perspectives

<table>
<thead>
<tr>
<th>Perspectives</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Technology</td>
<td>Integrating between business strategy and information system, improving efficiency and effectiveness, ensuring accurate information, and improving communication</td>
</tr>
<tr>
<td>Top Management Commitment</td>
<td>Commitment from top managers are vital as they are the brains behind the push toward organizational goals, and to mobilize the employees, they must be able to motivate and influence the subordinates to be aligned with the organization’s business objectives.</td>
</tr>
<tr>
<td>Partnership</td>
<td>Partnership is inter-firm cooperative arrangements for enhancing performance. It allow firms to focus on their core activities and fill resource inadequacies in critical operations</td>
</tr>
<tr>
<td>Service Quality</td>
<td>The view of quality in the whole process of delivering the product or service to the customers</td>
</tr>
<tr>
<td>Process</td>
<td>Process are utilized by companies to improve their manufacturing performance and as a result business performance states that process management requires the identification of objectives, the creation of policies and assignment of resources for the plan’s implementation.</td>
</tr>
<tr>
<td>Resource Capability</td>
<td>Resource capability is the efficiency properties of a resource and signifies the value of a resource or resource bundle in terms of its technical fitness or productivity.</td>
</tr>
</tbody>
</table>
Collaborative Framework for Cassava Chip Supply Chain in Thailand

| **Government Intervention** | Government intervention will indefinitely ease supply chain adoption among firms. Plus, we can argue that by highlighting governmental factor as one of the CSF, it draws the supply chain managers into paying more attention on government-related elements such as regulations, policies, or certification. |
| **Skilled Employee** | The importance of having well-trained and skilled employees is very significant in real industry situations. The internal resources must be satisfactory in order to achieve supply chain success, and this gives an indication to supply chain managers to invest in the human capital. |
| **Trust** | Degree to which supply chain partners have the intention and ability to work for the good of chain. |
| **Industry Focus** | Industry focus is the industry analysis to get the better knowledge across practice groups of a particular industry’s needs and intricacies. |
| **Open Communication** | Open communication promotes information exchange leading to mutual disclosure which helps volitional compliance between partners. It highlights shared interests and common goals and thus positively affects collaboration performance. |
| **Market Competence** | Routines related to the properties and characteristics of the value transfer between the firm and its environment. It covers a firm’s abilities to act and interact in its markets. |
| **Image/Reputation** | Reputation is the commercial image that is important to attract and retain the customers. |
| **Cost Minimization** | Cost minimization requires efficient-scale facilities, pursuit of cost reductions, and cost saving in all areas of the firm. This will give more profit. |
| **Planning and Implementation** | Planning and implementation is a system of forms and rules designed to encourage firms to take appropriate action when situations arise. |

V. CONCLUSION
The concept of collaborative supply chain is to enable cassava chip stakeholders and allow them to have better business performance and keep them integrated policies, information sharing, and incentive alignment. Recently, Thailand’s government has tried to clear directions for long term agriculture development and to increase agricultural productivity and quality standards of farm products, to promote the competitiveness of the agriculture sector through technological improvement and innovation, balance and sustainable management of agricultural resources. The government released the 20-year agriculture and cooperatives strategy which was in line with the government’s 20-year national strategy and also was to support Thailand 4.0 strategy [21]. To improve cassava chip collaborative supply chain and align with Thailand’s strategy, this research shows an explorative way which has fifteen perspectives are needed to develop a collaborative supply chain model. The model has been developed from Thailand’s 20-year agriculture and cooperatives strategy with fifteen perspectives as follows: Information Technology, Top Management Commitment, Partnership, Service Quality, Process, Resource Capability, Government Intervention, Skilled Employee, Trust, Industry Focus, Open Communication, Market Competence, Image/Reputation, Cost Minimization, Planning and Implementation. The collaborative supply chain model allows cassava chip stakeholders to use as a guideline for developing own systems and supply chain collaboration arrangement.

Future research will focus on collaborative supply chain development based on collaborative supply chain model. The focus will be on the cassava chip industry to enhance overall performance of the supply chain so as to actualize close coordination and seamless connection of sectors.

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