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SCHOOL OF BUSINESS

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Welcome Address from President, UTCC

It is my pleasure to present to the Volume 3, Number 1, 2011 issue of the University of the Thai Chamber of Commerce (UTCC) International Journal of Business and Economics (IJBE). In keeping with its tradition of promoting all forms of intellectual inquiry including that conducted outside the box, the current issue proposes to its readers, the findings of research in a variety of Business, Economics, and Accountancy areas.

It is our objective to publish in the UTCC IJBE high quality research and papers work from all subject areas of marketing, banking, economics, insurance and risk management, industrial and operation management, strategic management, and international and global business management with a particular emphasis on issues related International Business. I thank all authors for the quality of the manuscripts they submitted to our review and for trusting the UTCC IJBE to be the medium to share it with a truly global audience. I praise the scholars who volunteered their expertise to review these intellectual contributions.
More importantly, I sincerely appreciate and look forward to continued support of our sponsors: the UTCC, the Thailand Management Association (TMA) and the Kellogg College, University of Oxford, as well as to a challenging but bright future for the UTCC IJBE, with your help.

Chiradet Ousawat, Ph.D.
President,
University of the Thai Chamber of Commerce

Welcome Address from Deans, UTCC

We proudly present to you the University of the Thai Chamber of Commerce (UTCC) International Journal of Business and Economics (IJBE), Volume 3, Number 1, 2011 issue. UTCC IJBE is a publication of the UTCC and the Thailand Management Association (TMA). It is also listed in the Thailand National Library and any other libraries or database worldwide. The UTCC IJBE has the ISSN (ISSN: 1906-5582) issued by the Thailand National Library.

The UTCC IJBE issues are growing in importance from an issue to another and this fact is proven by the great number of the papers submitted by experienced researchers from many different countries in the World. We would like to assure you that we will do our best in the future, in order to offer you a high quality journal.

In this first issue of 2011, we publish 10 research papers of good quality for your reading. Each paper has successfully undergone a double blind peer-review process. You may enjoy scope of research papers ranging from international finance, international economics, business strategy, management of technology, entrepreneurship, organizational structure to quality management. We hope that you will enjoy reading this issue of the UTCC IJBE and look forward to the next issue.

Finally, we would like to express our sincere gratitude to numerous paper reviewers and editorial board for their contributions in making this issue.

Dr. Ekachai Apisakkul
Dean, School of Business,
University of the Thai Chamber of Commerce

Asst. Prof. Dr. Thanavath Phonvichai
Dean, School of Economics,
University of the Thai Chamber of Commerce

Asst. Prof. Naengnoi Chai-Onnom
Dean, School of Accountancy,
University of the Thai Chamber of Commerce

Editorial

Welcome to the fifth issue of the UTCC International Journal of Business and Economics (UTCC IJBE). We, the editors, appreciate greatly the support of the University of the Thai Chamber of Commerce and the Thailand Management Association (TMA), as well as the sponsorship of the Kellogg College, University of Oxford in asking us to become involved in this endeavor as editors of the UTCC IJBE.

Over the past few years, we have noticed the rapid development of business, economics, and accountancy within the industrial, academic and governmental sectors. More and more people are talking, researching and applying business, economics, and accountancy within a myriad of contexts. There is much excitement in the field.

The UTCC IJBE has been established in response to this increased interest in business, economics, and accountancy issues as a forum for interested parties to advance their knowledge and science of the said discipline. The geographical scope of the journal is not solely limited to Thailand and the surrounding region.

This fifth issue of the UTCC IJBE represents a compilation of submitted papers. It is hoped that this issue will set a new benchmark in terms of academic publications in Thailand, especially in the field of business, economics, and accountancy.

The Editors would like to invite academicians, practitioners and policy makers to submit their manuscripts on business, economics, accountancy, and other related disciplines. Through the support of our Editorial and Advisory Board, we hope to be able to provide academic articles of the highest quality to all our readers.

Ungul Laptaned
Suthawan Chirapanda
Gilbert Nartea
Editors

The Editors

Editors-In-Chief

Dr. Ungul Laptaned is an Assistant Professor in the Department of Logistics Engineering at the School of Engineering, University of the Thai Chamber of Commerce. He graduated with a Ph.D. in 2003 from the University of Nottingham, United Kingdom in the field of Manufacturing Engineering and Operations Management. Ungul has published over 40 proceedings and journal papers, pertaining to Industrial Engineering Network, Asia Pacific Industrial Engineering and Management, International Association of Science and Technology for Development, Operations and Supply Chain Management, Intelligent Manufacturing System, Business and Information, to name a few. He served as a program chair and a steering committee for several domestic and international conferences. He is a journal editor of International Journal of Logistics and Transport, and Thai Researchers' Consortium of Value Chain Management and Logistics Journal, and has consulted for several public organizations and industrial firms on logistics and supply chain management such as Thailand Research Fund, Phitsanulok Province, Public Warehouse Organization, Amatanakorn Industrial Estate, Wyncoast Industrial Park, Iron and Steel Institute of Thailand, Chacheongsao Province, and Kerry Distribution (Thailand) Co., Ltd., JWD InfoLogistics Co., Ltd., and TKL Logistics Co., Ltd.

Dr. Suthawan Chirapanda is a full-time lecturer at the School of Business, University of the Thai Chamber of Commerce. She obtained her PhD in International Management and Marketing Strategy from Leeds University Business School, University of Leeds, UK. Her research interests are: (1) marketing strategy, (2) strategic management, (3) international business and (4) business performance. She also had attended academic conferences organized by the American Marketing Association (AMA), the Business and Information (BAI), the Research and Development, the Innovation and Design (R&DID), and the Annual London Conference on Money, Economy and Management.

Dr. Gilbert Nartea is an Associate Professor in the Faculty of Commerce, Lincoln University, New Zealand. Dr. Nartea graduated a Master's Degree from New England and a Ph.D. from Illinois, USA. He is a senior lecturer in Finance. His teaching interests are in the area of investments, futures and options, and finance, futures and options. The area of research interests area asset pricing, investment management, decision-analysis and risk management, and microfinance and poverty alleviation. He has published several papers in such journals as of Property Investment and Finance, International Journal of Managerial Finance, Asian Journal of Business and Accounting, Australian Journal of Agricultural and Resource Economics, Pacific Rim Property Research Journal, Review of Applied Economics, Review of Development Cooperation, American Journal of Agricultural Economics, and Journal of the American Society of Farm Managers and Rural Appraisers.

Foreword

Welcome to the 1st edition of the 3rd volume of the UTCC International Journal of Business and Economics (UTCC IJBE), the Editors received a number of papers from different countries such as Australia, China, France, Indonesia, Iran, Singapore, Spain, Thailand, and United States of America. The submitted manuscripts for academic coverage represented the diverse scope of marketing, banking, economics, insurance and risk management, industrial and operation management, strategic management, and international and global business management. After the review process, a total of ten manuscripts were selected for publication.

The first article deals with human resources issues. This paper is co-authored by ***Antonia Ruiz-Moreno, Javier Lloréns-Montes, María Nieves Pérez-Aróstegui, and Valentin Molina-Moreno***, entitled ***"Climate of Flexibility: The Effects of Employment Externalization on Internal Workers"***. The research has stressed flexibility in the management of human resources, given that organizations must face a complex and dynamic environment that requires flexibility to adapt to changing conditions. The goal of this study is to analyze the consequences of externalization from the perspective of the employees, contributing to this line of research by examining how externalization influences internal employees' perceptions toward flexibility.

Article number two is conducted by ***Auttapol Suebpongsakorn***. His paper is entitled ***"The Evaluation of Productivity Change of the Construction Companies in Thailand: An Application of Malmquist Index"***. The objectives of this paper aim to estimate the efficiency scores of the top 20 construction companies of Thailand ranked by their profit earnings in 2009, and to detect the nature of the productivity change during the 2005 – 2009 periods. In this study, the traditional data envelopment analysis (DEA) based on input – oriented approach and the Malmquist index are estimated in order to serve these objectives.

The third article is authored by ***Charlie Charoenwong, David K. Ding, and Ping Wang***, and is entitled ***"SEC Rule 105 and Price Discovery in the Secondary Market"***. By using a bootstrap technique, the authors compared the speed of the price discovery of SEOs issued during the SEC Rule 10b-21 period and those issued during the Rule 105 period on the offer day. They made several observations upon the adoption of Rule 105. It was also observed that a higher fraction of price discovery attributable to private information under Rule 105 that was consistent with the hypothesis that a shortened restricted period would lead to difficulty of exploring the information contained in the offer price discounts and result in high information asymmetry on the offer day.

Article number four is entitled ***"Social Technographics and Business Strategies"***, and is written by ***Li-Zhong Zhang***. This paper argues that a more coherent approach should be adopted to analyse target customers and determine what kind of relationship to be built with them, based on what they are ready for. As a business research tool, Social Technographics can be used to categorize social computing behaviours into a ladder with deferent levels of participation, and analyse a population according to its participation in these levels. Brands, Web sites, and any other company pursuing social technologies should analyse their customers' Social Technographics first, and then create a social strategy based on that profile.

The fifth article is co-authored by ***Luciana Spica Almilia and Supriyadi***, and is entitled ***"Exploring the Model of Internet Use: Indonesia Context"***. The purpose of this research is to compare the two models (TPB and TAM); a model that has the best explanatory power of the intensity of the information use on the company's internal counters technology. The respondents in this study are accountants who work in the firm. There were 10 questionnaires received by mail, and 45 by post mail. For the 55 questionnaires, only 43 questionnaires can analysis to examine the hypothesis.

The sixth article, entitled ***"The Effect of Transportation on Global Petroleum Trade Trend"***, was conducted by ***Manouchehr Vaziri and Reza Omrani***. The objective of the study was to determine possible relations between international petroleum trade and transportation trends. The trend of global petroleum trade distribution was analyzed and the sensitivity of global petroleum trade with respect to distance was investigated. The study covered the petroleum trade activity among 173 countries over a time period extending from year 1965 to 2005. The examined database consists of 13 time-series variables, grouped in four categories: petroleum commodity trade, geographical, socio-economic and political characteristics. The centralized databases of international agencies were accessed and used to extract the study relevant information.

The seventh article is written by ***Ridhichai Tanchawal and Atthapong Sakunsriprasert*** and entitled ***"An Investigation of Individual Attitudes towards the Implementation of Corporate Social Responsibility Projects in Thai Firms"***. This research aims to study individual attitudes towards the implementation of CSR projects in Thai firms in four different areas, which are; economic responsibility, legal responsibility, ethical responsibility, and philanthropic responsibility. This research uses the Structure Equation Model technique as the chosen method of data analysis. The researcher collected 440 samples of primary data through questionnaires asking about areas of Corporate Social Responsibility in relation to each individual's attitude.

The eight paper is examined by ***Sylvain Bourjade***, and their paper is entitled ***"Existence of a Unique Equilibrium in Uniform-Price Auctions with Strategic Rationing"***. The author mentioned that uiform price auctions admit a continuum of collusive seeming equilibria due to bidders' market power. This paper modified auction rules in allowing the seller to ration strategic bidders. It showed that all of these "bad" equilibria disappear when strategic bidders did not know the seller's rationing strategy. More precisely, the unique equilibrium price was the highest that the seller could get.

The ninth article entitled ***"Regime Switching and Interest Rate Pass-Through: A Case Study of Thailand"***, and is written by ***Thatphong Awirothananon***. This paper examined the efficiency of the dynamic relationship between a money market rate (an inter-bank rate) and different short-term interest rates (deposit and lending rates). In particular, this paper modelled and measured the pass-through process as a vector auto-regressive approach in the Thai banking system from June 1999 to October 2010. Two models were examined and compared: one was a linear model called vector auto-regressive model and the other was a non-linear model known as the Markov switching model.

The last but not the least, the article entitled ***"Stakeholders of Dollar-Yuan Exchange Rate Negotiation"*** is examined by ***Yong Cao, Rashmi Prasad, and Zhengping Shen***. In this paper, they conducted a historical review how the United States deployed negotiation strategies with China on the exchange rate issue, and consider the degree to which it follows theoretical expectations. Then, the paper analyzed the changing nature of the factors which shape exchange rate negotiations between the two nations in projecting alternative scenarios for the future of conflict resolution between the U.S. and China on this issue. It was predicted that the U.S. was likely to continue alternating between competition and collaboration, a negotiation cycle influenced by U.S. domestic politics, China was less likely to continue with accommodation and compromise.

May you find these articles informative and substantial for further discussion to advance our existing knowledge in the application of Business, Economics, and Accountancy.

The UTCC International Journal of Business and Economics' Editorial Board and its Editors would like to welcome future submission from interested parties to make this journal your forum in sharing ideas and research findings.

Ungul Laptaned
Editor-In-Chief

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Climate of Flexibility: The Effects of Employment Externalization on Internal Workers

by

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Abstract

Externalization can increase a firm's flexibility in confronting the conditions of a changing market and the needs of the organization. The research has stressed flexibility in the management of human resources, given that organizations must face a complex and dynamic environment that requires flexibility to adapt to changing conditions. The goal of this study is to analyze the consequences of externalization from the perspective of the employees, contributing to this line of research by examining how externalization influences internal employees' perceptions toward flexibility. The hypotheses were tested with data collected from 249 internal workers in five organizations. The results of this study indicate that externalization has a negative and significant effect on climate of flexibility among internal workers. The negative consequences decrease in a context of group potency. However, these negative effects increase among employees with greater supervisory responsibility.

Keywords: Flexibility, Employment, Externalization

1. Introduction

Recent analyses of labor market tendencies suggest that the proportion of employees with temporary and stable work contracts remained constant from 1984 to 1992, although it has been growing progressively since (Beatson, 1995; Gallagher and Sverke, 2005). Similar developments seem to be occurring in all of the advanced industrial economies of Europe, the United States and other Pacific Rim countries (Bergström, 2001). Contingent or external work is an "umbrella" concept used to describe any employment relationship in a firm other than salaried, full-time and permanent work (internal work). The broadest understanding of the term includes not only jobs available through Temporary Agencies (TAs), but forms of employment such as part-time work, direct temporary hiring (without recourse to TAs), and contracts and subcontracts for goods and services (Conelly, 2004; Kunda, Barley and Evans, 2002; Walsh and Deery, 2006). Externalization has been the term used to describe these practices. Pfeffer and Baron (1988) distinguish between three kinds of externalization: externalization through reduction of length of employment (temporary employment), externalization of management control (independent contracts/outsourcing) and externalization from the workplace (e.g., e-work).

Internalization facilitates control within the organization, whereas externalization can increase a firm's flexibility in confronting the conditions of a changing market and the needs of the organization (Davis-Blake and Uzzi, 1993; Storey, Quintas, Taylor and Fowle, 2002). For client firms, the use of contingent or external work provides greater flexibility to respond to changes in the demand for products, whether these changes are foreseeable or unforeseeable. However, employing a contingent or external workforce can have negative consequences (Broschak, Davis-Blake, 2006; Cardon, 2004; George, 2003). Davis-Blake, Broschak and George (2003) find that internal employees who work with a large number of temporary employees show lower levels of loyalty and intent to stay in their organizations, as well as higher intention to form unions. Along the same lines, George (2003) concludes that the scope and dimension of externalization is negatively related to the attitudes of internal workers, especially those with fewer supervisory responsibilities.

Now that we have presented the important tendency in firms to use an external workforce, we are interested in investigating how this circumstance affects the work environment, specifically, how it influences the permanent workers. The configuration of this context will thus span multiple dimensions (Schneider, Brief and Guzzo, 1996) and determine the nature and way of working to be developed. As Schneider et al. (1996) establish, one of the dimensions of climate is the nature of the work, whether the tasks performed by the workers are more or less adaptable or rigid, which we can associate with the variable of flexibility—that is, whether the workers are more or less flexible when performing their tasks.

Many prior studies have analyzed the influence of structural and contextual variables on firm flexibility. We believe that the organizational climate play a relevant role, although there has been little research in this area. Our study introduces the variable climate of perceived flexibility by the employees into models of firm flexibility. In recent decades, research has stressed flexibility in the management of human resources, given that organizations must face a complex and dynamic environment that requires flexibility to adapt to changing conditions (Wright and Snell, 1998). Human Resource flexibility is one of the important aspects of organizational flexibility, and it focuses on adapting employee attributes (such as knowledge, skills and behaviors) to changing environmental conditions (Ngo and Loi, 2008). Researchers have considered two kinds of strategy in using labor flexibility (Kalleberg, 2001): enhancing employees' ability to perform a variety of jobs and participate in decision-making, and reducing costs by limiting workers' involvement in the organization. Both strategies have received different names: numerical vs. functional flexibility, or

internal vs. external flexibility. A firm achieves flexibility by coordinating behaviors through individuals and groups, such that flexibility in the behavior of the employees will provide us with an indicator of the firm's flexibility (Wright and Snell, 1998).

Our paper focuses on the consequences of externalization from the perspective of the employees, contributing to this line of research by examining how externalization influences internal employees' perceptions toward flexibility. Therefore, we will relate one kind of labor flexibility, externalization or utilization of contingent workers, to the flexibility that workers perceive in their own behavior and responsivenesswhen they perform their work, in the framework of the organizational climate. Our goal is to examine the relation between externalization and climate of flexibility. First, we analyze how the dimensions and scope of externalization are related to climate of flexibility in organizations. Second, we examine how these relationships can be moderated by contextual variables related to the work environment, organizational support perceived, and collective perception of efficacy. More specifically, we analyze contextual variables such as supervision, monitoring and group potency.

2. Theoretical Review and Hypotheses

Externalization and Climate of Flexibility

Although relatively few studies analyze the degree to which externalization impacts organizational climate of an organization directly, we believe that this idea is consistent with the hypothesis of attraction-selection-attrition proposed by Schneider (1987) and revised by Schneider, Goldstein and Smith (1995). The ASA model establishes that the result of three interrelated dynamic processes, attraction-selection-attrition, determines the type of people in an organization, and that the collective characteristics of the people define an organization (Schneider et al. 1995). These authors support the role of leadership in the implementation of organizational practices and the resulting climate. The idea that some practices that reflect the objectives and personality of leaders can influence the configuration of organizational climate is of great importance for research. The kind of contracts that workers have, specifically the use of employment externalization, it can influence the configuration of the organizational climate, therefore in the climate of flexibility. This may occur because hiring contingent workers can have affective consequences for the permanent workers' attitudes which, in turn, lead to cognitive consequences. For example, Johnson and Ashforth (2008) establish the negative effect of employment status (i.e. limited term vs. permanent) on service agents' customer-oriented service behavior.

Some researchers on flexibility have suggested that the right organizational climate is important for promoting flexible behavior and improving work performance (Dyer and Shafer, 1999). Some signs of this climate are open intraorganizational communication, recognition of individual excellence, orientation to and support for creativity, etc. Organizations with these attributes are more flexible and more successful (Breu et al., 2001; Dyer and Shafer, 2002). If climate affects work motivation in the way suggested by Schneider (1981), employee involvement could be strengthened or weakened in the long term by management policies and practices imposed by managers to raise levels of flexibility, since individuals' interpretations can lead to changes in their behavior. Thus, upper management's attitude toward change influences the adoption of practices that seek to increase flexibility (for example, externalization). Some top management teams have conservative behavior toward flexibility and change; they prefer the *status quo* and continue to use the same methodologies or those tested by time. Other managerial teams are open to risk, truly stimulating the use of flexible or radical methodologies that direct organizations proactively.

Management for flexibility is considered a responsibility that is competence of top management. Since the managers develop organizational systems that determine how goods and services are designed, processes of flexibility should begin with the commitment of management itself. Employees' work efficiency is a direct result of the quality of the systems that directors create and manage. Therefore, specific practices in the organization (such as externalization) should be related to the climate of flexibility, as it is assumed that they affect managerial policies and the consensual perceptions of individuals.

In this context, permanents employees may believe that the organization has chosen to hire external workers because such workers allow them to adjust personnel levels in response to fluctuating market demands. In this case, permanent employees may perceive the external workers as necessary to satisfy market demand and thus as beneficial for the organization and for the internal employees themselves. However, most studies show that permanent employees usually see recourse to external workers as a mechanism to facilitate changes in internal structures.

Hypothesis 1: ***The greater externalization will influence negatively in the perceptions of the internal employees about climate of flexibility***

Contextual factors

The foregoing arguments suggest that externalization can influence climate of flexibility, although these relationships can vary depending on contextual conditions. In this study, we suggest that different aspects of the context can intervene, such as perceived organizational support and collective perception of efficiency.

Any aspect of the employee-organization relationship that indicates high organizational commitment to internal workers can mitigate the negative effects of externalization. According to research by Eisenberger, Huntington, Hutchison and Sowa (1986), people's perception that the organization takes an interest in them, seeks their well-being and offers them help with personal problems when necessary will yield very favorable results for the organization in terms of employment and permanence. Riel, Berens and Dijkstra (2009) indicate what the perceived managerial efforts to stimulate the employee capabilities are needed to implement the company´s strategy with success. We therefore expect this factor to constitute an important moderator of the effects of externalization. The two traditional ways that organizations have favored commitment to workers are protecting employees and making them feel valued and supported by the organization (George, 2003). This study will analyze three elements of context: monitoring and supervisory responsibility as linked to support; and group potency or beliefs shared by members of the group concerning their capacity to achieve specific goals or perform predetermined activities.

Group potency as moderator

One construct that influences nearly all factors determining people's efficiency working in groups (for example, satisfaction, motivation, or cohesion), as well as groups themselves as operating units, is without doubt the "collective perception of efficacy", where "perception of efficacy" indicates the same behavior in the group as in the individual. Bandura (1982) defines perception of efficacy in the context of his cognitive social theory as self-perception of one's own competency. In a work on "group potency" or collective perception of efficacy, Lester, Meglino and Korsgaard (2002) apply Bandura's cognitive social theory to group and organizational productivity with interesting implications. "Group potency" is defined as the belief shared by members of a group

concerning their capacity to achieve specific goals or perform predetermined activities (Lindsley, Brass and Thomas, 1995).

Such feelings of group potency could lead internal workers to increase their motivation in the organization, decreasing the possibility that they interpret externalization in a negative way. A greater feeling of self-efficacy in the group of internal workers may mitigate the threat of externalization, as the situation is perceived as more controllable and less damaging, diminishing the negative effects on flexibility. However, expectations of efficacy determine how much effort workers wish to dedicate to an organization and how long they will persist in the face of adverse experiences and obstacles. The group's confidence in itself and its ability to achieve objectives is a fundamental motivating factor for facilitating and stimulating flexibility. Predisposition to change should be interpreted not only from the perspective of the need for change, but also from the ability to cope with new and possibly different or unfamiliar situations. Research on group potency supports these relationships (Lester et al., 2002; Shea and Guzzo, 1987). We thus propose that internal workers' level of group potency will reduce the negative relation between externalization and climate of flexibility.

Hypotheses 2: ***A greater perceived group potency by the internal employees will moderate the relation between externalization and climate of perceived flexibility***.

Monitoring as moderator

Individual autonomy has a positive effect on performance, based on the model of characteristics in research by Hackman and Oldman (1976). Numerous studies of self-esteem suggest that employees who have autonomy in their work are likely to feel more valued by their organizations (Pierce, Gardner, Cummings and Dunham, 1989). However, Langfred (2004) suggests that this positive relationship depends on the level of monitoring and that the autonomy-performance relationship can become negative if monitoring is insufficient. In other words, high levels of individual autonomy should be accompanied by relatively high levels of monitoring, and insufficient monitoring could lead to lower performance. Monitoring consists of a program of support and follow-up to help the worker develop capacities according to his or her potential and succeed through his or her behavior in uniting knowledge and abilities with other colleagues to satisfy the firm's overall needs. Along the same lines, Powell (1996) affirms that it is necessary to monitor employees, even if confidence on the part of management grants them greater autonomy. Although some research shows that monitoring and follow-up affect individual motivation negatively, most studies support the argument that performance benefits from monitoring (Larson and Callahan, 1990). Sabel (1993) also suggests that internal cooperation is based on sustained contact, regular dialogue and constant monitoring. However, Hales (2005) conclude what the persistence and prevalence of external supervision reflects a senior management reluctance to trust work teams to manage themselves and an abiding conviction that levels of effort and quality of work can only be guaranteed by close external monitoring.

Monitoring has been used to help workers in organizations to build on past experiences in order to break barriers that limit their progress or to inspire them to try to grow and realize their full potential. Monitoring facilitates change and flexibility in organizations, providing a structured, efficient model that enables good management of performance and stimulates development of workers' potential. If the results of applying more monitoring make workers feel that they are valued by the organization, permanent workers in a context of externalization might interpret externalization less negatively than workers not involved in similar programs. First, participation in a monitoring process can give permanent workers more information on external workers, which makes the threat

of externalization more controllable. Second, the organization's decision to improve its potential will transmit security and mitigate the personal risk that externalization can pose.

Hypotheses 3: ***A greater perceived monitoring among internal workers will moderate the relation between externalization and the climate of perceived flexibility.***

Supervisory responsibility as moderator.

Assigning internal workers supervisory responsibility involves a creative distribution of authority. This management practice is typical of the effort many organizations are currently making to give their employees a larger leading role, capacity for influence, visibility and ultimately power. To act with efficacy, to believe that being efficacious is important, is a necessary but certainly not a sufficient condition. Part of the secret of effective people is that they focus on activities over which they can exercise control. In so doing, they give substance to their personality and self-confidence and face any challenge positively. They seek and obtain pleasurable, reassuring experiences—this does not mean easy or simple ones—creating a base of confidence for future challenges. This is a very sure mechanism for affirmation and motivation, and it depends essentially on organizations (Hogg and Terry, 2000). In a context of externalization where internal workers acquire the role and responsibility of supervising and training their external colleagues, the former can feel more essential to the organization (George, 2003). Acquiring the role of supervisor can mitigate the perceived threat that processes of externalization could create, as the processes come to be seen as more controllable (Thomas, Clark and Gioia, 1993). The role of supervisor can also facilitate easier access to information about the external workers, which can also reduce the perception of risk (George, 2003).

Hypotheses 4: ***A greater perceived supervision responsibility among internal workers moderates the relation between externalization and climate of flexibility.***

The relationships proposed between these variables are presented in Figure 1.

3. Methodology

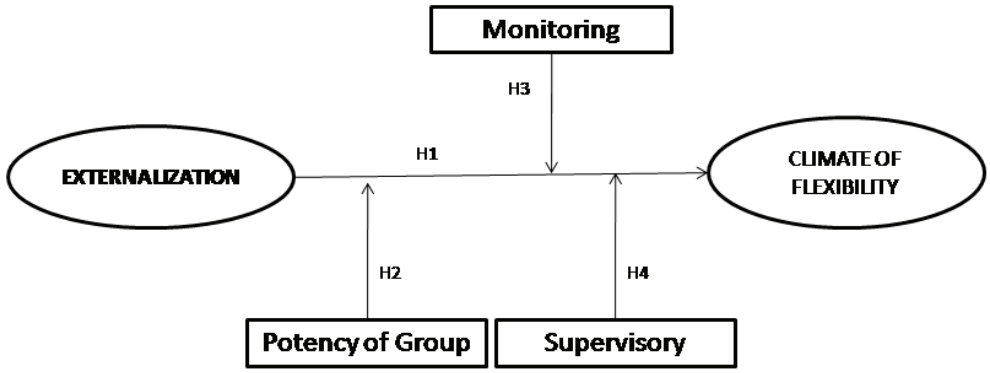

Figure 1 Hypothesized model

Sample

To contrast the different hypotheses, we performed an empirical study from a selection of five firms. The five organizations belonged to the following sectors: facilities, water management, integral management of administrative processes, transport and auto mechanics. The first organization studied was a firm for the integration of systems handling the full water cycle, meteorology and environment. This firm was a model in automatic information systems for water quality and systems for the control of water resources. It had a multi-disciplinary staff of over 240 professionals, of whom more than half were technicians with secondary school or university degrees. Most of the firm's professionals specialized in systems, telecommunications and computer science. The firm employed 142 internal workers.

The second firm analyzed worked in the management of public services included in the full water cycle, such as supply of drinking water, the sewer system, and customer management. The organization had a team of 102 workers to deliver its services, of whom 76 had permanent connection with the firm. The employees were primarily engineers, technicians and administrative personnel. The third organization had, since its beginning, performed various tasks related to large-scale data collection and analysis of documentation, particularly for credit-related organizations. This firm delivered technical support services with human resources specialized according to the needs of the different departments. It employed over 400 workers, of which 238 were permanent. The internal workers were mainly involved in the automation of processes through platforms based on new technologies, optical character recognition and image management. Most of the external workers were directed to technical support or administrative work. The fourth firm was dedicated essentially to ocean transportation and the export and import business. It had a multi-national dimension and participated in sectors such as transport, information technologies, and the commercialization and distribution of industrial products and raw materials. Its staff was over 500 employees, of whom somewhat more than half had a temporary relationship. The fifth firm offered integrated solutions for tires for all kinds of vehicles, as well as complete mechanical and maintenance services. It had a staff of over 100 employees, of whom only 30 had a permanent relation to the organization.

The firms invited to participate in the research were not involved in processes of suspension of payment, regularization, lay-offs or any other situation that could affect their structural work conditions. In choosing these firms, we considered the presence of the following essential motives for using externalization: flexibility with contracts, possible cost reduction, and the task of pre-selection that the intermediate firms perform. Some of the firms analyzed used externalization as a source of candidates for positions of indefinite duration. Although this personnel policy was not declared explicitly, the employees provided by the intermediary considered the session a trial period in the user firm that would end in the firm's deciding whether to hire them as part of its permanent staff. In some cases, one of the main reasons that these firms contracted temporary services was that they provided a relatively cheap and low-risk procedure for the job selection process. In all five firms, internal and external employees usually worked together, even if there were no formally established human resources policies for their integration.

The data were gathered through the distribution of questionnaires to the 313 internal workers of three organizational units in each participating organization. We explain how these units were selected in the next section. Due to the common problem of the low response rate to questionnaires on strategic issues in the firm, we were especially careful to maximize the response rate. To do this, we first performed a pre-test of the questionnaire through a series of in-depth interviews with workers at the five firms. We sent a second questionnaire to workers who had not answered by approximately one month after the first mailing. We obtained 249 valid responses, for a response rate

of 79.55 %. Of the workers surveyed, 182 (73%) were men and 67 women; 85 (34%) had studied at the university; 11 (4.3%) were managers, 44 (17.9%) professionals, 64 were in administration (25.5%), 70 were technicians (28.2%) and were 60 operators (23.9%). Finally, we analyzed the possible risk of bias between non-respondent and respondent firms. The database provided secondary information on the number of employees and billing of all sample firms that did not respond. We used the Kolmogorov-Smirnov test and did not find significant differences in occupation (p=0.496) or gender (p=0.633), nor did we find any other evidence of bias in the sample.

Measures

Externalization. The study measured externalization with the procedures used by George (2003). We obtained data that indicated the scope and duration of these firms' externalization. To measure scope, the employees responsible for human resources in the five firms participated actively as key informants in the research, following the methodology suggested by Seidler (1974) and George (2003). Each classified his or her organizational units into the three following groups: low, medium and high scope of externalization. This division is based on the subjective perception that each held of the organizations. To collect the data, we then randomly chose one organizational unit per category. Questionnaires were sent to all internal employees in these organizational units. To confirm the information provided by the people in charge of human resources, we analyzed whether the current number of external workers in each organizational unit corresponded to the subjective classification of the human resources directors. The data were adjusted to the categories of the managers. In the organizational units with high externalization, external workers represented on average 42% of the labor; in units with moderate externalization, 24%; and in units with low externalization, 11% of the personnel. We applied ANOVAs to analyze whether, within each organization, the three organizational units differed significantly in distribution of external workers. The differences were significant for all of the organizations. According to the arguments of Lawrence (1988) and George (2003) and to the results of the ANOVAs, which indicate that the categories themselves differ, we codified scope of externalization as a categorical variable. The value one represented low scope of externalization, the value three moderate scope, and five high scope.
To measure the duration of externalization, we also requested the participation of the people responsible for human resources in these five organizations. Each classified the organizational units chosen previously into the three following groups: low, medium or high duration of externalization. This division is also based on the participants' subjective perception of their organizations. To confirm the information given by the people responsible for human resources, we gathered data from records on the first time that they used external workers in each of the units studied. For each unit, we chose the position occupied for most time by external workers. Its duration provided the measure the duration of externalization in this unit. The data obtained from the records agreed with that provided by the people responsible for human resources. We then codified duration as a categorical variable. The value one represented low duration of externalization; the value three, moderate duration; and five, high duration.

Finally, for each unit, we calculated the average value of the scope and duration, which generated an index that approximated the degree of externalization of each unit in each of the organizations.

Climate of flexibility. To measure the climate of flexibility, we used a scale based on eleven items adapted from Nystrom, Ramamurthy and Wilson (2002). This scale measured to what extent the internal workers perceive whether the organizations to which they belong favor, encourage and recognize initiating practices and processes that favor flexibility. The internal consistency of the

scale was analyzed using the Cronbach's alpha. The resulting value was above the limit usually considered acceptable (α= 0.855).

Group potency. This variable was measured by a 5-point Likert scale composed of eight items from the scale of Guzzo, Yost, Campbell and Shea (1993). Internal consistency of the scale was measured by the Cronbach's alpha, and the statistical value is higher than the limit usually considered acceptable, 0.7 (α= 0.863).

Monitoring. To determine the degree of monitoring, we used the four-item scale of Cummings and Bromiley (1996). The scale used was a 5-point Likert-type scale, and the value obtained for reliability was high (α=0.911).

Supervisory responsibility. To determine perception of the degree of supervisory responsibility that permanent workers had in their firm, we used a scale based on four items that enabled us to determine whether the workers used part of their time supervising and training their colleagues. This scale was proposed by George (2003). The scale used was a 5-point Likert-type scale. We analyzed internal consistency with the Cronbach's alpha, and its value was higher than the limit usually considered acceptable, 0.7 (α= 0.845).

Other variables. The questionnaire measured age (in years), sex, academic level (primary school, secondary school, university study), professional occupation (managers, professionals, technicians and operators) and length of time with the organization (in years). Time with each of the five organizations studied was codified by five binary variables.

4. Results

To contrast the hypotheses, we used hierarchical regression analysis. In a preliminary stage, we performed a regression among the dependent and moderating variables. The next phase included the independent variable. Finally, we added five terms that represented the interactions between the independent variable and each of the moderators.

To complete the contrast of the hypotheses on moderation, we confirmed that there was a significant moderating effect and then analyzed the sign and significance of the slope of the relation between externalization and the dependent variables, as argued by Jaccard, Turrisi and Wan (1990), as a function of the values taken by the moderating variable. To do this, we performed an additional analysis, in which we evaluated the effect of the independent variable on the dependent variable, while distinguishing between different levels of the moderating variable. Following the recommendations of Jaccard et al., we classified values of an above-average standard deviation in the high level and values below the average standard deviation in the low level.

The descriptive analysis and the correlation matrix between dependent and independent variables can be seen in Table I, which also shows the reliability of the different scales. From analysis of the matrix, we see that there are no highly significant correlations between the variables, which would indicate a priori that there are no problems of multicolinearity in a regression between the variables considered. This was confirmed by calculating the tolerance indexes and inflation factors of the variance for each regression model. In all cases, we maintained levels well below those recommended, indicating that the results are not affected by possible multicolinearity

Table 1 Mean, Standard Deviation, reliability and correlations[a]

Variable	Mean	S.d	1	2	3	4	5	6
Climate of flexibility	3.122	0.86	**0.855**[b]					
Externalization	3.31	1.32	-0.248**	-0.266**	-			
Supervisory responsibility	3.02	1.30	0.022	0.229**	0.439**	**0.845**[b]		
Monitoring	3.61	0.93	0.250*	0.141*	-0.090	0.022	**0.911**[b]	
Group potency	3.844	0.63	-0.378**	0.059	-0.083	-0.016	0.080	**0.863**[b]

[a] n=249; [b] Cronbach's alpha

* p< .05; ** p< .01

The results of the hierarchical regression analysis are presented in Table II. . Hypothesis 1 suggests that greater externalization will influence climate of perceived flexibility unfavorably. As seen in Model 2, which incorporates the independent variable externalization, this variable has a negative and significant relation to climate of flexibility (□=-0.168, p<0.05). The introduction of this variable indicates an increase in the variance, meaning a change in R^2= 0.023 (p<0.01). These results support the validity of Hypothesis 1. Hypothesis 2 suggests that group potency moderates the relation between externalization and climate of perceived flexibility. As Model 3 shows, the resulting term of the product of externalization and group potency predicts the climate of flexibility significantly (□=0.249, p<001).

Table 2 Effects of Externalization on Climate of Flexibility

	Climate of flexibility		
	Model 1	Model 2	Model 3
Supervisory responsibility	0.148* (2.157)	0.079 (1.073)	0.147 (0.884)
Monitoring	0.266*** (3.955)	0.260*** (3.913)	0.202*** (3.061)
Group potency	-0.387*** (-5.668)	-0.383*** (-5.677)	-0.360*** (-5.357)
Externalization		-0.168* (-2.308)	-0.244*** (-3.453)
Externalization * Responsibility			-0.164* (-2.419)
Externalization * Monitoring		0.273	0.041 (0,622)
Externalization * Group potency			0.249*** (3.728)
R^2	0.258	0.281	0.374
ADJUSTED R^2	0.244	0.263	0.347
F	19.203	16.112	13.810
CHANGE IN R^2		0.023	0.093
F		5.329*	8.004***

* p< .05; ** p< .01;*** p< .001

For a more detailed examination of the first interaction, we verify the nature and strength of the moderating effect. To do this, we perform an additional regression analysis that enables us to confirm the effect of externalization on the climate, distinguishing between high and low levels of group potency. Thus, the analysis of the interaction term shows that, under the condition of low group potency, externalization is negatively related to climate. □□.41, p<0.001), as can be seen in Table III. Because this effect is not significant when we establish the condition of high group potency, we have confirmed that the multiplicative term is significant in the multiple regression analysis. This, together with the analysis of the nature of this term, provides support for Hypothesis 2.

Hypothesis 3 suggests the moderating effect of monitoring. The results indicate that monitoring does not moderate the relation between externalization and climate. Therefore, Hypothesis 3 is not supported by the results.

Hypothesis 4 suggests the moderating effects of supervisory responsibility. As Model 3 shows, the interaction between externalization and supervisory responsibility predicts climate significantly. To confirm the strength and nature of the moderating effect of supervisory responsibility, as shown in Table IV, we perform an additional regression analysis to confirm the effects of externalization on the climate of flexibility, distinguishing between high and low levels of supervisory responsibility. The detailed test of the interaction term shows that, when we establish the condition of high supervisory responsibility, externalization is negatively related to climate. □□-0.422, p<0.001). This effect is not significant when we establish the condition of low supervisory responsibility. Thus, the interaction term in the regression analysis and the research on its nature do not support Hypothesis 4, leading us to reject the moderating effect of supervisory responsibility.

Table 3 Effects of Externalization on Climate of Flexibility for Different Levels of Group Potency

	Climate of flexibility	
	Model 1[a] High group potency	Model 2[b] Low group potency
Externalization	0.017 (-0.158)	-0.410*** (-3.992)
R^2	0.000	0.168
ADJUSTED R^2	0.000	0.157
F	0.025	15.936***

*** p< .001

Table 4 Effects of Externalization Climate of Flexibility for Different Levels of Supervisory Responsibility

	Climate of flexibility	
	Model 1[a] Supervisory responsibility	Model 2[b] Supervisory responsibility
Externalization	-0.422*** (-3.924)	0.062 (-0.615)
R^2	0.178	0.00
ADJUSTED R^2	0.167	0.000
F	15.396**	0.379

** p< .01;
*** p< .001

5. Discussion

Our research has analyzed whether externalization influences the perceptions of internal employees toward flexibility. More specifically, we have examined their relation to climate of perceived flexibility. The results show that externalization has a negative and significant relation with climate of flexibility. However, these effects are moderated by perceived group potency by the workers and supervisory responsibility. We will now explain the implications of these results.

The results obtained add evidence to the small body of theoretical research that has studied the negative effects of externalization on internal employees' perceptions (Chattopadhyay and George, 2001; Geary, 1992; George, 2003; Smith, 1994). The data support the argument that

externalization is related to climate of flexibility. The results show that externalization causes internal workers to perceive their environment as jeopardizing their flexible action. This can mean that management policies and practices imposed by managers to raise levels of externalization can weaken the employee's involvement in the long term, as negative interpretation of these policies and practices will influence employees' behavior.

This paper suggests that flexibility and the reduction of costs may be the two main motives for the firm to use externalization (Kalleberg, 2000). An organization may choose external workers because they allow the firm to adjust its personnel levels in response to fluctuating market demand. Externalization may also allow the firm to reconfigure the deployment of resources and reduce the time of response to significant changes in the environment (Hitt et al., 1998). All of this can lead to greater flexibility. However, firms should consider the social costs that this firm strategy may incur. This suggests that organizations try to be flexible in the deployment of human resources by means of externalization but do not stimulate the conditions to make these resources in themselves flexible or to adopt flexible behaviors. Thus, the employment of external workers can be a source of static but not of dynamic flexibility. Organizations can have the flexibility to change or reconfigure their deployment of resources, but not the abilities they need to change in the direction required to navigate a competitive scenario efficiently, due to the low involvement of their internal workers.

The foregoing leads us to conclude that, in scenarios of externalization, climate is not favorable to flexibility to the extent that they condition negatively people's way of working, as well as the development of the processes through which they raise levels of flexibility. The perceptions of an organization's members can be determining factors in the adoption of flexible practices. However, the fact that the organizations chosen for the research were not involved in processes of suspension of payment, regularization, lay-offs, or any other circumstance that could affect their structural conditions of employment leads us to think that, even in situations of growth or stability, externalization has a negative influence.

This study extends prior research on externalization and flexibility. The research performed shows, paradoxically, that externalization can negatively influence an organization's capacity to be flexible by causing its workers to be less open to acquiring new knowledge and abilities to tackle the changes needed. Further research is needed to study what practices top management could impose in the organization to make the benefits of externalization compatible and not deteriorate the perceptions of its workers toward the phenomenon.

The results indicate that the negative relation between externalization and climate of flexibility is greater among internal employees who share lower group potency. Workers who share a greater sense of self-efficacy as an organization can mitigate the negative perception caused by externalization, since they perceive the situation as more controllable and less threatening. These feelings can increase their commitment to the organization and lead them to interpret externalization less negatively. In other words, in situations of externalization, group potency favors aproactive behavior of coping successfully with new situations that require flexibility, such as different and unfamiliar situations.

Contrary to our expectations, the effects of externalization are worse among employees with greater supervisory responsibilities. These results can lead us to conclude that the high rotation of personnel involved in externalization can jeopardize the perception of the internal workers responsible for supervising and training their external colleagues. This can occur especially when the supervising workers help others to develop by acquiring new abilities, internalizing perspectives and fulfilling their potential. The internal workers make an effort to supervise, develop, care for, share

and help, establishing a relationship in which they invest time, know-how and effort. They stimulate the other person's development in the area of knowledge and abilities and respond to critical needs in the life of this person in ways that prepare him or her for greater productivity and greater fit in the organization. Yet when the time is up, the external worker must leave the organization, and other workers arrive. This can lead the supervising worker to question his or her perception of the organization's support for the development of abilities that enables workers to face the changes and demands of the environment. However, these findings suggest the need for more research in the direction proposed.

The emphasis this study places on firms that are not involved in processes of suspension of payments, regularization, lay-offs, or any other circumstance that could affect their structural conditions of employment can be both an advantage and a limitation. We are studying firms in a phase of stability or growth. Situations of expansion or seasonality can justify the hiring of external workers. The foregoing leads us to ask what happens in situations of crisis or restructuring.

Our arguments are based on permanents workers' interpretations of externalization. However, the data were not obtained by asking them explicitly about their perceptions and interpretations, but rather from independent sources and not directly from the workers on which this study focuses. This is also a limitation in the study by George (2003). Previous research has shown that internal workers changed their interpretations of externalization. Future research could explore the perceptions and interpretations of internal workers in greater depth. Specifically, these studies could analyze the repercussions on internal workers of the kind and content of the information and monitoring received prior to the strategy of externalization that is being pursued or that the organization is planning to pursue.

Our research does not differentiate between different kinds of contingent work. Essentially, there are four differences that enable us to distinguish standard from atypical forms of employment. First, some atypical relations of employment do not provide a direct relation between the employee and the formal employer. Second, the work day can be shorter than that in relations of traditional employment. Third, it is very common not to ensure continuity either implicitly or explicitly in non-standard relations of employment. Finally, in some kinds of atypical hiring, there is no employer as such. Future studies could examine whether different kinds of externalization, such as temporary employees, independent contracts, outsourcing, or e-work, generate different perceptions about flexibility in internal employees.

Finally, this study used a convenience sample of five organizations. The non-random nature of choosing the firms in the sample as well as their cross-sectional character may limit the generalization of the results. Longitudinal studies should be developed to extend this line of research in order to determine the long-term implications of externalization policies and their long-term consequences.

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The Evaluation of Productivity Change of the Construction Companies in Thailand: An Application of Malmquist Index

by

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Abstract

The objectives of this paper aim to estimate the efficiency scores of the top 20 construction companies of Thailand ranked by their profit earnings in 2009, and to detect the nature of the productivity change during the 2005 – 2009 periods. In this study, the traditional data envelopment analysis (DEA) based on input – oriented approach and the Malmquist index are estimated in order to serve these objectives. The results showed that although the construction companies earned large amount of profits in 2009, 12 companies (RT, ACC, CUEL, TOC, VAT, CMC, STEC, SYNTEC, CK, ST, TRC, and CNT) still operated below the efficient frontier line, while the Malmquist Index indicated the productivity change of the construction firms especially during 2007/2008 period.

Keywords: Construction Companies, Efficiency, Productivity, Malmquist Index, Data Envelopment Analysis (DEA)

1. Introduction

The construction industry has been known as one of the strongest industries in Thailand. Notwithstanding, the performance of this industry is indeterminate due to the fluctuation of the Thai economy during the previous lustrum (2006 – 2010). This can be seen from the growth rate of this industry shown in Figure 1.

Source: Bank of Thailand

Figure 1 Growth Rate of Construction Industry of Thailand

Beginning with the high growth rate of 7.2% in 2004, the growth rate of the construction industry in Thailand tended to decrease over the period of 2005 – 2007 and had the negative growth rate in 2008 (the period of the global financial and economic crisis), and then it rebounded back to the rate of 0.4% and 6.8% in 2009 and 2010, consecutively during the recovery period. For the year of 2011, the growth rate of this industry is predicted to increase continuously from last year at the rate of 4.0% – 6.5%, especially for the expansion of the public construction such as trains, roads, and several infrastructures which are the main factor contributing to the growth of this sector. For the private construction, the growth rate is projected to be declined from last year at the rate of 3.5% – 5.5% due to the problems of oversupplies of housing, the upward trend of Thai interest rate concomitant with the end of supporting policies for residential investment and the risk for the incoming bubble economy (Kasikorn Research Center. 2010: www.kasikornresearch.com).

Due to the fluctuation of the rate of growth in the construction industry, there are several questions related to the performance of the firms in this industry, such as which firms produced on or under the efficiency frontier, how their productivity levels are changed during this period, how to measure the input and output slacks in order to provide the recommendation for improving the performance of each firm.

Generally, one of the most popular methods to measure the productivity of the particular firms is known as the Data Envelopment Analysis (DEA) and its related applications. From the past till present, the DEA technique can be applied to any fields of studies related to the measurement of efficiency. Thompson, Brinkmann, Dharmapala, Gonzalez-Lima, and Thrall (1997) applied the methods of Data Envelopment Analysis (DEA), Assurance Region (AR) and Linked – Cone profit ratios (LC) to measure the efficiency of the U.S.'s 100 largest banks ranked in asset size from 1986 to 1991. The results showed that with the method of DEA, the efficiency scores were insensitive to errors in the data comparing with another two methods. Barros and Alves (2003) estimated total productivity change and decomposes the efficiency score into technically efficient change and technological change for a Portuguese retail store chain by employing DEA method in order to search for the best practices and provide the recommendation to improve the performance of the whole retailed chain in Portugal. Odeck (2006) used DEA technique to examine the target achievements of the operational units of the Norwegian Public Roads Administration (NPRA)

charged with traffic safety services, and extended his study to include DEA-based Malmquist index so as to measure productivity growth in his interested target achievements. Finally, Sueyoshi and Goto (2011) presented the new DEA approach to measure the unified efficiency of energy firms in Japan by including both desirable outputs (e.g., electricity) and undesirable outputs (e.g. CO_2) within the computational framework of DEA.

Therefore, the main objectives of this study include:

1.1 To measure the technical efficiency score of the firms in construction industry by using the technique called Data Envelopment Analysis (DEA).

1.2 To gauge the productivity change of the construction firms during the previous lustrum by computing the Malmquist index.

The remainder of the paper is organized as follows. Section 2 explains the theoretical framework used in this study called the method of DEA and the Malmquist index. Section 3 defines the inputs and outputs of the DEA model and their descriptive statistics. Section 4 reports the computational results of technical efficiency scores and the Malmquist index, and Section 5 are the conclusion of this study and the recommendations for further studies.

2. Theoretical Framework for the Measurement of Efficiency

In this study, the paper aims at evaluating the construction firms' efficiency by using the concept of technical efficiency developed by Farrell (1957). The technical efficiency herein refers to the situation where a firm acquires the maximum level of outputs from a given amount of inputs. Normally, there are 2 ways to measure the technical efficiency, namely the input – oriented measure and the output – oriented measure. The input – oriented measure can be explained as the optimal combination of inputs to produce a given level of output, while the output – oriented measure defines efficiency as the optimal amount of output that could be produced under the given set of inputs. Diagram 2(a) and 2(b) illustrated the case where a firm used 2 inputs (x_1, x_2) to produce 2 outputs (y_1^*, y_2^*).

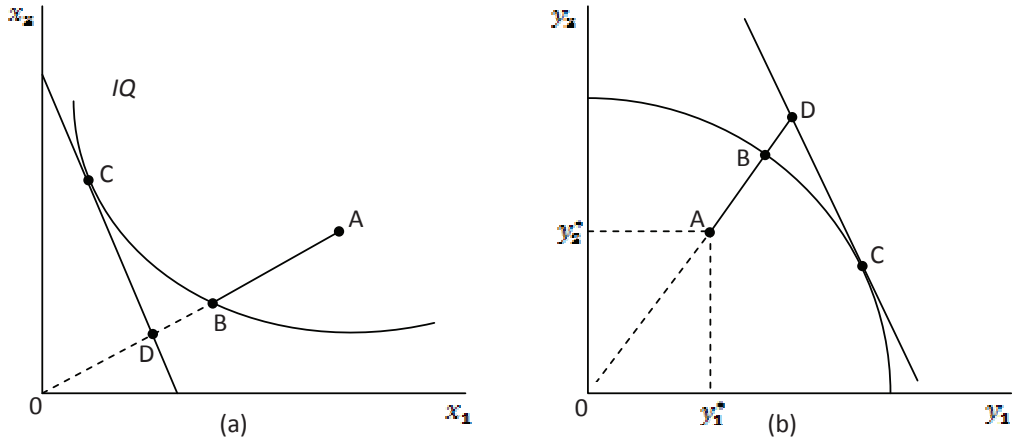

Figure 2 Input (a) and output (b) Oriented Efficiency Measures

Figure 2(a) shows the way to evaluate the technical efficiency by using the input – oriented measure. Here, the $IQ(y_1^*, y_2^*)$ curve represents the isoquant curve which indicates the minimum levels of inputs used to produce the output (y_1^*, y_2^*). If this firm used the combination of inputs at point A to produce, its production is ineffective, since the same level of outputs can be produced with less inputs (but at the same combination) at point B. Therefore, the level of technical efficiency defined by the input – oriented measure of this firm can be computed as the ratio between the distances 0B and 0A (or 0B/0A).

On the other hand, Diagram 2(b) explained the way to compute the technical efficiency by using the output – oriented measure. Point A in figure 1(b) represents the combination of outputs (y_1^*, y_2^*) produced by a particular firm using a given amount of inputs. Anyway, if this firm produces at the efficient level, it should produce more of both outputs at point B on the production frontier line by using the same level of inputs as before. Thus, the level of technical efficiency defined by the output – oriented measure in this case can be calculated as the ratio between the distances 0A and 0B (or 0A/0B).

In order to fulfill the objectives of this study, the input – oriented measure for evaluating the efficiency score is employed by using the non – parametric technique called Data Envelopment Analysis (DEA). Moreover, for the sake of measuring the productivity change overtime, the method called Malmquist index is computed. The roughly details for each approach are as follow:

Data Envelopment Analysis

Data Envelopment Analysis (DEA) is the non – parametric approach used for evaluating the efficiency score. This method uses the information from the extreme observations (treated as the body of the data) to determine the best practice efficiency frontier (Lewin and Lovell, 1990). The objective of DEA is to construct the production frontier in the way that all the observed data points (all characteristics for each DMU[1]) lay below or on this envelopment frontier. This can be done by specifying the following linear programming problem (Charnes, Cooper and Rhodes, 1978):

Under the assumption of constant returns to Scale (CRS)

In this case, each DMU is assumed to be operated with the appropriate scale of production. Thus, the linear programming problem is to:

$$Max_{u,v}\left(\frac{u'y_t}{v'x_i}\right)$$

subject to $\left(\frac{u'y_j}{v'x_j}\right) \leq 1 \ (j = 1,2,\ldots,N)$ and $u, v \geq 0$ (1)

where, $y_t =$ vectors of outputs from the $M \times N$ output matrix, Y

(M outputs from N DMUs)

[1] Under the DEA context, DMU is abbreviated for the decision making units. In other words, DMUs are the firms under our consideration.

x_i = vectors of inputs from the $K \times N$ output matrix, X
(K inputs from N DMUs)

$$i = 1,2,\dots,N$$

u, v = vectors of $M \times 1$ output weights and $K \times 1$ input weights, consecutively
Equation (1) can be equivalently transformed into the envelopment form as follows:

$$Min_{\theta,\lambda}\theta$$

subject to $-y_i + Y\lambda \geq 0, \theta x_i - X\lambda \geq 0,$ and $\lambda \geq 0$ (2)

where, θ = a scalar $(\theta \leq 1)$ and λ = $N \times 1$ vector of constants.
In order to include the input and output slacks[2], Ali and Seiford (1993) suggested the following model:

$$Min_{\lambda,OS,IS} \ (M_1'OS + K_1'IS)$$

subject to $-y_i + Y\lambda - OS = 0, \theta x_i - X\lambda - IS = 0,$ and

$$\lambda \geq 0, OS \geq 0, IS \geq 0 \qquad (3)^3$$

where, M_1' and K_1' = the $M \times 1$ and $K \times 1$ vectors of ones, respectively.
OS = a $M \times 1$ vector of output slacks
IS = a $K \times 1$ vector of input slacks

Under the assumption of variable returns to Scale (VRS)

Due to the effect of imperfect competition in the market (price rigidity, contracts, law and regulations and etc.), the assumption of CRS is not suitable for the real world, since most of DMUs may not be operated at the optimum scale. Thus, by imposing the assumption of VRS, the linear programming problem in equation (2) can be transformed into (Banker, Charnes, and Coopers, 1984):

$$Min_{\theta,\lambda}\theta$$

subject to $-y_i + Y\lambda \geq 0, \theta x_i - X\lambda \geq 0, N_1'\lambda = 1$ and $\lambda \geq 0$ (4)

where, N_1 = a $N \times 1$ vector of ones (the convexity constraint)

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[2] Input slacks refer to the surplus amount of inputs that could be decreased without the reduction of outputs, while the output slacks refer to the deficient amount of outputs that a firm could produce by using the given amount of inputs

[3] Equation (3) is the two – step procedure, since the parameter θ in equation (3) is no longer variable, and is obtained from the results of the calculation from equation (2).

Equation (4) allows us to decompose the technical efficiency score (under CRS assumption: TE_{CRS}) into 2 components, namely 1) pure technical efficiency score (TE_{VRS}) and 2) scale efficiency score (SE) as follows:

$$TE_{CRS} = TE_{VRS} \times SE \quad (5)$$

Moreover, in order to determine the nature of returns to scale used by each DMU. The linear programming equation (4) can be solved by imposing with the non – increasing returns to scale restriction to produce the NIRS efficiency frontier as follows:

$$Min_{\theta,\lambda}\theta$$

subject to $-y_i + Y\lambda \geq 0, \theta x_i - X\lambda \geq 0, N_1\lambda \leq 1$ and $\lambda \geq 0$ (6)

As a result, if the technical efficiency score computed from equation (6), or TE_{NIRS} is not equal to TE_{VRS} from equation (4), the nature of the particular DMU is increasing returns to scale (IRS). However, if they are equal, it means that decreasing returns to scale (DRS) is applied for this DMU.

Malmquist Productivity Index

This paper attempts to capture the over time efficiency change of construction firms in Thailand by using the Malmquist index based on DEA. Generally, the Malmquist Index measuring the productivity growth can be decomposed into the technical change and the technical efficiency change. In order to understand the basic idea of Malmquist Index, Farrell (1957) suggested the way to measure the technical efficiency as follows:

At time period t, the set of all feasible N input and M output vectors are determined by and $y^t = (y_1^t, y_2^t, \dots, y_M^t)$, consecutively where $x^t \epsilon R_+^N$ and. Moreover, the technology can be demonstrated by the input requirement set $(L^t(y^t))$:

$$L^t(y^t) = \{x^t : (x^t, y^t) \epsilon S^t\}, t = 1,2, \dots, T \quad (7)$$

where, $S^t = \{(x^t, y^t) : x^t$ can produce $y^t\}$ or the set of technology at period t. In other words, Equation (7) showed all feasible vectors of input (x^t) used to produce the output vector.

Under Farrell's method, the technical efficiency can be measured in two ways, namely output – oriented and input – oriented measures. For the output – oriented measure, the efficiency score can be measured by holding the level of output constant and radially decreasing the level of inputs with respect to the technology frontier. On the other hands, under the input – oriented measure which is the main focal points of this study, the technical efficiency score can be obtained by holding the level of input constant and radially expanding the level of output with respect to the technology frontier. Figure 2 illustrated the input – oriented measure of the technical efficiency.

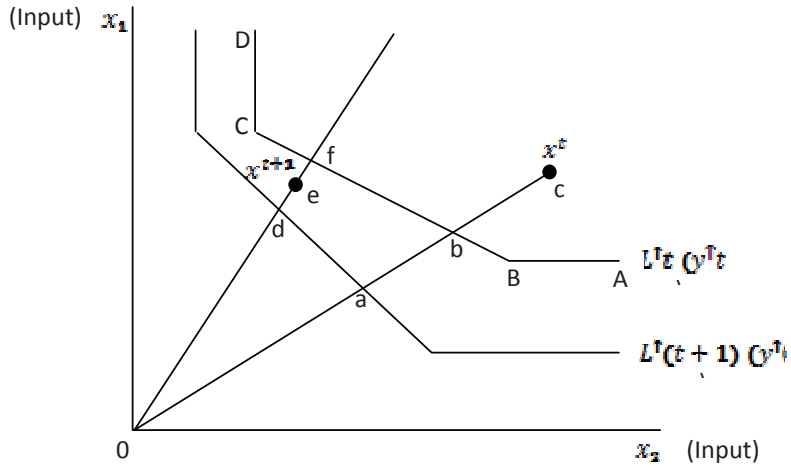

Figure 3 the Farrell's Input – Oriented Measure of the Technical Efficiency

Figure 3 exhibits two piecewise linear isoquants ($L^t(y)^t$ and) which represented the technology frontier in two periods (t and $t+1$). In this case, a firm produced at point c in period t and changed the pattern of production to point e in period $t+1$. Under Farrell's measure, the technical efficiency score of this firm in period t can be computed as 0b/0c and the distance function is given by its reciprocal or 0c/0b (Shephard, 1953). Thus, if the production activity is efficient, both efficiency score and the distance function are equal to 1. Moreover, the technical efficiency score ranged between 0 and 1but the distance function is varied from 1 to the value greater than 1.

If we let $F_i^t(y_t, x_t)$ be the input – oriented technical efficiency score measured by Farrell's concept and $D_i^t(y_t, x_t)$ be the input – oriented distance function, therefore at any time period t :

$$F_i^t(y^t, x^t) = min_\theta \{\theta : \theta x^t \in L^t(y)^t\}$$
$$D_i^t(y^t, x^t) = max_\theta \left\{\theta \geq 1 : \left(\frac{x^t}{\theta}\right) \in L^t(y^t)\right\} \quad (8)$$

or,

$$F_i^t(y^t, x^t) = [D_i^t(y^t, x^t)]^{-1} \quad (9)$$

Furthermore, in order to compute the Malmquist index to capture the productivity change between 2 time periods (t and $t+1$), other 3 more distance functions must be calculated as follows:

$$D_i^t\left(y^{t+1}, x^{t+1}\right) = max_\theta \left\{\theta \geq 1 : \left(\frac{x^{t+1}}{\theta}\right) \in L^t\left(y^{t+1}\right)\right\} \quad (10)$$

$$D_i^{t+1}\left(y^t, x^t\right) = max_\theta \left\{\theta \geq 1 : \left(\frac{x^t}{\theta}\right) \in L^{t+1}\left(y^t\right)\right\} \quad (11)$$

and

$$D_i^{t+1}\left(y^{t+1},x^{t+1}\right)=max_\theta\left\{0\geq 1:\left(\frac{x^{t+1}}{\theta}\right)\epsilon L^{t+1}\left(y^{t+1}\right)\right\} \quad (12)$$

Equation (10) represented the efficiency measure using the information in period $t+1$ with respect to the technology frontier of period t, while equation (11) referred to the efficiency measure using the information in period t with respect to the technology frontier of period $t+1$. Finally, the distance function in equation (12) represented the efficiency measure using the information in period $t+1$ with respect to the technology frontier of period $t+1$.

These distance functions can be explained by considering diagram 3 above. In this case, the input requirement set in period $t+1$ is represented by the isoquant line. Therefore, $D_i^t(y^{t+1},x^{t+1})$ is equal to the ratio 0e/0f. By the same token, $D_i^{t+1}(y^t,x^t)$ and $D_i^{t+1}(y^{t+1},x^{t+1})$ are the ratios 0c/0a and 0e/0d, consecutively. As a result, Caves et al. (1982) showed that the distance functions can be used to construct the Malmquist index in the form of the ratio between 2 distance functions for measuring the change of productivity between period t and $t+1$ as follows:

$$M_i\left(y^{t+1},x^{t+1},y^t,x^t\right)=\frac{D_i^t(y^{t+1},x^{t+1})}{D_i^t(y^t,x^t)} \quad (13)$$

Afterwards, Fare et al. (1994) computed the Malmquist index as the geometric mean of index in equation (13) between two time periods, or:

$$M_i\left(y^{t+1},x^{t+1},y^t,x^t\right)=\left[\frac{D_i^t(y^{t+1},x^{t+1})}{D_i^t(y^t,x^t)}\frac{D_i^{t+1}(y^{t+1},x^{t+1})}{D_i^{t+1}(y^t,x^t)}\right]^{\frac{1}{2}} \quad (14)$$

Moreover, Fare et al. (1994) also showed that index in equation (14) can be factored into the technical and the technical efficiency changes as follows:

$$M_i\left(y^{t+1},x^{t+1},y^t,x^t\right)=\frac{D_i^{t+1}(y^{t+1},x^{t+1})}{D_i^t(y^t,x^t)}\left[\frac{D_i^t(y^{t+1},x^{t+1})}{D_i^{t+1}(y^{t+1},x^{t+1})}\frac{D_i^t(y^t,x^t)}{D_i^{t+1}(y^t,x^t)}\right]^{\frac{1}{2}} \quad (15)$$

The first term on the right – hand side of equation (15) measures the input technical efficiency change (E_i) of a DMU between two time periods. That is if:

$\frac{D_i^{t+1}(y^{t+1},x^{t+1})}{D_i^t(y^t,x^t)}<1 \rightarrow$ Progress in the input technical efficiency

$\frac{D_i^{t+1}(y^{t+1},x^{t+1})}{D_i^t(y^t,x^t)}>1 \rightarrow$ Regress in the input technical efficiency, and

$\frac{D_i^{t+1}(y^{t+1},x^{t+1})}{D_i^t(y^t,x^t)}=1 \rightarrow$ Status Qua

The second geometric – mean term on the right – hand side of equation (15) measures the input technical change (T_i) (or the size of the input frontier shift) of a DMU between two time periods, that is to say if:

$$\left[\frac{D_i^t(y^{t+1},x^{t+1})}{D_i^{t+1}(y^{t+1},x^{t+1})}\frac{D_i^t(y^t,x^t)}{D_i^{t+1}(y^t,x^t)}\right]^{\frac{1}{2}} < 1 \rightarrow$$ Progress in the frontier technology

$$\left[\frac{D_i^t(y^{t+1},x^{t+1})}{D_i^{t+1}(y^{t+1},x^{t+1})}\frac{D_i^t(y^t,x^t)}{D_i^{t+1}(y^t,x^t)}\right]^{\frac{1}{2}} > 1 \rightarrow$$ Regress in the frontier technology, and

$$\left[\frac{D_i^t(y^{t+1},x^{t+1})}{D_i^{t+1}(y^{t+1},x^{t+1})}\frac{D_i^t(y^t,x^t)}{D_i^{t+1}(y^t,x^t)}\right]^{\frac{1}{2}} = 1 \rightarrow$$ Status Qua

Finally, the Malmquist index (M_i) indicates the change of productivity between period t and $t+1$. In this case, the productivity of a DMU improves, declines, and remains unchanged

M_t

if is less than 1, greater than 1, and equal to 1, respectively.

3. The Inputs and Outputs of DEA Model

The input and output data used in this study are collected from the income statements of construction companies in Thailand available at www.bol.co.th/corpus. The 20 construction firms (DMU) are chosen with respect to the ranking of the construction companies making the highest profits in 2009 (the latest year that the data are available at the time of study). The nature of their returns to scale is computed only for the year of 2009. Moreover, the panel data of these companies during the period of 2005 – 2009 are used to calculate the Malmquist index. The list of these DMUs is shown Table 1 as follows:

Table 1 Top 20 Highest Profits Construction Companies of Thailand in 2009

Rank	Company	Profits in 2009 (Baht)	Company Symbol
1	BANGKOK EXPRESSWAY PUBLIC COMPANY LIMITED	1,574,717,818	BECL
2	BENCHACHINDA HOLDING CO.,LTD.	862,597,215	BCH
3	SAMSUNG ENGINEERING CO.,LTD.	797,108,670	SSE
4	RITTA CO.,LTD.	566,754,715	RT
5	ACUMEN COMPANY LIMITED	527,006,777	ACC
6	S-TEC CIVIL & CONSTRUCTION CO.,LTD.	512,204,431	SCC
7	COM-LINK CO.,LTD.	433,037,849	COM
8	CUEL LIMITED	420,741,607	CUEL
9	THAI OBAYASHI CORPORATION LIMITED	393,544,000	TOC
10	VATANA PHAISAL ENGINEERING CO.,LTD.	384,351,460	VAT
11	CHIANGMAI CONSTRUCTION CO.,LTD.	369,586,414	CMC
12	SINO-THAI ENGINEERING & CONSTRUCTION PUBLIC COMPANY LIMITED	321,954,902	STEC
13	SYNTEC CONSTRUCTION PUBLIC COMPANY LIMITED	320,006,292	SYNTEC
14	CH. KARNCHANG PUBLIC COMPANY LIMITED	217,022,157	CK
15	JASMINE SUBMARINE TELECOMMUNICATIONS CO.,LTD.	212,147,633	JST
16	THAI KAJIMA CO.,LTD.	211,131,540	TK
17	THAI NIPPON STEEL ENGINEERING & CONSTRUCTION CORP.,LTD.	179,868,574	TNS
18	SIAM TONE CO.,LTD.	173,169,389	ST
19	TRC CONSTRUCTION PUBLIC COMPANY LIMITED	171,705,123	TRC
20	CHRISTIANI & NIELSEN (THAI) PUBLIC COMPANY LIMITED	159,090,372	CNT

Source: www.bol.co.th/corpus

The data on inputs and outputs for these DMUs used in this study are shown in Table 2. The inputs include the net value of lands, buildings, and equipments, Operating Cost, and Cost of Sales and/or Cost of Services, while the Revenue from Sales and Services (Y_1) and the total revenue of the construction company (Y_2) are treated as outputs.

Table 2 The Inputs and Outputs of DEA Model

Inputs (Millions of Baht)	Output (Millions of Baht)
- Net Value of Lands, Buildings, and Equipments - Operating Cost - Cost of Sales and/or Cost of Services (X_3)	- Revenue from Sales and Services (Y_1) - Total Revenue of the Construction Company (Y_2)

Table 3 shows the descriptive statistics of these variables during the period of 2005 – 2009.

Table 3 Descriptive Statistics for Input and Output Variables of DEA Model

Variables	y_1	y_2	x_1	x_2	x_3
2005					
Mean	3,945.98	4,051.36	437.86	194.24	3,266.82
Max	13,073.43	13,176.56	3,372.73	798.84	12,336.49
Min	0.00	0.03	0.30	0.07	0.00
S.D.	4,174.27	4,233.67	753.04	211.18	3,842.71
2006					
Mean	4,410.72	4,510.77	494.91	238.35	3,837.83
Max	14,472.67	14,570.39	3,683.47	931.73	15,995.54
Min	0.00	18.45	0.17	9.92	0.00
S.D.	4,676.16	4,636.95	801.40	255.27	4,694.86
2007					
Mean	4,398.78	4,596.68	564.60	241.89	3,795.10
Max	17,149.64	17,318.52	3,421.10	921.25	16,877.06
Min	64.71	94.04	0.09	21.65	120.48
S.D.	4,462.09	4,560.70	791.37	240.97	4,347.45
2008					
Mean	5,046.09	5,238.44	550.07	337.61	4,344.31
Max	14,806.56	14,844.73	3,141.55	1,489.04	14,027.94
Min	26.21	26.76	20.37	20.06	12.12
S.D.	4,730.38	4,747.20	748.11	394.98	4,387.15
2009					
Mean	4,681.29	4,985.42	514.41	323.06	3,891.55
Max	20,138.64	20,145.22	2,708.71	1,539.60	17,362.26
Min	64.92	558.75	19.36	18.13	58.20
S.D.	4,969.94	4,835.09	688.63	388.95	4,432.33

4. Results of the Study

The Calculation of the Technical and Scale Efficiency

In this study, the tradition DEA technique is applied to the input and output data only for the year of 2009 so as to measure the technical and scale efficiency and the nature of the returns to scale of the Thailand top 20 construction companies ranked by their profits in this year. The results are shown in Table 4.

Table 4 The Technical Efficiency, Scale Efficiency and Returns to Scale of the Thai Construction Companies in 2009

Firm	TE_{CRS}	TE_{VRS}	SE	Returns to Scale
BECL	1.000	1.000	1.000	-
BCH	1.000	1.000	1.000	-
SSE	1.000	1.000	1.000	-
RT	0.849	0.946	0.897	DRS
ACC	0.769	0.784	0.981	IRS
SCC	1.000	1.000	1.000	-
COM	1.000	1.000	1.000	-
CUEL	0.933	1.000	0.933	DRS
TOC	0.905	0.948	0.954	DRS
VAT	0.801	0.832	0.962	DRS
CMC	0.859	0.861	0.998	IRS
STEC	0.874	1.000	0.874	DRS
SYNTEC	0.970	1.000	0.970	DRS
CK	0.502	0.703	0.714	DRS
JST	1.000	1.000	1.000	-
TK	1.000	1.000	1.000	-
TNS	1.000	1.000	1.000	-
ST	0.977	1.000	0.977	IRS
TRC	0.925	0.930	0.994	DRS
CNT	0.892	0.904	0.987	DRS

Note: 1) The results are computed from the DEAP version 2.1.

2), and SE represented the technical efficiency scores under the assumption of the constant returns to scale, variable returns to scale and the scale efficiency, respectively.

The results showed that under the assumption of constant returns to scale (CRS), the construction companies operating on the efficient frontier line in 2009 consist of 8 companies namely, BECL, BCH, SSE, SCC, COM, JST, TK, and TNS, while the rest of 12 companies are inefficient with the technical efficiency score (TE_{CRS}) ranging from 0.502 to 0.977. Since, these technical efficiency scores are computed under the input – oriented measure, they can be interpreted as the percentage of overall inputs that inefficient DMU can be reduced in order to reach the efficient level. For example, RT and ACC with the value of TE_{CRS} of 0.849 and 0.769, consecutively, this can be interpreted in the way that RT and ACC could reduce their overall inputs by 15.1 (or 1 - 0.849) percent and 23.1 (or 1 – 0.769) percent, respectively.

On the other hands, the technical efficiency scores under the assumption of variable returns to scale (TE_{VRS}) exhibited that only 9 construction companies namely, BECL, BCH, SSE, SCC, CUEL, COM, JST, TK, and TNS were operated on the efficient frontier line in 2009, while the TE_{VRS} scores of the rest inefficient DMUs are ranged between 0.703 and 0.946. Moreover, by comparing TE_{CRS} scores with TE_{VRS} using equation (5), the results showed that only 8 companies (BECL, BCH, SSE, SCC, COM, JST, TK, and TNS) are operated with the efficient scale of production in 2009.

Finally, by applying equation (6), the results showed that among the 12 inefficient – scale DMUs, only 3 companies including ACC, CMC and ST have operated with increasing returns to scale (IRS) (or we can say that these companies have relatively small level of production comparing with the optimal – scale level). By contrast, the rest of inefficient scale companies (RT, CUEL, TOC, VAT, STEC, SYNTEC, CK, TRC and CNT) were operated under the decreasing returns to scale (DRS) (or they have relatively large level of production comparing with the optimal – scale level).

The Input and Output Slacks

The results for the input and output slacks are shown in Table 5. The numbers in the table indicated the size of inputs that can be reduced by maintaining the current output level of the particular firm (input slacks) and the size of outputs that can be raised by using the current level of inputs (output slacks).

In this case, the results showed that the construction companies, namely TOC and CK could increase their revenue from sales and services (Y_1) by the amounts of 43.99 and 1,736.45 million Baht by using the current level of inputs. By the same token, RT, TRC, and CNT could increase their total revenue (Y_2) by 15.58, 4.05, and 0.13 million Baht, respectively by using the current level of inputs.

On the other hands, the construction companies, viz., VAT and CK could reduce their net value of lands, buildings, and equipments by 541.44 and 549.13 million Baht without affecting their level of outputs. Finally, ACC could decrease its Operating Cost by 16.48 million Baht by maintaining the current level of output.

Table 5 The Input and Output Slacks for the Thai Construction Companies in 2009

Firm	Output Slacks		Input Slacks		
	y_1	y_2	x_1	x_2	x_3
RT	-	15.583	-	-	-
ACC	-	-	-	16.483	-
TOC	43.993	-	-	-	-
VAT	-	-	541.440	-	-
CK	1736.448	-	549.128	-	-
TRC	-	4.058	-	-	-
CNT	-	0.133	-	-	-

Source: Computed Results from the DEAP Version 2.1.

The Productivity Change in Thailand Construction Sector

In order to compute the Malmquist index, the panel data on the inputs and outputs of these companies are collected during the period of 2005 – 2009. However, the results of the Malmquist Index are calculated only for 18 firms excluding of BCH and SSC, due to the lack of the data on the cost of sales and/or cost of services and the revenue from sales and services (Y_1) of both companies in 2005 and 2006, respectively. The results are shown in Table 6.

Table 6 The Malmquist Indices and their Decomposition for the Thai Construction Companies during the Period of 2005 – 2009

Firm	2005/2006			2006/2007		
	E_i	T_i	M_i	E_i	T_i	M_i
BECL	1.000	0.963	0.963	1.000	1.043	1.043
RT	1.335	0.810	1.082	0.899	1.177	1.059
ACC	0.755	0.769	0.580	0.665	1.095	0.729
SCC	0.741	0.845	0.626	0.250	1.147	0.287
COM	1.000	0.841	0.841	1.000	1.213	1.213
CUEL	0.940	0.978	0.919	0.920	1.044	0.960
TOC	1.042	1.041	1.085	0.892	1.007	0.899
VAT	1.406	0.743	1.044	0.856	1.264	1.082
CMC	1.348	0.779	1.050	1.121	1.127	1.264
STEC	1.040	1.106	1.151	1.000	1.006	1.006
SYNTEC	1.176	0.891	1.047	0.939	1.105	1.037
CK	0.986	0.881	0.869	0.639	1.276	0.815
JST	1.000	0.768	0.768	1.000	1.204	1.204
TK	1.000	1.139	1.139	1.000	1.172	1.172
TNS	1.041	1.004	1.045	0.936	0.977	0.914
ST	1.344	0.875	1.176	0.903	1.033	0.933
TRC	0.819	0.941	0.771	0.837	1.280	1.072
CNT	1.061	0.989	1.049	1.044	1.022	1.066
Firm	2007/2008			2008/2009		
	E_i	T_i	M_i	E_i	T_i	M_i
BECL	1.000	0.950	0.950	1.000	1.005	1.005
RT	1.130	0.866	0.978	0.965	1.033	0.997
ACC	1.530	0.735	1.124	1.339	1.582	2.118
SCC	5.926	0.711	4.215	1.668	1.690	2.818
COM	1.000	0.673	0.673	1.000	1.533	1.533
CUEL	1.156	1.163	1.344	0.933	0.763	0.712
TOC	1.120	0.930	1.042	0.905	1.024	0.927
VAT	1.268	0.832	1.055	0.925	1.055	0.976
CMC	0.880	0.939	0.826	1.209	1.200	1.451
STEC	0.932	1.054	0.982	0.938	0.938	0.879
SYNTEC	1.126	0.925	1.042	1.018	1.018	1.036
CK	1.319	0.644	0.850	0.749	1.326	0.994
JST	1.000	0.842	0.842	1.000	0.948	0.948
TK	1.000	0.970	0.970	1.000	0.905	0.905
TNS	0.966	0.969	0.936	1.106	1.048	1.159
ST	0.700	0.878	0.614	1.744	1.151	2.008
TRC	1.189	0.783	0.931	1.134	1.020	1.157
CNT	0.961	0.952	0.915	0.986	1.014	1.000

Source: Computed Results from the DEAP Version 2.1.

The Input Technical Efficiency Scores (E_i) from 2005 – 2009

By considering the input technical efficiency change (E_i), the results showed that only 4 firms including BECL, COM, JST, and TK have no evidence of changes in the input technical efficiency level during the period of 2005 – 2009. In the period of 2005/2006, only 5 companies (ACC, SCC, CUEL, CK, and TRC) exhibited a progress in the input technical efficiency, while the E_i scores of the rest 9 companies (RT, TOC, VAT, CMC, STEC, SYNTEC, TNS, ST, and CNT) in the same period indicated a regress in the input technical efficiency level.

The situation was changed for the latter year (the end of the prosperous period). During the period of 2006/2007, the results indicated that 11 construction firms (viz, RT, ACC, SCC, CUEL, TOC, VAT, SYNTEC, CK, TNS, ST, and TRC) from the overall 18 construction firms had the evidence of improvement in the input technical efficiency level, while STEC still maintained its technical efficiency at the level of the previous year. Only CMC and CNT exhibited the regression of their input efficiency level.

During the period of financial crisis (2007/2008), the results showed the evidence of the regression in the level of input technical efficiency of most firms $(E_i > 1)$ except for CMC, STEC, TNS, and ST. This evidence supports the idea that the fluctuation of the world economic situation has an impact on the efficiency level of domestic construction firms.

Finally, by the end of the financial crisis period (2008/2009), the results showed that the level of input technical efficiency of 7 construction companies (ACC, SCC, CMC, SYNTEC, TNS, ST, and TRC) were worsened than the previous year, while those of the rest 7 companies (RT, CUEL, TOC, VAT, STEC, CK, and CNT) showed the evidence of an improvement on the technical efficiency level.

The input technical change (T_i) from 2005 – 2009

The computed T_i represented the size of the input frontier shift. The results showed that during the period before the financial crisis, the input technical change scores of the 14 companies (BECL, RT, ACC, SCC, COM, CUEL, VAT, CMC, SYNTEC, CK, JST, ST, TRC, and CNT) that used to have the input technical improvement in 2005/2006 period were turned out to be worsening in 2006/2007 period. Moreover, the T_i scores for TOC, STEC, and TK indicated that the level of input technical change for these three companies was deteriorated during 2005 – 2006. Only the T_i scores of TNS in 2005/2006 and 2006/2007 periods which were equal to 1.004 and 0.977, respectively indicated the improvement of the level of the input technical change.

The T_i scores during the financial crisis period (2007/2008) showed that all companies except for CUEL and STEC were improve their level of input technical change $(T_i < 1)$. This was possible since all companies attempted to adjust themselves in order to confront with the financial crisis.

Finally, by the end of 2009, the result showed that only 4 companies including CUEL, STEC, JST, and TK exhibited the evidence of an improvement in the level of input technical change $(T_i < 1)$, while the T_i scores of the rest of 18 companies indicated the regression of the technical frontier line in this period.

The Malmquist Index of the Construction Companies from 2005 – 2009

The results of Malmquist index (M_t) in 2005/2006 period showed that there was an improvement on the productivity level of the 8 construction companies including BECL, ACC, SCC, COM, CUEL, CK, JST, and TRC $(M_t < 1)$. By contrast, the productivity level of the rest 10 companies (RT, VAT, TOC, CMC, STEC, SYNTEC, TK, TNS, ST, and CNT) in the same period was declined. The worse productivity in this period came from the deterioration of the input technical efficiency in most cases.

The situation was changing during 2006/2007 period. The Malmquist indices indicated that only 7 companies (ACC, SCC, CUEL, TOC, CK, TNS, and ST) had improved their productivity level, while the productivity level of the rest 11 companies was regress. The reduction of the productivity level in this period mostly depended on the regression in the input technical change.

In the period of financial crisis (2007/2008), only 6 from 18 firms (ACC, SCC, CUEL, TOC, VAT, and SYNTEC) exhibited the reduction in the productivity level. However, the rest 12 companies showed the improvement of their productivity. In this period, the source of productivity improvement came from the overwhelming progress of the input technical frontier line over the effect of declining in the input technical efficiency.

Finally, in 2008/2009 period, the Malmquist indices indicated that only 7 firms including RT, CUEL, TOC, VAT, STEC, CK, JST, and TK improved their productivity level. Moreover, the main source of improvement came from the development in their input technical efficiency. On the other hand, the productivity level of the other 10 companies (viz., BECL, ACC, SCC, COM, CMC, SYNTEC, TNS, ST, and TRC) was regressed in the same period due to the contribution of both input technical efficiency regression and the worsen input frontier technology.

5. Conclusion and Recommendation

The measurement of the productivity change of construction companies in Thailand in this study used the technique called DEA and its application of Malmquist index as a tool for analysis. In this case, the financial data on the net value of lands, buildings, and equipments, Operating Cost, and Cost of Sales and/or Cost of Services were used as the input variables, while the Revenue from Sales and Services (Y_1) and the total revenue of the construction company (Y_2) are treated as the outputs. The results from DEA model showed that although the construction companies earned large profits in 2009, 12 companies (RT, ACC, CUEL, TOC, VAT, CMC, STEC, SYNTEC, CK, ST, TRC, and CNT) still operated below the efficient frontier line. Among the inefficient firms, 9 of them (RT, CUEL, TOC, VAT, STEC, SYNTEC, CK, TRC, and CNT) operated within the range of decreasing returns to scale and 3 of them (ACC, CMC, and ST) had increasing returns to scale production function. The results for the input and output slacks suggested that some firms including ACC, VAT, and CK could reduce their inputs and still maintaining the level of their outputs and some of them (RT, TOC, CK, TRC, and CNT) could increase their outputs by using the same level of inputs. Only 8 companies from the top 20 highest profit companies in 2009 operated on the efficiency frontier line and with the optimal scale of production.

The computed results of Malmquist Index indicated the productivity change of the construction firms during 2005 – 2009 periods. This index can be decomposed into the input

technical efficiency (E_i) and the input technical change. The study of the E_i scores exhibited a progress of the input technical efficiency of most firms during 2005/2006, but showed a regress of the input technical efficiency during the crisis period (2007 – 2009). In contrast, the improvement of the input technical change of most firms was emerged during the financial crisis period.

However, there are some criticisms about the results of DEA and the Malmquist index in this study. First, the efficiency scores and the Malmquist index are very sensitive to the changes of the input and output data (Talluri, 2000: 10). In this case, we only considered the financial variables from the income statements. Thus, the efficiency scores and the Malmquist might be different if we considered more variables from any other aspects of the construction companies. Second, DEA is the nonparametric method of estimation, thus the normal process in statistics such as hypothesis testing, the confidence interval estimation are out of the question (Talluri, 2000: 10). Finally, the reason why this study cannot include all variables on input and output sides is that some variables have negative number and some are zero, which the traditional DEA method could not be dealing with. Therefore, this is the challenge of the following studies that should consider the problems of negative or zero inputs and outputs in estimating DEA model.

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SEC Rule 105 and Price Discovery in the Secondary Market

by

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Abstract

Using a bootstrap technique, we compare the speed of the price discovery of SEOs issued during the SEC Rule 10b-21 period and those issued during the Rule 105 period on the offer day. We make several observations upon the adoption of Rule 105. After the adoption of Rule 105, the speed of price discovery slows and becomes less efficient on the offer day. We also observe a higher fraction of price discovery attributable to private information under Rule 105 that is consistent with the hypothesis that a shortened restricted period would lead to difficulty of exploring the information contained in the offer price discounts and result in high information asymmetry on the offer day.

Keywords: Price Dscovery, SEC Rule 105 SEOs, Offer Day

1. Introduction

The primary objective of the present study is to examine the effects of SEC Rule 105 on the amount and timing of price discovery in the secondary market during the offer day. Rule 105 was adopted by SEC in April 1, 1997 to replace Rule 10b-21. Compared with its predecessor, Rule 105 has a shorter restricted period for short sales. It can be argued that a shortened restricted period creates a good opportunity for informed short sellers to trade prior to the restricted period and cover their positions using shares in the offering. This could result in the decrease in information efficiency of pre-offer closing price and lead to the difficulty of interpreting the information contained in offer price discounts and thus could slow down the speed of price discovery on the offer day.

The focus of our study is to contrast the SEOs issued during the Rule 10b-21 period with those issued during Rule 105 period. We expect the speed of price discovery in these two categories of SEOs should be different. Altinkilic et al. (2003) maintain that the difference between the actual and predicted discounts, discount surprise, is the most important component of information. Positive discount surprise reveals adverse information of the firm and investors will adjust their evaluation of the firm's stock downside accordingly. In contrast, negative discount surprise signals favorable information that has not been incorporated into stock price and thus should lead to the lift of stock price on the offer day. However, if pre-offer price is less informative, it becomes harder for investors to judge the accurate information component in discount surprise. Under this situation, the price discovery would slow down on the offer day.

We investigate the timing and efficiency of offer-day price discovery for SEOs issued on both Nasdaq and NYSE from 1993 through 2005. Three issues are examined: (1) speed of price adjustment on the offer day, (2) efficiency of price discovery on the offer day, and (3) the fraction of price discovery attributable to private information over the offer day.

First, we compare the amount of information that is incorporated into stock price during each 15-minute-interval throughout the offer day between SEOs issued under Rule 10b-21 and SEOs issued under Rule 105. We find that the price discovery for those SEOs issued during the Rule 10b-21 period is much faster than those issued during the Rule 105 period. We observe a higher fraction of price discovery occurs during close-to-open period before the adoption of Rule 105. We also find that during the Rule 10b-21 period, it takes shorter time to complete 75% of the offer-day price discovery.

Second, we check the efficiency of price discovery for each 15-minute-interval on the offer day. We find that offer-day price discovery for SEOs issued under Rule 105 is less efficient than that for SEOs issued under Rule 10b-21. Using the "unbiasedness regression" inspired by Biais, Hillion, and Spatt (1999), we find that after the adoption of Rule 105, the price discovery is not efficient until the last trading hours. In comparison, prior to the adoption of Rule 105, during the most time of the offer day, the price discovery is efficient, especially during the first trading hour.

Third, following Hasbrouck (1991a, 1991b)'s technique, we estimate the fraction of price discovery attributable to private information. We observe a higher ratio of private information to total information after the adoption of Rule 105, which is consistent with the hypothesis that Rule 105 reduces the information efficiency of pre-offer closing price and leads to higher information asymmetry on the offer day.

Overall, the evidence shows that Rule 105 causes the low information efficiency of pre-offer stock prices and leads to the difficulty of interpreting the information contained in SEO discount and SEO discount surprise, which results in the slow speed and low efficiency of price discovery on the offer day.

The remainder of the paper is organized as follows. Section 2 describes the sample data and summary statistics. Section 3 examines the amount and timing of price discovery on the offer day. Section 4 analyzes the efficiency of offer-day price discovery. Section 5 investigates the fraction of price discovery attributable to private information. Section 6 concludes.

2. Data and Sample Characteristics

Sample Selection

We gather our sample of SEO firms from the Securities Data Company (SDC), which provides the data related to the offering characteristics of SEO firms, such as offer price, offer proceeds, shares issued and number of shares outstanding. The sample consists of seasoned equity issues of ordinary common shares on Nasdaq or NYSE from January 1993 to December 2005. We exclude unit offerings, shelf offerings, closed-end fund, real estate investment trust (REIT), and American Depository Receipt (ADR) from our sample. Further, we only include the firms with offer prices higher than $5 and firms that are in NYSE's Trade and Quote (TAQ) database or the CRSP database. The final sample contains 2553 SEOs, including 1890 Nasdaq SEOs and 663 NYSE SEOs.

Intraday data were collected from the NYSE TAQ database. Raw transactions data, however, may contain some problems, such as misordered time series and the existence of data outside regular trading hours. Therefore, time series data are reordered, and observations that lie outside the trading interval between 9:30 am and 16:00 pm Eastern Time are not included in the present study. Market information, such as stock prices, returns and market capitalization, was obtained from the CRSP database.

SDC database usually records date of announcing offer prices as offer date. However, some firms announce new offer prices after the market closes, and the effective offer date should be the next trading day of the SDC offer date. We follow the method suggested by Lease et al. (1991) and Corwin (2003) to correct the SDC offer date. Specifically, we identify the date following SDC offer date as effective offer date if the trading volume on the day following the SDC offer date is more than twice the volume of the SDC offer date and more than twice the average daily trading volume over the 250 days prior to the offer date.

Descriptive Statistics

Table 1 Summary Statistics for Seasoned Offers

		By Category		
	All	Rule 10b-21	Rule 105	*p-value*
Panel A: Nasdaq				
Number of SEOs	1890	851	1039	
Market Capitalization ($ mil.)	730.10 [281.78]	338.96 [194.53]	1050.46 [339.29]	0.00 [0.00]
Offer Price ($)	27.44 [22.00]	22.10 [20.00]	31.81 [23.75]	0.00 [0.00]
Offered Shares ($ mil.)	2.31 [2.00]	1.92 [1.70]	2.62 [2.10]	0.00 [0.00]
Offer Proceeds ($ mil.)	87.99 [55.50]	56.10 [41.60]	114.11 [71.00]	0.00 [0.00]
Panel B: NYSE				
Number of SEOs	663	311	352	
Market Capitalization ($ mil.)	2084.25 [783.48]	1328.94 [630.21]	2751.59 [995.94]	0.00 [0.00]

Offer Price ($)	30.96 [27.31]	29.41 [27.75]	32.32 [26.98]	0.03 [0.67]
Offered Shares ($ mil.)	4.56 [3.00]	3.73 [2.50]	5.32 [3.29]	0.00 [0.00]
Offered Proceeds ($ mil.)	186.84 [113.90]	134.66 [84.70]	232.94 [137.05]	0.00 [0.00]

This table presents means [medians] for a sample of 2553 seasoned offers issued on Nasdaq or NYSE from January 1993 to December 2005. The statistics for Nasdaq-issued SEOs are reported in Panel A and the statistics for NYSE-issued SEOs are reported in Panel B. The sample is divided conditioned on whether the offer is issued before April 1, 1997 (Rule 105 implementation date) or not. The *p-value* is from a test of the restriction that means [medians] are equal across subperiod based on t-test [wilcoxon test]. Market capitalization equals the closing price times the number of shares outstanding of the day prior to the offer. Offer proceeds equals the offer price times the number of offered shares.

Table 1 displays summary statistics for firm and offer characteristics for SEOs issued under Rule 10b-21 and under Rule 105. Issuing firms that issued after the adoption of Rule 105 are larger, with an average market capitalization of $1050.46 million on Nasdaq and $2751.59 million on NYSE. Average offer proceeds for SEOs issued under Rule 105 is much higher due to higher average offer price and higher average offered shares after the adoption of Rule 105.

Table 2 Trading Activity and Price Change for SEOs

	By Category		
	Rule 10b-21	Rule 105	*p-value*
Panel A: Nasdaq			
Opening Delay (min)	2.70 [0.52]	0.82 [0.08]	0.00 [0.00]
SEO Discount (%)	3.22 [2.29]	3.14 [2.32]	0.63 [0.74]
Close-to-close Return (%)	-0.37 [-0.63]	0.75 [-0.05]	0.00 [0.15]
Close-to-open Return (%)	-1.51 [-1.10]	-0.89 [-0.44]	0.00 [0.00]
Opening Trading Volume (% of offered shares)	0.48 [0.06]	0.29 [0.03]	0.29 [0.00]
Day 1 Trading Volume (% of offered shares)	112.18 [61.43]	131.91 [78.22]	0.33 [0.00]
Panel B: NYSE			
Opening Delay (min)	16.54 [13.05]	15.05 [10.24]	0.32 [0.00]
SEO Discount (%)	1.10 [0.43]	1.80 [0.99]	0.00 [0.00]
Close-to-close Return (%)	0.39 [0.00]	0.32 [-0.21]	0.82 [0.17]
Close-to-open Return (%)	-0.22 [0.00]	0.05 [0.00]	0.23 [0.80]
Opening Trading Volume	20.02	34.94	0.33

(% of offered shares)	[11.97]	[11.88]	[0.93]
Day 1 Trading Volume	58.19	110.95	0.19
(% of offered shares)	[38.66]	[52.29]	[0.00]

This table presents means [medians] for a sample of 2553 seasoned offers issued on Nasdaq or NYSE from January 1993 to December 2005. The statistics for Nasdaq-issued SEOs are reported in Panel A and the statistics for NYSE-issued SEOs are reported in Panel B. The sample is divided conditioned on whether the offer is issued before April 1, 1997 (Rule 105 implementation date) or not. The *p-value* is from a test of the restriction that means [medians] are equal across subperiod based on t-test [wilcoxon test]. Opening delay is the number of minutes from 9:30:00 to the opening trade. SEO discount is defined as -1 times the return from the previous day's closing transaction price to the offer price. Close-to-close return is defined as the return from the previous day's closing transaction price to the offer day's closing transaction price. Close-to-open return is defined as the return from the previous day's closing transaction price to the offer day's opening transaction price. Opening trading volume is the number of shares traded in the opening trade. Day 1 trading volume is the number of shares traded on the offer day.

Table 2 summarizes trading activities and price changes on the offer day for SEOs issued under Rule 10b-21 and under Rule 105. NYSE-issued SEOs open later than Nasdaq-issued SEOs. On average, NYSE-issued SEOs open 16 minutes after 9:30:00 open during the Rule 10b-21 period, and open 15 minutes after market open during the Rule 105 period. In comparison, Nasdaq-issued SEOs open less than 3 minutes after market open during the Rule 10b-21 period, and open less than 1 minute after open during the Rule 105 period. We do not observe obvious change in SEO discounts for Nasdaq-issued SEOs after the adoption of Rule 105, but we observe a significant increase in SEO discounts for those NYSE-issued SEOs.

For Nasdaq-issued SEOs, the average price change from close to close increases but average price change from close to open decreases after the adoption of Rule 105, which indicates that a lower portion of price discovery occurs before the market open during the Rule 105 period. For NYSE-issued SEOs, we do not observe an obvious change in average close-to-close returns, but a large decrease in average close-to-open returns during the Rule 105 period.

For Nasdaq-issued SEOs, the opening trading volume is 0.48% of offered shares during the Rule 10b-21 period, but decreases to 0.29% during the Rule 105 period. However, the average offer day trading volume increases after the adoption of Rule 105, which leads to a lower ratio or opening trading volume and offer-day trading volume during the Rule 105 period. For NYSE-issued SEOs, the ratio of opening trading volume and offer-day trading volume also decreases during the Rule 105 period. The evidence indicates that, after the adoption of Rule 105, fewer traders transact at the market open.

Admati and Pfleiderer (1988) suggest that the timing of liquidity trading depends on the degree of competition among informed traders and the timing of informed traders depends on the degree of concentration of liquidity trading. Specifically, liquidity traders tend to trade when opinions of informed traders are homogeneous and the competition between informed traders is intense. However, Rule 105 complicates the interpretation of information contained in offer prices, which leads to the diversity of informed traders' opinion and weakens the competition among informed traders. The exacerbation of terms of trade for liquidity traders results in thin trading of liquidity traders, and this, in turn, leads to thin informed trading at the market open.

3. Empirical Results

Price Discovery

In the previous sections, we analyzed the effects of Rule 105 on speed of price discovery on the offer day. We expect that Rule 105 would reduce the information content of offer prices and would slow down the process of price discovery. In this section, we estimate the amount of new information impounded into stock price during the each 15-minute-interval for both Rule 10b-21 period and Rule 105 period.

Weighted price contribution (*WPC*)

Following Barclay and Warner (1993), Cao et al. (2000) and Barclay and Hendershott (2003), the measure used to estimate the amount of price discovery is weighted price contribution (*WPC*) during each period.
For each 15-minute-interval i, WPC is determined as:

$$WPC_i = \sum_{s=1}^{S} \left(\frac{|ret_s|}{\sum_{s=1}^{S} |ret_s|} \right) * \left(\frac{ret_{i,s}}{ret_s} \right) \qquad (1)$$

where $ret_{i,s}$ is the logarithmic price change over interval i for stock s and ret_s is close-to-close stock return for stock s. The second term measures the fraction of price change during interval i relative to close-to-close return. The first term is the weight that is used to measure the contribution of each stock to the total absolute price change of all stocks on the offer day.

Table 3 Weighted Price Contribution from Close to Close by Time Period

Panel A: Nasdaq

15-minute-interval	Rule 10b-21	Rule 105	*p-value (bootstrap)*
Close to open	44.66*	36.86*	***
1	14.64*	13.57*	
2	3.42*	5.40*	
3	4.62*	3.98*	
4	1.79	3.59*	
5	2.53	1.49	
6	0.85	2.07*	
7	1.33	2.24*	
8	1.66	1.85*	
9	1.40	1.62*	
10	2.56*	1.77*	
11	-0.54	1.27*	*
12	1.44	1.41*	
13	-0.41	1.44*	*
14	0.76	1.01	
15	1.60	1.09	
16	-0.17	1.42*	

17	2.14	1.11	
18	-0.94	0.75	
19	2.74*	1.80*	
20	2.16	1.81*	
21	0.78	1.79*	
22	0.23	1.20	
23	1.55	2.96*	
24	2.11	1.95*	
25	2.73*	3.20*	
26	4.33*	1.34	**

This Table presents the weighted price contribution of each 15-minute-interval to the close-to-close return for a sample of 2553 seasoned offers issued on Nasdaq or NYSE from January 1993 to December 2005. For each 15-minute-interval i the weighted price contribution is calculated as follows:

$$WPC_i = \sum_{s=1}^{S} \left(\frac{|ret_s|}{\sum_{s=1}^{S} |ret_s|} * \left(\frac{ret_{i,s}}{ret_s} \right) \right)$$

where $ret_{i,s}$ is the logarithmic price change over interval i for stock s and ret_s is close-to-close stock return for stock s. The statistics for Nasdaq-issued SEOs are reported in Panel A and the statistics for NYSE-issued SEOs are reported in Panel B. The sample is divided conditioned on whether the offer is issued before April 1, 1997 (Rule 105 implementation date) or not. Values that are significantly larger than zero at the 0.05 level are denoted with an *. The *p-value* is from a test of the restriction that weighted price contributions are equal across subperiod based on bootstrap test. *p-values* that are lower than 0.01, 0.05, and 0.10 are denoted with *, **, and ***, respectively.

Table 3 Weighted Price Contribution from Close to Close by Time Period (Continued)

Panel B: NYSE			
15-minute-interval	Rule 10b-21	Rule 105	*p-value (bootstrap)*
Close to open	56.73*	52.82*	
1	0.02	2.16	
2	8.20*	5.51*	
3	4.02*	4.87*	
4	2.52	2.89*	
5	2.04	1.05	
6	2.61*	0.80	
7	-1.45	2.00*	***
8	0.83	1.89*	
9	0.48	1.04	
10	3.32*	1.50	***
11	1.88	2.14*	
12	0.66	1.98*	

13	1.61	1.08	
14	0.44	0.11	
15	1.78	1.07	
16	0.65	0.85	
17	1.91	0.90	
18	1.54	1.35	
19	1.79	1.75*	
20	1.07	1.40	
21	0.51	1.93	
22	-0.20	2.63*	**
23	2.62*	1.75	
24	3.42	1.43	
25	2.54*	3.02*	
26	-1.53	0.08	

As noted by Barclay and Warner (1993), the advantage of introducing weighting scheme when calculating average price contribution is to lessen the effects of extreme values among observations. Specifically, if absolute values of close-to-close return is very small, while price change in some interval is relatively large, then fraction of price change in that interval will be abnormally high, which will pull up the average price contribution in the interval. Weighted price contribution can avoid this problem by downweighting observations with low absolute price change on the offer day. However, the distribution of weighted mean is unknown, which leads to the difficulty of calculation of statistical inferences for weighted average of price contribution and statistical comparison of the amount of price discovery between SEOs issued during the Rule 10b-21 period and those issued during the Rule 105 period. Therefore, we employ bootstrap technique to conduct univariate tests for WPC and gauge statistical difference in WPC (detail provided in the Appendix).

Panel A of Table 3 displays interval-by-interval WPC for close-to-close return for the two Nasdaq-issued subsamples conditioned on whether the offer is issued before April 1, 1997 (Rule 105 implementation date) or not. Two main results can be seen from the analysis. First, most offer-day price discovery occurs during close-to-open period, the first trading hour and the last trading hour of the offer day. For those stocks issued on Nasdaq, about 40% of price discovery occurs prior to the market open, about 20% occurs during the first trading hour and about 10% occurs during the last trading hour. Secondly, the speeds of price discovery for SEOs issued during the Rule 10b-21 period are much faster than those issued during the Rule 105 period. During the Rule 10b-21 period, 44.66% of price discovery occurs during close-to-open period; in comparison, during the Rule 105 period, only 36.86% occurs during close-to-open period. The bootstrap test shows that the difference in close-to-open WPC is significant at the 1% level. On a further analysis, we find that during the Rule 10b-21 period, the amount of price discovery declines rapidly after the open and falls close to zero after ¾ trading hours. However, during the Rule 105 period, the price discovery persists almost over the whole trading day.

Panel B of Table 3 displays interval-by-interval WPC for close-to-close return for NYSE-issued SEOs during the Rule 10b-21 period and Rule 105 period. Similar to the results for Nasdaq-issued stocks, we observe slower price discovery after the adoption of Rule 105. During the Rule 10b-21 period, 56.73% of price discovery occurs prior to the market open, whereas during the Rule 105 period 52.82% occurs. Furthermore, significantly positive price discovery lasts for a shorter time during the Rule 10b-21 period than that during the Rule 105 period.

Cumulative weighted price contribution (*Cum_WPC*)

Panel A of Table 4 reports the cumulative weighted price contribution (*Cum_WPC*) based on close-to-close return during each 15-minute interval for Nasdaq-issued SEOs. We observe that during the trading hours, the amount of price discovery increases monotonically. Notably, the price discovery is faster for those SEOs issued before the adoption of Rule 105. During the Rule 10b-21 period, 75% of price discovery has completed after 1.5 trading hours; in comparison, during the Rule 105 period, it takes 2.25 trading hours to complete 75% of price discovery. Furthermore, during the first trading hours, the differences in price discovery for the two periods are significant at the 1% level. The gap shrinks gradually as the time goes by and become insignificant after three trading hours.

Table 4 Cumulative Weighted Price Contribution from Close to Close by Time Period

Panel A: Nasdaq			
15-minute-interval	Rule 10b-21	Rule 105	*p-value (bootstrap)*
Close to open	44.66	36.86	***
1	59.30	50.43	***
2	62.73	55.83	***
3	67.35	59.81	***
4	69.14	63.40	**
5	71.67	64.89	***
6	72.52*	66.96	**
7	73.84*	69.21	**
8	75.51*	71.06	**
9	76.91*	72.68*	**
10	79.47*	74.44*	***
11	78.93*	75.72*	*
12	80.37*	77.13*	*
13	79.97*	78.57*	
14	80.73*	79.58*	
15	82.33*	80.67*	
16	82.16*	82.09*	
17	84.30*	83.20*	
18	83.36*	83.95*	
19	86.10*	85.75*	
20	88.27*	87.56*	
21	89.04*	89.35*	
22	89.28*	90.55*	
23	90.83*	93.51*	
24	92.94*	95.46*	
25	95.67*	98.66*	
26	100.00*	100.00*	-

This Table presents the cumulative weighted price contribution of each 15-minute-interval to the close-to-close return for a sample of 2553 seasoned offers issued on Nasdaq or NYSE from January 1993 to December 2005. For each 15-minute-interval i the weighted price contribution is calculated as follows:

$$WPC_i = \sum_{s=1}^{S} \left(\frac{|ret_s|}{\sum_{s=1}^{S} |ret_s|} \right) * \left(\frac{ret_{i,s}}{ret_s} \right)$$

where $ret_{i,s}$ is the logarithmic price change over interval i for stock s and ret_s is close-to-close stock return for stock s. The statistics for Nasdaq-issued SEOs are reported in Panel A and the statistics for NYSE-issued SEOs are reported in Panel B. The sample is divided conditioned on whether the offer is issued before April 1, 1997 (Rule 105 implementation date) or not. Values that are significantly larger than 75 at the 0.05 level are denoted with an *. The *p-value* is from a test of the restriction that weighted price contributions are equal across subperiod based on bootstrap test. *p-values* that are lower than 0.01, 0.05, and 0.10 are denoted with *, **, and ***, respectively.

Table 4 Cumulative Weighted Price Contribution from Close to Close by Time Period (Continued)

Panel B: NYSE			
15-minute-interval	Rule 10b-21	Rule 105	*p-value (bootstrap)*
Close to open	56.73	52.82	
1	56.76	54.97	
2	64.96	60.49	
3	68.98	65.36	
4	71.50*	68.24	
5	73.54*	69.29	
6	76.14*	70.09	*
7	74.70*	72.10*	
8	75.52*	73.98*	
9	76.01*	75.02*	
10	79.33*	76.52*	
11	81.21*	78.67*	
12	81.87*	80.65*	
13	83.47*	81.73*	
14	83.91*	81.84*	
15	85.69*	82.91*	
16	86.34*	83.76*	
17	88.25*	84.67*	
18	89.79*	86.01*	*
19	91.58*	87.76*	*
20	92.65*	89.16*	*
21	93.16*	91.09*	
22	92.96*	93.72*	
23	95.58*	95.47*	
24	99.00*	96.90*	
25	101.53*	99.92*	
26	100.00*	100.00*	-

Panel B of Table 4 reports the cumulative weighted price contribution during each 15-minute interval for both categories of SEOs. Similar to the results in Panel A, Rule 105 reduces the speed of

price discovery. During the Rule 10b-21 period, it takes less than one trading hour to complete 75% of price discovery; however, during the Rule 105 period, it takes 1.75 hours to complete 75%.

Efficiency of Price Discovery

Unbiasedness regression

Biais et al. (1999) propose that the orders placed during the preopen period could be "noisy" or manipulative (noise hypothesis) or could be informative and equal the conditional expectation of the asset value (learning hypothesis). Similarly, the price discovery occurred during the trading hours may also be due to the noisy trading of liquidity traders. Liquidity trading could result in temporary price move that would eventually reserve. Therefore, it is necessary to estimate the informativeness of stock prices and the efficiency of price discovery by using the "unbiasedness regression" inspired by Biais, Hillion, and Spatt (1999).

The following unbiasedness regression model is estimated:

$$close - close = \alpha + \beta_i (price_i - close) + \varepsilon_i \qquad (2)$$

where we refer the closing price of the offer day to new equilibrium value of the asset and take offer price as the proxy for old market equilibrium prices. $price_i$ is indicative price for each 15-minute interval.

We estimate the cross-sectional regression for each 15-minute interval. If indicative price is conditional expectation of asset value, we are supposed to observe that the slope of the coefficient in the model is equal to one. If, otherwise, the price change during the first trading hours are mainly the result of noisy trading, the coefficient of the model is expected to be significantly different from 1.

Table 5 Unbiasedness Regressions by Time Period

Panel A: Nasdaq

15-minute-interval	Slope Coefficient (β)			Adjusted R-square ($Adj.\ R^2$)		
	Rule 10b-21	Rule 105	*p-value (bootstrap)*	Rule 10b-21	Rule 105	*p-value (bootstrap)*
Close to open	1.02	1.22*	***	0.51	0.42	**
1	1.02	1.24*	***	0.64	0.58	*
2	1.03	1.22*	***	0.68	0.64	*
3	1.05	1.21*	***	0.73	0.68	*
4	1.05*	1.19*	***	0.75	0.71	*
5	1.06*	1.21*	***	0.78	0.74	*
6	1.08*	1.19*	***	0.81	0.76	**
7	1.07*	1.18*	***	0.82	0.78	**
8	1.05*	1.18*	***	0.82	0.80	
9	1.05*	1.17*	***	0.83	0.82	
10	1.07*	1.16*	***	0.86	0.82	***
11	1.08*	1.14*	**	0.86	0.83	**
12	1.07*	1.13*	**	0.86	0.84	*
13	1.06*	1.13*	**	0.86	0.85	
14	1.05*	1.12*	**	0.86	0.86	

15	1.06*	1.11*	**	0.87	0.87	
16	1.06*	1.10*	*	0.88	0.88	
17	1.05*	1.10*	**	0.88	0.89	
18	1.05*	1.09*	*	0.88	0.89	
19	1.03	1.08*	**	0.90	0.90	
20	1.03	1.07*	**	0.91	0.91	
21	1.02	1.05*		0.92	0.92	
22	1.03*	1.05*		0.92	0.93	
23	1.02	1.02		0.93	0.94	
24	1.01	1.02		0.94	0.95	
25	0.98	0.99		0.94	0.97	
26	1.00	1.00	-	1.00	1.00	-

This Table presents the slope coefficients and adjusted R-squares of unbiasedness regressions for each 15-minute-interval for a sample of 2553 seasoned offers issued on Nasdaq or NYSE from January 1993 to December 2005. For each 15-minute-interval i , the following regression model is estimated:

$$close - close = \alpha + \beta_i (price_i - close) + \varepsilon_i$$

The statistics for Nasdaq-issued SEOs are reported in Panel A and the statistics for NYSE-issued SEOs are reported in Panel B. The sample is divided conditioned on whether the offer is issued before April 1, 1997 (Rule 105 implementation date) or not. Slope coefficients that are significantly larger than 1 at the 0.05 level are denoted with an *. The *p-value* is from a test of the restriction that weighted price contributions are equal across subperiod based on bootstrap test. *p-values* that are lower than 0.01, 0.05, and 0.10 are denoted with *, **, and ***, respectively.

Table 5 Unbiasedness Regressions by Time Period (Continued)

Panel B: NYSE						
	Slope Coefficient (β)			Adjusted R-square ($Adj.\ R^2$)		
15-minute-interval	Rule 10b-21	Rule 105	*p-value (bootstrap)*	Rule 10b-21	Rule 105	*p-value (bootstrap)*
Close to open	1.03	1.08		0.74	0.59	*
1	1.04	1.11		0.75	0.61	*
2	1.03	1.14*	*	0.78	0.66	
3	1.05	1.16*	*	0.83	0.72	*
4	1.06	1.13*		0.85	0.75	*
5	1.06	1.13*		0.86	0.76	*
6	1.05	1.15*	*	0.87	0.79	*
7	1.06	1.15*	*	0.87	0.81	
8	1.07	1.13*		0.89	0.82	
9	1.07	1.13*		0.90	0.83	*
10	1.06	1.13*		0.90	0.84	*
11	1.05	1.13*	*	0.92	0.86	*
12	1.05	1.11*		0.92	0.87	*
13	1.04	1.10*	*	0.92	0.88	
14	1.05	1.11*		0.92	0.89	

15	1.04	1.11*	*	0.93	0.90	
16	1.02	1.10*	**	0.93	0.89	
17	1.02	1.11*	**	0.94	0.90	*
18	1.01	1.09*	**	0.94	0.90	*
19	1.00	1.08*	**	0.95	0.92	
20	1.00	1.07*	**	0.95	0.93	
21	1.00	1.06*	**	0.96	0.93	**
22	1.02	1.03		0.97	0.95	**
23	1.00	1.02		0.97	0.96	
24	0.96	1.01		0.95	0.98	
25	0.96	0.99		0.96	0.99	
26	1.00	1.00		1.00	1.00	-

Panel A of Table 5 reports the slope coefficients in the model for the Nasdaq-issued SEOs. It can be observed that before the adoption of Rule 105, during the first and the last trading hours, the slope coefficients are not significantly different from 1, which indicates that the trading activities are informative and stock prices are efficient during these periods. In comparison, after the adoption of Rule 105, the slope coefficients are different from 1 until the last trading hour before the market close, which indicates that during the most time of the trading period, the price discovery is less efficient. Furthermore, the bootstrap test for difference in slope coefficients between Rule 10b-21 period and Rule 105 period suggests that the offer-day price discovery during the Rule 10b-21 period is more efficient than those during the Rule 105 period.

Panel B of Table 5 reports the slope coefficients for the NYSE-issued SEOs. Similar to the results for Nasdaq-issued SEOs, we find that the offer-day price discovery prior to the adoption of Rule 105 is more efficient than that after the adoption of Rule 105. During the Rule 10b-21 period, the slope coefficients for each interval are all not significantly different from 1, whereas during the Rule 105 period, the slope coefficients are only close to 1 during the first half and the last one trading hours. The bootstrap test further corroborates that the offer-day price discovery is more efficient during the Rule 10b-21 period.

In addition, we estimate the adjusted R-squares for each interval and for each category of SEOs. Adjusted R-square can reflect the uncertainty remaining about the equilibrium of stock value after we take into account the information contained in the indicative stock prices. The uncertainty should decrease when more information is embedded into stock prices and thus the adjusted R-square should increase accordingly.

From Panel A of Table 5, we observe that R-squares for both categories of SEOs increase monotonically during the trading hours. During the Rule 10b-21 period, the R-square increases rapidly from 0.51 to 0.81 during the first 1.5 trading hours, and after 11:00 am, the R-square continues to increase but the increasing speed slows down obviously until it reaches 1 at the market close. In comparison, during the Rule 105 period, the R-square rises rapidly from 0.42 to 0.80 during the first two trading hours and the speed of increase slows down after that. In particular, during the first 1.5 trading hours, the adjusted R-square for those SEOs issued during the Rule 10b-21 period is significantly higher than those for SEOs issued during the Rule 105 period. All of these evidences show that the efficient price discovery for SEOs issued during the Rule 10b-21 period occurs much later than that for SEOs issued during the Rule 105 period. The results for NYSE-issued SEOs are similar to those for Nasdaq-issued SEOs.

Convergence of stock price to equilibrium asset value

We mention in last section that when more and more information are impounded into stock price, stock price should be closer and closer to the market equilibrium asset value. Therefore, we should observe convergence tendency between stock price and close price during the offer day.

We measure the extent of divergence between stock price and offer-day closing price using the following formula:

$$divergence_i = abs(\log(close / price_i)) \qquad (3)$$

where close is the closing price of the offer day, and $price_i$ is price at the end of each 15-minute interval.

Table 6 Convergence of Stock Price to Equilibrium Value by Time Period

Panel A: Nasdaq			
15-minute-interval	Rule 10b-21	Rule 105	*p-value (bootstrap)*
Close to open	2.86	3.98	***
1	2.46	3.28	***
2	2.24	2.98	***
3	2.02	2.83	***
4	1.95	2.71	***
5	1.83	2.56	***
6	1.75	2.47	***
7	1.66	2.36	***
8	1.64	2.26	***
9	1.59	2.15	***
10	1.47	2.09	***
11	1.47	2.01	***
12	1.43	1.94	***
13	1.46	1.87	***
14	1.46	1.83	***
15	1.37	1.75	***
16	1.30	1.69	***
17	1.31	1.62	***
18	1.28	1.60	***
19	1.18	1.54	***
20	1.12	1.43	***
21	1.09	1.35	***
22	1.02	1.27	***
23	0.96	1.14	***
24	0.85	1.01	***
25	0.78	0.79	
26	0.00	0.00	-

This Table presents the average convergence of stock price to equilibrium value of each 15-minute-interval for a sample of 2553 seasoned offers issued on Nasdaq or NYSE from January 1993 to December 2005. The extent of divergence between stock price and offer-day closing price using the following formula:

$$divergence_i = abs(\log(close / price_i))$$

where close is the closing price of the offer day, and $price_i$ is price at the end of each 15-minute interval. The statistics for Nasdaq-issued SEOs are reported in Panel A and the statistics for NYSE-issued SEOs are reported in Panel B. The sample is divided conditioned on whether the offer is issued before April 1, 1997 (Rule 105 implementation date) or not. The *p-value* is from a test of the restriction that weighted price contributions are equal across subperiod based on bootstrap test. *p-values* that are lower than 0.01, 0.05, and 0.10 are denoted with *, **, and ***, respectively.

Table 6 Convergence of Stock Price to Equilibrium Value by Time Period (Continued)

Panel B: NYSE			
15-minute-interval	Rule 10b-21	Rule 105	*p-value (bootstrap)*
Close to open	1.39	1.91	***
1	1.37	1.82	***
2	1.25	1.67	***
3	1.12	1.54	***
4	1.04	1.43	***
5	0.96	1.37	***
6	0.93	1.32	***
7	0.93	1.25	***
8	0.87	1.22	***
9	0.85	1.18	***
10	0.81	1.14	***
11	0.73	1.10	***
12	0.71	1.05	***
13	0.70	1.03	***
14	0.71	1.00	***
15	0.67	0.96	***
16	0.65	0.96	***
17	0.59	0.93	***
18	0.58	0.91	***
19	0.56	0.86	***
20	0.53	0.81	***
21	0.49	0.75	***
22	0.41	0.64	***
23	0.38	0.54	***
24	0.32	0.44	***
25	0.19	0.24	
26	0.00	0.00	-

Panel A of Table 6 reports the extents of divergence to the offer day's closing price in each 15-minute interval for Nasdaq-issued SEOs. We find that divergence between stock price and closing

price shrinks quickly during the two trading hours after the market open. In particular, the divergences of those SEOs issued before the adoption of Rule 105 are much smaller than those of SEOs issued after that. During the Rule 10b-21 period, the average divergence has been shrunk to 2.86 at the market open. However, during the Rule 105 period, the average divergence is 3.98. Until the last half trading hour, the divergences for Nasdaq-issued SEOs are much lower than those for NYSE-issued SEOs.

Similar results can be observed for NYSE-issued SEOs from Panel B of Table 6. At the market open, the average divergence between stock price and offer-day closing price for those SEOs issued during the Rule 10b-21 period is 1.39, compared with 1.91 for those SEOs issued during the Rule 105 period. Furthermore, throughout the offer day, the divergences for SEOs issued during the Rule 10b-21 period are much lower than those for SEOs issued during the Rule 105 period.

Public Versus Private Information

Because of the implementation of Rule 105, pre-offer prices become less informative, which leads to the difficulty of interpreting the information contained in the offer prices. Therefore, during the Rule 105 period, the ratio of public information on the offer day should be relatively lower than that during the Rule 10b-21 period.
In this section, we decompose information into its public and private components following Hasbrouck (1991a, 1991b)'s technique. We estimate the following VAR models for each category of SEOs:

$$r_t = \sum_{i=1}^{p} \alpha_i r_{t-i} + \sum_{i=0}^{p} \beta_i x_{t-i} + \varepsilon_{1,t} \quad (4)$$

$$x_t = \sum_{i=1}^{p} \gamma_i r_{t-i} + \sum_{i=0}^{p} \delta_i x_{t-i} + \varepsilon_{2,t} \quad (5)$$

where r_t denotes the percent change (in logarithm) in the quote midpoint subsequent to the t-th transaction. x_t denotes the trading direction inferred by Lee and Ready (1991)'s method, which equals 1 for a buyer-initiated order and equals 0 for a seller-initiated order. The lags used in the equations are 10.

Table 7 Public and Private Information: Variance Decomposition

	σ_x^2/σ_v^2		
	Rule 10b-21	Rule 105	*p-value*
Nasdaq	8.03	14.68	0.00
	[4.80]	[13.83]	[0.00]
NYSE	29.07	32.73	0.00
	[27.15]	[32.60]	[0.00]

This table presents the means [medians] of variance component of stock prices on the offer day for a sample of 2553 seasoned offers issued on Nasdaq or NYSE from January 1993 to December 2005. The statistics for Nasdaq-issued SEOs are reported in Panel A and the statistics for NYSE-issued SEOs are reported in Panel B. The sample is divided conditioned on whether the offer is issued before April 1, 1997 (Rule 105 implementation date) or not. The following VAR system for quote revisions and trades are estimated:

$$r_t = \sum_{i=1}^{p} \alpha_i r_{t-i} + \sum_{i=0}^{p} \beta_i x_{t-i} + \varepsilon_{1,t}$$

$$x_t = \sum_{i=1}^{p} \gamma_i r_{t-i} + \sum_{i=0}^{p} \delta_i x_{t-i} + \varepsilon_{2,t}$$

where r_t denotes the percent change (in logarithm) in the quote midpoint subsequent to the t-th transaction. x_t denotes the trading direction inferred by Lee and Ready (1991)'s method, which equals 1 for a buyer-initiated order and equals 0 for a seller-initiated order. The lags used in the equations are 10.

Table 7 reports the ratio of private information to total information (σ_x^2/σ_v^2) for each category of SEOs. Consistent with our expectation, the ratio of private information to total information rises after the adoption of Rule 105. For those SEOs issued in Nasdaq, the fraction of price discovery attributable to private information is 8.03% during the Rule 10b-21 period, compared with 14.68% during the Rule 105 period. For NYSE-issued SEOs, the ratio of private information rises from 29.07% to 32.73% after the adoption of Rule 105.

4. Conclusion

In 1997, SEC adopted Rule 105 to shorten the restricted period of short sales in order to reduce the adverse effects on informed short sales. However, the shortened restricted period provides informed traders an opportunity to trade in a relatively narrow span of time immediately prior to the beginning of restricted period so that they can cover their short positions using offering shares. The timing of informed trading would lead to the lower information efficiency of pre-offer stock prices, and lead to the difficulty of interpreting the information component in the offer price discounts, which could slow down the price discovery on the offer date. Using a bootstrap technique, we compare the speed of the price discovery of SEO issued during the Rule 10b-21 period and those issued during the Rule 105 period through the offer day. We observe a substantial decrease in the speed of price discovery after the adoption of Rule 105. We also find that, after the adoption of Rule 105, the trades during the offer day have large temporary price impacts that introduce noise in the stock prices and the price discovery is less efficient than that under Rule 10b-21. In addition, the convergences of stock prices to equilibrium asset values are lagged under Rule 105. Furthermore, we show that a higher fraction of price discovery attributable to private information under Rule 105 which is consistent with our hypothesis that shortened restricted period would lead to the difficulty of exploring the information contained in the offer price discounts and result in the high information asymmetry on the offer day.

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Appendix

We generate a bootstrap distribution under the null hypothesis of no difference of information efficiency of pre-offer stock price between Rule 10b-21 period and Rule 105 period. We merge the sample of 851 (311) Nasdaq (NYSE) SEOs issued before the adoption of Rule 105 and the sample of 1039 (352) Nasdaq (NYSE) SEOs issued after the adoption of Rule 105 together. Take a sample of 851 (311) SEOs randomly (with replacement) from the combined sample as "Rule 10b-21" sample and similarly draw a sample of 1039 (352) SEOs as "Rule 105" sample. We then calculate weighted average price discovery, convergence of stock price to equilibrium value and run Biais, Hillion, and Spatt (1999)'s unbiasedness regression model to get β and adjusted R-square. We repeat this procedure 2,000 times to build up a distribution of sample statistics under the null hypothesis that the distribution of sample statistics for "Rule 10b-21" sample is the same as the distribution for "Rule 105" sample. The test on difference of sample statistics is one-sided.

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Social Technographics and Business Strategies

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Abstract

Many companies approach social computing as a list of technologies to be deployed as needed to develop and implement business strategies. This paper argues that a more coherent approach should be adopted to analyse target customers and determine what kind of relationship to be built with them, based on what they are ready for. As a business research tool, Social Technographics can be used to categorize social computing behaviours into a ladder with deferent levels of participation, and analyse a population according to its participation in these levels. Brands, Web sites, and any other company pursuing social technologies should analyse their customers' Social Technographics first, and then create a social strategy based on that profile. The paper concludes that Social Technographics can be very helpful to any business trying to embark on the journey of marketing their products and services to the growing community of social networking participants.

Keywords: Social Media, Social Technologies, Social Technographics, Business Strategies

1. The Definition of Social Technogrphics

The emergence of social technologies that enable customers to connect and share experiences regardless of physical location or prior acquaintance is reshaping the ways in which businesses take themselves to market (Balkin 2004, Li & Bernoff 2008). Before brands and online publishers attempt to deploy social technologies, they must understand their target audience, specifically its social technographic make-up, and only then create a social-computing strategy, according to a Forrester Research report titled "Social Technographics: Mapping Participation in Activities Forms the Foundation of a Social Strategy" (Li & Bernoff 2008).

The term "Social Technographics" refers to the levels of audience participation in social computing rather than specific technology adoption. Forrester groups users into different participation categories, using a ladder metaphor, with "Inactives" at the bottom rung and "Creators" at the topmost rung. According to the Forrester report, there are six levels of participation in the Social Technographics Ladder (Figure 1):

(1) Creators are those who have, within the previous month, posted to a blog, updated a web page or uploaded a video that they themselves may have created. They tend to be younger and evenly split between men and women.

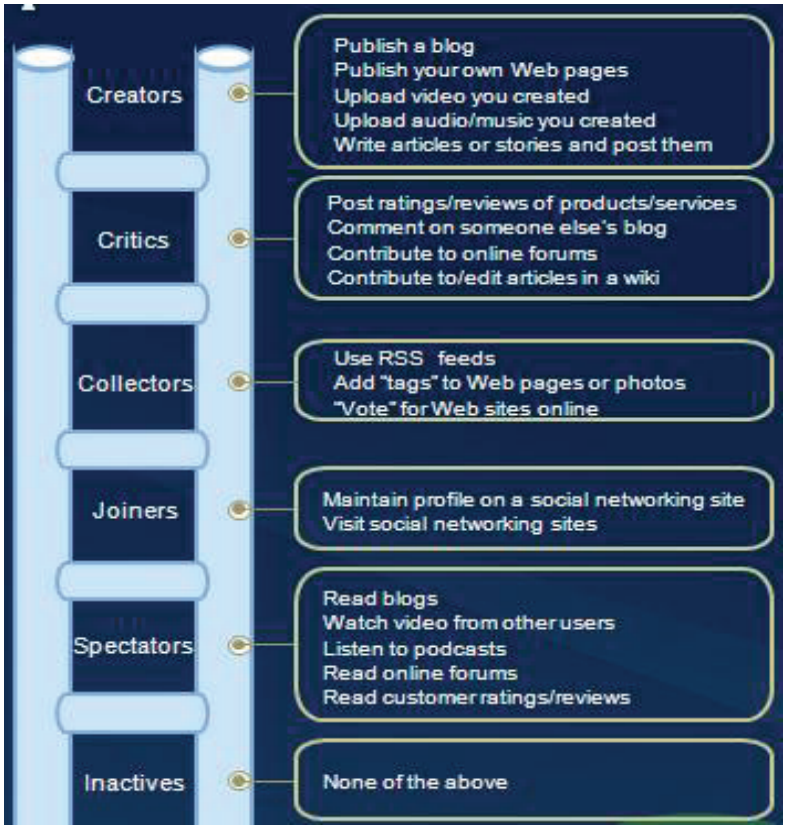
(2) Critics participate by commenting on blogs or posting ratings and reviews. They are on average several years older than Creators. Four of 10 are also Creators.

(3) Collectors save URLs on a social-bookmarking service, use RSS feeds, or create metadata that they share with a community. They are the most male-dominated among the Social Technographics groups.

(4) Joiners use a social-networking site and are the youngest of the Social Technographics groups. More than half also read blogs and nearly a third themselves publish blogs.

(5) Spectators consist mostly of blog readers and also video viewers and podcast listeners, essentially constituting the audience for user-generated social content. They are slightly more likely to be women and have the lowest household income among Social Technographics groups.

(6) Inactives are the remaining online adults and do not participate at all in social computing activities. Their average age is 50, and they are more likely to be women.



Source: Forrester Research, Inc.

Figure 1 Six Overlapping Levels of Participation

Social Technographics are valuable because they can be used by companies to create their social strategies. The report considers, for example, how Social Technographics differ by primary motivation of online use, site usage, and PC ownership (Bruns 2008).

2. Using Social Technographics to Create Business Strategies

From a practical point of view, it is important to explore how companies can create business strategies using Social Technographics to help figure out which strategic steps to deploy first, and how to help users ascend the ladder toward higher levels of engagement (Cook 2007, Wertime 2008).

The core idea of using Social Technographics is that, instead of starting from a list of social media tools, companies should start with their target audience, and develop their social media strategy based on the Social Technographics profile of their audience.

While social networks like Blogs, Twitter, Facebook, Flickr and YouTube are transient, the underlying value system consisting of the following five archetypes, or 5Cs (Cosme 2008, Safko & Brake 2009):

(1) Consumer Generated Content: Your consumers are authors, photographers and filmmakers, all rolled into one. Tap into their creativity, ask them to interpret your brand.

(2) Conversations: Your customers, partners and employees are talking about you, in public. Listen to them, reach out to them, engage them in a two-way conversation.

(3) Collaboration: People work together in flow when they connect with each other as people. Create rich profiles and shared workspaces to enable people to help each other.

(4) Community: Communities come together around a shared social object: a lifestyle, cause or passion. Build and nurture a community around a social object that is bigger than your brand.

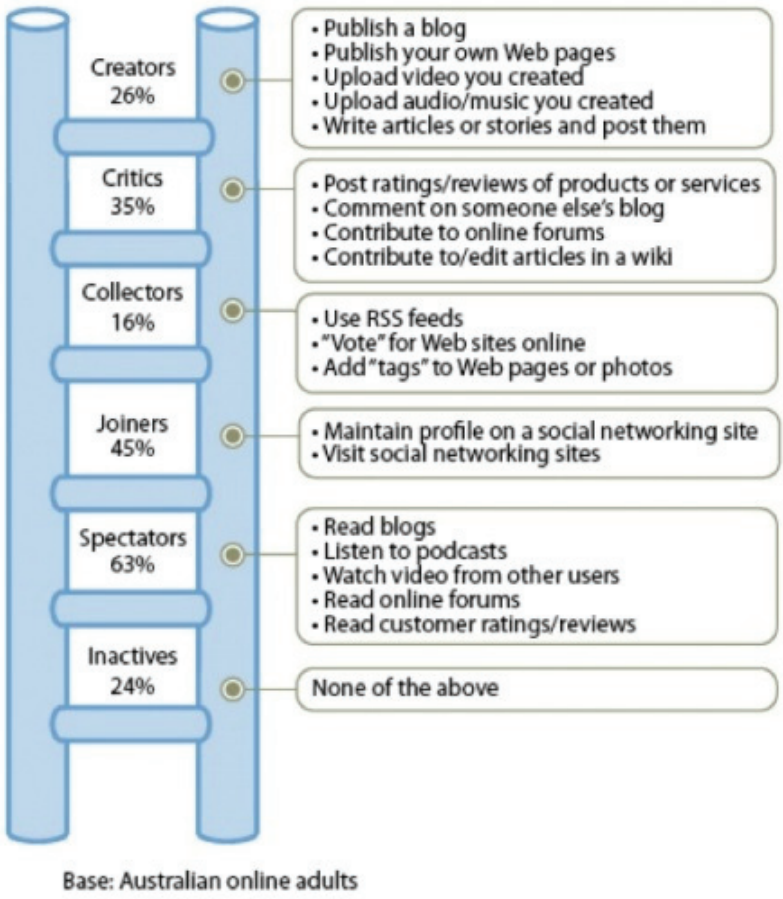
(5) Collective Intelligence: Customers, employees and partners can give you new ideas and insights. Observe their behaviour, ask them for their ideas, recognize and reward them for their contribution.

Everyone wants to leverage these emerging social networks to grow their business, but often lack some of the basic ingredients for making any successful marketing effort as you have got to know your customers (Weber 2007). In particular, since small businesses around the world can't boast their huge market research budgets, there is no harm in using something that is already out there. Therefore the Social Technographics Profile Builder can be adopted to help many businesses get back to basics through formulating and implementing a strategic framework for online merchants to start getting a better understanding of the whole social networking buzz and to see where their customers fit in (Cunningham 2000, Giles 2005).

3. Case Study: Social Media Engagement in Australia

Forrester's recent survey on social technology usage by consumers around the world has accompanied by the Social Technographics Profile Builder – a practical and useful tool which brings the percentages of selected demographics that are in each of the previously defined groups. The data comes from the global survey with over 37,000 total respondents with many huge markets covered so you'll probably find some of these results very interesting. The survey results go in greater depth with some countries while for some the samples were not large enough to provide reliable answers.

On November 14, 2008, Forrester released a report on the Social Technographics Profile of Australia's Social Media Engagement (Figure 2).



Source: Forrester Research, Inc.

Figure 2 Social Media Engagement in Australia

Specifically, Forrester reported that Australian consumers were blocking marketing messages and turning to each other for advice. Importantly, their research found that (Noble 2008):

(1) Three quarters of Australian online adults now use social technologies at least monthly.

(2) One-quarter create their own content.

(3) Australians are more likely to be content creators than their US counterparts.

(4) Men are slightly more likely to use social technologies than women, but when it comes to joining social networks, the difference is negligible.

(5) Creating content or joining social networks falls away dramatically as participants get older.

(6) 46% of online adults in the Older Boomers and Seniors demographic, though, continue to consume some form of social media at least monthly, whether it's watching other peoples' videos, reading other peoples' blogs, or looking at other people's photos.

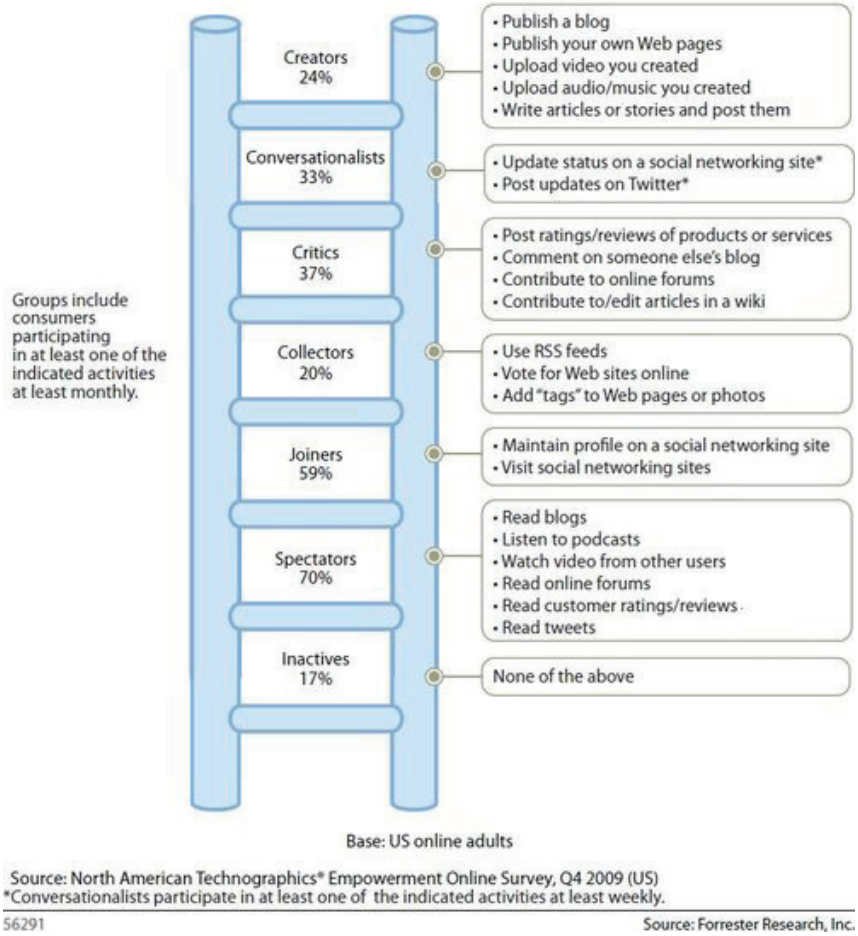
With such a fundamental shift in how Australians use media, marketers, government, and private organisations must rethink their communications and engagement strategies. For example, to engage online women in Australia Forrester suggests, interactive marketers should focus on content and connections. As a small, developed market that makes heavy use of social technologies, Australia is the perfect launch pad for global brands adopting social marketing tactics.

Evangelists and marketers will be surprised if they assume that social technologies are uncommon in Australia, they'll be surprised to find they're now mainstream. In fact, only 24% of online adults in Australia do not regularly use social technologies in some way (Endeshaw 2001, Newson & others 2008).

4. Conversationalists as a New Rung

Forrester Research's Social Technographics Ladder has been the cornerstone of many social media marketing efforts constructed in the last few years. The inactives-to-creators rating of how people use social media essentially shows that most people are either inactive or watch the social web; a few join networks; some collect content; a few (about the same number who join) play critic, commenting on other's works; and a small number actually create content.

In their latest report, Forrrester has revised the Technographics Ladder to add another type of participant, the Conversationalist, or someone who updates their status updates and participates in quick conversations on Twitter and Facebook (Bernoff 2010). This development is interesting because for years social media evangelists have been preaching that, "it's all about the conversation."



Source: Forrester Research, Inc.

Figure 3 The New Social Technographics Ladder

As we can see from the North American Technographics Empowerment Online Survey (Figure 3), a new rung, "Conversationalists", is added to the ladder. The new category "Conversationalists" reflects two changes. First, it includes not just Twitter members, but also people who update social network status to converse, since this activity in Facebook is actually more prevalent than tweeting. And second, the new rung includes only people who update at least weekly, since anything less than this isn't much of a conversation.

As shown in the Social Technographics ladder, the new category of "Conversationalists" encompasses 33 percent of online participants. The fact Forrester now recognizes this segment of online users is significant. It implies smart marketers should find ways to engage those consumers. The data from this survey continues the trends from the last two years: Spectators are maxing out at around 70%, Joiners are still growing rapidly, and Creators are still growing slowly.

As in any social environment, people have found lots of uses for this data. To create a social strategy, the data as generated by Social Technographics could be used in the following ways:

(1) To convince business decision makers that social media engagement is for real, and that if you have not jumped on it, you are late.

(2) To profile a customer base, and see what they are ready for, before planning a project to reach out to them.

(3) To segment target audience and build different strategies for different segments.

It can be argued that social is so prevalent now that a single approach for any business development is probably too broad (Lucking-Reiley & Spulber 2001, Todd 2005).

5. Conclusion

The surge in social media use has given voice to millions of people who are freely sharing their thoughts and opinions through social networks, photo and video sharing sites, blogs, community forums, wikis and more. On the other hand, social media also enables companies to provide strategic services in line with social media-based application development and aligned marketing innovations to brands, which dovetail into their marketing tool kits, goals and drivers. Furthermore, strategic relationships with non-mainstream data suppliers and innovative software developers would enable businesses to provide clients with the highest quality, freshest and most relevant data solutions.

It is critical for companies to profile target audience and determine what kind of relationship to be built with them, based on what they are ready for. However, every business is different and could need some kind of social network exposure and some kind of social media strategies. As a tool, Social Technographics can be very helpful to any business trying to embark on the journey of marketing their products and services to the growing community of social networking participants.

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Exploring the Model of Internet Use: Indonesia Context

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Abstract

The purpose of this research is to compare the two models (TPB and TAM); a model that has the best explanatory power of the intensity of the information use on the company's internal counters technology. The respondents in this study are accountants who work in the firm. There were 10 questionnaires received by mail, and 45 by post mail. For the 55 questionnaires, only 43 questionnaires can analysis to examine the hypothesis. The results of this research indicate that: first**,** subjective norm and perceived behavioral control affect individual users of information technology in using the Internet; second**,** Perceived Ease of Use affects individual users of information technology in using the Internet; third**,** the TPB model is the best model to explain the use of the Internet on company accounting professionals; fourth**,** there is moderate support for experience and gender as moderating variables on TPB and TAM model.

Keywords: Theory of Planned Behavior, Technology Acceptance Model, Internet Use, Gender, Internet Experience

1. Introduction

The business world nowadays has been experiencing such a heavy pressures. The environment around organization becomes more complex and fluctuating due to those communication, transportation and technology progresses. International pressures are also inevitable. The competition is *global* and borderless. Various pressures in the business world have forced the business to proprietarily change its practice. A business company must be more proactive and continue making thorough improvements. Various practices such as *business process reengineering*, business alliance and both creative and quantitative decision making have been done in larger amount. Here, the role of Information Technology (IT) is rapidly developed since such a technology is the enabler of successful business practices done by business organizations. Information technology enables a company to do data processing and produce quick and accurate information. Information technology also provides both communication and coordination those are necessary to operate in a scattered geographic location since such a technology will accelerate information distribution to the users and facilitate information collection.

Along with the more increasing industrial globalization, it is very important to have a better understanding about factors those can improve the success of technology development and adoption in the organization. Particularly, there is a need to understand social and psychological factors those affect the adoption and implementation of information technology. By understanding social and psychological factors those affect the application of information technology it will help the organization that will implement data by means of new information technology. There are many studies which focus on psychological variables of whether the technology is applied or not. Two preferable models in the study of this type are *planned behavior* (Ajzen, 1991) and *technology acceptance model* (Davis, 1989; Davis et al., 1989).

In addition to TPB and TAM models, there are several studies those try to see the *gender* and experience impact (Venkatesh and Morris, 2000; Gefen and Straub, 1997; and Baker et al., 2007) (Venkatesh and Davis, 2000; Mahmood et al., 2001; Anandarajan et al., 2000; and Fusilier and Durlabhji, 2005) on information technology application. The contribution of this study compares two models (TPB and TAM), which model that has the best confirmation power to the intensity of information technology application by including the moderating variable such as gender and experience.

2. Theoritical Framework and Hypothesis Development

Planned Behavior Theory (TPB)

Beck and Ajzen (1991) test the capability of TPB to predict the dishonest action of university students. Another study performed by Parker et al. (1995) tests which vehicle riders in their effort to avoid threat. Those two studies prove that in addition to TPB construct of behavior is also affected by individual norm construct that provides extra confirmation power in the model although the effect of interaction is not taken into account.

TPB model is most applied to predict individual behavior in various types of context. In the context of tax payer's obedient behavior, Bobek and Hatfield (2003) shows that TPB construct (attitude, subjective norm, and *perceived behavioral control*) relates to the disobedient behavior of tax payer. Other studies try to use TPB model in the context of predicting ethical behavior and unethical behavior and decision making (Carpenter and Reimers, 2005; Chang, 1998; Buchan, 2005 and Hofmann et al., 2007). Carpenter and Reimers (2005) use TPB model to predict the decision made by company manager (s) with respect to fraudulent financial statement, and the result shows that TPB model can be used to predict whether the company manager takes ethical or unethical action with respect to fraudulent financial statement. Similar study also performed by Chang (1998) shows that TPB model can be used to predict the unethical behavior of university students with respect to illegal software reproduction.

Buchan (2005) tests TPB model in the context of predicting the unethical behavior of public accountant and the result shows that *attitude* has the biggest confirmation power to predict the unethical behavior of public accountant. It is different from the study performed by Hofmann et al. (2007) which shows that attitude and subjective norm, as the components of TPB model, affect the individual investment decision.

TPB model can also be used to predict the application and non-application of information technology. Several studies show that TPB model can be used to predict: new technology application in developed countries such as Saudi Arabia (Baker et al., 2007), internet utilization by university

students in India (Fusilier and Durlabhji, 2005), *information security* utilization (Hazari et al., 2008) and information technology adoption both before and after adoption (Karahanna et al., 1999). The utilization of information technology nowadays becomes a need for many parties, especially for accountants since they can obtain the required information by using information technology without having to be limited by time and place. By virtue of the above argumentation, this study tries to apply TPB model in the context of information technology application internal accountant. The first hypothesis is:

H1 : Attitude, perceived behavioral control, and subjective norm can be used to predict the application of information technology.

Technology Acceptance Model (TAM) Theory

Technology Acceptance Model (TAM) theory was introduced by Davis (1989) who adapts from *theory of reasoned action* (TRA) with modification in order to create *user acceptance* model from information system. The purpose of TAM is to provide description of determinant factor whether the general application of computer can be accepted or not. TAM ideally can help to not only predict but also provide a description so that both researcher and practitioner are able to identify why certain system cannot be accepted by the system user that a corrective action is required in order that the system can be accepted by the user. The key purpose of TAM is to provide a ground to test the effects of external factors on internal *belief*, attitude and purpose. TAM theory states that the purpose of behavior to use technology comes from two beliefs namely: (1) *Perceived usefulness* defined as an expectation that technology will improve the work performance; (2) *perceived ease of use* defined as a belief that the use of technology will be effortless.

Davis et al. (1989) indicates that *perceived usefulness* is the major determinant factor of an individual to use computer, while *perceived ease* will come later. The similar research is also shown by Szajna (1996) who confirmed the previous study that TAM is a valuable model to predict the application of information system. Taylor and Todd (1989a) indicate that TAM model can also be used to predict the application of information technology by taking the previous experience of information technology action into account.

Venkatesh and Davis (2000) try to develop TAM model. The developed model is called TAM2 in which theoretical construct of *social influence process* (subjective norm, *voluntary*, and *image*) and *cognitive instrumental process* (job relevance, output quality, *result demonstrability*, and *perceived ease of use*) are included. The result of study conducted by Venkatesh and Davis (2000) proves that the *social influence process* and *cognitive instrumental process* can significantly affect the acceptance of information technology application. Therefore, this study tries to apply TAM model in the context of information technology application for educator accountant, corporate/management accountant, public accountant, and accounting student. The second hypothesis is:

H2 : Perceived usefulness and perceived ease can be used to predict the application of information technology.

Planned Behavior (TPB) Theory and Technology Acceptance Model (TAM) Theory in the Prediction of Information Technology Application

Several studies have tried to compare two models with common purpose as the criteria to predict the application of technology. Matheson (1991) shows that TAM explains 69% behavior

variation of university student in *spreadsheets* application, TPB explains 62% behavior variation of university student *spreadsheets* application. Gentry and Calantone (2002) show that TAM' capability is superior to explain the behavior of university student in terms of e-purchase technology application. Taylor and Todd (1995b) also show that TAM explains 52% and TPB explains 57% of behavior intensity variation of *computer center* employment. Fusilier and Durlabhji (2005) indicate that TAM model explains about 36% and TPB explains 32% of internet utilization by university students in India. Based on the above argumentation, this study tries to test whether TAM model is better model than TPB in the context of information technology application for educator accountant, corporate/management accountant, public accountant, and accounting student. The third hypothesis is:

H3 : *Technology Acceptance Model* is a better than *Theory of Planned Behavior* model in the context of information technology application.

The Effect of Experience on Technology Application Prediction

The study conducted by Venkatesh and Davis (2000) indicates that the experience of user will affect the relationship between model components and intensity. The experience can be considered as another important factor that can affect the application of both models. It is shown in the study of Mahmood et al. (2001) that TAM *perceived usefulness* and *ease of use* component has the largest effect on technology application so does the level of experience that has large effect on technology application. Anandarajan et al. (2000) provides evidence that *perceived usefulness* is related to the period of time required to use internet.

Fusilier and Durlabhji (2005) provide evidence that experience does not give any major effect on technology application. However, when experience is interacted in the components of TAM and TPB, it shows that experience can be used to explain the variation of internet utilization by university students in India. Based on the above argumentation, this study tries to apply TAM and TPB models in the context of information technology application for educator accountant, corporate/management accountant, public accountant, and accounting student by taking the previous individual experience of technology application into account.

H4a : *Attitude, perceived behavioral control* and *subjective norm* can be used to predict the application of information technology moderated by experience variable.

H4b : *Perceived usefulness* and *perceived ease* can be used to predict the application of information technology moderated by experience variable.

The Effect of Gender on Technology Application Prediction

Several study examine the effect of gender on technology application prediction. The psychological study that tests *gender* classification in decision making process shows that there is inter-*gender* difference in *self-esteem* determinant (Tashakkori, 1993). Bem (1981) argues that man and woman codes and processes information by means of different social cognitive structure construct to help determining and directing individual perception. Consequently, an individual tends to make a decision that reflects *bias inherent* in individual perception and action (Nisbett and Ross, 1980, in Venkatesh and Morris, 2000). It means that *gender* scheme can be considered as normative guidance (Kagan 1964; and Kohlberg, 1996, in Venkatesh and Morris, 2000) that causes unconscious action or internalization action that is consistent with *gender* scheme.

The study result of *gender* effect in the decision to apply information technology is highly varied. Venkatesh and Morris (2000) indicate that men are highly affected by utility perception, while women are highly affected by easiness perception and subjective norm, although the effect of subjective norm will decrease along with the time spent by information technology application. Similar study performed by Geffen and Straub (1997) shows similar result that there is a different perception based on *gender* with respect to information technology application. It is different with the study performed by Baker at al (2007) which shows that there is not any effect of gender variable moderation on new technology application. Based on the above argumentation, this study tries to apply TAM and TPB models in the context of information technology application for educator accountant, corporate/management accountant, public accountant, and accounting student by taking *gender* variable into account.

H5a : Attitude, perceived behavioral control and subjective norm can be used to predict the application of information technology moderated by gender variable.

H5b : Perceived usefulness and perceived ease can be used to predict the application of information technology for educator accountant moderated by gender variable.

TPB model shows that TPB construct includes attitude, subjective norm, and *perceived behavioral control*. TAM theory indicates that the purpose of behavior to use technology comes from two beliefs namely: (1) *Perceived usefulness* defined as an expectation that technology will improve the work performance; (2) *perceived ease of use* defined as a belief that using technology will be effortless. The hypotheses are illustrated in Figure 1 and 2.

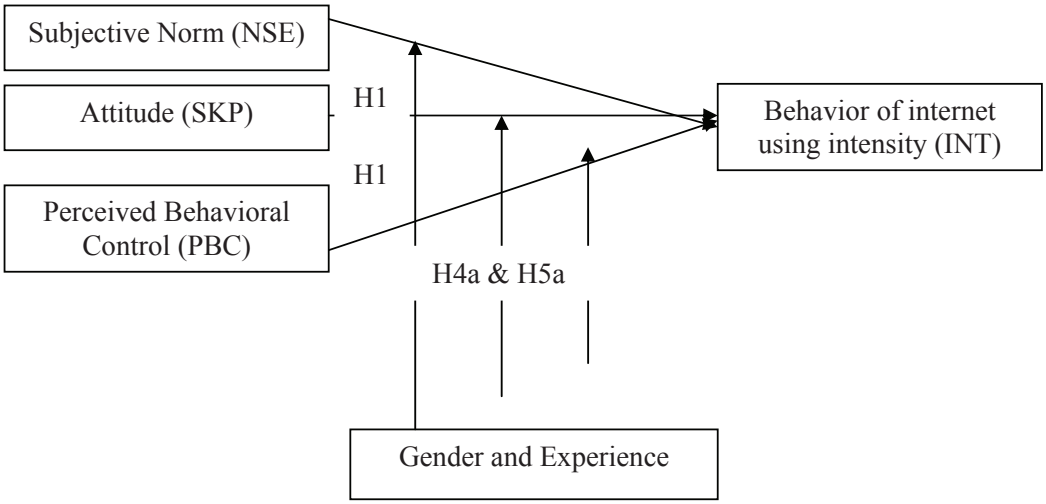

Figure 1 Theory of Planned Behavior (TPB) Model

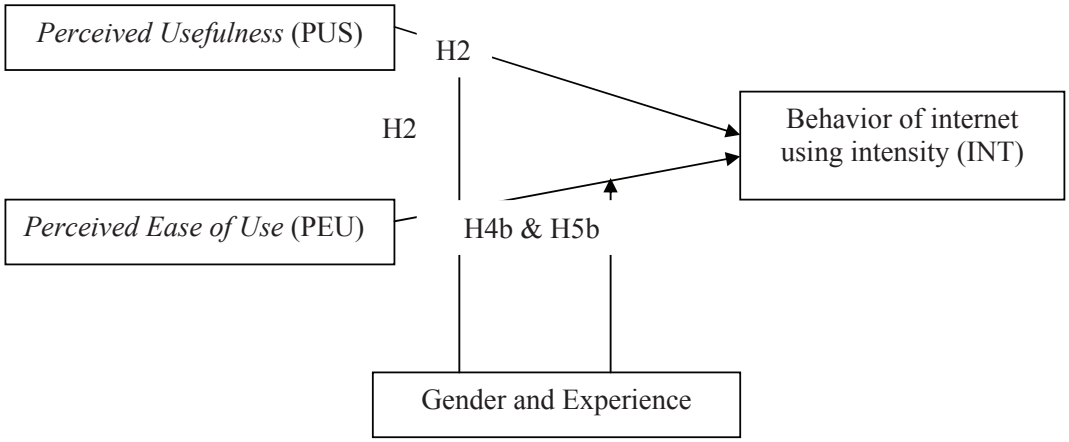

Figure 2 Technology Acceptance Model (TAM) Model

3. Research Method

Population, Sample and Sampling Technique

The study population is the users of information technology application. *Purposive sampling* is used to determine the sample of study namely sampling technique by means of certain consideration and limitation. In other words, purposive sample is carefully selected the sample so that it is relevant with the aim of study. The research sample is internal accountants who have been working at least for 3 months at a company of service, trading or manufacture in Java.

Research Variables

This study uses two models: *Theory of Planned Behavior* and *Technology Acceptance Model* to predict the application of information technology. In this study, information technology application is projected as internet use. Dependent and independent variables in this study will be categorized according to the two models those are going to be tested. Each instrument of *Theory of Planned Behavior* Model is measured by means of seven (7) likert scale from very disagree (1) to very agree (7). In *Theory of Planned Behavior* model (TPB), those dependent and independent variables are:

1. Dependent variable is the behavior of internet using intensity (INT) measured by means of instrument developed by Ajzen (1991) that consists of 3 instruments.
2. Independent variable shall include:

a. Subjective Norm (NSE) that is measured by means of instrument developed by Ajzen (1991) consisting of 3 instruments.

b. Attitude (SKP) that is measured by means of instrument developed by Ajzen (1991) consisting of 5 instruments.

c. *Perceived behavioral control* (PBC) that is measured by means of instrument developed by Ajzen (1991) consisting of 3 instruments.

Each instrument of *Technology Acceptance Model* is measured by means of seven (7) likert scale from very disagree (1) to very agree (7).While in *Technology Acceptance Model* (TAM), the followings are dependent and independent variables:

1. Dependent variable is the behavior of internet using intensity (INT) measured by means of instrument developed by Ajzen (1991) consisting of 3 instruments.
2. Independent variable shall include:

a. *Perceived Usefulness* (PUS) that is measured by means of instrument developed by Davis (1989) consisting of 4 instruments.
b. *Perceived Ease of Use* (PEU) that is measured by means of instrument developed by Davis (1989) consisting of 4 instruments.

There are also 2 (two) moderation variable used in this study: *gender* and experience. The measurement for those moderation variables respectively shall be as the followings:

1. *Gender* (GEN) is measured by means of category data namely 1 for women and 2 for men.
2. Experience (EXP) is measured by means of instrument developed by Fusilier and Durlabhji (2005) consisting of 8 instruments. Each instrument of EXP is measured by means of seven (7) LIKERT scale from NEVER (1) to VERY OFTEN (7). The maximum total scores is 56 (8 instruments times 7) and the minimal score is zero. The subject is classified into a group of high experience or low experience by means of *median score split* method. If the respondent has a low experience then he/she will be coded 1 and if the respondent has a high experience then he/she will be coded 2.

Data Analysis Technique

Before making any hypothesis test, reliability and validity test of instrument used in the study was performed. In this study, all instruments used to measure the variable of study will be tested for its validity and reliability by using *try-out* method. In this study, the validity is only limited to items validity (questions provided in the questionnaire) by correlating between item score and total scores of Pearson Correlation except for the instrument of cognitive style that uses *factor analysis item parceling* method as recommended by Allison and Hayes (2000).

In this matter, such a high correlation coefficient indicates the compatibility between the function of item and test as a whole. One point theory or indicator is said to be valid when the score of its correlation coefficient is under 0.8, those points or indicators which correlation coefficient is higher than 0.8 or inter-correlated will be considered as invalid. This validity test is computerized by means of *person product moment* correlation concept. Cronbach alpha used to analysis the reliability test of this study is considered as reliable when its alpha is more than 0.6.

Table 1 Research Model

No.	Hypothesis	Research Model
1.	H1	**TPB Model**: $INT = \beta_0 + \beta_1 NSE + \beta_2 SKP + \beta_3 PBC + \varepsilon_t$ **(Model 1)**
2.	H2	**TAM Model**: $INT = \beta_0 + \beta_1 PUS + \beta_2 PEU + \varepsilon_t$ **(Model 2)**
3.	H3	Comparing R^2 value for TPB Model and TAM Model.
4.	H4a	**TPB model with experience as moderating variable:** $INT = \beta_0 + \beta_1 NSE + \beta_2 SKP + \beta_3 PBC + \beta_4 EXP + \beta_5 NSE \times EXP + \beta_6 SKP \times EXP + \beta_7 PBC \times EXP + \varepsilon_t$ **(Model 3)**
5.	H4b	**TAM model with experience as moderating variable:** $INT = \beta_0 + \beta_1 PUS + \beta_2 PEU + \beta_3 EXP + \beta_4 PUS \times EXP + \beta_5 PEU \times EXP + \varepsilon_t$ **(Model 4)**
6.	H5a	**TPB model with gender as moderating variable:** $INT = \beta_0 + \beta_1 NSE + \beta_2 SKP + \beta_3 PBC + \beta_4 GEN + \beta_5 NSE \times GEN + \beta_6 SKP \times GEN + \beta_{67} PBC \times GEN + \varepsilon_t$ **(Model 5)**
7.	H5b	**TAM model with gender as moderating variable:** $INT = \beta_0 + \beta_1 PUS + \beta_2 PEU + \beta_3 GEN + \beta_4 PUS \times GEN + \beta_5 PEU \times GEN + \varepsilon_t$ **(Model 6)**

Note:
INT = Behavior of internet using intensity
NSE = Subjective Norm
SKP = Attitude
PBC = *Perceived Behavioral Control*
PUS = *Perceived Usefulness*
PEU = *Perceived Ease of Use*
EXP = Experience
GEN = *Gender*

Hypothesis test in this study uses multiple linear regression analysis. The research equation can be summarized as shown in table 1. The followings are the criteria of hypothesis acceptance and rejection in the study:

1. Hypothesis H1 will be accepted when regression coefficients β_1, β_2 and β_3 on model 1 are significant.
2. Hypothesis H2 will be accepted when regression coefficients β_1 and β_2 on model 2 are significant.
3. Hypothesis H3 will be accepted when the R^2 score of model 2 is higher than R^2 score of model 1.
4. Hypothesis H4a will be accepted when regression coefficients β_5, β_6 and β_7 on model 3 are significant.
5. Hypothesis H4b will be accepted when regression coefficients β_4 and β_5 on model 4 are significant.
6. Hypothesis H5a will be accepted when regression coefficients β_5, β_6 and β_7 on model 5 are significant.
7. Hypothesis H5b will be accepted when regression coefficients β_4 and β_5 on model 6 are significant.

4. Analysis

The key participants in this study were the accountants who work in the firm. Questionnaires were distributed by mail and email. There were 125 questionnaires sent by post mail and 55 questionnaires sent by email. There were 10 questionnaires received by mail, and 45 by post mail, and total data collected is 55. For the 55 questionnaires, only 43 questionnaires can be analyzed to examine the hypothesis. The respondents of this research consist of 44% male and 56% female. The average of work experience of the respondent is 3.44 years, with minimal work experience 3 months and maximal work experience 24 years.

The validity test used in this research correlates between item score and total scores of Pearson Correlation. The results of validity test indicated that all items are valid. The reliability test of this study use *Cronbach Alpha,* the variable states are reliable if the *Cronbach Alpha* is more than 0.6. The reliability of these variables showed that all variables are reliable because all variables have *Cronbach Alpha* more than 0.6.

The results showed that the regression coefficient for *subjective norm* variable is positive and significant as shown in Table 2. This suggests that *subjective norms* affect individual users of information technology in using the Internet; the results also indicate that the higher the individual's *subjective norms* on the internet, the higher the individual internet usage. The *attitude* variable is positive but not significant; the results indicate that the *attitude* did not affect individual users of information technology in using the Internet.

The research results also showed that the regression coefficient for *perceived behavioral control* variable is positive and significant. This suggests that *perceived behavioral control* affect individual users of information technology in using the Internet; the results also indicate that the higher the individual's *perceived behavioral control* on the internet, the higher the individual internet usage. All result for TPB model showed that *subjective norm* and *perceived behavioral control* affect individual users of information technology in using the Internet; these results support hypothesis 1 especially for *subjective norm* and *perceived behavioral control* variables.

Table 2 The Results of Hypothesis 1, 2 and 3

	TPB Model: $INT = \beta_0 + \beta_1 NSE + \beta_2 SKP + \beta_3 PBC + \varepsilon_t$	**TAM Model**: $INT = \beta_0 + \beta_1 PUS + \beta_2 PEU + \varepsilon_t$
Intercept	1.115	1.727
	(1.530)	(2.505)
NSE	0.265	-
	(2.721)*	
SKP	0.012	-
	(0.069)	
PBC	0.569	-
	(4.025)*	
PUS	-	0.226
		(1.555)
PEU	-	0.491
		(3.066)*
N	43	43
R^2	0.553	0.462

Adj R^2	0.519	0.435
F	16.085*	17.187*

Note: *INT = Behavior of internet using intensity; NSE = Subjective Norm; SKP = Attitude; PBC = Perceived Behavioral Control; PUS = Perceived Usefulness; PEU = Perceived Ease of Use*
* significant at 1%

The TAM model showed that the regression coefficient for *Perceived Usefulness* variable is positive but not significant as shown in Table 2; the results indicate that the perceived usefulness did not affect individual users of information technology in using the Internet. The research results also showed that the regression coefficient for *Perceived Ease of Use* variable is positive and significant. This suggests that *Perceived Ease of Use* affect individual users of information technology in using the Internet; the results also indicate that the higher the individual's *Perceived Ease of Use* on the internet, the higher the individual internet usage. All result for TAM model showed that *Perceived Ease of Use* affect individual users of information technology in using the Internet; these results support hypothesis 2, especially for *Perceived Ease of Use* variable.

Table 3 The Results of Hypothesis 4 and 5

	TPB Model		**TAM Model**	
	Moderating Variable		**Moderating Variable**	
	Experience	***Gender***	***Experience***	***Gender***
Intercept	4.583	3.776	5.998	2.392
	1.864	1.441	2.514	0.973
NSE	0.432	0.508	-	-
	1.370	1.383		
SKP	0.212	0.299	-	-
	0.422	0.496		
PBC	-0.272	-0.320	-	-
	-0.583	-0.636		
PUS	-	-	-0.675	1.431
			-1.577	2.908*
PEU	-	-	0.616	-0.821
			1.211	-1.468
GENDER	-	-1.596	-	-0.357
		-1.037		-0.253
G*NSE	-	-0.135	-	-
		-0.634		
G*SKP	-	-0.198	-	-
		-0.557		
G*PBC	-	0.545	-	-
		1.836***		
G*PUS	-	-	-	-0.734
				-2.552**
G*PEU	-	-	-	0.790
				2.447**
EXPERIENCE	-2.452	-	-2.884	-
	-1.522		-1.937	
E*NSE	-0.079	-	-	-

	-0.366			
E*SKP	-0.175	-	-	-
	-0.507			
E*PBC	0.588	-	-	-
	1.980***			
E*PUS	-	-	0.316	-
			2.199**	
E*PEU	-	-	0.338	-
			-0.546	
N	43	43	43	43
R^2	0.619	0.595	0.542	0.554
Adj R^2	0.542	0.514	0.480	0.493
F	8.106*	7.351*	8.746*	9.178*

Note: *INT = Behavior of internet using intensity; NSE = Subjective Norm; SKP = Attitude; PBC = Perceived Behavioral Control; PUS = Perceived Usefulness; PEU = Perceived Ease of Use*

* significant at 1%; ** significant at 5%; *** significant at 5%

The hypothesis 3 of this research was examined by comparing the adjusted R^2 for both TPB and TAM models. The adjusted R^2 for TPB model is 51.9% and for TAM model is 43.5%. This indicates that the value of adjusted R^2 for the TPB model is larger than TAM model. The results of this study indicate that the TPB model is the best model to explain the use of the Internet on company accounting professionals. This can be shown that the TPB model can explain 51.9% of internet usage and TAM model only explain 43.5% of internet usage. These results does not support hypothesis 3.

The results show that experience as moderating variable only has significant and positive impact on *perceived behavioral control* in TPB model and *perceived usefulness* in TAM model as shown in Table 3. The results of this research indicate that: first**,** interaction of higher *perceived behavioral control* and higher experience affect individual to use internet more frequently; second**,** interaction of higher *perceived usefulness* and higher experience affects individual to use internet more frequently. These results moderately support hypothesis 4.

The results also examine *gender* as moderating variable in the TPB and TAM models. The results show that *gender* as moderating variable only has significant and positive impact on *perceived behavioral control* in TPB model as shown in Table 3. These results also show that gender has significant and positive impact on *perceived ease of use*; and has significant and negative impact on *perceived usefulness* in TAM model. The results of this research indicates that: first**,** interaction of higher *perceived behavioral control* and female affect individual to use internet more frequently; second**,** interaction of higher *perceived usefulness* and male affects individual to use internet more frequently; third**,** interaction of higher *perceived ease of use* and female affects individual to use internet more frequently. These results moderately support hypothesis 5.

5. Conclusion

The development of information technology is quite rapid. Information technology also provides both communication and coordination those are necessary to operate in a scattered geographic location since such a technology will accelerate information distribution to the users and facilitate information collection. There is need to understand social and psychological factors those can improve the success of technology development and adoption in organization. These study focus

on psychological variables of whether the technology is applied or not. The purpose of this research is to compare the two models (TPB and TAM); a model that has the best explanatory power of the intensity of the use of information on the company's.

The results of this research indicates that for TPB model, *subjective norm* and *perceived behavioral control* affect individual users of information technology in using the Internet; and for TAM, *Perceived Ease of Use* affect individual users of information technology in using the Internet. The results of this study also indicate that the TPB model is the best model to explain the use of the Internet on company accounting professionals than TAM. The results of moderating variabel show that experience only has significant and positive impact on *perceived behavioral control* in TPB model and *perceived usefulness* in TAM model; and *gender* only has significant and positive impact on *perceived behavioral control* in TPB model.

The implication of this research shows that it is very important to have a better understanding about factors those can improve the success of technology development and adoption in the organization. Particularly, there is a need to understand social and psychological factors those affect the adoption and implementation of information technology. The organization needs understanding the social and psychological factors those affect the application of information technology and it will help the organization that will implement data by means of new information technology.

The limitations of this research are: *first,* the sample of this research only use the internal accountant that causes low generalization of research result. *Second,* this researh only explore two models that explain the intensity of the use of information technology. The future research can use and compare the other group respondent who utilize information technology; and use the other models that have more explanatory power of the intensity of the use of information technology.

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The Effect of Transportation on Global Petroleum Trade Trend

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Abstract

The objective of the study was to determine possible relations between international petroleum trade and transportation trends. The trend of global petroleum trade distribution was analyzed and the sensitivity of global petroleum trade with respect to distance was investigated. The study covered the petroleum trade activity among 173 countries over a time period extending from year 1965 to 2005. The examined database consists of 13 time-series variables, grouped in four categories: petroleum commodity trade, geographical, socio-economic and political characteristics. The centralized databases of international agencies were accessed and used to extract the study relevant information. After collecting the pertinent data and creating the database for the study time span, trend, gravity and linear programming models were developed. Preliminary statistical analyses revealed that distance between countries and Gross Domestic Product, GDP, were the major contributing factors impacting petroleum trade. Modeling petroleum spatial distribution and flow was based on cross-sectional analyses. The elasticity of bilateral trade with respect to distance showed increasing time trend for distance coefficients in gravity models. The Linear Programming modeling was applied to facilitate identifying possible relations between trade and transportation distance, optimizing the possible distributions during different years, and comparing the total cost of petroleum transportation for the observed distribution and the optimal one. Comparison of the results for multimodal network revealed that the percentages of possible improvements increased over time and the observed petroleum distributions diverged from the possible optimal solutions. Future petroleum trade strategies and business decision makings are suggested to more directly incorporate distance and transportation aspects by utilizing the study methodology and results.

Keywords: Transportation, Distribution, Petroleum, Multimodal Network

1. Introduction

The dramatic increase in energy prices that has occurred in recent decades has had profound implications on the world economy. Freight transportation plays an important role in global trade, economic growth and development (Helpman and Krugman, 1985). To enhance transportation, interest in multimodal and intermodal movements of goods and commodity has steadily increased (Linnermann, 1966; Southworth and Peterson, 2000; Whitelegg and Haq, 2003). Petroleum trade is one of the most strategic worldwide trades. The cost of transportation of petroleum has a significant effect on its net price. To reduce transportation cost, trade partners are expected to make business decisions accordant to selection of nearest demand and supply hubs. Limited research attempts were made to examine the role of transportation impedance in the petroleum trade (Disdier and Head, 2008; Vaziri and Tabatabi, 2009). Indeed the effect of the distance on the trade is ambiguous because there are many different mechanisms that might be at work (Bergstrand, 1985; Bermelon and Freund, 2008; Brun, Carrere, Guillaunmont and Delmelo, 2005; Rocco, 2007). By taking a direct approach and carrying out a number of econometrics tests that examine the role of distance, the study reported herein tried to fill the existing gap in the literature.

The objective of the study was to determine possible relations between international petroleum trade and transportation trends. Many factors affect international petroleum trade. In this research four categories of variables were considered as relevant: trade, geographical, socio-economic and political. The study covered the petroleum trade activities among 173 countries over a time period extending from year 1965 to 2005. The relevant information was extracted from centralized databases of international agencies. The examined database consists of 13 time-series variables grouped in the four categories. After preliminary and correlation statistical analyses, the status quo of cross-sectional petroleum distribution was deployed in gravity models. As for elasticity of bilateral trade with respect to distance, the gravity model results suggested an increasing time trend for distance coefficient based on sensitivity analysis concept. The Linear Programming modeling was applied to facilitate identifying possible relations between trade and transportation distance, optimizing the possible distributions during different years, and comparing the total cost of petroleum transportation for the observed distribution and the optimal one. Comparison of the results for multimodal network revealed that the percentages of possible improvements increased over time and the observed petroleum distributions diverged from the possible optimal solutions. Future petroleum trade strategies between countries and continents, especially Asia-Pacific and Europe, are suggested to more directly incorporate distance and transportation aspects by utilizing the study methodology and results.

2. Database Development

The appraisal of global petroleum trade required establishing a conceptual framework for analysis and a corresponding set of pertinent data. The centralized databases of international agencies were accessed and used to acquire the study relevant information. From the United Nations Commodity Trade Statistics Division website, COMTRADE, most of the study statistics were extracted (United Nations Commodity Trade Statistics Division, 2009). The relevant times-series information, covering 173 countries for 9 years during 1965 to 2005, was classified into four categories.

Trade category consisted of bilateral petroleum trades, extracted from the United Nations Commodity Trade Statistics Division's web pages. The complex nature of the basic customs and statistical needs makes it necessary to have a rather detailed commodity classification. There are several commodity classifications widely used including Harmonized System, HS, Standard International Trade Classification, SITC, and Broad Economic Categories, BEC. The SITC covers a broad database worldwide comparing to others and is often the preferred UN commodity classification. Considering missing data for countries and calendar years, commodity code 33 at the 5 digit SITC Rev.3 level over the period 1965-2005 in the 5 year intervals for 173 countries was selected. The selected commodity code represents petroleum and petroleum products. This resulted in 9 time intervals 1965, 1970… to 2005.

Geographic category consisted of the geographic transportation distance and the characteristic of the country whether it is land-lock or not. The geographic distance between trade partners was referred to as the impedance variable. Two petroleum trade networks were developed and compared: an integrated multimodal land and marine network and the conventional air distance network. Petroleum trade is mainly based on global networks consisting of a multimodal land and sea transportation networks. The sea transportation network is the most essential mode in international trade. Thus, in this study, an integrated marine and land transport network was developed. The multimodal network included road distances between origin country capitals and loading ports, marine distance between loading port in origin to unloading port and road distance between unloading port and capital in destination country. The sea network was built on the marine port distances. One port or in some cases, more than one port were chosen as representative node(s) of the specific country in the marine network. For land-lock countries, marine distance to the nearest port was measured and then was added to the road distance from that port to the capital of the land-lock country. Consequently, a multimodal transportation network was developed. The air distance network was the straight distance of trade centers of countries. Alongside of petroleum transportation networks, land-lock variable was defined as a dummy variable taking the value 1 for 43 landlocked countries and 0, otherwise.

Socio-economic category demonstrated characteristics that affect oil trade. The variables consisted of population, area, and Gross Domestic Product. The relevant data were extracted from the United Nation Statistic Division sources.

Political category consisted of dummy variables reflecting affiliations with international organizations. The selected organizations were: Organization of Petroleum Exporting Countries, OPEC, Organization of Arab Petroleum Exporting Countries, OAPEC, Organization of non OPEC countries, NON-OPEC, Organization for Economic Cooperation and Development, OECD, and North Atlantic Treaty Organization, NATO.

For the period of 1965 to 2005, the pertinent data of 13 variables representing the aforesaid 4 categories for 173 countries, were gathered. Totally 9 vectors and 4 matrixes were used for each of the 9 years covering 1965 to 2005. Dimension of vector variables was 173, equal with the number of selected countries. Dimension of matrixes of trades and distances between exporting and importing countries was 173x173. Database preliminary statistical analysis consisted of cross-sectional univariate and correlation analyses. The unvariate analysis determined statistics such as: maximum, minimum, mean, standard deviation and coefficient of variation for each of the 9 years. Correlation analysis between 2 trade variables and other variables showed that GDP and distance had the strongest significant correlations

with trade during the 9 years. The distance variables showed negative correlations with trade variables. As an example, the results of preliminary univariate statistical analysis for the year 2000 are summarized in Table 1.

Table 1 Results of Univariate Statistical Analysis for Year 2000

No	Description	Symbol	Unit	No. of cases	Min	Max	Mean	St. Dev.	Coef. of var.
1	Population	P	Person	173	46×10^3	12.6×10^8	34.8×10^6	12.6×10^7	3.638
2	Area	A	Km^2	173	25	17.1×10^6	78.2×10^3	20.2×10^5	2.580
3	Landlocked	LL	-	173	0	1	0.179	0.384	2.146
4	Gross Domestic Product	GDP	$/Year	173	49×10^6	97.6×10^{11}	19.5×10^{10}	8.8×10^{11}	4.518
5	Air Distance	DijAir	Km	29929	60.8	19904	7947.3	4448.4	0.560
6	Multimodal Distance	DijMM	Km	29929	258.5	31820	12630.5	5359.7	0.424
7	Oil Import Data	TijIM	$/Year	29929	0	17.3×10^9	20.4×10^6	30.0×10^7	14.686
8	Oil Export Data	TijEX	$/Year	29929	0	17.1×10^9	17.3×10^6	28.9×10^7	16.752
9	OPEC members	OPEC	-	173	0	1	0.0956	0.295	3.085
10	Non-OPEC members	NOPEC	-	173	0	1	0.0608	0.240	3.947
11	OAPEC members	OAPEC	-	173	0	1	0.086	0.2401	2.791
12	OECD members	OECD	-	173	0	1	0.217	0.414	1.907
13	NATO members	NATO	-	173	0	1	0.252	0.431	1.710

3. Petroleum Trade Distribution Modeling

The database consisted of 2 dependent variables of trade category and 11 independent variables of the other three descriptive categories. The trade distribution modeling consisted of three major parts: distribution gravity modeling, distribution linear programming modeling, LP, and time series modeling based on sensitivity analysis and elasticity concept.

The gravity model of international trade was developed more than 50 years ago (Kepaptsoglou, Karlaftis and Tsamboulas, 2010; Melitz, 2007; Vaziri and Khademi, 2010; Zwinkels and Beugelsdijk, 2009). The gravity model is presented by Equation 1. The logarithm of this function has a linear form, and can be easily used to calibrate the regression model.

$$T_{ij} = \alpha \frac{M_i^{\eta} M_j^{\theta}}{D_{ij}^{\rho}} \quad (1)$$

Where T_{ij} is the trade between the two countries, M_i is a size measure of the country i, such as national income, GDP or population, D_{ij} is the distance between the two countries, others are coefficients to be calibrated. Based on the two transportation networks of air distance and multimodal for the 9 time intervals of import and export trade flows, totally 36 models were developed. As an example, Table 2 shows the results of petroleum export trade modeling, $T_{ij}EX$, by stepwise regression method for selected years based on multimodal and air distance networks.

Table 2 Petroleum Export Distribution Models for Multimodal and Air Distance Networks

Year	Network	R^2	F	Model
1965	Multimodal	0.366	36.26	$10^{5.616} \frac{GDP_i^{0.555} P_i^{0.368} 10^{0.438\mathrm{OPECi}}}{D_{ij} MM^{0.773} 10^{0.479 LL_j} 10^{1.174 LLi} P_j^{0.272} 10^{0.112\mathrm{OPECj}} 10^{0.120\mathrm{OECDi}}}$
	Air distance	0.264	36.88	$10^{5.119} \frac{GDP_i^{0.541} P_i^{0.392} 10^{0.365\mathrm{OPECi}}}{D_{ij} Air^{0.680} 10^{0.594 LL_j} 10^{1.244 LLi} P_j^{0.278} 10^{0.044\mathrm{OPECj}}}$
1970	Multimodal	0.387	50.96	$10^{6.590} \frac{GDP_i^{0.293} GDP_j^{0.648} A_i^{0.107} 10^{0.567\mathrm{OPECi}} 10^{0.054\mathrm{NOPECi}}}{D_{ij} MM^{0.853} 10^{1.358 LLi} P_i^{0.285} P_j^{0.177} A_j^{0.108} 10^{0.237\mathrm{OPECj}} 10^{0.159\mathrm{OECDi}}}$
	Air distance	0.325	62.15	$10^{5.924} \frac{GDP_i^{0.156} GDP_j^{0.647} 10^{0.568\mathrm{OPECi}}}{D_{ij} Air^{0.695} 10^{1.419 LLi} P_j^{0.191} A_j^{0.111} 10^{0.034\mathrm{NATOj}} 10^{0.187\mathrm{OPECj}}}$
1980	Multimodal	0.456	104.24	$10^{7.284} \frac{GDP_i^{0.408} GDP_j^{0.609} A_i^{0.218} P_j^{0.180} 10^{0.954\mathrm{OPECi}} 10^{0.221\mathrm{NOPECi}}}{D_{ij} MM^{1.287} 10^{1.403 LLi} A_j^{0.158} P_i^{0.518} 10^{0.124\mathrm{OPECj}} 10^{0.254\mathrm{OECDi}}}$
	Air distance	0.351	90.33	$10^{6.734} \frac{GDP_i^{0.366} GDP_j^{0.542} A_i^{0.227} P_j^{0.191} 10^{0.745\mathrm{OPECi}} 10^{0.098\mathrm{NOPECi}}}{D_{ij} Air^{1.113} 10^{1.502 LLi} 10^{0.423 LLj} A_j^{0.144} P_i^{0.504} 10^{0.843\mathrm{OPECj}} 10^{0.057\mathrm{OECDi}}}$
1985	Multimodal	0.521	221.01	$10^{6.286} \frac{GDP_j^{0.740} P_i^{0.693} 10^{1.234\mathrm{OPECi}} 10^{0.169\mathrm{NOPECi}}}{D_{ij} MM^{1.628} 10^{0.787 LLi} A_j^{0.101} 10^{0.154\mathrm{OPECj}} 10^{0.308\mathrm{OECDi}}}$
	Air distance	0.402	168.71	$10^{5.452} \frac{GDP_j^{0.664} P_i^{0.661} 10^{0.876\mathrm{OPECi}} 10^{0.112\mathrm{NOPECi}}}{D_{ij} Air^{1.362} 10^{0.979 LLi} 10^{0.422 LLj} A_j^{0.084} 10^{0.942\mathrm{OPECj}} 10^{0.076\mathrm{OECDi}}}$
2000	Multimodal	0.444	226.54	$10^{6.042} \frac{GDP_i^{0.283} GDP_j^{0.598} P_i^{0.253} P_j^{0.131} 10^{1.456\mathrm{OPECi}} 10^{0.326\mathrm{NOPECi}}}{D_{ij} MM^{1.448} 10^{0.300 LLi} A_j^{0.140} 10^{0.257\mathrm{OPECj}} 10^{0.410\mathrm{OECDi}}}$
	Air distance	0.342	224.90	$10^{5.413} \frac{GDP_i^{0.307} GDP_j^{0.610} P_i^{0.237} 10^{1.045\mathrm{OPECi}} 10^{0.198\mathrm{NOPECi}}}{D_{ij} Air^{1.317} 10^{0.262 LL_j} 10^{0.489 LLi} A_j^{0.077} 10^{0.143\mathrm{OPECj}} 10^{0.267\mathrm{OECDi}}}$

2005	Multimodal	0.424	232.30	$10^{4.256}\frac{GDP_i^{0.406}GDP_j^{0.637}P_i^{0.368}P_j^{0.173}10^{1.136\text{OPECi}}10^{0.286\text{NOPECi}}}{D_{ij}MM^{1.390}A_j^{0.151}10^{0.181LL_i}10^{0.33\text{NATOj}}10^{0.38\text{OPECj}}10^{0.328\text{OECDi}}}$
	Air distance	0.375	305.76	$10^{4.726}\frac{GDP_i^{0.464}GDP_j^{0.619}A_i^{0.078}P_i^{0.299}10^{1.205\text{OPECi}}10^{0.156\text{NOPECi}}}{D_{ij}Air^{1.698}10^{0.411LL_i}10^{0.403LL_j}10^{0.24\text{NATOj}}10^{0.54\text{OPECj}}10^{0.286\text{OECDi}}}$

In general, the 36 models fitted the data fairly well with significant t and F statistics. Table 2 shows that some of independent variables such as GDP and distance were dominant variables in petroleum modeling. This reveals that on one hand, GDP as a measure of economic size increased petroleum consumption and trade, and on the other hand, distance and transportation costs reduced trade. The D_{ij}MM and D_{ij}Air appeared in the denominators. Based on t statistics and 95% confidence level, all of the descriptive variables using multimodal distance network were significant while D_{ij}Air was marginally significant. The fact that the R^2 for multimodal network models were higher than air distance network models, suggested that multimodal network was more representative and appropriate to describe petroleum trade modeling and the outcomes were closer to observed values comparing to air distance network used in most previous studies. Other social-economic and political variables also were entered in models reflecting their role in global petroleum trade. Table 2 shows that there was a strong reverse relation between LL land-lock variable, as a dummy one, and petroleum trade. This outcome revealed that access to open sea facilitated international trade, especially petroleum trade. Some political dummy variables, such as OPEC and OECD, were also entered the models.

4. Trend Analysis

The trade sensitivity with respect to distance was determined during 1965 to 2005. As a measure of demand or supply response to changes in the exogenous variables that affect it, elasticity can be a useful tool in analysis. The elasticity, which is the ratio of the percent change in one variable to the percent change in another variable, was used for trade and distance relation appraisal. Since linear relationships between logarithms of variables results in power models such as Equation 1, the elasticity of global petroleum trade to other independent parameters would be the same as the power of variables in the model. As an example, from Equation 1, the elasticity of trade with respect to distance is (Pindyck, 1979):

$$E_{x,y}=\frac{\partial y/y}{\partial x/x}=\frac{\partial T_{ij}/T_{ij}}{\partial D_{ij}/D_{ij}}=\frac{\partial T_{ij}}{\partial D_{ij}}\times\frac{D_{ij}}{T_{ij}}=T_{ij}(-\frac{\rho}{D_{ij}})\times\frac{D_{ij}}{T_{ij}}=-\rho \qquad (2)$$

The simple linear regression modeling was applied to appraise the trend of transportation coefficient with respect to time (Kanafani, 1983). Based on estimated coefficients of D_{ij}MM, and D_{ij}Air, as some are presented in Table 2, the results are presented in Figures 1 and 2. The figures confirmed upward trends of distance coefficients for multimodal and air distance networks.

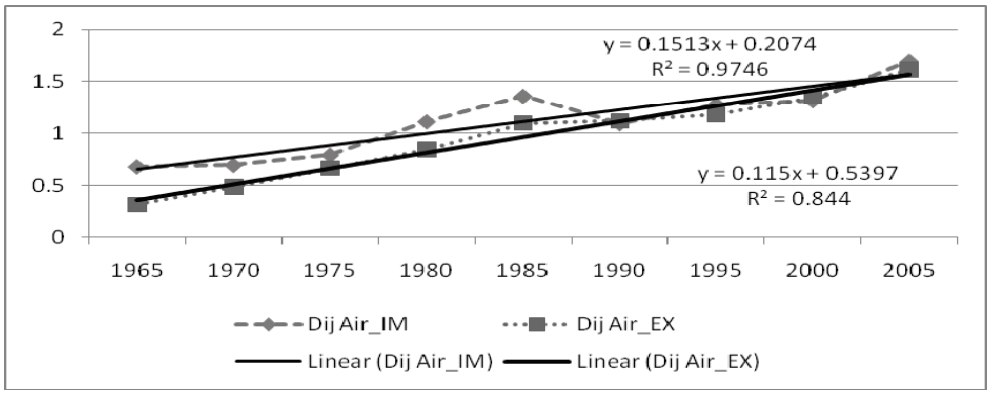

Figure 1 Trend of Distance Coefficient for Air Distance Network

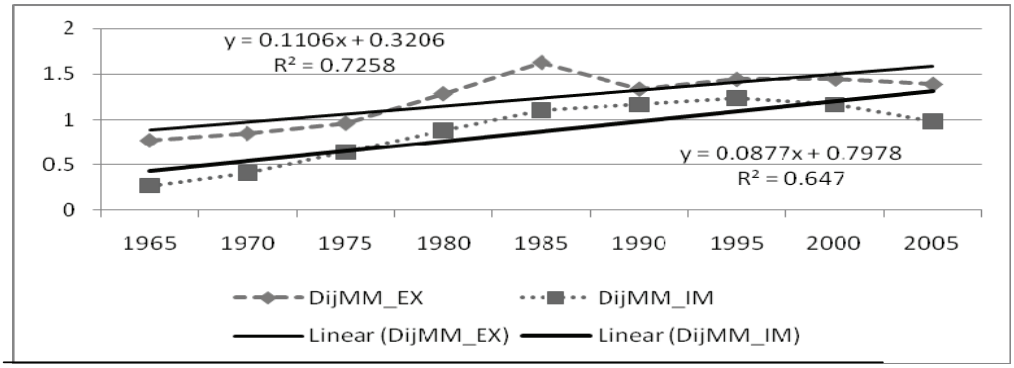

Figure 2 Trend of Distance Coefficient for Multimodal Distance Network

The results of linear modeling revealed that the relation between global petroleum trade and transportation parameters has intensified during the time. In fact, in spite of some proposed claims regarding the distance death, the upward trend of distance effect on trade values showed that this is not an accurate claim, at least in global petroleum trade. In contrast, countries tried to minimize petroleum transportation costs over time. It is expected that closer supplier of goods would be chosen rather than more distance ones, mainly because they have lower transaction costs as a result of being cheaper or easier to access.

5. Linear Programming

Utilization of optimization techniques has a long history in economy and trade analysis (Intriligator, 1971; Desouza and Foust 1979). The linear programming, LP, often has been used to compare observed distribution with optimal distribution using information regarding transportation characteristics. Using Simplex Method, in this study, the total cost function for the petroleum trade exports and imports were minimized. The total cost function for the trade exports and imports were

minimized for each of the 9 points in time during 1965 to 2005. Transportation problem as a LP model to minimize Z, total transportation cost, is presented by following relations (Vaziri and Khademi, 2010):

Minimize $Z = \sum\sum C_{ij} T_{ij}$

Subject to: $\sum T_{ij} \geq D_j$ for all j's (3)

$\sum T_{ij} \leq S_i$ for all i's

$T_{ij} \geq 0$ for all i's and j's

Where C_{ij} is the cost or distance between i's and j's, T_{ij} is the trade between i's and j's, D_j is the demand at j's and S_i is the supply at i's. Considering i's and j's as the 173 countries, optimized trade distribution was obtained by solving LP program and then optimized distribution was compared with observed distribution. Therefore, 36 LP were solved for 2 observed petroleum trade distribution of the petroleum export and import values for 2 transportation networks during the 9 time periods. Table 3 shows the result of LP model for global petroleum trade for multimodal and air distance network. Improvement percentage is the difference of observed and optimized total costs divided by observed total costs. Possible improvements for the multimodal network distributions were found in the range of 13% to 31%.

Table 3 Trade Distribution Linear Programming Results

Multimodal Network						
Year	Import			Export		
	Observed Z	Optimized Z	Improvement percentage	Observed Z	Optimized Z	Improvement percentage
1965	1.423E+08	1.216E+08	14.56%	6.205E+07	5.024E+07	19.04%
1970	2.231E+08	1.798E+08	19.42%	1.031E+08	8.512E+07	17.46%
1975	1.418E+09	1.230E+09	13.27%	8.428E+08	6.837E+08	18.87%
1980	3.439E+09	2.806E+09	18.41%	2.372E+09	1.976E+09	16.70%
1985	2.259E+09	1.679E+09	22.67%	1.010E+09	7.049E+08	30.20%
1990	2.451E+09	1.924E+09	21.50%	1.055E+09	7.585E+08	28.13%
1995	2.231E+09	1.737E+09	22.12%	1.145E+09	8.768E+08	23.41%
2000	4.254E+09	3.335E+09	21.61%	3.037E+09	2.277E+09	25.01%
2005	8.672E+09	6.656E+09	23.25%	6.281E+09	4.359E+09	30.59%
Air Distance Network						
Year	Import			Export		
	Observed Z	Optimized Z	Improvement percentage	Observed Z	Optimized Z	Improvement percentage
1965	6.691E+07	4.923E+07	26.42%	3.929E+07	2.844E+07	27.61%
1970	1.090E+08	7.139E+07	34.48%	4.816E+07	3.221E+07	33.11%
1975	7.356E+08	5.822E+08	20.86%	4.843E+08	3.700E+08	23.61%
1980	1.954E+09	1.520E+09	22.19%	1.445E+09	1.093E+09	24.37%
1985	1.237E+09	8.338E+08	32.60%	5.499E+08	3.074E+08	44.10%
1990	1.380E+09	1.036E+09	24.98%	6.249E+08	3.887E+08	37.80%
1995	1.250E+09	9.449E+08	24.42%	6.313E+08	4.295E+08	31.96%
2000	2.353E+09	1.835E+09	22.04%	1.683E+09	1.230E+09	26.88%
2005	4.864E+09	3.763E+09	22.65%	3.439E+09	2.484E+09	27.77%

Linear approximation model was also used to study the improvement percentage trend. Figures 3 and 4 show the improvement percentage trends for import and export values.

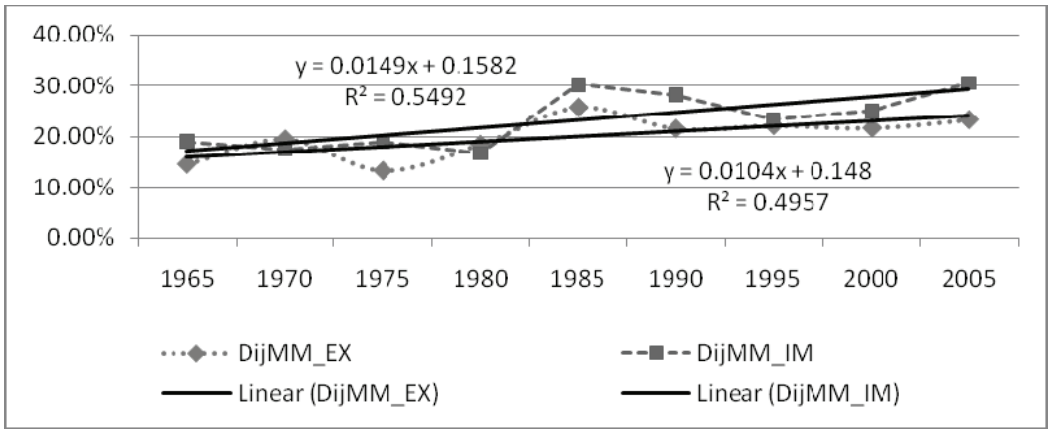

Figure 3 Improvement Percentage Trends for Multimodal Transportation Network

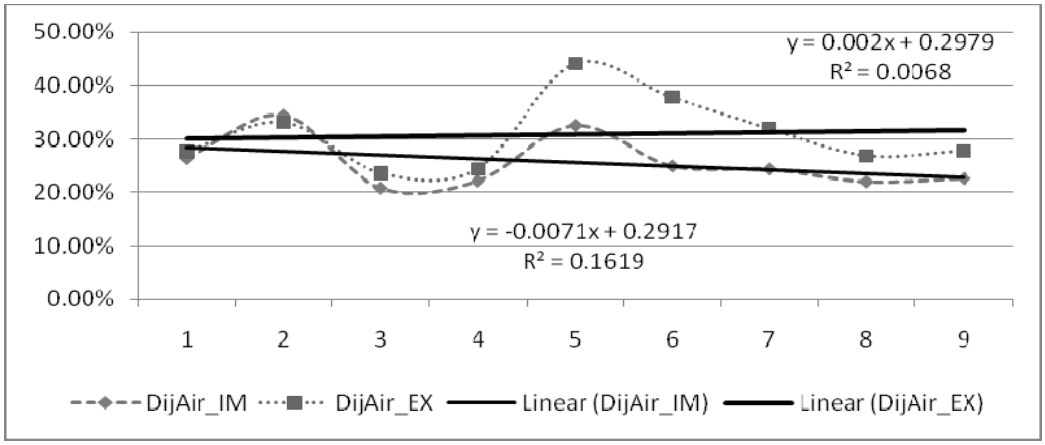

Figure 4 Improvement Percentage Trends for Air Distance Network

The models revealed that the coefficients of time variable were positive for linear assumption. The difference percentage for petroleum distributions increased during time periods and did not often follow optimal distributions. Nevertheless, the figures further suggested the possibility of nonlinear trend.

6. Conclusion

Using cross-sectional analyses, trends of international petroleum trade were studied. The study covered 173 countries, over the period of 1965-2005. To model trade distribution, gravity and linear programming were deployed. The models' descriptive variables included distance, GDP, political and land-lock variables.

A multimodal transportation network and an air distance network were developed and used as the most important factors in the gravity model. The other contributing factors included in this model were: GDP, population, area, country political attributes and land-lock variables. Thus, the major contributions of this paper are: 1) the development of a multimodal transportation network in commodity trade modeling and 2) and the development of a new gravity model based on four variable categories: commodity, geographical, economic and political characteristics. GDP, political factors, population and distance were all shown to be significant variables in this model. However, the developed calibrated gravity model based on the integrated sea-land network was shown to be more statistically significant and representative than the traditional gravity model based on the air distance alone. In addition, modeling results revealed a robust negative relationship between the distance separating trade partners and the bilateral trade values which indicated that the geographic distance was still an important predominant factor in the international petroleum trade. The findings from the sensitivity analysis highlighted that the developed multimodal transportation network played an important role in explaining global petroleum trade and its effect was increasing over time. This effect was expected to be even more significant in the near future with the introduction of large ship size.

The LP modeling determined optimized petroleum trades and the results were compared with the observed global distributions. Comparison revealed that up to 30% of total transportation cost in multimodal network could have been reduced if the observed trades were replaced by the optimized distributions. Percentage possible improvements in multimodal transportation network often increased during time, indicating that observed oil distribution did not always follow the optimal one. That could have been attributed to the political and other variables that were not directly considered in the LP. Future strategies and business decision makings of petroleum trade partners are suggested to more directly incorporate distance and transportation aspects by utilizing the study methodology and results.

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An Investigation of Individual Attitudes toward the Implementation of Corporate Social Responsibility Projects In Thai Firms

by

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Abstract

Corporate Social Responsibility (CSR) has been increasingly adopted as part of Thai firms' strategies. This research aims to study individual attitudes towards the implementation of CSR projects in Thai firms in four different areas, which are; economic responsibility, legal responsibility, ethical responsibility, and philanthropic responsibility. This research uses the Structure Equation Model technique as the chosen method of data analysis. The researcher collected 440 samples of primary data through questionnaires asking about areas of Corporate Social Responsibility in relation to each individual's attitude. The results show that all areas of CSR give significant value to consumer's attitudes, which implies that Thai individuals place more emphasis on the areas of economic and legal responsibilities. It also suggests that the Thai individual also gives priority towards the areas of ethical and philanthropic responsibility but in a very minimal manner. This research is expected to provide an understanding of consumer attitudes to support the strategy and activity formulation for CSR projects in Thai firms that would like to pursue CSR programs. It is applicable not only to new firms but also for existing firms.

Keywords: Corporate Social Responsibility, Consumer Attitude, CSR Implementation

1. Introduction

In various countries around the world, several firms have adopted Corporate Social Responsibility as part of the strategic direction of their company to create a competitive advantage and differentiation for long term sustainable development rather than the traditional way of just maximizing their profits. While making profit is still one of the primary objectives of every firm, it is found that Corporate Social Responsibility is being used by more and more firms as an attribute that connects their actions and activities with their consumers in several ways. Therefore, many firms are looking into contributing to the well being of society through Corporate Social Responsibility. However, sharing concepts with all stakeholders is not a new concept, and many

researches, conferences, publications, books and management practices are continuously being introduced and developed on the topic or in the area of Corporate Social Responsibility. The author can also see through researches in which many consumers have given more attention and importance to the issues that matter or are related to their community and society through past studies that have researched consumer behavior in relation to different areas of Corporate Social Responsibility in various contexts.

The Pyramid of Corporate Social Responsibility has been used as a conceptual model for various studies that have examined the effect and relationship of awareness to the attitude and consumer behavior in the economic, legal, ethical, and philanthropic areas of Corporate Social Responsibility. It is also interesting to see what sort of attitude is being perceived by individual consumers via Corporate Social Responsibility activities. (Carroll, 1991)

Most of the studies have been conducted in a Western context with only a few in Asian contexts. The substantial differences of these two contexts are found in the different perceptions and attitudes of the consumers. This paper is an extension of previous studies that have investigated the awareness and relationship of corporate social responsibility to attitude and consumer behavior in different contexts. While there are various studies on consumer attitudes and consumer behavior that respond to Corporate Social Responsibility in many contexts, it is also important for this study to carry out in its research in a Thai context as no-one has studied Thai consumer attitudes and their value in the Corporate Social Responsibility area. This study is expected to help Thai firms to understand the direction and consumer attitudes toward Corporate Social Responsibility needed by Thai consumers in order for the firms to match their recourse and allocate their budget in the appropriate Corporate Social Responsibility program.

The Objectives of the Research

The two main objectives of this research are firstly to examine individual consumers' attitudes to the relationship aspect of the Corporate Social Responsibility activities of the firms. Secondly, this research also aims to examine the Corporate Social Responsibility areas that would affect consumer behavior.

Scope of the Study

This study examines the attitude of the individual Thai consumer toward Corporate Social Responsibility areas. This study emphasizes research of the consumer outlook. This is because the source of a firm's strategy or activity should have linkage or connection with the perspective or attitude of the consumer.
To summarize, the scope of this study has been limited to the attitude and perception of individual consumers toward Corporate Social Responsibility.

2. Review of Literature

Stakeholder Theory

Stakeholders in this case consist of owners, financiers, activist groups, suppliers, customers, employers, trade unions, competitors, authorities and political groups. To develop a successful business, the firms need to understand, identify and create a linkage between the relationships of the

most important stakeholders to come up with an objective and plan that form an engaging association with such stakeholders. (Ditlev-Simonsen & Midttun, 2010)

In this study, the most important stakeholder is the individual consumer. It is vital for firms to maximize consumer response to the Corporate Social Responsibility program that the firms want to carry out. In particular, the firms need to know which type or categories of Corporate Social Responsibility activities get the most attention from their consumers. Managers need to understand the linkage between what the firm offers and the consumers' attitude in order to optimize the utilization of their Corporate Social Responsibility program. (Pirsch, Gupta, & Grau, 2007)

Concept on Corporate Social Responsibility

Corporate Social Responsibility has become the strategy that firms around the world have adopted and used to sustain their core value and competitiveness in the market. There are many differing viewpoints of what the exact meaning of Corporate Social Responsibility actually is. Various organizations have contrasting interpretations and implement their programs differently to sustain their value and performance in society. The term 'Corporate Social Responsibility' is, in fact, a very broad idea. It is interesting to see that researchers in the global context have given various definitions of what it actually means for a company to be Socially Responsible.

In terms of the concepts and techniques for crafting and executing strategy, the core concept of Corporate Social Responsibility has been defined as "the notion of Social Responsibility as it applies to businesses concerns a company's duty to operate in an honorable manner, providing good working conditions for employees, be a good steward of the environment and actively work to better the quality of life in the local communities where it operates and in society at large". (Thompson Jr., Strickland III, & Gamble, 2010). In a parallel view, Peter Dober (2009) defines Corporate Social Responsibility, as "the commitment of business to contribute to sustainable economic development, working with employees, their families, the local community and society at large to improve their quality of life". It is also referred to by Research in the United Kingdom, which defines Corporate Social Responsibility as "the obligations of the firm to society or, more specifically, the firm's stakeholders—those affected by corporate policies and practices." (Smith, 2003) All the researchers have given different meaning although with a degree similarity in each of them. In this paper, Corporate Social Responsibility would mean the obligation of a firm in creating trust and respect through its direction and action to benefit all stakeholders.

Exploring further from the extensive definitions discussed previously, it is interesting to see the coverage of Corporate Social Responsibility usage as it will be vital for firms to understand which type of corporate social responsibility they should consider in their strategy. Many literary works have referred to the coverage or platform of Corporate Social Responsibility by using the Pyramid of Corporate Social Responsibility model introduced by Archie B. Carroll. This model has described Corporate Social Responsibility in four different levels, which are economic, legal, ethical, and philanthropic. Each of the four types of Corporate Social Responsibility has its own area and scope but, ultimately, a firm should engage all types of Corporate Social Responsibility to become legitimately Socially Responsible. (Carroll, 1991) It has been identified from this Pyramid of Corporate Social Responsibility that the most important type of Corporate Social Responsibility is economic responsibility because for a firm to be able to be responsible in all of the other three Corporate Social Responsibility areas, they need good profits. However, not everyone agrees with the Pyramid of Corporate Social Responsibility. An American economist, Milton Friedman, argues that it is not a firm's responsibility to be Socially Responsible or Philanthropically Responsible, and the only objective of the firm is to maximize its profits to satisfy only the stakeholders that are

stockholders or owners of the company by following the law with minimum ethics. Philanthropic Responsibility should be the responsibility of nonprofit organizations or governments. (McDaniel, Lamb Jr., & Hair Jr., 2007) One study on Corporate Social Responsibility showed a contrast in the ranking of the consumer behavior of Americans, French, and Germans toward Corporate Social Responsibility. This study by Maignan and Ferrell (2003) showed that Americans give the most importance to Legal Responsibility followed by Economic Responsibility, Ethical Responsibility and Philanthropic Responsibility respectively. The French also show differences in their ranking with Legal Responsibility first, followed by Ethical Responsibility, Economic Responsibility, and Philanthropic Responsibility respectively, while Germans show that they prioritize the most to least important as Ethical Responsibility, Legal Responsibility, Economic Responsibility and Philanthropic Responsibility. Consumers in Malaysia also have different perspectives of the prioritization of Corporate Social Responsibility types as they give Economic Responsibility as their first priority followed by Philanthropic Responsibility, Ethical Responsibility, and Legal Responsibility. (Rahim, Jalaludin, & Tajuddin, 2010) Still different results are shown by consumers in India, where Ethical Responsibility is given as the most important type of Corporate Social Responsibility followed by Legal Responsibility, Philanthropic Responsibility, and finally Economic Responsibility. (Planken, Sahu, & Nikerson, 2010)

From previous studies, it is shown that the results are not parallel to the concept of the Pyramid of Corporate Social Responsibility. However, all contexts did show some parallel aspects of positive relationships between Consumer Attitudes towards all the various dimensions of Corporate Social Responsibility. The differences are that various contexts have different interpretations and attributes of Corporate Social Responsibility to their stakeholders. This paper aims to study the parallel relationships between all Corporate Social Responsibility dimensions and Consumer Attitude, and to determine whether the findings concur with the concept of the Pyramid of Corporate Social Responsibility and the interpretation of consumers in the Thai context.

3. Variables

In this research, the author studies four areas of Corporate Social Responsibility affecting consumer attitude on corporate social responsibility as discussed below:

Consumer Attitude

Consumer Attitude in this study means the assessment of an individual's favorable or unfavorable emotion, belief, and action tendencies toward the object or idea. This paper discusses the idea in the context of Corporate Social Responsibility. Consumer Attitude also refers to the state of mind, such as liking or disliking, and moving toward or away from Corporate Social Responsibility. A firm's strategy or action should be to move toward the existing attitude of their consumer. (Kotler & Keller, 2009)

Economic Responsibility

Carroll (1991) defined Economic Responsibility as the expectation on the corporation to maximize the earnings per share. Economic Responsibility requires that businesses be profitable and produce goods and services which are desirable in society. Controlling employees' productivity or monitoring customer complaints are examples of activities signifying Economic Responsibility.

Legal Responsibility

Legal Responsibility refers to the obligation of obeying laws and regulations. Businesses also have to follow the rules of behavior considered appropriate by society. Legal Responsibilities correspond to society's expectations to see businesses meet their economic duties within the framework of the law. (Maignan & Ferrell, 2003)

Ethical Responsibility

Ethical Responsibility is the responsibility of doing what is expected morally and ethically. Ethical Responsibilities require that businesses follow the modes of conduct considered as morally right. Ethical Responsibility covers several areas such as consumer, employee, environment, local community, and business community. (Brunk, 2010)

Philanthropic Responsibility

Philanthropic Responsibilities reflect the society's expectations of the charitable initiatives of a corporation to get actively involved in the betterment of society beyond the three basic responsibilities, which are economic, legal, and ethical responsibilities. Work-family programs, corporate volunteerism, and donations to cultural organizations are examples of philanthropic initiatives. (Maignan & Ferrell, 2003)

Based on these four components, a socially responsible firm should strive to make a profit, obey the law, be ethical, and be a good corporate citizen

4. Conceptual Framework

The following framework is the result of a review of available literature.

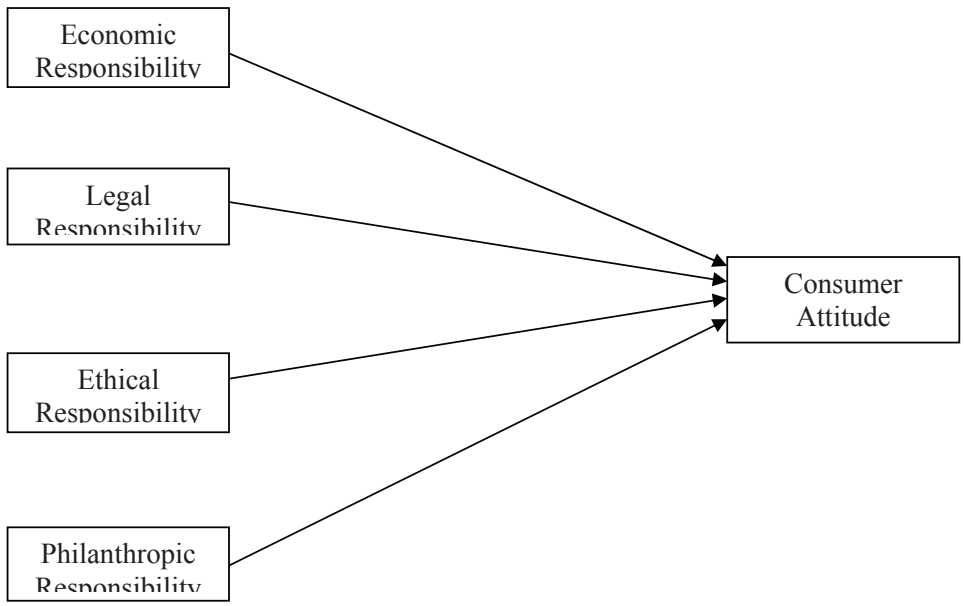

Figure 1 Proposed Conceptual Framework

Research Hypothesis

According to the above framework, the author proposes the research hypotheses as follow:

H1: The economic dimension has a positive relationship with Consumer Attitude
H2: The legal dimension has a positive relationship with Consumer Attitude
H3: The ethical dimension has a positive relationship with Consumer Attitude
H4: The philanthropic dimension has a positive relationship with Consumer Attitude

Data Collection

Self-administered questionnaires were used to ask a wide variety of questions that could be answered anonymously if so desired. The questionnaires all consisted of basically the same questions, and respondents were allowed enough time to consider their answers carefully. The researcher's data collection teams were sent to different areas in Bangkok and randomly asked potential individuals to participate in the survey. The researcher would read out the questions and write down the participant's answer to maintain the quality of the questionnaire. A total of 440 sets of the questionnaire were collected.

Method of Data Analysis

This study aims to use descriptive statistics and the structure equation model (SEM).

5. Results and Analysis

Descriptive Statistics

Table 1 Gender of the Respondents

Gender	Frequency	Valid Percent %
Male	219	49.8
Female	221	50.2
Total	440	100.0

Of the total of 440 respondents, 219 male respondents and 221 female respondents were used in this study.

Table 2 Age range of the Respondents

Age range	Frequency	Valid Percent %
20-30	181	41.1
31-40	158	35.9
41-50	55	12.5
51-60	28	6.4
more than 60	18	4.1
Total	440	100.0

In this study, a total of 181 respondents fell in the age range of 20 to 30 years old, which accounted for around 41.1% of the total respondents. Moreover, 158 respondents were in the age range of 31 to 40 years old, which constituted around 35.9% of the total respondents. Therefore, with a total proportion of around 77%, the majority of the respondents were in the age range of between 20 and 40 years old. As a result, the study showed how Corporate Social Responsibility related to consumer attitude of people aged between 20 and 40 years old.

Table 3 Education level of Respondents

Education	Frequency	Valid Percent
High School	1	0.2
Bachelor Degree	329	74.8
Master Degree	104	23.6
Doctorate Degree	4	0.9
Others	2	0.5
Total	440	100.0

74.8% of the respondents had an education level of bachelor degree, followed by 23.6% with a master degree. Therefore, at around 98.4%, the majority of the respondents had an education background of bachelor or master degree.

Table 4 Occupation of the Respondents

Occupation	Frequency	Valid Percent
Business Owner	67	15.2
Private Company Employee	269	61.1
Government Sector Employee	80	18.2
Others	24	5.5
Total	440	100.0

The majority of the respondents were private company employees, which was about 61.1% of the total respondents or 269 from 440 respondents. Also, 18.2% or 80 respondents, and 15.2% or 67 respondents were Government sector employees and business owners respectively. The other 5.5% or 24 respondents had various other occupation statuses.

Table 5 Income level of the Respondents

Income level	Frequency	Valid Percent
Below 10,000 Baht	35	8.0
10,000 - 20,000 Baht	181	41.1
20,001 - 30,000 Baht	99	22.5
30,001 - 40,000 Baht	53	12.0
40,001 - 50,000 Baht	27	6.2
50,001 - 60,000 Baht	16	3.6
More than 60,001 Baht	29	6.6
Total	440	100.0

41.1% or 181 respondents had an income of 10,000 to 20,000 baht, 22.50% or 99 respondents had an income level of 20,001 to 30,000 baht, and 12% or 53 respondents had an income level of 30,001 to 40,000 baht. Therefore, the majority of the respondents had an income level ranging from 10,000 to 40,000 baht, with 75.6% of the total respondents in this category.

Reliability Analysis

A reliability analysis using Cronbrach's alpha was performed to measure the quality and consistency of the constructs. In this study, there are five constructs which are Consumer Attitude, Economic Responsibility, Legal Responsibility, Ethical Responsibility, and Philanthropic Responsibility. The criterion for Cronbrach's alpha is 0.7. All constructs have Cronbrach's alpha scores of more than 0.7, with the highest alpha being Ethical Responsibility at 0.967 and the lowest alpha being Economic Responsibility at 0.737. This results show that all constructs for this study are reliable and within the acceptable criterion of quality and consistency.

Table 6 Constructs and Reliability Analysis

Constructs	Cronbrach's alpha
Consumer Attitude (CA1-CA5) 5 items	0.863
Economic Responsibility (ER1-ER3) 3 items	0.737
Legal Responsibility (LR1-LR5) 5 items	0.931
Ethical Responsibility (ETR1-ETR7) 7 items	0.967
Philanthropic responsibility (PR1-PR6) 6 items	0.963

Model Development

Convergent Validity and Discriminant Validity is carried out to test the data. Only constructs that have a high factor loading of 0.6 and above are selected, while others are eliminated from formulating the model.

Convergent Validity

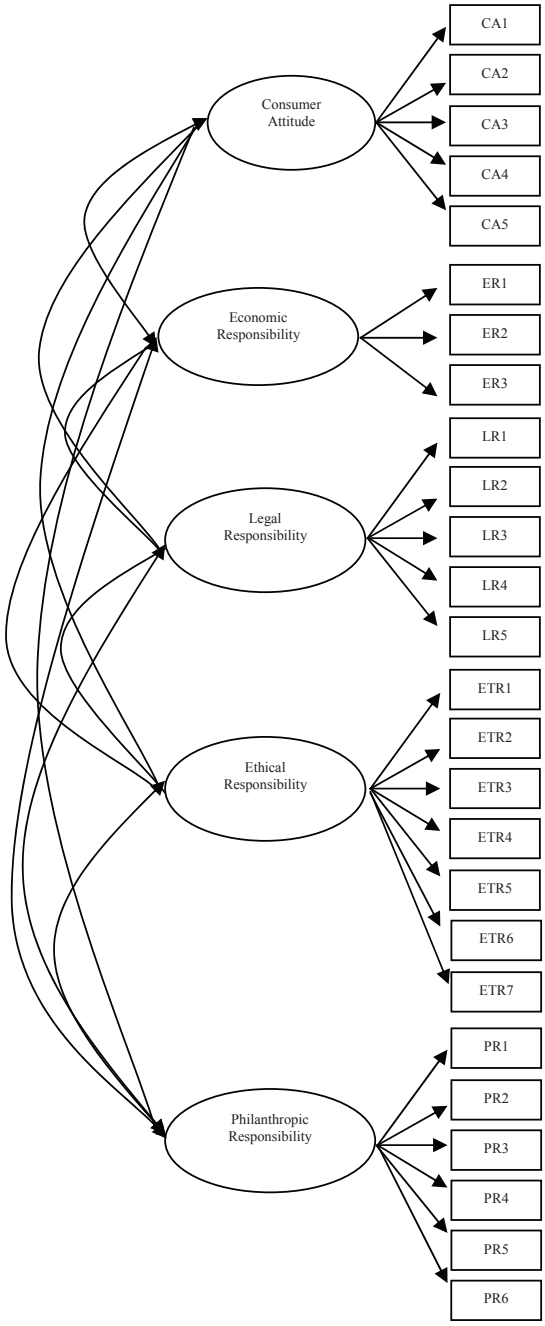

Figure 2 Convergent Validity

Table 7 Construct Measurement

Factor	Standardized Loading [a]
Consumer Attitude (F1)	
CA1	0.681 [b]
CA2	a0.706 (10.900)
CA3	0.745(11.402)
CA4	0.793(11.979)
CA5	0.746(11.416)
Economic Responsibility (F2)	
ER1	0.791
ER2	0.665(9.405)
ER3	0.648(9.272)
Legal Responsibility (F3)	
LR1	0.877
LR2	0.882(21.784)
LR3	0.895(22.448)
LR4	0.829(19.378)
LR5	0.788(17.69)
Ethical Responsibility (F4)	
ETR1	0.862
ETR2	0.895(22.594)
ETR3	0.938(25.026)
ETR4	0.918(23.817)
ETR5	0.932(24.680)
ETR6	0.92(23.953)
ETR7	0.847(20.232)
Philanthropic responsibility (F5)	
PR1	0.879
PR2	0.915(24.719)
PR3	0.911(24.477)
PR4	0.909(24.340)
PR5	0.939(26.316)
PR6	0.857(21.393)

Notes: [a] t-values from the unstandardized solution are in parentheses, [b] fixed parameter

Table 8 The Goodness of Fit for Convergent Validity

Items	Fit Indices	Criteria
Normal Fit Index (NFI)	0.944	>0.90
Non-Normed Fit Index (NNFI)	0.950	>0.90
Comparative Fit Index (CFI)	0.954	>0.90

The studies of Anderson & Gerbing (1988), Sabherwal &Becerra (2003), and Fornell & Larcker (1981) stated that Convergent Validity is valid when the result of the variance extracted value is more than 0.5. Factor loading in table 4.8 demonstrates a variance extracted value for all constructs greater than 0.6, which is more than 0.5. Therefore, Convergent Validity is achieved. Convergent Validity was tested to determine whether the goodness of fit of the model was met with

the criteria of fit indices. According to table 4.9, the result of all fit indices of NFI, NNFI, and CFI more than fit the criteria of 0.9. Therefore, a good fit for convergent validity of this model is valid.

Discriminant Analysis

Table 9 Pairwise Analysis of Discriminant Validity

Construct	Construct	x^2 fixed	x^2 free	x^2 difference [d.f.=1]
Consumer Attitude	Ethical Responsibility	81.012	85.155	4.143
Consumer Attitude	Legal Responsibility	274.924	227.251	47.673
Consumer Attitude	Ethical Responsibility	249.144	244.334	4.810
Consumer Attitude	Philanthropic responsibility	164.670	170.482	5.812
Economic Responsibility	Legal Responsibility	77.859	82.236	4.377
Economic Responsibility	Ethical Responsibility	195.723	183.651	12.072
Economic Responsibility	Philanthropic responsibility	121.098	115.830	5.268
Legal Responsibility	Ethical Responsibility	311.758	324.346	12.588
Legal Responsibility	Philanthropic responsibility	161.595	153.418	8.177
Ethical Responsibility	Philanthropic responsibility	279.270	240.771	38.499

According to the pairwise analysis table, the results show that the differences of constructs between fixed and free chi-square were all higher than 3.841 as a minimum criteria mentioned in the studies of Forrel & Larchker (1981) and Sin, Tse, & Yim (2005) and, therefore, achieves the condition of Dricriminant Validity. The research will continue to discuss the results of testing for the structural model and further investigate the research hypotheses.

Model Assessment

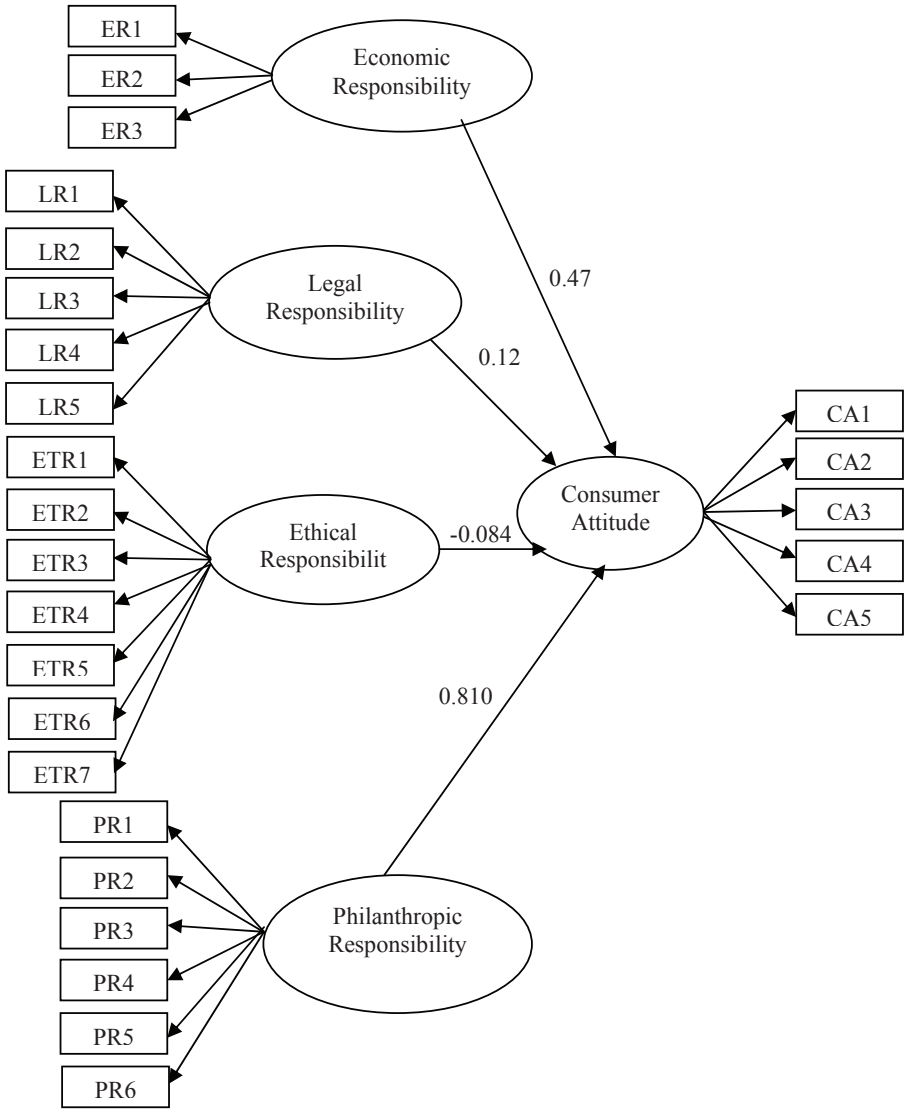

Figure 3 Proposed Model for SEM Testing

Table 10 The Results of the Proposed Model

Items	Fit Indices	Criteria
Normal Fit Index (NFI)	0.940	>0.90
Non-Normed Fit Index (NNFI)	0.948	>0.90
Comparative Fit Index (CFI)	0.953	>0.90

According to table 10, the result of all fit indices of NFI, NNFI, and CFI for model assessment are more than the criteria of 0.9. Therefore, a good fit for of this model is valid.

Parameter Estimates of Proposed Model

Table 11 The Relation of Parameters and Parameter Estimates of Proposed Model

The Relation of Parameters	Standardized Estimates
Economic Responsibility→Consumer Attitude	.474 * (7.072)
Legal Responsibility→Consumer Attitude	.126 * (3.437)
Ethic Responsibility→Consumer Attitude	-.084 * (-2.513)
Philanthropic Responsibility→Consumer Attitude	.081 * (2.124)

All relationships in the hypotheses from this research have been measured and the results show that all the relations of parameters have statistical significance. This study attempted to find factors affecting consumer attitude toward Corporate Social Responsibility. The results show that the Economic Responsibility factor scored a parameter estimate of .474 and t-value of 7.072. The results also indicate Economic Responsibility has the most influence on consumer attitudes. Legal Responsibility and Philanthropic Responsibility are also given a significant parameter estimate result at .126 and .081 and t-value of 3.437 and 2.124 respectively. Ethic Responsibility also shows significant parameter estimates at -.0840, while the t-value is -2.513. The findings give an interesting indication that supported this research's hypothesis 1, hypothesis 2, and hypothesis 4 as Economic Responsibility, Legal Responsibility, and Philanthropic Responsibility show positive relationships toward consumer attitudes. However, while Ethical Responsibility did show a relationship with Consumer Attitude, it has a negative impact. Therefore, hypothesis 3 was not supported.

6. Discussion

The proposed model in this study consisted of a latent construct, which is Consumer Attitude, and observed constructs, which are the four dimensions of Corporate Social Responsibility, including Economic Responsibility, Legal Responsibility, Ethical Responsibility, and Philanthropic Responsibility. Each line from the observed constructs to the latent construct represents the study's hypotheses. It was found that relationships hypothesized from the conceptual framework and proposed model were all significant as shown in the results and analysis of this study. The results of this study show that the relationships between Consumer Attitude and the three Corporate Social Responsibility dimensions of Economic Responsibility, Legal Responsibility, and Philanthropic Responsibility have a positive relationship, which corresponds to the studies of Carroll (1991), Maignan and Ferrel (2003), McDaniel, Lamb, Hair (2007), Planken, Sahu, Nickerson (2010) as all the studies from these authors discussed the influential factors of each dimension of Corporate Social Responsibility to Consumer Behavior or Consumer Attitude. The only difference of this research was that it was not in line with any of the studies mentioned earlier in terms of Ethical Responsibility. However, it concurred with the findings of the Katja H. Brunk (2010) which discussed that Consumer Attitude could have a negative relationship with Ethical Responsibility.

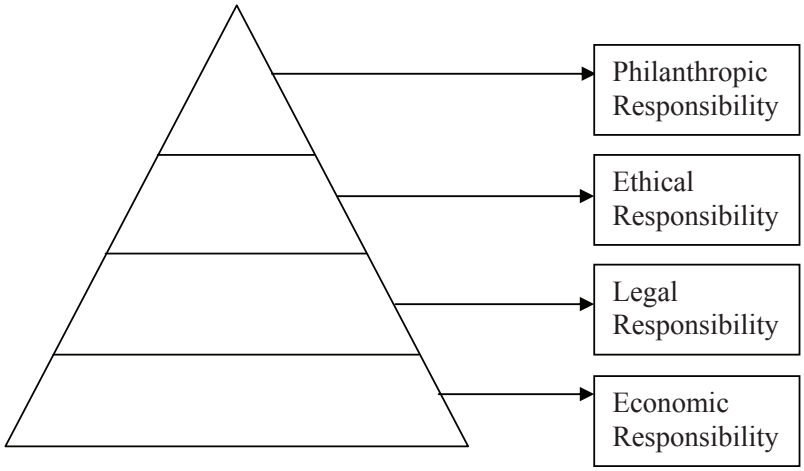

Figure 4 Pyramid of Corporate Social Responsibility (Carroll, 1991)

The result of this study also demonstrated that out of the four dimensions of Corporate Social Responsibility, Economic Responsibility affected or influenced Thai consumers' attitudes the most followed by the rest of the dimensions. There are several findings that the author felt were important to discuss. First, these findings seem to confirm the concept of the Pyramid of Corporate Social Responsibility, which states that the fundamentals of business are to do well in the economic aspect first before looking into other dimensions of Corporate Social Responsibility. It could mean that Thai consumers expected firms first and foremost to be a good business that served the market and their customers well with their products and services. Firms also need to maximize the productivity of their employees as firms need to have a long-term success plan to ensure that they continue to maximize profit. After Economic Responsibility, Legal Responsibility is also another important aspect of Corporate Social Responsibility that has great influence. It seems that apart from profitability, Thai consumers also expected firms to comply with the law and regulations in their business operations. Therefore, it is important to Thai consumers that firms should concentrate on their performance and profitability without breaking the law and regulations. Consumer attitude indicated that this point affected the consumer decision when choosing to purchase products and services.

The second point that needs to be discussed is the Ethical and Philanthropic aspect of Corporate Social Responsibility. From the results, both Ethical and Philanthropic responsibilities were important. However, both of them affected consumer attitudes in a very minimal attribute. It is very interesting to see that Ethical Responsibility had a negative relationship with consumer attitudes. Research by (Singhapakdi, Salyachivin, Virakul, & Veerayangkur, 2000) studying Ethical decision making indicated that the Ethical perception of Thai managers was influenced by relativism from the culture of the firms. The implication was that the action of the manager reflected the direction of the firms. Therefore, firms' actions could be considered as unethical in the view of consumers, even though they may be the company practice that all managers have followed. Therefore, in the perception of the manager, the actions are ethical, although this ethical perception might not match with the consumers' perception. Therefore, Thai consumers might not concur in their ideal perspectives with firms when the firm indicated that their actions or operations were ethical. Thus, it could lead to negative attitudes from consumers. For Philanthropic Responsibility, even though it is important and it affects consumer attitudes, the effect was very minimal and it could be that consumers believed firms in Thailand should concentrate more on Economic Responsibility and Legal Responsibility, while the Philanthropic Responsibility aspect of Corporate Social

Responsibility should be the responsibility of non-profit organizations or governments. It was clearly seen that Thai consumers give more importance to Economic Responsibility and Legal Responsibility than Ethical Responsibility and Philanthropic Responsibility.

Corporate Social Responsibility for Thailand, it has been widely discussed especially during the past 2-3 years. It cannot be denied that the image of the society contribution in all level of Corporate Social Responsibility is often to Focus on large companies such as those companies in Petrochemical industry and Construction & Building material industry that has budget allocation for Corporate Social Responsibility. Several examples could be seen in Thailand of firm that matches with this research estimate parameter which is firm A.

Firm A's principal businesses are the production and sale of alcoholic and non-alcoholic beverages and other by-products as well as any other related businesses through its subsidiary and associated companies. Firm A acts as the center for management, support and overseeing the overall operation of the Company. In the economic responsibility, they have provided their products throughout the country and been having a well response from the consumer. In legal responsibility, their policy is committed to Corporate Social Responsibility to conduct the business in compliance with all laws and regulations applied to firm A. Firm A is actively contributed back to the society in the philanthropic responsibility in building its corporate image through its TVC and campaign. However, in ethical responsibility, due to its products are in alcoholic beverage which in Thailand as a Buddhist country it is considered as unethical.

7. Conclusion

The two objectives have been studied throughout this research and the results have substantially demonstrated that first, all the dimensions of Corporate Social Responsibility, which are Economic Responsibility, Legal Responsibility, Ethical Responsibility and Philanthropic Responsibility, have shown significant relationships with the individual consumer's attitude as per the finding through the parameter estimates of the proposed model. Moreover, this study also found that Carrol (1991)'s Pyramid of Corporate Social Responsibility model could be applied to the Thai Context as the results in our model showed that Economic Responsibility (.474) is the most important factor that affects individual Thai consumers' attitudes, and this was followed by Legal Responsibility (.126), Ethical Responsibility (-.084) and finally Philanthropic Responsibility (.081). As a result, the study and all discussions were able to conclude that the two objectives of this study were successfully achieved with satisfaction.

8. Research Contributions, Limitations and Directions for Further Research

This research has provided comprehensive contribution in both theoretical and practical aspects. This research gave a better understanding to the concept of Corporate Social Responsibility as well as expanding on the existing literature on Corporate Social Responsibility in terms of the relations of consumer attitudes to the different aspects of Corporate Social Responsibility as a theoretical contribution. As for the practical contribution, the results from this study give substantial consideration to factors of Corporate Social Responsibility that affect consumer attitudes, and this could become an initial guidance for firms in strategizing their activity formulation for Corporate Social Responsibility initiatives, which would result in budgets and resources being utilized in a more efficient and effective way.

Many benefits and contributions have been discussed throughout this paper. However, there were also limitations with this research as it did not give an insight into any specific industry. Generalization was applied to this research and hence the findings from this study could not be applied to all industries. Moreover, the data of this research can only be considered representative at the time of the data being collected.

Attributable to the limitations of this study, further industry-specific research is recommended for future studies because consumers in different industries could have difference interpretations of Corporate Social Responsibility and hence the results of further studies could offer substantial explanations and benefits to firms in specific industries. Moreover, extensive research relating to Corporate Social Responsibility focusing on in-depth consumer behaviors, such as customer loyalty, purchase intent, and value creation is highly recommended.

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Existence of a Unique Equilibrium in Uniform-Price Auctions with Strategic Rationing

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Abstract

Uniform price auctions admit a continuum of collusive seeming equilibria due to bidders' market power. In this paper, this study modifies the auction rules in allowing the seller to ration strategic bidders. It is showed that all of these "bad" equilibria disappear when strategic bidders do not know the seller's rationing strategy. More precisely, the unique equilibrium price is the highest that the seller could get.

Keywords: Uniform price Auctions, Financial Auctions, Rationing.

1. Introduction

Uniform price auctions are often criticized because they give rise to underpricing equilibria due to bidders' market power. This paper analyzes the existence of such equilibria when the seller is allowed to ration the quantity awarded to bidders after having observed the bids. I find that, when the degree of rationing is uncertain enough, this strategy induces bidders to bid more aggressively in mitigating their market power. The main insight of this result is that rationing prevent bidders to manipulate uniform price auctions.

This auction format is commonly used in financial and electricity markets to sell a divisible good. Following Milton Friedman's advice, the US Department of the Treasury has even moved from a discriminatory to a uniform price auction to sell government bonds. UK treasury also sells index-linked bonds using a uniform price auction. Uniform price auctions are also used in California to buy electricity in the power exchange. They are said to be superior to discriminatory auctions to allocate sulfur dioxide emissions permits. More recently, Open IPO, a new, web-based, underwriter proposes to sell shares, using a uniform price auction.

The extensive use of this auction format is due to leading economists and policy makers who have asserted that uniform price auctions were the most efficient multi unit auction format. Their conclusions are based on the single unit auctions literature. They have generalized the single unit auctions literature to multi unit auctions. However, as Ausubel and Cramton (1998a) and Ausubel and Cramton (1998b) show, the uniform price auction is not the generalization of the second price auction

to multi unit auctions. Consequently, truthful bidding is not the optimal strategy, and bidders have an incentive to shade their bids.[1]

Another surprising result was the Maskin and Riley's (1989) one. Maskin and Riley (1989) extend Myerson's (1981) study of optimal auctions where the seller has k units for sale and each bidder has one unit demand. They show that the revenue equivalence theorem holds in this case. The main difference between their framework and mine is that this model considers a good which is perfectly divisible contrary to their. Wilson (1979) and, later, Back and Zender (1993) are the first who have pointed out that the indivisibility of the good is a critical assumption in the revenue equivalence theorem for multi unit auctions.

In a uniform price auction, bidders strategically submit demand schedules for a divisible good and the price is set to equate supply and demand. Within this framework, Wilson (1979), Back and Zender (1993) and Biais and Faugeron-Crouzet (2002) show that there exists arbitrarily low equilibrium price that may be sustained by bidders. The intuition for this result is the following: a bidder's demand schedule is only known at the market clearing price level, hence the slope is not determined by the equilibrium condition. This indetermination allows them to submit a rather inelastic demand schedule. This offsets other bidders' incentives to bid more aggressively. A big price increase is required to get a larger share. Consequently, underpricing equilibria emerge.

Therefore, multi unit auctions for an indivisible and homogenous good have the same nice properties than single unit auctions while share auctions (multi unit auctions for a perfectly divisible good) have a multiplicity of equilibria, some of them being very inefficient.

To select among these equilibria, Klemperer and Meyer (1989), and Back and Zender (1993) introduce uncertainty about the supplied quantity and search for ex post optimal supply function equilibria. Klemperer and Meyer (1989) prove that when uncertainty is unbounded, the set of equilibria is significantly reduced. The intuition is that the bidders' demand schedules has to be defined not only at the market clearing price, but also around it. Despite this result, Back and Zender (1993) and Wang and Zender (2002), in the risk averse case, show that arbitrarily low equilibrium prices always exist in the case of uniform price treasury auctions.

However, natural experiments about the Treasury auctions are not in line with these predictions. Umlauf (1993) analyses the Mexican US Treasury auction and estimate that the switch from discriminatory to uniform price auction has enhanced competition and has reduced bidder profits. Nyborg and Sundaresan (1996) find that the change in revenue, due to the same switch in the US, range from relatively small losses to moderate gains. Malvey and Archibald (1998) observe that this switch produces small gains in revenue. Keloharju, Nyborg and Rydqvist (2003) study Finnish Treasury auctions and show that underpricing is low, and it is not due, as suggested by the theory, to the exercise of monopsonist market power by the bidders.

The same evidence comes from the IPO's literature, indeed, Derrien and Womack (2003) prove that the auctioning mechanism leads to less underpricing than book building or fixed price methods. Kandel, Sarig and Wohl (1999) indicate that underpricing in Israeli uniform price IPOs auctions is significant but small compared to what happens with other mechanisms.
An important remark, in the commonly used theoretical setting for modelling uniform price auctions, is that there is a strategic disadvantage for the seller who can not mitigate the bidders' market power. A reasonable question is then whether there exists any ways to reduce this strategic disadvantage?

[1] See Binmore and Swierzbinski (2001) for a critical review about treasury auctions, and Martimort (2002) for a survey about multi-unit auctions.

McAdams (2007), and Back and Zender (2001) show that, when sellers have the possibility to adjust the quantity put for sale ex post, bidders cannot sustain all equilibrium prices as before and, then, underpricing is significantly reduced. The economic sense of this result is that when the seller can adjust the supply ex post, bidders are concerned not only with the market clearing price that would occur without possibility of adjustment, but also with any price that could be an equilibrium with an ex post adjustment.

McAdams (2002) proves that "collusive seeming" equilibria disappear when some amount of cash is shared between rationed bidders who have bid more aggressively for marginal units. This encourages aggressive bidding for marginal units and, therefore, raises the equilibrium price.

LiCalzi and Pavan (2003) study uniform price auctions when the seller is strategic and can precommit to an increasing supply schedule. They prove that even if underpricing is still present, it is significantly reduced. In this setting of increasing supply, with a little price increase, the residual supply increases a lot, and bidders get a bigger quantity. This reduces each bidder's market power. Consequently, bidders bid more aggressively and low price equilibria are eliminated.

However, adjusting the supply schedule is not the only way to boost competition in uniform price auctions. Kremer and Nyborg (2004a) and (2004b) show that changing the rationing rule or allowing a finite number of bids is also a good way to eliminate bad equilibria. This is due to the same reasons than previously. Modifying these rules generate more price competition for the marginal units, resulting in less underpricing.

Another commonly used strategic tool is to set the price below the market clearing price. For instance, in the Mise en Vente, an auction like IPO used in France, the price does not clear the market and pro-rata rationing is used.[2] This is also a rule used by Open IPO. One can read on their website (www.openipo.com) "The company may choose to sell shares at the clearing price, or it may offer the shares at a lower offering price". For instance in a recent Open IPO (RedEnvelope, Inc.), the pro-rata percentage for the entire offering is approximately 56%.

Rationing in IPOs is surprising. Indeed, as bidders submit price dependent bids, when rationing takes place, the seller should raise the IPO price to satisfy bidders' demand. Parlour and Rajan (2003) study a model of book building in IPOs in which the seller can ration bidders. Following Sherman (2001), they model the Book Building process as a multi unit common value auction and use the symmetric equilibrium characterized by Milgrom (1981). They show that rationing mitigate the winner's curse, i.e., bidders bid more aggressively. They also determine the optimal degree of rationing in the class of credible mechanisms i.e. mechanisms in which the seller use the announced pricing rule. However, a critical assumption in their model is that the bidders have unit demand. These results can not be generalized when bidders have multi unit demand while this is an essential feature of IPOs. Surprisingly, this important issue has not been yet addressed by the literature.

More recently, in an IPO auction framework, Bourjade (2009) shows that when the seller has an uncertain interest in achieving a more dispersed ownership structure, strategic bidders are induced to bid more aggressively even though some underpricing always remains in equilibrium.
In this paper, I modify the uniform price auction rules in allowing the seller to ration bidders ex post as is usually the case in real world financial auctions.

[2] See Biais and Faugeron-Crouzet (2002).

Rationing the quantity of shares awarded to each bidder raises the number of "winners" in the auction resulting in a dispersion of ownership. This may be in the seller's interest for keeping control over the firm as emphasized by Brennan and Franks (1997) or to improve the liquidity in the secondary market which is one of the main seller's objective either in IPOs (see Amihud, Hauser and Kirsh, 2001, Boehmer and Fishe, 2001, Booth and Chua, 1996), Treasury auctions (see Castellenos and Oviedo, 2003, and Roseboro, 2002) or tradeable carbon permit auctions (see Cramton and Kerr, 1999). As an important feature of IPO, treasury or electricity auctions is that they are repeated frequently, the seller can also use the previous auctions to make rationing credible. Indeed, if the seller randomly ration shares in an auction, bidders will believe that she will play in the same way in the next auction.

The objective of this paper is not to explain why rationing could be in the seller's interest, but to show that rationing helps the seller to reduce the bidders' market power. The main result is that when the seller is not constrained to set the offering price equal to the market clearing price, but can choose a lower price after having observed the aggregate demand, bidders have an incentive to bid more aggressively. Moreover, under standard assumptions, there is less underpricing in this model than in the Back and Zender's (2001) one. Having the possibility to ration bidders is thus more efficient against market power than adjusting demand after having observed bids.
The paper is organized as follows. Section 2 describes the model. The basic Wilson (1979) and Back and Zender's (1993) model and results are presented in Section 3. In Section 4, I solve the model with strategic rationing and compare the results with the Back and Zender's (2001) one and section 5 concludes. Finally, all proofs are in section 6.

2. The Model with Strategic Rationing

In this section, I develop a model of the uniform price auction, in the lines of Wilson (1979), or Back and Zender (1993).

A seller wants to auction a fixed quantity, Q, of a homogenous and perfectly divisible good using a uniform price auction. The market is formed by N rational and risk neutral agents (bidders). All bidders share the same information about the per unit common value of the good, v.[3] Bidders compete in the auction in simultaneously submitting piecewise, non increasing, continuously differentiable demand schedules for the divisible good. Let $X(p) = \sum_{i=1}^{N} x_i(p)$ be the aggregate demand for the shares at price p, $X(p)$ is also piecewise, non increasing, continuously differentiable.
In a usual uniform price auction, the price is set to equate supply and demand. However, I will modify the basic model of uniform price auctions of Wilson (1979), in allowing the seller to ration bidders after having observed the bids. More precisely, I assume that the bidders have prior beliefs about the rationing scheme used by the seller. Bidders only know that the degree of rationing that will be used by the seller, α, is distributed over some non empty support $]0,1]$ with c.d.f. $F(\alpha)$. For instance, these beliefs may come from the seller's reputation of rationing during previous auctions, and cannot be exactly anticipated. Consequently, the equilibrium price is not the market clearing price but a lower one.
The equilibrium price is now defined as:[4]

[3] In Wilson (1979), or Back and Zender (1993) bidders have private information about the shares' value. However, their equilibria are not sensitive to the distributional properties of the signals.
[4] This specification assumes that the seller's reserve price is zero.

$$p^*(\alpha) = \begin{cases} \max\{p / \alpha X(p) \geq Q, p \geq 0\} & \textit{when such } p \textit{ exists}, \\ 0 \quad \textit{otherwise.} \end{cases} \quad (1)$$

where $\alpha x_i(p^*(\alpha))$ is the degree of rationing chosen by the seller after having observed the aggregate demand.

Let's remark that, given α, this market clearing price price exists and is uniquely defined when the aggregate demand is non increasing. The quantity $\alpha x_i(p^*(\alpha))$ is awarded to bidder *i*.

The objective of this paper is not to explain why the seller benefits from rationing, but to show that rationing may help the seller to reduce the bidders' market power and consequently their ability to manipulate the uniform price auction. Hence, I will first look at the bidders' behavior when they face this rationing scheme, then, in section 5, I will give rationales for rationing, such as reputation and dispersion of ownership among others, in markets where uniform price auction are commonly used.

However, the rationing scheme used by the seller must be uncertain enough for the bidders. If it was not the case, bidders would anticipate it and, as in Wilson (1979), "collusive-seeming" equilibria would not be eliminated. Intuitively, if they precisely anticipate the degree of rationing, bidders perfectly know the residual supply they face and could implicitly collude on an arbitrarily low equilibrium price. The seller would therefore lose all the benefits from rationing.

This uncertainty about the seller's objective may be explained by the market conditions which are better known by the seller than by the bidders. Another explanation may be that the relative importance accorded by the seller to the rationales for rationing, such as reputation, control or liquidity of the secondary market, with respect to the revenue of the auction is perfectly known by the seller, but not by the bidders. These asymmetry of information between the seller and the bidders could explain the presence of uncertainty in the seller's objective. According to these assumptions, the objective of the seller is to maximize the revenue of the auction given that he will use a rationing scheme $F(\alpha)$.

The bidders being risk neutral, their program is to choose a demand schedule which maximizes their expected profit under the market clearing condition, the expectation being with respect to α.

This study focuses on symmetric ex post optimal Nash equilibria in pure strategies, i.e. if a bidder expects other bidders to submit their equilibrium strategy, his best response is also the equilibrium strategy. Moreover, given other bidders' bid schedules, for each realization of the degree of rationing, α, bidders would not change their bids even though they were allowed to do it ex post.
The timing of the game is the following

1. The seller announces that, depending on the market conditions, he can ration the bidders according to $F(.)$.
2. Each bidder *i* simultaneously submit a piecewise, non increasing, continuously differentiable demand schedule.
3. After observing the aggregate demand, the seller chooses a degree of rationing, $\alpha \in]0,1]$according to the rationing scheme $F(\alpha)$.
4. The seller sets the equilibrium price *p** which can be lower than the market clearing price without rationing.

5. Shares are allocated. Each bidder receives his rationed demand at the equilibrium price

3. Equilibria of the Basic Uniform Price Auction

This research will first study the equilibria of the uniform price auction without rationing. This framework, has been first examined by Wilson (1979) and generalized by Back and Zender (1993).

In this basic model of uniform price auction, the price is set to equate supply and demand. In order to ensure that a unique market clearing price exists, let me define it as:

$$p^*(\alpha) = \begin{cases} \max\{p / X(p) \geq Q, p \geq 0\} & \textit{when such } p \textit{ exists}, \\ 0 & \textit{otherwise.} \end{cases}$$

Wilson (1979), and Back and Zender (1993), show that there exists arbitrarily low equilibrium price that may be sustained by bidders. The intuition for this result is the following: a bidder is only concerned with his demand schedule at the market clearing price, hence the slope is not determined by the equilibrium condition. This indetermination allows them to submit a rather inelastic demand schedule. The value of the slope acts as an implicit veto if a bidder tries to increase his market power. This offsets other bidders' incentives to bid more aggressively. A big price increase is required to get a larger share. Consequently, underpricing equilibria emerge.
These results can be summarized in the following proposition from Back and Zender (1993) extended by Kremer and Nyborg (2003b):

Proposition 1 (Back and Zender (1993) modified) *Bidders can sustain any equilibrium price* p_0 *in the range [0,v] in submitting the following bidding strategy,*

$$d(p) = a\left[1 - \frac{p}{v}\right]^{\frac{1}{N-1}}$$

where $a \geq Q/N$, *and the stop out price is*

$$p_0 = \left[1 - \left(\frac{Q}{aN}\right)^{N-1}\right] v.$$

Proof. See Back and Zender (1993).

There exists a multiplicity of equilibria in the uniform price auction, indexed by the slope of the demand schedule, *a*. Each price in the interval [0,v] is an equilibrium price given *a*. Only the Bertrand's equilibrium price *v* could achieve the first best.

Therefore, selling a divisible good using a uniform price auction is risky. This is not in line with Friedman's advice who predicted that uniform price auctions have the same "nice properties" than Dutch auctions, i.e. truthful bidding is the best strategy.

To cope with the multiplicity of equilibria, Back and Zender (1993), followed by Wang and Zender (2002), introduce supply uncertainty using Klemperer and Meyer's (1989) methodology. They show that, under supply uncertainty, the previous equilibria are the only one which are ex post optimal, i.e. bidders would not change their bids even though they were allowed to do so ex post.

However, arbitrary low equilibrium prices can still be sustained by the bidders. Hence, in this context, supply uncertainty does not allow them to select among these equilibria as in Klemperer and Meyer (1989).

4. Equilibria of the Uniform Price Auction with Rationing

In this section, the bidders have prior beliefs about the rationing scheme used by the seller. Bidders only know that the degree of rationing that will be used by the seller, α, is distributed over some non empty support]0,1] with c.d.f. $F(\alpha)$. The bidders being risk neutral, their program is to choose a demand schedule, $x_i(p)$ which maximizes their expected profit under the market clearing condition, the expectation being with respect to α.

Let's remark that, within this framework, low equilibrium prices do not necessarily result from bidders' market power because the seller may have incentives to sustain them in rationing. So, to analyze the effects of rationing against market power, I will consider the slope of the bidders' demand schedules instead of the price level. Indeed, a steep demand schedule results from a bidder exerting his market power and a flat demand schedule reflects a more aggressive price competition. Indeed, when other bidders submit steep demand schedules, when a bidder wants to get more shares, he is forced to sustain a large increase in price which is not the case with flat demand schedules.
A Nash equilibrium of this game is characterized firstly by a degree of rationing, α, optimally selected by the seller, secondly by an equilibrium price $p^*(\alpha)$ defined to equalize the aggregate demand for shares and the supplied quantity when the degree of rationing is α and finally by the fact that each bidder i finds optimal to submit a demand schedule $x_i(.)$ which sustains this price. More formally, the equilibrium price is defined as:

$$p^*(\alpha) = \begin{cases} \max\{p / \alpha X(p) \geq Q, p \geq 0\} & \textit{when such } p \textit{ exists}, \\ 0 \quad \textit{otherwise.} \end{cases} \qquad (2)$$

where α is the degree of rationing chosen by the seller after having observed the aggregate demand.
As noted previously, given α, this market clearing price exists and is uniquely defined when the aggregate demand is non increasing. The quantity $\alpha x_i(p^*(\alpha))$ is awarded to bidder i. Moreover, the demand schedules $x_i(.)$ (i=1,...,N) sustain the equilibrium price $p^*(\alpha)$ when the degree of rationing is α.

Let's denote X_{-i} the aggregate demand of all bidders but i. Given the demand X_{-i} and the degree of rationing α, the price $p^*(\alpha)$ maximizes bidder i's profit. I will solve for the Nash equilibrium of this game. The seller maximizes the revenue of the auction given that he will use a rationing scheme $F(\alpha)$. Let's remark that as bidders are uncertain about the realization of α, they cannot anticipate it.

Now, consider the bidder $i's$ program. This bidder wants to set a price $p^*(\alpha)$ when the degree of rationing is α, in submitting a demand schedule $x_i(p)$ The bidder $i's$ program is

$$p^*(\alpha) \in Arg\max_p E_\alpha\{(v-p)[Q-\alpha X_{-i}(p)]\}$$

where $[Q - \alpha X_{-i}(p)]$ is the residual supply that bidder *i* will face.

This program can be replaced by the maximization of profits for each realization of α,[5] i.e.,

$$p^*(\alpha) \in Arg \max_p \{(v - p)[Q - \alpha X_{-i}(p)]\}$$

The first order condition of this program is

$$-Q + \alpha X_{-i}(p) - \alpha(v - p)X'_{-i}(p) = 0 \qquad (3)$$

If second order conditions are satisfied (this is checked in the appendix), then (3) implicitly determines $p^*(\alpha)$ for each realization of α. The quantity awarded to bidder *i* is $\alpha[Q - \alpha X_{-i}(p)]$ Moreover, if $p^*(\alpha)$ is strictly increasing, the quantity awarded to bidder *i* can be written as a function from price to quantity. This implies that $x_i(p)$ intersects $i's$ residual supply once and only once for each α at $p^*(\alpha)$. So, by submitting $x_i(p)$, bidder *i* can achieve ex post optimal adjustment to the degree of rationing. Thus, bidder $i's$ best response to $X_{-i}(p)$ consists in submitting the demand schedule $x_i(p)$ The following proposition characterizes the unique pure strategy ex-post optimal symmetric equilibrium of this game.

Proposition 2 *Assume that the seller can ration bidders after having observed the aggregate demand. Then, the only equilibrium price is* $p^* = v$.

Proof. See Appendix.

Proposition 1 establishes that when rationing may arise in the uniform-price auction, there exists a unique equilibrium in which the price is equal to the true value of the shares. The ability of bidders to manipulate the equilibrium price is therefore restricted. Despite the fact that rationing reduces the proceeds from the sell, it may be beneficial for the seller.

Indeed, due to the possibility of rationing, bidders are facing an uncertain residual supply. As they cannot anticipate the degree of rationing selected by the seller, the bidders are not only concerned with their demand at the market-clearing price but also with any price that could result from an ex-post rationing. This prevents them from submitting demand functions as flat as they want. The bidder's ability to inhibit competition from their rivals is reduced. They cannot manipulate bidding as they made it in the Wilson (1979) and the Back and Zender (1993) models. As the seller is allowed to use all degree of rationing in]0,1], this results in a unique equilibrium price, the true value of the shares. It means that in this case, the bidders have no way to manipulate the uniform-price auction. The "collusive seeming" equilibria, introduced by Wilson (1979) and Back and Zender (1993), are thus very sensitive to the possibility of ex post rationing.

It would also be interesting to compare this result with the results of Back and Zender's (2001) and McAdams (2007). I will first state their results:

[5] *This is equivalent to the Euler equation of the program*.

Back and Zender's (2001) show that when the seller can reduce the supplied quantity as much as she wants, the stop out price is at least $p_0 = \frac{N-1}{N} v$. McAdams (2007) proves that when the seller can infinitely increase the supply[6] after having observed the bids schedules, no collusive seeming equilibria exists. Rationing is therefore more efficient than decreasable-supply and equivalent to increasable-supply in order to reduce bidders' ability to exercise their market power. However, as in IPOs there is a maximum amount of proceeds a firm can get, it is difficult to adjust the quantity put for sale optimally while strategic rationing is very common. This result can therefore explain why strategic rationing is generally used in IPO auctions.

5. Conclusion

An important part of the literature supports the use of discriminatory auctions when selling a divisible good because of the "collusive seeming" equilibria of the uniform price auctions. Recent contributions have shown that adjusting supply after observing bids eliminate some of these equilibria. This analysis introduces a new strategic tool for the seller, commonly used in IPOs: rationing shares. This reduces the bidders' market power and, hence, eliminates all those "bad" equilibria.

These findings may explain why Open IPO usually set the IPO price below the market clearing price. Indeed, as strategic rationing eliminates low prices, if it is a credible strategy, underpricing will disappear. So, even if it is not profit maximizing, Open IPO underprices to make rationing a credible strategy. This strategy therefore eliminates "collusive seeming" equilibria.
Most of the critics about uniform price auctions are, thus, not justified. Small rules' modifications, eliminate "collusive seeming" equilibria. Moreover, this is not only true in discrete models, but also in the Wilson's continuous share auction model.

An interesting extension could be to generalize this approach in introducing a private cost of acquisition of the shares supported by the bidders. This would allow us to understand if those results are robust to the introduction of an asymmetry between the bidders.[7] This issue is left for future research.

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Thanks for helpful comments to Bruno Biais, Jacques Cremer, Denis Gromb, Jean Tirole, Bruno Jullien and an anonymous referee. All remaining errors are mine.

[6] In fact, the auctionner can increase the demand in McAdams (2007), because this is a model about electricity procurement.

[7] Bourjade (2008) builds a model of Uniform Price Auctions with asymmetric bidders and shows that an equilibrium may fail to exist due to a non-monotonicity of the demand functions submitted by the bidders.

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About the Author

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Appendix

Proof of Proposition 2. Let $\overline{Q}$ be the maximum quantity a bidder can absorb, Q the quantity of shares putting for sale, N the total number of risk neutral bidders, $x_i(p)$ an equilibrium strategy (piecewise continuously differentiable and downward sloping), α the rationing scheme.

Let's denote X_{-i} the aggregate demand of all bidders but i. Given the demand X_{-i} and the degree of rationing α, the price $p^*(\alpha)$ maximizes bidder i's profit.

I will solve for the Nash equilibrium of this game. Let's first consider the bidder $i's$ program. As I will characterize the pure strategy symmetric equilibrium of this game, all bidders use the same equilibrium strategy and $X_{-i}(p) = (N-1)x(p)$.

The market clearing price is then chosen such that $\alpha Nx(p)=Q$.

Bidder i wants to set a price $p^*(\alpha)$ when the degree of rationing is α, in submitting a demand schedule $x_i(p)$. The program of this bidder is

$$p^*(\alpha) \in Arg\max_p E_\alpha\{(v-p)[Q-\alpha X_{-i}(p)]\}$$

where $\alpha[Q-\alpha X_{-i}(p)]$ is the residual supply that bidder i will face.

This program can be replaced by the maximization of profits for each realization of α, i.e.,

$$p^*(\alpha) \in Arg\max_p\{(v-p)[Q-\alpha X_{-i}(p)]\}$$

Bidder i's objective is to maximize his profits with respect to the price p. I obtain the following first order condition[8]

$$-Q+\alpha(N-1)x(p^*(\alpha))-\alpha(N-1)(v-p^*(\alpha))x'(p^*(\alpha))=0 \qquad (4)$$

However, in a symmetric equilibrium, the market clearing condition must be satisfied

$$\alpha Nx(p^*(\alpha))=Q \qquad (5)$$

The derivative of the market clearing condition with respect to α gives

$$Nx(p^*(\alpha))+\alpha N\frac{dp^*(\alpha)}{d\alpha}x'(p^*(\alpha))=0$$

This gives, together with (5),

[8] Second order conditions are satisfied, see the Lemma in the Appendix.

$$\frac{dp^*(\alpha)}{d\alpha} x'(p^*(\alpha)) = -\frac{Q}{\alpha^2 N} \tag{6}$$

Putting this into the first order condition (4) gives

$$(N-1)\frac{p^*(\alpha)}{\alpha} + \frac{dp^*(\alpha)}{d\alpha} - (N-1)\frac{v}{\alpha} = 0$$

A particular solution of this differential equation is $p(\alpha)=v$.
I have to solve the homogenous equation which is

$$\frac{\frac{dp^*(\alpha)}{d\alpha}}{p^*(\alpha)} = -\frac{(N-1)}{\alpha}$$

$$\Leftrightarrow p^*(\alpha) = -\frac{k}{\alpha^{N-1}}$$

Hence, the general solution of this differential equation is

$$p^*(\alpha) = -\frac{k}{\alpha^{N-1}} + v \tag{7}$$

where $k = v - p^*(1)$ with $p^*(1) \in [0, v]$ is the equilibrium price with no rationing.

This means that the equilibrium price is completely determined when the value of $p^*(1)$ is given. $p^*(\alpha)$ determines the set of the equilibrium prices when the rationing scheme varies.
However, positivity of the equilibrium price needs to be respected.

Moreover, one can remark that $p^*(.)$ is increasing in α which implies that the equilibrium I consider is ex post optimal. This remark together with $\alpha \in [\underline{\alpha}, 1]$ ensures that the positivity of the equilibrium price is given by $p^*(\underline{\alpha}) \geq 0$ where $\underline{\alpha}$ is the lower bound of the degree of rationing that the seller may use. That is, $p^*(1) \geq v\left[1 - (\underline{\alpha})^{N-1}\right]$.
As $\underline{\alpha}$ goes to 0, I get:

$$p^*(\alpha) = v \quad for\, all\ \alpha.$$

Lemma 3 *The demand schedule x(.) form a symmetric "Demand" Function Equilibrium tracing through ex post optimal points if and only if for all p≥0, x(.) satisfy the first order condition of the problem (4) together with the Market Clearing condition (5) and is non increasing.*

Proof.

- Sufficiency:

Since $x(.)$ is non increasing, the aggregate demand intersects the (fix) supply at a unique point for each α.

Moreover, the demand schedules satisfy first order condition for ex post profit maximization when the other firms choose equilibrium strategy.

Both conditions together implies that $\Pi_i^{''} < 0$ for all $p^*(\alpha)$.

Indeed, the first order condition of bidder i's problem is

$$-Q + \alpha(N-1)x(p^*(\alpha)) - \alpha(N-1)(v - p^*(\alpha))x'(p^*(\alpha)) = 0.$$

Putting the market clearing condition in the previous equation gives

$$x(p^*(\alpha)) = -(N-1)(v - p^*(\alpha))x'(p^*(\alpha)).$$

I now make the derivative of this equation with respect to the price

$$x'(p^*(\alpha)) = (N-1)x'(p^*(\alpha)) - (N-1)(v - p^*(\alpha))x''(p^*(\alpha)).$$

Or equivalently

$$(N-2)x'(p^*(\alpha)) = (N-1)(v - p^*(\alpha))x''(p^*(\alpha)).$$

Let me state the second order condition of bidder i

$$\Pi_i''(p^*(\alpha)) = 2(N-1)x'(p^*(\alpha)) - (N-1)(v - p^*(\alpha))x''(p^*(\alpha)).$$

Those conditions together give

$$\Pi_i''(p^*(\alpha)) = 2(N-1)x'(p^*(\alpha)) - (N-2)x'(p^*(\alpha)) = Nx'(p^*(\alpha)). \quad (8)$$

This is clearly non positive when the demand schedule $x(.)$ is non increasing.

So, global second order conditions for ex-post profit maximization are satisfied everywhere. Therefore, the demand schedules form a symmetric "Demand" Function Equilibrium tracing through ex post optimal points.

- Necessity:

Satisfaction of the first order condition of the problem together with the Market Clearing condition is a necessary condition for a supply function to trace through ex post optimal points.
Moreover, if for some $p^*(\alpha)$, $x'(p^*(\alpha)) \geq 0$, then $\Pi_i''(p^*(\alpha)) \geq 0$, see (**Error! Reference source not found.**).

Therefore, the demand schedules $x(.)$ cannot be a symmetric "Demand" Function Equilibrium.

Regime Switching and Interest Rate Pass-Through: A Case Study of Thailand

by

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Abstract

This paper examines the efficiency of the dynamic relationship between a money market rate (an inter-bank rate) and different short-term interest rates (deposit and lending rates). In particular, this paper models and measures the pass-through process as a vector auto-regressive approach in the Thai banking system from June 1999 to October 2010. Two models are examined and compared: one is a linear model called vector auto-regressive model and the other is a non-linear model known as the Markov switching model.

Keywords: Money Market Rate, Pass-Through Process, Banking, Markov Switching

1. Introduction

It has been generally agreed that monetary policy can significantly influence economic behavior. However, the extent to which it can affect economic behavior is largely an empirical issue. The transmission mechanism of monetary policy (or of money market conditions) is usually sluggish and incomplete in the short term but rather complete in the long term. It thus takes time for any change in inter-bank rate, which is induced by monetary policy decisions or by changing conditions in money market, to pass-through its effect on short-term interest rates. The speed of responses is usually associated with the efficiency of this transmission mechanism, so properly identifying, modeling, and measuring the pass-through process is crucial to improving the understanding of the whole process.

The main concerns of this paper are twofold. First, to analyze the pass-through process between a money market rate (an inter-bank rate) and different short-term interest rates (deposit and lending rates) in the Thai banking system. Second, at the basis of these findings, this paper will assess the efficiency of Thai monetary policy. Shocks in international and non-financial markets that may affect domestic markets have potential to change the pass-through process in a non-linear way. Previous studies tend to ignore this change while they examined the pass-through process. This paper is motivated by some encouraging results previously reported in literature on the presence of regime shift (see Hamilton, 1988; Gray, 1996; Anderson, 1997) as well as by the relative success of the linear approach in modeling the term structure of interest rates (see Hall, Anderson & Granger, 1992). The allowance for regime shifts may provide potentially important insights about the behavior of short-term interest rates and hence the entire yield curve.

This paper's strategy for analyzing and assessing the Thai monetary transmission mechanism is to take a non-linear approach in understanding the dynamic changes in money market rate. The main focus is the response of short-term interest rates (deposit and lending rates) to changes in money market rate (an inter-bank rate). The Markov switching model together with vector auto-regressive approach (hereafter called the MS-VAR model) that allows for time varying regime change is proposed to model the interest rate pass-through process.

This paper contributes to literature in several ways. First, Disyatat and Vongsinsirikul (2003) empirically examine the degree of pass-through from the money market rate to retail interest rates in Thailand using a linear VECM model. This model demonstrates that a transmission mechanism is particularly sensitive to monetary shocks. Their study also indicates that commercial banks play an important role for monetary policy in real economic activities. This paper argues that the dynamics of the term structure of interest rates may be better characterized by a non-linear model. In particular, this paper explores empirically the idea of regime switching in the behavior of short-term interest rates. Second, Disyatat and Vongsinsirikul (2003) use RP14 and 3-month deposit rate for their analysis. This may have a maturity problem because the maturity of RP14 is 14 days but for 3-month deposit rate, it is 90 days, which is a different time-frame. The estimated coefficients, therefore, may be inappropriate and the interpretation of monetary transmission will lack clarity. This paper hence uses the overnight inter-bank and saving deposit rates. These two interest rates could avoid the maturity problem.

The results of this paper suggest that the non-linear MSIA-VAR model better explains the interest rate pass-through process of Thai banking system, when compared with the linear VAR model. With 100 basis points increase in inter-bank rate during normal market conditions, deposit rate increases by 0.6112%, while lending rate responds by -0.8938%. Deposit and lending rates, however, respond 0.3510% and -0.2552% during volatile market conditions when inter-bank rate raises 100 basis points. These results indicate that the Thai interest rate pass-through process is quite inefficient. The results also clearly show that the linear VAR model fails to capture significant non-linearilities in the data generating process.

The structure of this paper is organized in six sections. Sections One and Two provide a brief discussion of interest rate pass-through literature. Section Three gives an overview of simple model on which this paper's empirical model is based and a justification of why this model is appropriate for the Thai banking structure. Section Four develops research methodology in relation to short-term interest rates and discusses key variables. Section Five reports the results of linear and non-linear models. Within this section is a further attempt to interpret the results with actual incidents. Section Six gives the summary with concluding remarks.

2. Interest Rates Pass-Through in Thailand

To reach the ultimate objective of monetary policy, which is sustained economic growth and attainment of stable inflation, the Bank of Thailand (hereafter called BOT) focuses primarily on its leverage over short-term interest rates in the money market. In addition, the BOT focuses on four channels of changing these rates in term of influencing commercial banks' retail interest rates, long-term yield in bond market, asset prices, and private balance sheet. These different channels together make up the monetary transmission mechanism.

Short-term interest rates are a crucial channel of monetary transmission mechanism. Duguay (1994) describes the monetary transmission mechanism as a process that starts off with a monetary

authority's actions influences retail interest rates and exchange rate and then proceeds to ultimately affect aggregate demand and inflation. A key dimension of monetary transmission mechanism lies in size and speed with which retail interest rates respond to the change in monetary policy or money market rate. Retail rates are important because these rates represent the marginal cost of new credit as well as the opportunity cost of funds in the economy, especially in Thailand where non-bank sources of finance are limited. The Thai monetary transmission mechanism is thus explored by estimating the pass-through from a money market rate (an inter-bank rate) to commercial banks' lending and deposit rates.

In Thailand, removal of interest rate controls was initiated due to the change in money market and financial development policy in 1997 (Bank of Thailand, 2008). This change has developed a new financial structure for encouraging internal competitions among commercial banks. In past eras, the BOT used the strict controlling interest rate policy within the banking industry. This scenario only allowed for a limited fluctuation in deposit and lending rates. The competition between commercial banks, therefore, only integrated horizontally in branches with customer service facilities only. The strict policy of interest rate is recently relaxed; commercial banks have a better control of effective interest rates, which are the main cost of their operation (Nuraphong, 1997). Commercial banks can now operate better in a competitive price environment and increase bank cost efficiency. Thus, to fully characterize the monetary transmission mechanism, it is imperative to have a good model of the behavior of short-term interest rates.

3. Imperfectly Competitive Banking Industry Model

This section presents an overview of an imperfectly competitive banking industry model, as discussed in Freixas and Rochet (1997). This model is designed around three short-term interest rates: deposit, lending, and inter-bank rates, respectively. In fact, the essence of this model is to study banking behavior in a "perfectly" and an "imperfectly" competitiveness in the banking industry. The model also sets out the equilibrium relationship between these three interest rates where deposit and lending rates are endogenous, while the inter-bank rate remains exogenous and depends on the central bank's policy. The imperfectly competitive banking industry model is suitable for the Thai banking industry, which is an oligopolistic market structure where a small number of commercial banks are major players in the money market. The model suggests that banks are mutually interdependent and each bank more specifically must consider possible reactions of rivals to its prices, promotion, and product development (Jackson & McIver, 2004). Any change in some major commercial banks' interest rates may thus significantly influence volumes of deposit and loan of other banks. Each bank must recognize that changes in its own policies are likely to elicit changes in policies of its competitors as well. Because of this inter-dependence, oligopolists face a situation in which the optimal decision of one commercial bank depends on what other banks decide to do. There is opportunity for both conflict and cooperation.

Each bank has deposit, D_n, on the liability side and the asset side has an inter-bank balance, R_n, and loans, L_n. The balance sheet identity equation of each bank is

$$D_n = R_n + L_n, \tag{1}$$

where n is the n^{th} bank in banking industry; for $n = 1, 2, 3, \ldots, N$ and N is the total number of banks in the banking industry.

According to Freixas and Rochet (1997), a bank is in the business of the production of deposit and loan services, which will be represented by a cost function:

$$C_n = \gamma_D D_n + \gamma_L L_n, \tag{2}$$

where γ_D and γ_L are the marginal costs with respect to deposit and loans.

the banking industry face a downward sloping aggregate demand of loans, $L(r_L)$, and an upward sloping aggregate supply of deposits, $D(r_D)$. The equilibrium lending, deposit, and inter-bank rates are r_L, r_D, and r_B, respectively. Each bank will maximize its profit by taking volume of deposit and loan of other banks. As a result, the objective function of each bank is

$$\Pi_n = r_L(L_n + \sum_{m \neq n} L_m^*)L_n + r_B(D_n - L_n) - r_D(D_n + \sum_{m \neq n} D_m^*)D_n - C_n(D_n, L_n), \tag{3}$$

where n (and m) are the n^{th} (and m^{th}) bank in the banking industry.

For the Cournot oligopolistic version of banking industry, there is a unique equilibrium. Let $L_n^* = L^*/N$ and $D_n^* = D^*/N$, where L^* and D^* are the amount of optimal loan and deposit. Solving the first order condition gives the industry's optimal lending and deposit rates as

$$r_L(L^*) = r_B + \gamma_L - r_L'(L^*)L_n^*, \tag{4a}$$

$$r_D(D^*) = r_B - \gamma_D - r_D'(D^*)D_n^*, \tag{4b}$$

where r_L' and r_D' are the first derivative of the lending and the deposit rates with L_n.

The above two equations cover a number of stylized models of imperfectly competitive banking behavior. They describe two fundamental relationships between the levels of interest rates given the exogeneity of inter-bank rate, r_B. These two equations also show the positive response of deposit, r_D and lending rates, r_L, to inter-bank rate, r_B. For a perfectly competitive banking industry ($N \rightarrow \infty$), the deposit intermediation margin ($r_D^* - r_B$) equals its marginal cost ($-\gamma_D$), while the lending intermediation margin ($r_L^* - r_B$) equals its marginal cost (γ_L). However, if banking industry become oligopolistic (N is smaller) or monopoly cases (N = 1), the size of the deposit intermediation margin decreases (since $r_D' > 0$), while the size of the loan intermediation margin increases (since $r_L' > 0$).

4. Methodology and Data

This section discusses research methods used in this paper. It consists of linear and non-linear models. This section also outlines key variables and the source of data.

Linear model

The linear VAR model introduced by Sims (1980) is widely used in econometric studies. Its popularity is due to the flexibility of VAR framework and the ease of producing economic models with useful descriptive characteristics together with the availability of statistical tests of economically meaningful hypothesis. In Freixas and Rochet's (1997) model, commercial banks are assumed to change their deposit and lending rates (in response to changes in inter-bank rate) to achieve equilibrium. This paper, however, assumes that the equilibrium cannot be achieved

instantaneously, but with adjustment paths (encompassing the speed and size of changes) that reflect adjustment costs (symmetric or asymmetric). It is particularly interesting to look at the response of bank short-term interest rates to an impulse in money market rate. Equations (4a) and (4b) assume that the money market rate is exogenous. In the following discussion, this assumption is relaxed by allowing the inter-bank rate to be also endogenous because the past short-term interest rates (deposit and lending rates) might affect the current money market rate (an inter-bank rate) over time. A general *n*-variable VAR model of order *p* can be, therefore, represented as:

$$x_t = v_t + \sum_{l=1}^{p} A_l x_{t-l} + u_t \,, \tag{5}$$

where x_t, v_t, A_l, and u_t are a vector of variables, intercept term, auto-regressive parameters, and error term, respectively.

Non-linear model

This section outlines the econometric procedure employed to model regime shifts in the dynamic relationship among interest rates (deposit (r_D), lending (r_L), and inter-bank (r_B) rates) from Equations (4a) and (4b). The MS-VAR model has been proposed as an alternative to a constant parameter, linear VAR model, because the MS-VAR model allows for changes in regime of the process generating time series. The idea behinds this class of regime switching model is that parameters of *D*-dimensional vector time series process (x_t) depend upon an unobservable regime variable (s_t), which represents the probability of being in a particular state of economy. This could be specified as:

$$x_t = v(s_t) + \sum_{l=1}^{p} A_l(s_t) x_{t-l} + u_t \,, \tag{6}$$

where x_t is defined as a *p*-VAR conditional upon s_t; for $s_t \in \{1, 2, \ldots, M\}$, and
u_t is assumed to be a Gaussian innovation process conditional upon s_t: $u_t \sim \text{NID}(0, \Sigma(s_t))$.

The MS-VAR model would be referred to as the MSI-VAR model if only intercept term, $v(s_t)$, is regime-varying, the MSIA-VAR model if parameters, $A_l(s_t)$, also change with regime, and the MSIAH-VAR model if additionally variances, $\Sigma(s_t)$, are regime-dependent. The MSIAH model is also able to capture the autoregressive conditional heteroskedasticity effect (Krolzig, 1997). The MS model could be estimated by using a maximum likelihood procedure (hereafter called ML). The ML algorithm of this model is based on a version of the Expectation Maximization (hereafter called EM) algorithm discussed in Hamilton (1990). The EM algorithm is originally described by Dempster, Laird and Rubin (1977) as a general approach to iteratively compute the ML estimation technique. This technique is designed for general models where the observed variables are dependent on some unobserved variables.

Key variable and data

According to the imperfectly competitive banking industry model discussed in Section 3, there are three short-term interest rates: deposit, lending, and inter-bank rates, respectively. Minimum lending rate (MLR) is used as a proxy for the lending rate (r_L). The MLR is an interest rate that lending commercial banks can charge their most creditworthy borrowers on loans with pre-specified repayment schedules. The proxy for the deposit rate (r_D) is the saving deposit rate. The inter-bank rate is a proxy for the inter-bank rate (r_B). Disyatat and Vongsinsirikul (2003) also state that the results are similar when using either overnight inter-bank rate or RP14. All variables are collected from the BOT; to assess the effectiveness of Thai monetary transmission mechanism, the

data from June 1999 to October 2010 are employed. The starting period is from June 1999 since the Thai government has not drawn any money from IMF (IMF External Relations Department, 2000). The total number of observations is 137. In addition, monthly data is used because it can mitigate the potential impact of infrequent trading effects on the statistical inference, as suggested by Harvey (1995). This data can also capture long-term movements in volatility.

5. Findings and Discussion

This section presents the analysis results from linear and non-linear model, which can be divided into three sub-sections as follows:

Preliminary analysis

The analysis shows that during the sample period covered from June 1999 to October 2010, the deposit rate has the lowest average of 1.4361% followed by the inter-bank rate of 2.2384%. The lending rate is considerably higher, being on an average of 6.9597%. This probably shows a larger credit risk involved in lending activities. For all short-term interest rates, moreover, the null hypothesis of normality are statistically rejected (the *p*-value for all rates is less than 0.05), implying that these short-term interest rates do not follow a normal distribution. All interest rates are significantly correlated; as expected, the deposit rate is highly positive correlated with the lending rate (0.8732). For the inter-bank rate, there is also a positive relationship between deposit and lending rates (0.3440 and 0.29376).

Linear model

Table 1 shows that the data supports a three-variable linear VAR with two lags. As expected, the past short-term interest rates ($r_{D\text{-}1}$, $r_{L\text{-}1}$, and $r_{B\text{-}1}$) have positively significant effect on the current rates. For the deposit equation, $r_{B\text{-}1}$ has a positively significant impact on the current rate. The similar pattern can also be found in the lending equation. An increment of 100 basis points in inter-bank rate could lead deposit and lending rates to increase by 0.1571% and 0.1248%. This indicates that the interest rate pass-through process is quite inefficient.

The results show that the size of pass-through after the Asian financial crisis is even smaller, when compared with Disyatat and Vongsinsirikul (2003). The analysis shows that 100 basis points rise in inter-bank rate would lead to a rise of 15.71% and 12.48% in deposit and lending rates, while the previous study shows that the immediate pass-through from RP14 to 3-month deposit rate and MLR are 5.70% and 8.90%. There is a possible explanation for this result. Disyatat and Vongsinsirikul's (2003) study, for example, covers the period (from the Second World War to July 1997) where Thailand was under the pegged exchange rate policy that aims to defend the Baht value against the US dollar. In fact, all monetary and financial measures are mainly designed to be consistent with the pegged exchange rate system. During this period, the monetary policy could affect real activity through exchange rate channel in which the effects are likely to be slow because nominal exchange rate is not allowed to fluctuate. This paper, however, covers the period where the monetary targeting policy (from July 1997 to May 2000) and inflation targeting policy (from May 2000 to present) are in place. Under these two policies, the BOT monitors domestic money supply in

order to ensure macro-economic consistency as well as to reach the ultimate objectives of sustainable growth and price stability (Bank of Thailand, 2008).

Table 1 Linear VAR model

This table shows the estimated parameters of linear VAR model with two lags (or the VAR(2) model):

$$x_t = v_t + \sum_{l=1}^{p} A_l x_{t-l} + u_t ,$$

where $x_t = [r_D, r_L, r_B]'$ and u_t is a vector of error terms with mean zero and covariance matrix, and v_t and A_l are defined as a vector of intercept term and estimated parameters.

The sample contains monthly deposit, lending, and inter-bank rates (r_D, r_L, and r_B) from June 1999 to October 2010.

Coefficient on	Deposit	Lending	Inter-bank
Constant, v_t	-0.0245	0.3089**	0.4155*
	(0.1813)	(0.1428)	(0.2220)
Deposit_1, $r_{D\text{-}1}$	1.2524***	0.1074	-0.0627
	(0.0986)	(0.0776)	(0.1207)
Lending_1, $r_{L\text{-}1}$	-0.1412	1.0220***	0.6816***
	(0.1375)	(0.1082)	(0.1685)
Inter-bank_1, $r_{B\text{-}1}$	0.1571**	0.1248**	1.0627***
	(0.0710)	(0.0559)	(0.0869)
Deposit_2, $r_{D\text{-}2}$	-0.3119***	-0.0781	0.1344
	(0.0983)	(0.0774)	(0.1203)
Lending_2, $r_{L\text{-}2}$	0.1503	-0.0822	-0.7435***
	(0.1339)	(0.1054)	(0.1639)
Inter-bank_2, $r_{B\text{-}2}$	-0.1461**	-0.1028*	-0.0956
	(0.0701)	(0.0552)	(0.0858)

Note: Standard errors are given in parentheses.
One, two, and three asterisks stand for 10%, 5%, and 1% statistical significance, respectively.

Non-linear model

The first step of estimating the MS-VAR model is to simultaneously determine the numbers of regimes and lags based on the Schwarz (1978) information criterion (hereafter called SIC) as the simulation results of Awirothananon and Cheung (2009) show that SIC performs better than Akaike (1973) and Hannan-Quinn (1979) information criteria as well as MSC (Smith, Naik & Tsai, 2006). SIC value for all competing models with two to three regimes and up to three lags are calculated. SIC value suggests that the best model is the MS-VAR model that allows intercept term and auto-regressive parameters varying with two regimes and two lags (or the MSIA(3)-VAR(2) model) as its value is smaller than other models.

The adequacy of MS-VAR model for the interest rate pass-through process can be examined by testing for non-linearity. Log-likelihood ratio is used to test for the null hypothesis of linearity

against the non-linear specification in the VAR framework. The MS-VAR model could be seen as a generalisation of VAR model, while a linear VAR model could be treated as the restricted model. The result clearly shows that the linear VAR model fails to capture significant non-linearities in the data generating process. The linear VAR model is rejected in favor of the non-linear MSIA(3)-VAR(2) model as the LR Linearity statistics are 550.9069, which is significant at the 5% level.

The estimated parameters of MSIA(3)-VAR(2) model presented in Table 2 clearly show very different behavior for both lending and deposit equations. As expected, $r_{D\text{-}1}$ and $r_{L\text{-}1}$ have a positively significant effects on the current rates during both highly and volatile market conditions. In normal market conditions, only lagged lending rate could create significant impact on both current deposit and lending rates. In the deposit equation, $r_{B\text{-}1}$ has a positively significant effect on the current deposit rate in all market conditions. For the lending equation, $r_{B\text{-}1}$ could create a negatively significant impact during both normal and volatile market conditions, while a positive impact only occurs in highly volatile market conditions. With an increment of 100 basis points in inter-bank rate, deposit and lending rates switch from 0.3116% and 0.1596% in highly volatile market conditions to 0.3510% and -0.2552% in volatile market conditions. The same movement of inter-bank rate also leads deposit and lending rates changing by 0.6115% and -0.8938%. This result indicates that the Thai interest rate pass-through process is quite inefficient.

Table 2 Non-linear Markov switching model

This table presents the estimated parameters of non-linear MS-VAR model that allows for intercept terms and auto-regressive parameters switching with three regimes and two lags (or the MSIA(3)-VAR(2) model):

$$x_t = v(s_t) + \sum_{l=1}^{p} A_l(s_t) x_{t-l} + u_t \ ,$$

where x_t is $[r_D, r_L, r_B]'$ and u_t is assumed to be a Gaussian innovation process: $u_t \sim \text{NID}(0, \Sigma)$, and $v(s_t)$ and $A_l(s_t)$ are defined as estimated parameters conditional upon s_t; $s_t = \{1, 2, \ldots, \text{and } M\}$.

The sample contains monthly deposit, lending, and inter-bank rates (r_D, r_L, and r_B) from June 1999 to October 2010.

Coefficient on	Deposit	Lending	Inter-bank
Volatile market conditions			
Constant, $v(s_t)$	7.8793***	-2.9521***	1.4585**
	(0.5342)	(0.7153)	(0.6907)
Deposit_1, $r_{D\text{-}1}$	-0.4804***	1.1868***	-0.4707***
	(0.0915)	(0.1247)	(0.1177)
Lending_1, $r_{L\text{-}1}$	-0.4443***	0.8568***	0.1002
	(0.0739)	(0.1031)	(0.0941)
Inter-bank_1, $r_{B\text{-}1}$	0.3510***	-0.2552***	-0.0446
	(0.0301)	(0.0411)	(0.0386)
Deposit_2, $r_{D\text{-}2}$	-0.2885***	-0.2064	0.6432***
	(0.1001)	(0.1383)	(0.1281)
Lending_2, $r_{L\text{-}2}$	0.0815	0.2248*	-0.1416
	(0.0904)	(0.1228)	(0.1164)
Inter-bank_2, $r_{B\text{-}2}$	-0.2864***	-0.1117	0.2846**
	(0.0910)	(0.1240)	(0.1168)
Normal market conditions			

Constant, $v(s_t)$	-0.8263	10.0614***	13.7724***
	(0.8364)	(1.1181)	(1.0947)
Deposit_1, r_{D-1}	0.0323	0.6435***	-0.8729***
	(0.0605)	(0.0808)	(0.0783)
Lending_1, r_{L-1}	-0.6128***	0.5643***	-0.5965***
	(0.0384)	(0.0513)	(0.0504)
Inter-bank_1, r_{B-1}	0.6112***	-0.8938***	-0.5806***
	(0.0466)	(0.0623)	(0.0612)
Deposit_2, r_{D-2}	0.8083***	-1.2921***	0.0826
	(0.0724)	(0.0969)	(0.0940)
Lending_2, r_{L-2}	0.7070***	-0.4335***	-0.5797***
	(0.0584)	(0.0781)	(0.0760)
Inter-bank_2, r_{B-2}	-0.2821***	-0.4635***	-0.4126***
	(0.0499)	(0.0667)	(0.0647)
Highly volatile market conditions			
Constant, $v(s_t)$	-0.2117	3.1662**	-3.2639**
	(1.0850)	(1.4326)	(1.4063)
Deposit_1, r_{D-1}	-0.2587**	0.4650***	0.0755
	(0.1025)	(0.1356)	(0.1322)
Lending_1, r_{L-1}	-0.5403***	0.7936***	0.3386
	(0.1688)	(0.2245)	(0.2178)

Table 2 Non-linear Markov switching model (cont'd)

Coefficient on	Deposit	Lending	Inter-bank
Inter-bank_1, r_{B-1}	0.3116***	0.1596	-0.2598*
	(0.1044)	(0.1395)	(0.1351)
Deposit_2, r_{D-2}	0.6478***	-0.8178***	0.8463***
	(0.1936)	(0.2561)	(0.2505)
Lending_2, r_{L-2}	1.2125***	-0.8189***	1.1687***
	(0.1929)	(0.2559)	(0.2500)
Inter-bank_2, r_{B-2}	-0.0152	0.1204	0.0143
	(0.0560)	(0.0737)	(0.0704)

Note: Standard errors are given in parentheses.
One, two, and three asterisks stand for 10%, 5%, and 1% statistical significance, respectively.

By comparing the result of linear VAR with that of non-linear MSIA-VAR models, two interesting differences can be found. The first difference is that the size of immediate pass-through from inter-bank rate to deposit and lending rates are quite small in the linear VAR model, whereas the non-linear MSIA-VAR model show that the size of pass-through is larger (smaller) in deposit (lending) rate. For a 100 basis points rise in inter-bank rate, deposit and lending rates increase by 0.1571% and 0.1248% in the linear case. For the non-linear model, with a similar increase in inter-bank rate would lead deposit (lending) rate to increase (decrease) by 0.6112% (0.8938%) in normal market conditions. This might be possibly caused by high lending rate and low borrowing demand in a money market. For example, on 12 March 2003, the Monetary Policy Committees (hereafter called MPC) noted that inflation rose slightly from 0.6% in quarter 4 of 2002 to 1.2% in quarter 1 of 2003 as driven by higher world oil prices and an upward adjustment in domestic diesel prices. Core inflation also rose slightly. To curb down the threat of inflation, the MPC decided to increase RP14 by 0.25% (from 1.50% to 1.75%). Lending rate, however, drops significantly afterward as there is excess liquidity of 600 billion Baht (Khanthong, 2003; Srisukkasem & Pongvutitham, 2003). This

may explain why lending rate may go down after RP14 goes up. During highly volatile market conditions, however, with 100 basis points rise in inter-bank rate, deposit and lending rates increase 0.3116% and 0.1596%.

6. Summary and Conclusion

This paper examines and assesses the efficiency of interest rate pass-through in Thailand within two models: linear VAR and non-linear MS-VAR models. Preliminary analysis shows that deposit and lending rates have a highly positive correlation. Lending rate is also consistently greater than deposit rate, which is also lower than inter-bank rate. In addition, these three interest rates do not have a normal distribution. This paper reports an analysis of the degree of interest rate pass-through in a multivariate linear and non-linear framework by using monthly short-term interest rates from June 1999 to October 2010. The analysis shows strong evidence of the presence of non-linearities in changes of money market rate, which is successfully captured and modeled by a non-linear MS-VAR model.

The linear VAR model clearly shows that each interest rate is positively affected by its own past value. Estimating the linear VAR model, however, is not appropriate apparently due to the presence of several changes in money market conditions. This paper finds that non-linear MS-VAR model (or the MSIA-VAR model) could describe the interest rate pass-through process better than the linear VAR one. The results show that the size of immediate pass-through from the inter-bank rate to deposit and lending rates is quite high. For a change of 100 basis points in inter-bank rate during normal market conditions deposit and lending rates respond 0.6112% and -0.8938%, respectively. With the same increase in inter-bank rate, however, deposit rate raises by 0.3510%, while lending rate decreases by 0.2551% during volatile market conditions. This might suggest that the Thai monetary policy may not be effective. The result also clearly shows that a non-linear MSIA-VAR model could capture significant non-linearities in the data generating process. This paper, therefore, concludes that the non-linear MSIA-VAR model better captures the Thai interest rate pass-through. This model also indicates that the pass-through process is quite inefficient.

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Stakeholders of Dollar-Yuan Exchange Rate Negotiation

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Abstract

Exchange rates influence a country's trading capability, foreign reserves and competitiveness. Recently, the exchange rate between Chinese RMB and US Dollar has been a contentious issue in both United States and China. In this paper, we conduct a historical review how the United States deployed negotiation strategies with China on the exchange rate issue, and consider the degree to which it follows theoretical expectations. We then analyze the changing nature of the factors which shape exchange rate negotiations between the two nations in projecting alternative scenarios for the future of conflict resolution between the U.S. and China on this issue. We predict that the U.S. is likely to continue alternating between competition and collaboration, a negotiation cycle influenced by U.S. domestic politics, China is less likely to continue with accommodation and compromise. The sequencing and timing of each nation's negotiation strategy will lead to widely divergent consequences for the management of exchange rates and the world economy.

Keywords: Exchange Rates, Negotiation, World Economy

1. Introduction

Over the course of the past decade the revaluation of the Chinese RMB has become an extremely important and contentious issue in the global business and political communities. Following an export-oriented development strategy, China's economy has experienced a boom for nearly twenty years since the early 1990s. Contrasted to China's long-term boom, many other nations, especially wealthier industrialized countries, have experienced relatively low growth and de-industrialization during this period. Critics of Chinese economic policy charge that China continues to run large current-account surpluses while their own nations suffer from trade deficits that result in a reliance on foreign capital and increased national debt. Others have accused China of attaining its

status as an export powerhouse through mercantilism. It has been argued that China subsidizes its exports unfairly by giving exporters credit at cheap rates and keeping its currency, the RMB, artificially undervalued. International pressure has been building for China to revalue its currency and boost domestic consumption, which compared to other nations, makes up a noticeably small share of its GDP.

The PRC government has resisted pressure to increase the value of the RMB, citing concerns about the potential loss of domestic jobs and exposure of domestic banks to currency risks for which they are not prepared. Unable to ignore the heightened called for currency revaluation by its major trading partners and foreign governments, China ultimately revalued the RMB by 2.1% on July 21, 2005.[1] At the same time, Chinese authorities abandoned the dollar peg system that the nation had previously adopted, choosing to instead "reform to improve the exchange rate formation mechanism of the Yuan" ('Yuan reform'). The reason for this change, articulated by a spokesperson of the People's Bank of China (PBOC) was: "Promotion of reform of the Yuan's foreign exchange rate formation mechanism is based on the need to alleviate foreign trade imbalance, expand domestic demand, improve companies' international competitiveness, and raise the country's level of openness to the world."[2] Under the new "managed float" policy, China agreed to let the RMB trade in a defined daily trading band while allowing it to gradually appreciate. This move pacified China's trading partners while still allowing it to maintain complete control over its currency.

Meanwhile, holding the RMB at a low value is proving increasingly difficult. For one, the increasing budget deficit due to the war and stimulus spending, persistent trade deficit, and aggressive monetary policy have resulted in downward pressure on the U.S. dollar. The policy of pegging the RMB to the dollar has resulted in the massive increase in China's dollar reserves. The Chinese Central Bank has already declared that they will no longer hold new dollars, but will instead trade them for copper gold, oil, and the like. At this rate, China will be all but forced to let the RMB appreciate against the dollar. In recent years the RMB-dollar exchange rate has been unstable, increasing 21% from 2005-2008, then, after a series of ups-and-downs, fixed once more at 6.83 RMB per dollar, where it remains today.

In this paper, we conduct a historical review of how the United States deployed negotiation strategies with China on the exchange rate issue, and consider the degree to which these follow theory. We then analyze the changing nature of the factors which shape exchange rate negotiations between the two nations, as a basis for projecting alternative scenarios for future conflict resolution strategies between the U.S. and China on the currency management issue. We predict that the U.S. is likely to continue alternating between competition and collaboration as its primary negotiation strategies, a cycle greatly influenced by the dynamics of U.S. domestic politics. Additionally, the U.S. is likely to complement its bilateral negotiations with multi-lateral alliance building, with a focus on mobilizing significant stakeholders in the G-20 process. China is less likely to continue with accommodation and compromise, countering with competitive and collaborative strategies, and attempts to build counter-alliances. The sequencing and timing of each nation's negotiation strategy lead to potentially widely divergent consequences for the management of exchange rates and the world economy.

The reminder of the paper is organized as follows. Section 2 provides a brief review of the literature. In section 3 we present a historical review of RMB-Dollar exchange rate policies. In

[1] http://www.managementcanvas.iimindore.in/icanvas/index.php?option=com_content&view=article&id=54:yuan-chronicle&catid=36:economics&Itemid=53

[2] http://www.rieti.go.jp/en/china/08082601.html

section 4 we describe the negotiation strategies used by both sides related to the RMB exchange rate. In sections 5 we discuss the important factors, including institutions, politics, economics and culture, which explain the choices of negotiation strategies utilized by each side. Finally, in section 6 we discuss the alternative future scenarios for conflict management between the U.S. and China, each of which indicates widely divergent outcomes for the world economy.

2. Literature Review

RMB related foreign exchange markets have been thoroughly researched by scholars in different disciplines which could be broadly classified into two broad categories. The first category is the study of RMB exchange regimes, such as the characteristics of regimes and the design of regimes (Li 2003, Xu2004, Kuroda 2004). Analysts implore policymakers to learn the lessons of major episodes of the transitioning of currency regimes, such as the "Nixon Shock" of 1971 and the "Plaza Agreement" in 1985, in order to avoid economic turmoil (Kuroda 2004). Many analysts draw cautionary lessons from the Plaza Agreement, and fear that the United States pressure on China to let the RMB appreciate will result in a repeat of the scenario that the Japanese economy has suffered from. China is seen as facing even more serious potential threats than Japan, with a repeat of the downward pressure on interest rates and possible liquidity trap that Japan endured since the mid-1990s (McKinnon 2005). Eichengreen (2005) further suggested that the best time for China to change its regime from pegged to dollar policy to a managed float is when there is substantial capital inflow.

The second category of literature focuses on the relationship between RMB exchange rate and economic and trade growth. It is generally believed that undervaluation of the currency can stimulate economic growth, particularly for developing countries (Rodrik, Henry and Woodford 2008). A lower RMB exchange rate is a double edged sword in that it can help China pursue export-oriented growth and job creation, however, it will also create financial and economic vulnerabilities, such as an overheating domestic economy (Kaplan 2006). The relationship between exchange rate and trade is complicated. By using the autoregressive distributed lag model, Narayan (2006) found that in both the short run and the long run a real devaluation of the Chinese RMB improves the trade balance. The uncertainty of exchange rates may have both negative and positive effects on the trade flows. By using disaggregated data between the U.S. and China at the commodity level for 88 industries, Bahmani-Oskooee and Wang (2007) found that almost half of the industries are sensitive to a measure of exchange rate uncertainty. Similarly, by using disaggregated monthly trade data and excluding China's decentralization period, Marquez and Schindler (2007) found that a 10 percent real appreciation of the RMB lowers the share of aggregate Chinese exports by nearly one percentage point.

The above two categories of research are interrelated in some ways, because the underlying factors, such as trade and account surplus vary under different regimes. This creates challenges for exchange rate forecasting, which is regarded as a hazardous endeavor (Moosa 2008). As noted by Moosa, forecasting exchange rates is difficult due to the outcome of a financial decision taken today is contingent upon, among other things, the value of the underlying exchange rate that will prevail in the future. This is particularly true for the RMB and dollar exchange rate, because the underlying factors are largely due to the negotiation game between the Unites States and the Chinese government. This important underlying factor is somewhat neglected in the academic literature, despite the fact that it has governed the directions of RMB-dollar exchange rate in the past and is likely to do so in the future as well.

3. Historical Review of Chinese RMB

China emerged as a major exporting economy during the 1990s as a consequence of adopting the export-oriented industrialization strategy common to most East Asian nations. Since 1994, Chinese RMB has been pegged with the value of the U.S. dollar. During the Asian financial crisis of 1998, China did not devalue its currency; instead, it continued its dollar pegging policy. "This policy was praised during the Asian Financial Crisis of 1998 as it prevented a round of competitive devaluations."[3] However, Chinese trade and exchange rate policies had raised political sensitivities in the United States from an early point. Until China became a member of the WTO on December 11, 2001, there was an annual, rancorous debate in the U.S. Congress over renewing 'most favored nation' status to the PRC.

As China became a WTO member, the Bush Administration emphasized the need for stability in trade relations and for flexibility on exchange rate policy. According to the online "Press Room" of the United States Treasury Secretary, the United States, under the Bush Administration, developed a three-part financial diplomacy strategy. The first element of the strategy consisted of conducting a series of talks between high-level officials (including the president) in order to prioritize the importance of attaining a flexible exchange rate policy. The second element of the U.S. strategy was to mobilize support on the issue of RMB exchange rate flexibility from other countries. Finally, the "Bush administration worked intensively with the Chinese on the essential, technical, economic, and financial steps need to move exchange rate flexibility".[4] The U.S. executive has tended to be more multi-faceted in dealing with issue of relations with major foreign nations, as economics forms only one aspect of the multiple dimensions in international relations.

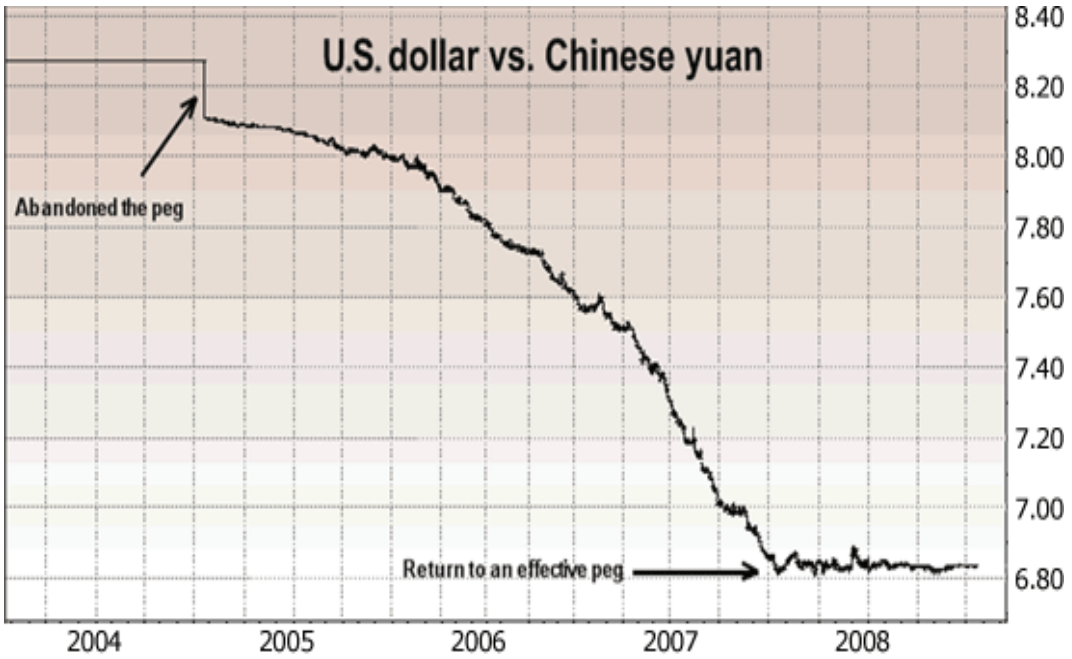

Figure 1 Exchange Rates between US Dollar and Chinese Yuan

[3] http://www.wordiq.com/definition/Renminbi

[4] http://www.stanford.edu/~johntayl/taylorspeeches/New%20Directions%20for%20U.S.%20Economic%20Policy%20towards%20Japan%20and%20China.doc

The U.S. Congress tends to be more concerned with protection and promotion of domestic industry and jobs and is typically less conciliatory than the executive in economic relations with foreign countries. As the rapid rise of imports from China coincided with the loss of millions of manufacturing jobs during the U.S. recession of 2001-2002, legislators started to take actions. In 2003, U.S. Senator Charles Schumer introduced the first Congressional bill targeting the value of the Yuan[5]. On February 9, 2005 Congressman Bernie Sanders and others moved to withdraw normal trade relations treatment[6]. In 2006, two US senators co-sponsored a bill that would impose high tariffs on Chinese products if the country did not let the Yuan rise; this was in response to the trade imbalance with China, which hit a record $233 billion in 2006[7]. The Bush Administration discussed the issue with Chinese President Hu Jintao, and the two countries agreed to work together on a "joint technical cooperation program to promote the development of China's financial markets and to examine ways China can move more quickly towards a floating exchange rate."[8] The Fair Currency Alliance hired a Washington law firm to prepare a Section 301 petition, which challenged the Chinese exchange rate policy[9].

U.S. negotiation strategy has many elements, but ultimately it reflects the dynamics of the domestic political economy. Today, the Obama Administration is under tremendous pressure from Congress, organized labor and the media, to put greater pressure on China regarding the manipulation of their currency. On April 15, 2010, the United States Department of Treasury was expected to release the semi-annual report on exchange rate policies. Treasury Secretary Timothy Geithner was expected to label China as a currency manipulator in this report. However, Secretary Geithner did not do so and instead pushed the deadline for the report back, citing the upcoming visit of President Hu Jintao to the White House. During the most tense days of the financial crisis both Bush and the incoming Obama administration were keenly aware of the need for cooperation from China to keep credit flowing to businesses and consumers and avoid a collapse of the financial system. However, as the U.S. economy experiences a 'jobless' recovery, domestic political forces are once again mobilizing to pressure the administration to confront China on the exchange rate issue. President Obama recently stated that "China and its currency policies are impeding the rebalancing of the global economy that's necessary. My goal over the course of the next year is for China to recognize that it is also in their interest to allow their currency to appreciate because, frankly, they have got a potentially overheating economy."[10] On April 14 2010 the U.S. President, in private a meeting with his Chinese counterpart Hu Jintao in Washington urged him to move to "more market oriented exchange rate."[11] Jintao replied that he would not raise the RMB due to external pressure from the US. [12]

China tended to be on the accommodative earlier, but has shifted to a more assertive stance, post-2008 crisis. The dynamics of the Chinese domestic political economy work differently from those of the U.S. and the lack of understanding of these factors often caught Chinese officials off-guard and put them on the defensive. Pre-crisis, the Chinese tended to adopt an accommodative, gradualist approach as evidence by the official adoption in 2005, of a flexible exchange rate system resulting in RMB appreciation of approximately 21% in the subsequent three year period. The gradualist nature of the approach was exemplified by the decision to allow the Yuan to rise or fall

[5] http://www.reuters.com/article/idUSTOE63804D20100409
[6] http://csis.org/files/media/csis/pubs/0501qus_china.pdf
[7] http://www.reuters.com/article/idUSSP13020091113
[8] http://www.policyarchive.org/handle/10207/bitstreams/3795.pdf
[9] http://www.piie.com/publications/chapters_preview/3942/02iie3942.pdf
[10] http://www.businessweek.com/magazine/content/10_08/b4167032896448_page_5.htm
[11] http://economictimes.indiatimes.com/news/international-business/Obama-presses-Beijing-for-a-market-oriented-FX-rate/articleshow/5673614.cms
[12] http://www.benzinga.com/life/politics/224454/debate-on-china%E2%80%99s-exchange-rate-policy-continues

only 0.3% a day against the dollar. The decision was also taken to benchmark a basket of currencies rather than just the U.S. dollar. [13] Additional steps towards currency flexibility were taken in form of the launch (in 2006) of "over-the counter trading of the RMB", and a broadening of the Yuan's daily trading band against the dollar to 0.5%. [14]

By the end of 2008 the RMB reached 6.83 to the US dollar. The rise in the Yuan created complications for China's domestic economy. The gradual RMB appreciation from July 2005 to July 2008 created a "one-way-bet" that disordered China's financial markets, the increasing capital inflow and the trade surplus leading to an undue build up of China's exchange reserves, which produce additional pressure for RMB appreciation. After July 2008, the credit crunch induced an unexpected unwinding of the dollar carry trade leading to a sharp appreciation in the dollar's effective exchange rate. RMB's appreciation against the dollar was then stopped and China's forward exchange market was restored. Since March 2009, the fall in the dollar (with the RMB tied to it) again threatens to undermine the RMB/dollar rate. In December 2009 the authorities of China found another way to reduce financial risks. According to the U.S. Treasury Department, China sold a package of U.S. Treasury bonds amounting to $ 34.2 billion.[15] As a result, the leading holder of U.S. debt receipts was Japan ($ 769 billion), overtaking China for the first time since August 2008. Chinese officials have started to disagree openly with Americans on the issue of currency manipulation and exchange rate policy. On February 4, 2010 China dismissed the latest U.S. criticism on its trade surplus, saying its currency exchange rate is close to a reasonable level [16], and on March 14 2010 Premier Wen Jiabao told the domestic and foreign press that China opposes any coercion to push its currency to appreciate, and intends to resolve the exchange rate issue through negotiation[17]. Meanwhile, the Chinese government is under the pressure to seek alternatives to a U.S. dollar reserve-based international financial system. Zhou XiaoChuan, the governor of China's central bank, was cited that "he may also have been playing to his audience at home, seeking to deflect criticism that the Chinese authorities, by failing to actively seek out alternatives to the dollar, have not been careful stewards of the country's international reserves".[18]

4. Patterns of Conflict Management over Exchange Rate Policy

There have been five distinguishable phases in U.S.-China negotiations on the exchange rate issue over the previous thirteen years (see figure 2). The secular trend in bilateral negotiations has been towards increasingly competitive modes, punctuated by a retreat from such modes during the severe economic crisis of 2008-9. Explanations for the evolving modes of conflict management reside mainly in structural factors, though cultural factors also contribute to our interpretation of events. For instance, in the first period we identify, between 1997 and 2002, the exchange rate issue was not identified as an important issue by either country, and thus both followed an avoidance strategy, as predicted by even the most elementary models of conflict management (such as Dual Concerns). U.S.-China commercial policy centered mainly on the annual renewal of MFN status for China by the U.S. Congress during this period, and it must be remembered that the late 1990s was a period of generally benign economic conditions, including low unemployment and a cyclical peak for the U.S. Dollar. Thus, despite concerns long-standing concerns about competition from low-cost

[13] http://www.law.ku.edu/library/researchlinks/research/intltrade/HKLJ_Virtues_Yuan_and_American_Trade_Empire.pdf
[14] http://imarketnews.com/node/11107
[15] http://english.peopledaily.com.cn/90001/90780/91421/6900299.html
[16] http://english.peopledaily.com.cn/90001/90776/90883/6888449.html
[17] http://english.cctv.com/program/bizchina/20100318/101326.shtml
[18] http://www.wright.edu/~tdung/dollar_dilemma.htm

Asian manufacturers, a sense of economic well-being was widespread in the U.S.

In the period from 2002 to October 2003 the RMB-Dollar exchange rate became a salient political issue in the United States, which adopted a more competitive negotiation strategy on the issue, while Chinese government counterparts preferred to continue with an avoidance strategy. The U.S. approach was not purely competitive as it incorporated collaborative elements, which were facilitated by engaging in backroom negotiations among selected elites, shielded from the gaze of larger domestic constituencies. This strategy was buffeted and pushed to a more competitive approach by the activism of Congress members in tune with the interests and moods of their own particular constituencies. The changed U.S. strategy can be explained by multiple factors, starting with power asymmetries: as the world's economic and geopolitical superpower, the country's representatives perceive their capacity to be forceful on issues high on the national-interest agenda. Additionally, the recession of 2000-2001 witnessed a dramatic loss of manufacturing jobs, and their perceived rapid shift to China. These renewed long-standing economic anxieties about de-industrialization that began in the 1970s (Harrison and Bluestone 1982). Culture is also a moderating factor in the U.S. approach, as the widespread competitive-bias (or 'fixed pie fallacy') reinforces the negotiation approach of a nation with superpower capabilities (Lewicki et al. 2006). The Chinese responded to the changed American negotiation strategy with an attempt to continue the avoidance strategy. This can be explained by several factors, starting a perception of structural power. If one perceives oneself as less powerful in a relationship, then attempting to avoid is a rational tactic, especially if the power asymmetry is moderate (extremes of power difference reduce one's capacity to avoid). Additionally, the Chinese government was not directly pressured by domestic constituencies, nor did it run the risk of losing credibility with its constituents by appearing weak. Additionally, cultural factors would tend to favor avoidance: perceptions of time and conflict resolution are very different among Chinese, who prefer not to rush into negotiations, preferring a slower pacing. Avoidance as a negotiation strategy receives a higher preference ranking among Chinese in comparison with Americans (Prasad and Cao 2010).

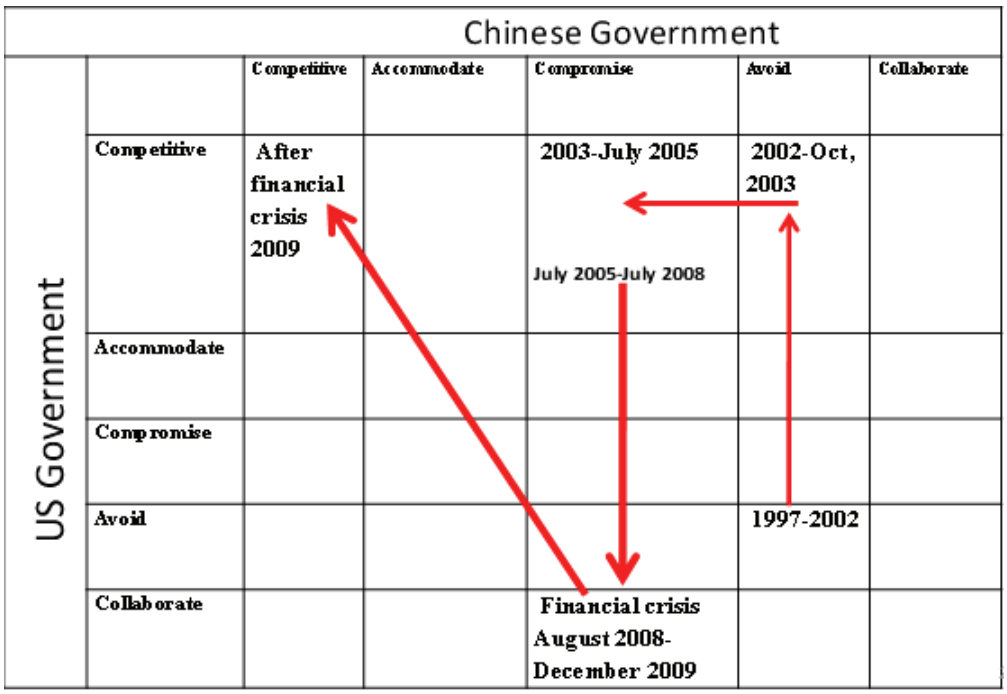

Figure 2 The Negotiation Strategies and Interactions between China and the United States

From 2003 until the economic crisis of 2008-9 the U.S. strategy remained the same: a competitive approach oscillating between the executive's statecraft and the legislature's more belligerent stance. Under American pressure, the Chinese government could no longer sustain the preferred avoidance strategy and attempted compromise. The election of a compromise strategy reflected both a perception of power-relations and a preference for equality of outcomes, reflective of Chinese values. The Chinese government's fundamental assessment of its interests remained in continuing its export-oriented industrialization, and therefore continued access to the U.S. domestic market was paramount. In the U.S. the period of 2003-2008, though marked by a housing boom, was a period of economic anxiety with a slow-recovering labor market and a fear that globalization threatened even white-collar jobs through new phenomena such as 'out-sourcing' and 'off-shoring'. Americans became familiar with the name of cities such Bangalore and its back-office firms such as Infosys, made famous by Tom Friedman's (2005) best seller 'The World is Flat'. The public's economic anxieties often found expression in the assertive behavior of their elected representatives.

In year 2003, the Bush administration employed a financial diplomacy strategy that consisted of three parallel points of engagement: talks between high-level officials, talks between the two presidents and the convening of a special committee charged with de-pegging the RMB from the US dollar. While the United States' primary negotiating thrust was bilateral, this was supplemented with a multilateral mobilization of other nations and groupings, such as the G8 and European Union for the aim of RMB flexibility. In the same year, U.S. Senator Charles Schumer introduced the first Congressional bill targeting value of RMB.[19] Under the consistent and increasing pressure from multiple sources, the Chinese government in 2003 decided to take several steps including technical, economic, and financial measures to move to a flexible RMB policy. [20] By October of 2003, it can be said that China's strategy shifted from avoidance to compromise. With the continuous pressure from the U.S. Congress with threats of labeling China as a currency manipulator, President Bush Administration discussed the issue with Chinese President Hu Jintao, and the special joint technical cooperation program with the objective to move RMB towards a floating system began to operate.[21] During the course, competitive measures were constantly used. On January 21, 2004 President Bush added to the diplomatic pressure by remarking that "countries like China have got to deal with their currency." A law firm hired by the Fair Currency Alliance began to prepare a Section 301 petition, furthering supplementing the competitive approach towards China in RMB negotiations.

After nearly a full year of preparation under the auspices of the joint technical cooperation program on Chinese RMB (engaging government officers and technical staff from the two countries), an agreement was produced regarding the future directions of RMB. In an expression of satisfaction with the progress of its competitive negotiation approach by September 2004, the United States announced that China had made significant progress in its "transition to the market based exchange rate system". Meanwhile, lobbyists such as the China Currency Coalition kept up the pressure on the government to take a hard-line in the negotiations. The US Congress took similar steps to push the administration in proposing the Chinese Currency Act of 2005 (H.R. 1498). The U.S. negotiation strategy was implemented seamlessly. For instance when, on 26 June, 2005, China's Prime Minister Wen Jiabao expressed the view that China should not be in a hurry to revalue the Yuan and that a stable Yuan helps global financial stability and the growth of trade (during a meeting with European finance chiefs), a US spokesperson promptly retorted that the current value of about 8.3 to the US dollar was artificially low.

[19] http://www.reuters.com/article/idUSSP13020091113
[20] http://www.allbusiness.com/finance/432550-1.html
[21] http://fpc.state.gov/documents/organization/41125.pdf

On July 21, 2005, China officially allowed the RMB to be flexible to other currencies. People's bank of China (PBOC) ended the dollar peg and revalued the Yuan by 2.1 percent to 8.11 per dollar.[22] The new system was to be based on market supply and demand with reference to a basket of currencies. The Yuan was permitted to rise or fall 0.3 percent a day against the dollar from a reference rate set every morning by the PBOC. After the promulgation of the new policy, the major players of RMB systems shifted from the governments to investment funds, banks and other invisible hands. As a consequence of the new currency policy the RMB's value against dollar increased 20% by July 2008.[23]

In spite of the new RMB policy, the US Congress kept up the pressure for an increased revaluation of RMB. Against the backdrop of a record $233 billion trade deficit, in 2006, two U.S. senators co-sponsored a bill to impose high tariffs on Chinese goods if the RMB did not appreciate to satisfactory levels. In response to this new pressure, the RMB's daily trading band against the dollar was widened to plus or minus 0.5 percent in 2007. With speculation of RMB appreciation rampant and Chinese government policy to attract more foreign investment, a large influx of capital from the United States and Europe found its way to China, which resulted in an increased money supply and pressure on the RMB to appreciate. From 2005 to 2008 the exchange rate of RMB appreciated 5 percent per year and the Shanghai Stock Market Index increased 400 percent from 1500 in year 2005 to 6000 in year 2008. Meanwhile, in order to encourage more exports, the Chinese government exempted all export taxes. However, in July 2008, as the global financial crisis loomed, China reasserted control of the RMB's and maintained it in a narrow range around 6.83 per dollar.

The economic crisis of 2008-9 fundamentally changed the competitive-compromise negotiation equilibrium on the exchange rate issue. In September and October of 2008 panic gripped the financial system of the United States. Among the responses was massive and unprecedented policy intervention by the Federal Reserve, which for a time operated a proxy financial system, and continues an extremely loose monetary policy. This unprecedented crisis management would not have been possible without Chinese cooperation as a key purchaser of U.S. government securities. Collaboration between the two countries on the exchange rate issue faded with the crisis. The positive-sum approach would not last, as both nations shifted their positions by adopting a competitive strategy on the exchange rate issue. Among the factors leading to this change, particularly in China's approach, is a fundamental change of power perceptions, encompassing Chinese perceptions of the strength of American institutions and systems. While Chinese observers still acknowledge the enormous power-capabilities of the U.S., American ideas and institutions with respect to economic policy have lost much credibility in Chinese eyes. Moreover, some Chinese elites have become more self-confident in asserting a counter model of state capitalism, as is argued in the 'Beijing Consensus' by Joshua Cooper Ramo (2004). Such new frameworks are aided by the resilient performance of the Chinese economy against fears of an export-led collapse. Additionally, the Chinese national government has become increasingly responsive to public opinion, as it attempts to bolster its legitimacy in the face of the consequences of rapid growth (Cao et al 2009).

During the financial crisis, the Bush administration started to pool resources to create programs to save banks and other troubled firms. The policy required the raising of enormous sums of money from domestic as well as foreign creditors, with China being the 2nd largest holder of US

[22] http://www.southasiaanalysis.org/%5Cpapers40%5Cpaper3938.html

[23] http://www.realinstitutoelcano.org/wps/portal/rielcano_eng/Content?WCM_GLOBAL_CONTEXT=/elcano/elcano_in/zonas_in/cooperation+developpment/ari62-2009

treasury bonds in 2008. The RMB exchange rate issues were put aside for the time being. During the financial crisis, China's economy was immediately affected as the volume of China's exports decreased dramatically. However, China's banking system was much less vulnerable to systemic risks than that of the United States. This move apparently built trust between government officials in the two countries and China become more confident of working closely with the United States on various issues including RMB exchange rate negotiation. This trend was continued even after the November 2008 elections, as the new President Obama continued his predecessor's policies in seeking Chinese cooperation to mitigate the effects of the financial crisis. With the additional purchase of US treasury bonds, Chinese central bank governor Zhou Xiaochuan in March 2009 proposed that the RMB be added as a component of the IMF's Special Drawing Rights. In July 2009, a pilot program started to operate with the objectives of using the RMB as a currency for import-export transaction among selected regions and countries as part of a larger program to internationalize the RMB.

The period of reciprocal collaboration would not last. After the financial crisis was over in fall 2009, the United States started to look for new measures to further strengthen its economy. In the face of an anemic recovery of growth and persistently high unemployment, the US congress and influential voices in the US media began to apply pressure on the Obama administration to take more competitive and combative measures to negotiate with China over RMB revaluation. Various union groups, lobbyists and their representatives in the congress started to criticize for President Obama for his gentle policy towards the RMB. Under the increasing domestic pressure, the US government began to shift their negotiation strategies from collaborative to competitive. In December 2009, the United States decided to impose punitive tariffs on several selected goods produced in China and considered labeling China a currency manipulator. The US media added fuel to the conflict by highlighting the views of scholars who estimated that RMB is 25 to 40 percent undervalued.[24] Chinese officials pushed back against the renewed American pressure, as on March 25, 2010, when the deputy minister of finance in China, Zhong Shan, in uncharacteristically blunt remarks before the United States Chamber of Commerce stated that American pressure for a stronger RMB "is unacceptable to China."[25] President Obama decided to escalate the competitive approach in designating an April 15, 2010 deadline to determine whether China should be branded a currency manipulator. The deadline of April 15 represented a high pressure tactic as it coincided with Chinese President Hu Jintao's visit to the United States for a global security meeting threatening the visiting head of state with a loss of face. After the deadline of April 15 passed and the President Hu Jintao's visit to the United States was over, China was not labeled a currency manipulator, though Secretary Geithner warned that the exchange rate was still "a significant issue, and China should have a more flexible exchange rate system".

5. Factors Influencing U.S.-China Exchange Rate Negotiation

The Realist perspective on international relations holds that rising powers inevitably come into competition and conflict with incumbent great powers (e.g. Mearshiemer 2006). The Liberal view on international relations emphasizes the great scope for collaboration and positive-sum games. Normative negotiation theory (Lewicki et al. 2006) makes the essential point that all conflict management approaches are appropriate contingent on circumstances. However, such researchers also indicate that while the scope for collaboration is large, achieving it is difficult and fragile; many experienced business negotiators fail to visualize the full scope of positive sum potential in simulated

[24] http://www.usw.org/media_center/speeches_interviews?id=0038
[25] http://www.nytimes.com/2010/03/26/business/global/26yuan.html

experiments. Another important insight from research is that history matters. Trust and collaboration are built on the fragile foundations of multiple iterations of satisfactory interactions. The burden of a negative history is very difficult to overcome. Whether in relatively simple two-person dyadic negotiation, or highly complex state to state bargaining, there are five primary modes of conflict resolution: collaboration, competition, accommodation, avoidance and compromise. The structural factors determining the conflict management strategy adopted may be relatively simple encompassing a few variables (e.g. issue importance and relationship importance), or become very complex (e.g. adding additional variables such as power-relations, interests of many parties and stakeholders, time constraints). Bargaining between collectivities always involves the deputation of agents, and thus an additional critical aspect to negotiations: the consideration and crafting of signals for varied stakeholders and audiences. Therefore, in inter-state negotiations, level, becomes one of the most critical determinants of negotiation strategy. Agents are deputed by a national-level government which operates in the crucible of domestic political economy, thus, predicting the modes of conflict management elected by U.S. and Chinese negotiators (on the RMB-Dollar issue) requires an understanding of each nation's internal dynamics, which we outline in the next section.

In addition to the bi-lateral negotiation alternatives, a state (or states) may opt to resolve conflicts through multi-lateral means. While alliance-building has long been regarded as a means for weaker states to protect themselves from more powerful ones, the principle of multilateralism goes much further by empowering even the smallest states with legally enforceable treaty rights. According to Sutter (2010), both the United States and PRC regard the engagement of the other through multilateral forums as a 'Gulliver strategy' effective in constraining the disruption of relations and mutual interests by a powerful rival.

The history of negotiations on the exchange-rate issue has been largely defined by bi-lateral, rather than multi-lateral bargaining approaches. The Chinese tendency towards adopting accommodation and compromise reflects a number of factors. Among these are high issue importance (of the exchange rate) and high relationship importance with the United States, perceptions of a power asymmetry (both material and institutional strength), and lower domestic political pressures. At the level of inter-state bargaining, Chinese agents have had greater relative autonomy from domestic constituencies, than do agents from democratic societies with more empowered civil societies. As argued above, the U.S. negotiation strategy has largely been competitive, punctuated by periods of collaboration. For the U.S., issue importance has been high, as the trade deficit and loss of manufacturing jobs have co-trended in the past decade.

The value attributed to the relationship with China depends upon one's relative position within the U.S. system. Those who think 'globally' will tend to ascribe more value to the relationship than those whose thinking is mostly local. Thus, officials in the executive branch, who deal directly with their foreign counterparts on economic and diplomatic matters tend to be less confrontational than members of Congress whose main focus is on their congressional districts. Similarly, among business and civil society, multi-national corporations with global supply chains and markets extending to China, will value the relationship much more than smaller local companies, trade unions, or NGOs concerned with causes such as the environment, labor standards, and human rights. It follows that a preponderance of political and civil society in the U.S. is disposed towards a more confrontational approach with China on a range of issues, including the RMB exchange rate. Those that value the relationship and would favor positive-sum bargaining approaches tend to be elements in the executive and multi-national corporations. Thus, we have seen effective lobbying on behalf of China (for example the Most Favored Nation issue) conducted by major U.S. based multinationals such as Boeing. Additionally, the electoral cycles and outcomes also provide periods in which the pressure on the executive to confront China abates. Typically, if a U.S. President is

elected to a second term of office, his administration enjoys a greater degree of autonomy from domestic constituency pressures. For example, the last years of the second terms of both Bill Clinton and George W. Bush were periods of considerable collaboration on trade and exchange rate issues. An additional factor that promoted collaboration on the exchange rate issue was the severe and fast-developing financial crisis of 2008-9. In an environment of great perceived danger and high uncertainty, both parties reverted to collaboration. However, it does not follow that difficult economic conditions are generally conducive to cooperative behavior rather than mutual recriminations.

Dynamics of the U.S. Political Economy in Shaping RMB-Dollar Negotiations

The US constitution provides the Congress with considerable powers to oversee, regulate and enact legislation with respect to foreign trade. However, Great Depression era legislation provided the executive with the authority to negotiate on international trade matters (Baron 2010: 589). The change of law provided for a measure of buffering of the nation's international economic relations from the protectionist pressures of the domestic political economy which often erupt in the Congressional arena.

The U.S. system is a classical pluralist one, in which competing interests are free to organize in order to influence public policy outcomes. The U.S. is an especially large and complex pluralist system:

If we are thinking of the American state, the variety of state actors and the multiple levels at which they operate become a central focus of analysis. Whereas for much of American history, the federal state did not interact closely with the economy, sub national states have been continuously involved in the constitution of sectors and industries…As important as the distinction of federal, state and local is, the very special role of courts, judges, and the legal profession as distinctive actors in the history of the American economy must not be overlooked. For much of American history, the courts were the only state institution that could stand outside of political party domination and claim to perform an integrative state-like function. (Lindberg and Campbell 1991: 357)

The nature of political-economy competition in the U.S. was laid out in the classic formulation of the Wilson-Lowi matrix (Baron 2010; Lowi 1964; Wilson 1980). The principle alternative forms of competition are 'interest-group politics', 'entrepreneurial politics', 'client politics' and 'majoritarian politics'. Currently, when Congress members call for across the board tariffs on Chinese imports in retaliation to RMB policy, they are engaging in a form of entrepreneurial politics and therefore must arouse a broad range of constituents, by framing messages about the protection of jobs, or resisting unfair Chinese practices that can be heard by the general public. U.S. companies with stakes in the Chinese economy (especially those using China as part of their global procurement strategy) may resist this form of entrepreneurial politics, by engaging in client politics, which involves leveraging their direct access to Congressional members whose constituencies rely heavily on these multinationals. In the Wilson-Lowi formulation client and entrepreneurial politics are regarded as the obverse and reverse of the same coin.

Congress is the arena in which U.S. interests on the RMB policy are fought out; however, the executive branch still retains a capacity to act as a brake on Congress. The President can veto Congressional legislation targeted to the RMB-Dollar and trade issues. The President can also depute agents such as the U.S. Trade Representative or the Treasury Secretary to engage with Chinese representatives in direct negotiations as a means of buffering unilateral Congressional measures that are likely to invite retaliation. At its core, however, the U.S. government must contend

with the fundamental social and political imperatives of any state: balancing interests of different elements in the society, dealing with questions of distribution and growth, of 'accumulation and legitimation' (O'Connor 1973). Thus, a President is highly constrained from managing RMB-Dollar negotiations out of the view of domestic pressures. Most candidates from the Presidency make strident remarks about 'getting tough' with China on a range of issues. This was true of candidate Clinton and candidate George W. Bush. Thus, they are somewhat straitjacketed by their campaign positions. Of the two parties, Democrats tend to take a stronger anti-China economic position due to their core constituency among labor unions. Each President strives mightily for re-election, and is thus much more sensitive to domestic pressures during the first four-year term. If they manage to secure a second (and final) term, they tend to become freer to pursue ambitious foreign-policy goals, behaving often like international statesmen. Thus, any chance for a cooperative negotiation approach by the U.S. administration awaits a potential second term in office for Barack Obama.

Dynamics of the Chinese Political-Economy in Shaping RMB-Dollar Negotiations

The PRC system has been regarded as another in the line of East Asian 'developmental states' (e.g. Haggard & Moon 1990, Onis 1991), in which state bureaucracies centralize power and coordinate economic policies, with business as a junior partner, and civil society suppressed. But as Moon and Prasad (1994) have argued, asserting state strength does not adequately account for developmental states in East Asia; intra-state and state-business dynamics, such as politics and network ties contribute to an improved description of economic policy making. In the PRC system state institutions are the most powerful actors, with the business community being less well-organized and influential, and civil-society even less so. The role of foreign capital has been greater in the Chinese case of economic development than in the Japanese and South Korean cases, which is consistent with Amsden's (2003) extension of Gerschenkron's thesis about late industrialization. And yet, the concerns of civil society figure prominently in the calculations of state policy makers, who fear social instability above all else.

The fundamental importance of the exchange rate in China's development strategy was recently confirmed by Hu Xiaolian, Deputy Governor of the central bank, the People's Bank of China (PBC), who stated that "China's central bank has supported the economic development goal through its pursuit of currency stability which is its monetary objective" [Hu 2007], though Chinese Premier Wen has also recently conceded that "... the biggest problem with China's economy is that it is unstable, unbalanced, unco-ordinated and unsustainable" [quoted in Aziz and Dunaway 2007].

The development of the current 'unsustainable' Chinese model is explained in part by the intra-state dynamics of China's emergence from an autarchic economic system, promulgated by Deng's 'four modernizations'. China's central state institutions were mainly conservative, and opposed to liberalizing rules with respect to investment and entrepreneurship. Deng, a self-described 'old man in a hurry', circumvented the obstructionist power of the central state by creating and expanding 'special economic zones' as beach heads of a liberal investment policy and thereby empowering local levels of the government. Ultimately, this spearheaded the massive and accelerating investment boom of the previous three decades. And this investment and export-led model of development has reached a penultimate stage in the currency exchange conflict that has emerged with the United States.

6. Future Perspectives of Chinese RMB and Conclusion

The changing nature of the factors that shape negotiation strategies portend that the next decade of U.S.-China exchange rate negotiations will not replicate the previous decade. One principle factor in transition is the power-relation. While perceptions of U.S. power are still very high, the country is now seen as a 'diminished giant'. In fact, it is Bhagwati's (2008) contention that the nation's turn towards aggressive bilateralism is a product of 'diminished giant syndrome', that it behaves in a more competitive and bilateral fashion on economic issues because it no longer wields the hegemonic power it did when it constructed the post-World War II Bretton Woods system. Diminishment of the U.S. model is as consequential as quantitative changes in trade and GDP. One consequence has been disillusionment among Chinese policy elites about U.S. expertise and superiority concerning matters of currency and economic management. In a recent article entitled 'The Beijing Blues' Fareed Zakaria (Newsweek 6/4/2010) describes a state of great uncertainty in China following the diminishment of the U.S. model:

A Chinese businessman said to me over lunch in Beijing, "In many ways the financial crisis and the discrediting of the American model has been bad for us. You see, we don't really have an ideology anymore. We don't know what we believe in. We used to think it was some version of the American Dream—liberalize, open up, grow. But then you had your crisis. We can say, it proves we're strong. But where do we go now?"

The angst is being exacerbated by China's ongoing political transition, in which the top leadership will be replaced in two years, and in which for the first time, the new president and premier will have no personal connection with or blessing from Deng Xiaoping, the architect of modern China. This has broader consequences. China knows it is now a great power and demands that it be respected and listened to. But short of protecting its narrow interests, the regime still doesn't seem sure what it wants internationally. What are its broader foreign-policy goals? Is it an ally or a rival of the United States? What kind of a world does it hope to shape?

As argued above, the higher the level of a negotiation and the greater the number and monitoring by empowered constituencies, the greater the tendency towards a competitive approach in negotiation. While Chinese civil-society has been relatively quiescent, the government is always very vigilant about the potential for disorder that could threaten the position of CCP rule. As argued by Cao et al. (2009) rapid growth has precipitated a complex set of regulatory crises and may presage a greater sensitivity towards resolving domestic conflict. Thus, a more insecure CCP may feel less autonomy from domestic pressures in its dealings with foreign governments, especially the US with respect to important issues. Meanwhile, post-crisis U.S. political society is aflame, with movements such as the Tea Party pressuring the political establishment. Commentators widely infer that economic insecurity, especially among white males has fed such movements. The domestic pressure on the administration to confront China on the exchange rate issue will be stronger than ever. Based on our above analysis, the next two years will be highly confrontational on the exchange rate issue, with some pressure relief only possible if the Obama administration is elected to a second term, and if committed internationalists win the arguments within such an administration.

Thus, the next few years are likely to witness competitive positions from both the U.S. and China made even more confrontational by domestic politics. Additionally, as the U.S. model has lost credibility, the nation's usual rhetorical advantages in multi-lateral forums is less likely to persist. The issue is likely to retain its importance for both parties, as the path to a post-dollar centric world economy is not at all clear. Thus, while both parties will be tempted to disengage and attempt avoidance to the demands of the other party, they will be unable to sustain strategies of mutual

avoidance.

In June of 2010 China announced a return to its flexible exchange rate policy of permitting its currency to shift in value by up to 0.5% each day. However, this does not end bilateral conflict over the exchange rate issue between the U.S. and China. Though the U.S. was the architect of the post-World War II principle of multilateralism (institutionalized in the Bretton Woods institutions), it has in recent years been aggressive in pursuing a bilateral approach to economic conflicts (see Bhagwati 2008), whether with Japan, the EU or China. The negotiation on exchange-rate between U.S.-China has taken a zero-sum turn (see figure 2). Is this likely to be sustained in the future, or will another dynamic prevail? The negotiations over exchange-rate are a highly complex issue, influenced by a large number of factors, and are therefore difficult to predict. In such circumstances a scenario approach is preferable to conventional forecasting methods. Below we review the many factors influencing exchange rate negotiation between the U.S. and China, and conclude by presenting three plausible scenarios for the mid-term future.

The exchange rate issue is likely to remain of high importance throughout the medium term. The size of the U.S. and Chinese commercial relationship insures the salience of the issue, as does the final fading of the Bretton Woods system of currency management. Though the U.S. formally de-pegged its currency from gold in 1973, the dollar has served as a reserve currency for most nations ever since, thus continuing the Bretton Woods system in a modified form. International finance is likely to remain unstable without new institutional arrangements being developed, which U.S.-China currency arrangement a key element. Thus, issue salience indicates that some kinds of competition and/or cooperation are likely outcomes, with avoidance and accommodation unlikely.

Another key factor driving exchange rate negotiations is power-relations. Chinese power potential (Virmani 2005) is projected to steadily close the gap with the U.S. over the next three decades. This again raises the classic question of the relationship between rising and incumbent great powers. The realist theory predicts competition, though such an outcome is not preordained. A key factor affecting the extent of U.S.-China competition or cooperation is the fate of the principle of multilateralism in international economic relations.

Other factors influencing the course of negotiations are the dynamics of each nation's respective political-economy. While the pluralist U.S. system is more volatile in terms of how the system aggregates preferences for conducting international economic relations, the Chinese system is more elitist and stable over time. State to state level negotiations are inherently more difficult to conduct on a collaborative basis, if conducted in the glare of the public, and the revolution of media and communications has made the focus of the public more intense and fast-paced (e.g. the 'smart mobs' phenomenon). This factor has led to greater public pressure being focused and felt even in the PRC. As the Chinese system evolves to meet its many domestic challenges, it is likely to become more accountable to domestic constituencies, a factor that may tend to support a more competitive approach to international relations with other countries.

Leadership and path dependency are also critical to the development of future negotiation strategies between U.S. and China on the exchange rate issue. Leaders can do many things to build a foundation for collaborative relations, from deploying culturally intelligent agents who are trusted by the other side, to instituting principles of collaboration (or competition) in the relations between two countries. History also matters, as it is the repeated iterations of cooperative games on which trust is built and collaboration can occur between two parties. Conversely, the burden of a history of conflict traps nations in zero-sum games. In the U.S. new leaders are elected regularly, included Presidents every 4-8 years. Thus, much of the future of exchange rate negotiations rests on the type of

leadership that emerges in each country, and their elective preferences regarding other nations and international economic policy.

Based on the above analysis we envision the following three scenarios possible in the medium term:

1) Rising Conflict-Economic De-integration: Economic relations suffer from abrupt changes and the adjustment shocks damage many economic interests in both countries. Painful structural changes continue in U.S. economy, Election of non-internationalist politician to Presidency, continual episodes of conflict, political adventurism of U.S. vis a vis Taiwan, Leadership generation change in China-more anti-U.S. based on history of conflict. Politicians in each nation give in to the temptation to take punitive actions, which invite 'tit for tat' retaliation in the form of a negative feedback cycle.

2) Reconstituted G-4/G-20: new heuristic multi-lateralism: emphasis on elite management of international economy, defuse emphasis on U.S.-China bilateral negotiation, conduct negotiation in multilateral forum; currency coordination across $, ¥,€, and Yuan. Increasing understanding of dynamics of domestic politics across national borders; gov't-to-gov't relations are less volatile due to understanding, and through trust built through a new generation/cadre of economic diplomats. Additional factors favoring: structural changes and distributional changes favoring emerging market countries. This outcome indicates a building on long history of multi-lateralism founded at Bretton Woods. Supported by network of inter-connections among firms in the G-4/G20 countries. Also helped by new commodity cycle (these are usually 20yrs long) that ushers in lower commodity prices (also energy prices, promoted by supplies of Shale Gas) that decreases competition for these among major industrialized countries.

3) U.S.-China deep collaboration, constitution of G2 to manage international finance: U.S. and China engage in deep collaboration to coordinate currency movements, sovereign debt. Involves institutionalizing relations among key government agencies in U.S. and China.

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Dr. Cao received his Ph.D. in Marketing from the University of Iowa. Among his publications are articles on customer relationship management, pricing strategy, and database marketing. In 1990-1993 he worked at the Institute of Geography, Academy of Sciences, Beijing, where he published extensively on geo-political systems, transportation, geography, China's regional development and other relevant topics.

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Thailand Management Association (TMA) is a highly professional body of managers and executives, from all branches of business in Thailand who are dedicated to seeking and transferring knowledge through the exchange of the latest information on advanced managerial principles and practices in various fields. This exchange is considered as a contribution from the business sector to the efficient and productive utilization of human and material resources, which contributes ultimately to the well-being of the nation. In 1962, two top management development conferences, inspired by Mr. W.T.Utting, then Chief of the United Nations International Labor Organization (ILO), were organized, by the Thailand Management Development and Productivity Center. These two conferences concluded that the proper and well organized management training center was urgently needed, to improve the overall management skills of both local and foreign enterprises in Thailand. This led to the establishment of the Thailand Management Association, with the late Khun Snoh Nilkamhaeng, then Director of Lever Brothers (Thailand) Ltd., as its first president. The objectives are: 1) to improve the general abilities, education, technical knowledge and effectiveness of person engaged in management, by providing a forum for members for discussion of management subject, 2) to provide mutual assistance in applying management practices to increase the efficiency of the members' enterprises, 3) to propagate the concept that management is a worthwhile and honorable profession, and 4) to promote and maintain high ethical standards of management practices.

Kellogg College, University of Oxford, United Kingdom

Kellogg College is one of Oxford's largest, most international graduate colleges and membership is diverse. The College was named in honour of W. K. Kellogg on the 1st October 1994, in recognition of the generous support given by the W K Kellogg Foundation to the University over the preceding decades. The College has close connections with the University Department for Continuing Education, the Department of Education and other departments active in areas of professional and part-time study. The College can trace its origins back to the start of university extension movement in the 1870s, and came into being on 1st March 1990 (as Rewley House).

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