OKAN UNIVERSITY
INSTITUTE OF SOCIAL SCIENCES

IMPACT OF SUPPLY CHAIN STRUCTURE ON BUSINESS PERFORMANCE: A STUDY ON PHARMACEUTICAL INDUSTRY

Emre GÖLLÜ

PhD THESIS

BUSINESS ADMINISTRATION PROGRAM

ADVISOR
Prof. Dr. Enar A. TUNÇ

ISTANBUL, May 2014

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Submission date : 24 April 2014
Dissertation date : 13 May 2014

Advisor : Prof. Dr. Enar A. TUNÇ

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ISTANBUL, May 2014

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ACKNOWLEDGEMENT

Before starting my PhD study, I used to hear that PhD is a unique experience in life which is not easy to describe and therefore needs to be experienced. Now I am able to confirm that indeed it needs to be experienced and it is a precious experience which brings a different perspective to the life.

I would like to express my special thanks to my advisor Prof. Dr. Enar A. Tunç for his continuous support, developing guidance and encouragement. His supervision and guidance in every phase of this study have been invaluable. I also would like to thank my other jury members, Prof. Dr. Mehmet Tanyaş and Prof. Dr. Refika Bakoğlu who have been members of my thesis pursuit committee too, for their valuable comments and feedback during the phases of my thesis; and Prof. Dr. H. Targan Ünal and Prof. Dr. S. Gonca Telli Yamamoto for having accepted to be in my dissertation jury and their noteworthy comments.

In addition, I am greatly thankful to all my colleagues in the pharmaceutical industry who have kindly offered their contributions to this study.

Special thanks are deserved by my dear classmate and friend T. Aydın Kayı, with whom we have succeeded to motivate each other reciprocally and continuously to accomplish our goals since the beginning of our PhD studies and who did not preserve his ideas to improve this study since the beginning; my parents for their endless support, love, kindness and devotion as I have experienced in every stage of my educational background; and my fiancée Gülden Ergün being my great motivator to complete this study with her understanding, love, support and encouragement.

ÖZET

TEDARİK ZİNCİRİ YAPISININ İŞ PERFORMANSI ÜZERİNDE ETKİSİ: İLAÇ ENDÜSTRİSİ ÜZERİNE BİR ÇALIŞMA

Tedarik zinciri ve tedarik zinciri yönetimi kavramlarının, özellikle çeşitli sektörlerde küresel olarak artan rekabete bağlı olarak akademik alanın ve iş hayatının her ikisinde de özel ilgi çekmelerine rağmen, tedarik zinciri yapısı ile iş performansı arasındaki ilişkiyi inceleyen araştırmalar sadece sınırlı sayıdadır.

Literatürde, bu ilişkiyi özellikle ilaç endüstrisinde araştıran bir çalışma bulunmamaktadır. Dolayısıyla, bu çalışmanın ana amacı, Türkiye'deki ilaç firmalarının tedarik zinciri yapılarını araştırmak, firmaların tedarik zinciri yapılarının, iş performansları üzerindeki etkisini incelemek ve firmaları tedarik zinciri yapılarına göre sınıflandırmak; bunun yanı sıra, tedarik zinciri yapıları arasında, çokulusluluk, ürün orijinalliği ve sahiplik yapısına göre anlamlı farkları ve ayrıca iş performansları arasında çokulusluluk, ürün orijinalliği ve sahiplik yapısına göre anlamlı farkları incelemektir. Bu amaçla geliştirilen araştırma modeli, Türk ilaç endüstrisinde faaliyet gösteren firmalardan elde edilen veri vasıtasıyla ampirik olarak denenmiştir.

Bu çalışmada, veri toplama yöntemi olarak anket kullanılmıştır. Araştırma modeline dayanılarak teyit edici veri analizleri yapılmıştır. Elde edilen sonuçlar, Türkiye'deki ilaç firmalarının tedarik zinciri yapılarının, iş performansları üzerinde anlamlı bir etkiye sahip olduğunu göstermektedir. Bununla birlikte, tedarik zinciri yapılarında ikincil üretim tesisi bulunan firmaların, tedarik zinciri yapısında ikincil üretim tesisi bulunmayan firmalara göre anlamlı farklılık gösteren iş performanslarına sahip oldukları; tedarik zinciri yapılarında kendi üretim tesisleri bulunan firmaların, tedarik zinciri yapılarında kendi üretim tesisi bulunmayan firmalara göre anlamlı farklılık gösteren iş performanslarına sahip oldukları ve tedarik zinciri yapılarında fason üretim tesisi bulunan firmaların, tedarik zinciri yapılarında fason üretim tesisi bulunmayan

firmalara göre anlamlı farklılık gösteren iş performanslarına sahip oldukları gösterilmiştir. Ayrıca, bu araştırmanın sonuçları Türkiye'deki ilaç firmalarının tedarik zinciri yapıları arasında çokulusluluk, ürün orijinalliği ve sahiplik yapısı bakımlarından anlamlı farklılıklar bulunduğunu ortaya koymaktadır. İlave bir sonuç, Türkiye'deki ilaç firmalarının iş performansları arasında ürün orijinalliği bakımından anlamlı bir farklılık bulunmasıdır. Tedarik zinciri yapısı, çokulusluluk ve sahiplik yapısındaki değişiklikler üzerine hipotezler, firma bazında ayrı ayrı uygulanan yapısal kırılma analizleriyle sınanmıştır. Sonuçlar, tedarik zinciri yapısı, çokulusluluk ve sahiplik yapısındaki değişiklikler ve Türkiye'deki ilaç firmalarının iş performansları arasında firma bazında değişen şekilde hem anlamlı bir farklılık bulunduğunu hem de anlamlı farklılık bulunmadığını ortaya koymaktadır. Bu çalışmanın son kısmında, yerel olarak üretilen ürünlerin satışlara olan yüzdesel (%) katkısı üzerine hipotezler sınanmıştır. Sonuçlar, birincil üretimi yerel olarak yapılan ürünlerin satış cirosuna yüzdesel (%) katkıları ile iş performansı, ikincil üretimi yerel olarak yapılan ürünlerin satış hacmine ve satış cirosuna yüzdesel (%) katkıları ile iş performansı, fason üretimi yerel olarak yapılan ürünlerin satış hacmine ve satış cirosuna yüzdesel (%) katkıları ile iş performansı arasında anlamlı birer ilişki bulunmadığını göstermektedir.

Bu çalışma, tedarik zinciri yapısının iş performansı üzerindeki etkisini ortaya koyan, tedarik zinciri yapısı ile çokulusluluk, tedarik zinciri yapısı ile ürün orijinalliği, tedarik zinciri yapısı ile sahiplik yapısı ve ürün orijinalliği ile iş performansı arasındaki anlamlı ilişkileri gösteren bir modeli geliştirip geçerli kılmak suretiyle hem teoriye hem de uygulamaya katkı sağlamaktadır. Literatürdeki boşluklara hitap etmekle birlikte yöneticiler ve yatırımcılar için bir temel oluşturmaktadır.

Anahtar kelimeler: Tedarik zinciri yapısı, iş performansı, ilaç endüstrisi, çokulusluluk, ürün orijinalliği, sahiplik yapısı

Tarih: 13.05.2014

SUMMARY

IMPACT OF SUPPLY CHAIN STRUCTURE ON BUSINESS PERFORMANCE: A STUDY ON PHARMACEUTICAL INDUSTRY

Despite the concepts of supply chain and supply chain management attract particular attention both in academic field and business life, especially based on the globally increasing competition in various sectors, research investigating the relationship between supply chain structure and business performance can be found in a limited number only. In the literature, there was no study made to examine this relationship in the pharmaceutical industry specifically. Accordingly, the main objective of this study is to examine the supply chain structures of pharmaceutical companies in Turkey, investigate the impact of supply chain structures of companies on their business performances, and classify the companies according to their supply chain structures, as well as examination of significant differences between supply chain structures and multinationality, product originality and ownership structure, and between business performances and multinationality, product originality and ownership structure. The research model developed for this purpose is tested empirically through data obtained from companies operating in Turkish pharmaceutical industry.

Questionnaire is the data collection method used for this study. Based on the research model, confirmatory data analyses were performed. Findings indicate that supply chain structures of pharmaceutical companies in Turkey have a significant impact on their business performances. In addition, it has been shown that pharmaceutical companies having secondary manufacturing sites in their supply chain structures have significantly different business performances than pharmaceutical companies having no secondary manufacturing site in their supply chain structures; pharmaceutical companies having own manufacturing sites in their supply chain structures have significantly different business performances than pharmaceutical companies having not own manufacturing

site in their supply chain structures; and pharmaceutical companies having toll manufacturing sites in their supply chain structures have significantly different business performances than pharmaceutical companies having no toll manufacturing site in their supply chain structures. Furthermore, findings of this research reveal that there are significant differences between supply chain structures of pharmaceutical companies in Turkey in terms of multinationality, product originality and ownership structure separately. An additional finding is that there is a significant difference between business performances of pharmaceutical companies in Turkey in terms of product originality. Hypotheses about changes in supply chain structure, multinationality and ownership structure were tested using structural break analysis carried out on company basis severally. Outcomes indicate both a significant relationship and no significant relationship as varying per company between the changes in supply chain structure, multinationality and ownership structure and business performances of pharmaceutical companies in Turkey. In the final part of this study, hypotheses tested about the percentage (%) contribution of domestic manufactured products to sales. Findings indicate that there was no significant relationship found between the percentage (%) contribution of domestic primary manufactured products to sales turnover, the percentage (%) contribution of domestic secondary manufactured products to sales volume and sales turnover, the percentage (%) contribution of domestic toll manufactured products to sales volume and sales turnover, and business performance.

This study contributes both to the theory and practice significantly by developing and validating a model that reveals the impact of supply chain structure on business performance, significant relationships between supply chain structure and multinationality, supply chain structure and product originality, supply chain structure and ownership structure, and product originality and business performance. It addresses to the gaps in the literature and constitutes a basis for the managers and investors.

Keywords: Supply chain structure, business performance, pharmaceutical industry, multinationality, product originality, ownership structure

Date: 13.05.2014

ABBREVIATIONS

AHP : Analytical Hierarchy Processing
AI : Active Ingredients
ANN : Artificial Neural Network
ANOVA : Analysis of Variance
API : Active Pharmaceutical Ingredients
ATO : Book Value of the Firm
B2B : Business to Business
BMI : Business Management Institute
CAGR : Compound Annual Growth Rate
CEO : Chief Executive Officer
CLM : Council of Logistics Management
CPI : Chemical Process Industry
CTT : Corporate Technology Traditions
CUSUM : Cumulative Sum Control Chart
CVI : Content Validity Index
D : Domestic
DEA : Data Envelopment Analysis
EU : European Union
EVA : Economic Value Added
FDA : Food and Drug Administration
FDI : Foreign Direct Investment
FMS : Functional Movement Systems
G : Global
GATT : General Agreement on Tariffs and Trade
GPN : Global Production Network
HMO : Health Management Organization
I-CVI : Item-Level Content Validity Index

IFPMA : International Federation of Pharmaceutical Manufacturers and Associations

IMF : International Monetary Fund

IMS : International Medical Statistics

IPR : Intellectual Property Right

IPT : Information Processing Theory

IS : Information Systems

ISI : Import Substituting Industrialisation

IT : Information Technologies

JIT : Just in Time

JPM : Jordanian Pharmaceutical Manufacturing

KPI : Key Performance Indicator

KRI : Key Result Indicator

MANOVA : Multivariate Analysis of Variance

MKBK : Market to Book Ratio

MNC : Multinational Corporation

MNE : Multinational Enterprise

NCE : New Chemical Entity

NDA : New Drug Application

OECD : Organisation for Economic Cooperation and Development

OEM : Original Equipment Manufacturer

OTC : Over-the-Counter

PI : Performance Indicator

PLS : Partial Least Squares

R : Regional

R&D : Research and Development

RBV : Resource Based View

ROA : Return on Assets

ROE : Return on Equity

ROI : Return on Investment

ROS : Return on Sales

SC : Supply Chain

SCC : Supply Chain Council

SCM : Supply Chain Management

SCS : Supply Chain Structure

SEM : Structural Equation Modeling

SKU : Stock Keeping Unit

SME : Small and Medium Size Enterprise

T : Trans-regional

TCE : Transaction Costs Economics

3PL : Third Party Logistics

TI : Technological Innovation

TNI : Transnationality Index

TRIPS : Trade Related Aspects of Intellectual Property Rights

TQM : Total Quality Management

UK : United Kingdom

UNCTAD : United Nations Conference on Trade and Development

US : United States

USD : United States Dollar

VACA : Physical Capital

VAT : Value Added Tax

WIP : Work-In-Process

WTO : World Trade Organization

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CHAPTER 1. INTRODUCTION

Supply chain management is a concept which has a continuously increasing popularity both in academic field and business life. Especially in the recent years, globally increasing competition in various sectors has brought supply chain management into a key position to achieve business success and to ensure sustainability. Although the concepts of supply chain and supply chain management have been studied from various perspectives, studies about supply chain structure and its relationships can be found in a limited number in the literature.

Moreover, pharmaceutical industry has been another field of specific attention with his strong and positive influence on the economies of the countries and his unique characteristics as high research-intensivity, dependence to regulations, having physicians as the determinants of product choices, and having high value added. In addition, it needs to be taken into account for the pharmaceutical industry that the major proportion of the expenditures for medicines is reimbursed by the social security institutions.

Being a fast growing pharmaceutical market in Europe having the 6^{th} rank after the countries called as big five; Turkey has a developed pharmaceutical industry which has its roots on the time of the Ottoman Empire. Today, Turkey ranks as the 16th largest pharmaceutical producer worldwide with its developed pharmaceutical industry in terms of production standards, technology and capacity. These are the major facts, which bring Turkey into a position of attracting attention from both perspectives, namely as a fast growing market in consumption perspective, and as a country with high standards to compete globally in production perspective. The national policy of Turkish pharmaceutical industry is mainly focused on the production of generic drugs. It is obvious that in order to maintain its growth, Turkish pharmaceutical industry needs to compete on a global level and starting from Europe particularly. New investments are in a position of being prerequisite for the progress of Turkish pharmaceutical industry.

1.1. OBJECTIVE OF THE STUDY

The main objective of this study is to examine the supply chain structures of pharmaceutical companies in Turkey, investigate the impact of supply chain structures of companies on their business performances, and classify the companies according to their supply chain structures, as well as examination of significant differences between supply chain structures and multinationality, product originality and ownership structure, and between business performances and multinationality, product originality and ownership structure, and propose a model. In addition, this study aims to fill the gaps existing in the literature about the impact of supply chain structure on business performance, relationship between product originality and supply chain structure, relationship between product originality and business performance, relationship between multinationality and supply chain structure, and relationship between ownership structure and supply chain structure.

1.2. STRUCTURE OF THE STUDY

This study consists of five chapters. In Chapter 1, introduction, objective and structure of the study are given sequentially.

Chapter 2 presents the literature review on pharmaceutical industry in general, Turkish pharmaceutical industry and on the concepts of supply chain management, supply chain structure, supply chain structures in pharmaceutical industry, business performance, multinationality, product originality and ownership structure.

In Chapter 3, the design and methodology of the research are given under following topics as; objective of the research, research model, research questions, hypotheses, research design, sampling method, data collection instrument and method, pilot study together with validity and reliability analyses, operationalization of variables, and data analysis method.

Chapter 4 exhibits the research findings and Chapter 5 provides the conclusions to the study including contributions to both theory and practice, limitations and recommendations for further researches.

CHAPTER 2. LITERATURE REVIEW

2.1. PHARMACEUTICAL INDUSTRY

The pharmaceutical industry can be defined as a complex of processes, operations and organizations involved in the discovery, development and manufacture of drugs and medications. There are number of key players in the pharmaceutical industry, including (Shah, 2004):

(i) The large, research and development-based multinationals with a global presence in branded products, both ethical/prescription and over-the-counter (OTC). They tend to have manufacturing sites in many locations.

(ii) The large generic manufacturers, who produce out-of-patent ethical products and over-the-counter products.

(iii) Local manufacturing companies that operate in their home country, producing both generic products and branded products under license or contract.

(iv) Contract manufacturers, who do not have their own product portfolio, but produce either key intermediates, active ingredients (AI) or even final products by providing outsourcing services to other companies.

(iv) Drug discovery and biotechnology companies, often relatively new start-ups with no significant manufacturing capacity.

2.1.1. Characteristics and History

The pharmaceutical industry is a relatively small research-intensive industry that showed a consistently strong innovative record as of its establishment at the beginning of the 19th century. From its establishment to this day, it has maintained a close and fruitful two-way relation with academic research institutions in chemistry, pharmacology, the life sciences and medicine. The succession of technologies did not create waves but only ripples of creative destruction because leading companies were flexible enough to adapt to the exigencies of the new regimes and even to prosper from them. A thriving and extremely profitable business was created with some of its innovations becoming household names for nearly a century and others having deeply affected the nature, structure and morals of our society. Indeed, in this latter aspect, there is no other industry that had a comparable effect (Achilladelis and Antonakis, 2001).

The pharmaceutical industry is characterized by the following (Danko, 2011):

- It is in fact not one industry, but rather a set of industries with different business logics
- The technological decisions made at the beginning of the product life-cycle have long-term effects on later production development options and, indirectly, also on the profitability of products, that is to say they cause partial – or less frequently complete – technological path dependence
- During the protracted product development process, the risk associated with the technological feasibility, regulatory compliance and business viability of the product can only be reduced in a number of consecutive steps (multistep risk management), with a number of stop-or-go decisions having to be made while the psychological commitment of participants increases in proportion to the quantity of effort and capital invested, which may become a factor causing inflexibility and hence a risk factor in some cases
- Besides business considerations, ethical aspects also have a key role in product development, and these two viewpoints may become conflicting
- During the product life-cycle, people from a number of different professions (specialists in the natural and life sciences, technologists, economists,

lawyers as well as other professions) contribute both individually and as members of multidisciplinary working groups – the latter lending particular significance to organizational coordinatory endeavours, which, of course, also increases coordination needs and costs

Prior to the 19th century, the pharmaceutical industry was confined to small scale apothecaries, simple laboratories in the back of local shops, and in the hands of self-proclaimed druggists. Medicinal shops date back to Greek and Roman times, with a more advanced drug industry found in the 6th and 7th centuries in the Middle East, before expanding into Europe. By the 18th century, countries such as Britain, Germany, Switzerland, and even the American Colonies had taken a keen interest in this small scale industry because of the growing interest in therapeutic remedies, as well as advances in the field of chemistry that had medicinal implications. Around this time, the colonization of North and South America led to the discovery of various indigenous plants, beginning what pharmaceutical historians call the "Age of Botanicals." Many of these plants were developed into medicinal remedies by the natives to those lands. When Western colonists encountered these native remedies, it sparked a study of indigenous plants allowing for the discovery and testing of many more indigenous remedies that could be utilized by colonized peoples as well as Europeans Along with the Industrial Revolution, a large growth in the biological sciences and the growth of state-sponsored universal education, the pharmaceutical industry grew exponentially. With the ability to discover, study, and test new medicines, as well as the technological ease of manufacturing brought the consolidation of all aspects of this process into large pharmaceutical companies. Scientists, pharmacists, manufacturers, researchers and everything in between now worked under one name for the common goal of high levels of production and innovation. With this production came the need to protect new medical formulas via patents and intellectual property rights. Patent laws motivated companies' creativity and innovation and many gains were made in terms of disease fighting capabilities (Tsinopoulos and McCarthy, 2002).

The modern pharmaceutical industry effectively began in the second half of the 20th century. Prior to that, new drug compounds were the province of the chemists, independent scientists, and entrepreneurs. Firms in this industry had research facilities but their primary concern was ensuring standardized, safe products, not development of

new, cutting edge products (Lacetera and Orsenigo, 2001; Watts and Hamilton, 2011). The mobilization of governments (US and UK), universities, and pharmaceutical firms to develop drugs and the introduction of penicillin and other antibiotics is credited with the investment of significant funding into drug research (Lacetera and Orsenigo, 2001; Liu and Schmid, 2009). R&D efforts in the pharmaceutical industry have continued to grow, doubling from 1994 to 2004 (Watts and Hamilton, 2011). Firms in this industry range from those with a strong 'R' focus on discovering new chemical entities (NCEs) and developing drugs to firms emphasizing over-the-counter (OTC) and generic formulations. A strong grounding in chemistry and biology (on the basic side), but especially chemistry, allows researchers to understand the properties of chemical compounds, but these firms integrate a variety of applied sciences – medicine, toxicology, pharmacology – with a goal of developing and producing safe and effective medicines that are also fiscally attractive (Lewi and Smith, 2007).

The new millennium marked the start of a great debate regarding the pharmaceutical industry over the past two decades. Countries like the United States, Germany, and Britain had made large advances in this field as a result of mergers, regulations, and scientific breakthroughs. Plans like that of America's Health Management Organizations (HMO) also emerged during the 1980s to contain the rising costs of medicine. Intellectual property laws emerged to also protect the rights of pharmaceutical companies worldwide. 20 year patents were enforced by the World Trade Organization's TRIPS agreement in the 1990s. In countries like America, prescription drugs are largely regulated by the government and pharmaceutical companies are given a virtual monopoly by the restriction of the importation of global pharmaceutical products. According to the drug industry, companies must charge prices beyond their costs of production in order to cover their large research and development budgets (McAlice, 2009).

The process of globalization and the emergence of a rules-based multilateral trading system pose significant challenges to local pharmaceutical industries in developing countries (Kılıc, 2011). The pharmaceutical industry is currently undergoing significant change, driven by factors such as declining research and development (R&D), vigorous competition from generics industry, the emergence of new markets in middle-income countries, and social pressures (Sharabati and Nour, 2013).

Pharmaceutical industry has the major characteristic of being research-based. In the past 30 years, the operating context of the pharmaceutical industry has evolved and become much more challenging. The industry's preferred mechanism to overcome the productivity crises has been to increase investment in current business activities, primarily R&D and sales, the two extreme ends of the supply chain. Companies will only improve their profit margins if they change the relationship between volume and costs, which can be achieved through productivity gains in the supply chain.

The pharmaceutical industry is not like most other industries. Apart from the manufacturer and final consumer of a new medicine, several other 'third parties', are involved, responsible for the distribution, payment and availability of medicines onto the marketplace:

(a) Third-party payers (governments, statutory health insurance funds, private insurers) are responsible for the payment of medicines. They act on behalf of consumers or patients and take part in reimbursement decisions;

(b) Wholesalers are responsible for distributing pharmaceuticals from source to retail outlets (i.e. pharmacies), and in doing so they are interested in acquiring pharmaceuticals from the cheapest source;

(c) Prescribing physicians make decisions on behalf of their patients, since the latter have neither the knowledge nor the information to decide which is the most suitable medicine for their condition;

(d) Dispensing pharmacists usually follow physicians' instructions on what to dispense, but their dispensing behaviour can be influenced by the incentive structure of their payment method;

the latter being directly related to the type of products they dispense;

(e) Finally, Ministries of Finance often levy VAT (usually at a lower than the standard rate) or any applicable consumption tax on prescribed and consumed medicines.

Therefore, each of the above agents has a vested interest in the pharmaceutical industry and its products (Kanavos, 2001).

The pharmaceutical industry is the most closely regulated manufacturing sector because of the significance of medicines for public health, and of public health insurance systems, which are in most countries the industry's most important customers.

Regulation of companies' business practices, pricing of medicines by Government Agencies, measures to protect domestic markets, patent legislation, wartime measures to ensure availability of drugs, regulations for the testing and approval of new drugs, and "Welfare State" legislation have contributed in a positive or negative way to the growth and competitiveness of national pharmaceutical industries (Achilladelis and Antonakis, 2001).

Other characteristics of the pharmaceutical industry which differentiate it from other industries are that the industry has high fixed R&D costs and low marginal costs of production. The industry is also exceptional in terms of the fact that patents rather than first-time mover advantages or any other source of monopoly power provide the key protection from the perspective of innovators (Kremer, 2002).

According to Lainez etal. (2012), there are a number of characteristics of the life cycle of an innovative pharmaceutical product that differentiate such products from other sectors of the chemical process industry (CPI) and impose significant challenges for enterprise-wide decision making including:

- High cost and low success rate in product discovery and clinical development; in fact this uncertainty leads most companies to continuously look for externally developed products which could be in-licensed to bolster the pipeline. The timing of such business deals and the stage of product development at that the time can add a great deal of uncertainty.
- High cost and extended time to conduct clinical trials.
- Heavy regulatory burden with many national and/or regional variations.
- Limited product shelf life due to chemical and/or physical instabilities.
- Length of manufacturing time for some products can be quite long especially in comparison with consumer products. For example, the total manufacturing cycle time for some pharmaceutical products can be 6–9 months due to complicated processes, long product testing and release times, etc.
- Global business structure with distributed manufacturing and extended supply chain; ongoing manufacturing commitments will require a more complex set of initial conditions. Also in many cases, a cold supply chain is necessary. Highly uncertain demands often combined with a mismatch in

timelines between construction time necessary for added capacity and time for product approval or actual assessment of initial market demand.

- Generic competition at the end of product patent life.

The first of these, the significant required investment and low success rates in the discovery of a new therapeutic drug, arises in part because of the still limited, although growing, understanding of the mechanisms associated with various diseases and medical conditions and how these can best be evaluated clinically, including how to best screen patients to minimize adverse events and maximize efficacy. The second is the major cost and time associated with the phased clinical trials that are required in order to demonstrate the safety and efficacy of a new molecular entity. Pharmaceutical companies invested US$67.4 billion in R&D in 2010, representing about 18% of their sales. The average cost of a new drug is some US$1.3 billion, with about 50% representing clinical trial costs, and the time from discovery to market launch can take up to 15 years. The success rate is low with less than 1 in 1000 discovered compounds reaching the clinical stage and only one of five that undergo clinical trials achieving commercialization (Tollman etal., 2011). The high failure rate imposes considerable challenges in planning under uncertainty so that resources are effectively assigned and then redeployed as failures occur. Note that redeployment of resources becomes even more difficult if projects vary significantly in their demand for specific skill sets or experience levels. The third characteristic is the heavy regulation to which any drug product is subjected over its entire life cycle. While there are continuing efforts to harmonize the regulatory requirements and procedures among countries and regions, significant differences remain which, among other things, complicate the product supply chain through the introduction of large number of stock keeping units (SKUs). Drug products, whether based on biologics or synthetic organic compounds, contain active and sensitive molecular entities that can degrade with time even with modern packaging and careful control of environmental conditions during distribution. This imposes special constraints for inventory management and the additional risk of loss of product value to the enterprise. The pharmaceutical business is inherently global with some 80% of sales in North America, Europe and Japan but rapid growth on the rest of the world (IFPMA, 2013). This leads naturally to an extended supply chain requiring

the coordination of multiple manufacturing sites for active ingredients, drug products as well as packing, including contract manufacturers.

The IMS Institute for Healthcare Informatics predicts that the global pharmaceutical market will reach nearly USD 1,200 billion by 2016, an increase of nearly USD 250 billion from the USD 956 billion recorded in 2011. This growth is coming mainly from market expansion in the leading emerging countries and from generics. Global brand spending is forecast to increase from USD 596 billion in 2011 to USD 615–645 billion in 2016. Global generic spending is expected to increase from USD 242 billion to USD 400–430 billion by 2016, of which USD 224–244 billion of the increase is from low-cost generics in emerging markets (IFPMA, 2013).

2.1.2. Pharmaceutical R&D and Production

The pharmaceutical industry's activities have a strong and positive influence on the economy. This economic footprint is most visible in the form of investments in manufacturing and R&D, but it often has other positive socioeconomic impacts, such as constant improvements in academic research. It also stimulates the creation of companies that support parts of the research and production process.

The pharmaceutical industry was one of the first to initiate large-scale corporate R&D within firm boundaries. As early as the first few decades of the nineteenth century, firms like Merck and Pfizer used their in-house R&D labs to develop products like medicinal grade morphine and tartaric acid. By the twentieth century, commercial R&D was a key competitive feature of the industry; as the scale-intensity of the function rose; internal operations grew in size (Chandler, 2005).

From the 1880s, when they were established, until today, the competitive setting of R&D-intensive pharmaceutical companies went through three distinct phases. During the first phase (1880–1950), they operated within a national framework of rules and policies even when their export markets were significant. Protectionist policies at the turn of the century (Thompson, 1977), the First World War, the economic recession of the 1920s, the depression of the early 1930s and the preparations for the Second World War led governments to raise barriers to international trade, curtail imports and apply policies of national autarky. Transfer of technology across national frontiers was very limited and companies seldom licensed their products and processes to third parties.

Thus, the driving forces for TI were strongly influenced by the national environment and the companies, which attained excellence during that phase, did so because of the advantages of their home country. All the large R&D-intensive pharmaceutical companies of today were established during that period (Achilladelis and Antonakis, 2001).

In the second phase (1950–1980), peacetime economic growth and liberalized world trade created a new competitive environment based on both international agreements and national rules. R&D-intensive companies became multinational but kept the operations they considered vital—including their R&D departments—in the home country. Transfer of technology accelerated because of the multinational character of the large companies, the easy movement of researchers across national frontiers and the widespread licensing of technologies. Thus, the competitive environment was shaped by both national and international rules and practices, which also affected the intensity of the driving forces for TI. In the third phase (1980–), the globalization of financial markets and the expansion of international trade led to the globalization of the large R&D intensive companies by direct investments overseas or by mergers and acquisitions of foreign companies. Thus, the competitive setting of the pharmaceutical industry is shaped today by large global companies operating in the framework of international regulations aimed largely at liberalizing trade. Thus the effects of national policies on the intensities of the driving forces for TI became marginal. And yet, a handful of national pharmaceutical industries still enjoy substantial competitive advantages because of their highly competent companies, which consolidated their position in the world markets by research intensity, CTTs, and corporate growth by mergers and acquisitions of foreign companies, rendering extremely difficult the entry of new competitors (Achilladelis and Antonakis, 2001).

The pharmaceutical industry changed again with the emergence of biotechnology in the 1970s (Galambos and Sturchio 1998). While previous changes in drug discovery had emerged from the large pharmaceutical firms, the biotechnology revolution was led by a number of smaller start-up firms. This and other changes to R&D moved drug discovery towards a more targeted approach that did not necessarily favor large R&D operations. In fact, Cockburn and Henderson (2001) showed that large firm size was not an advantage in R&D, while competence in the use of recombinant DNA (a type of

biotech) was an advantage. Munos (2009) shows that during this period, the number of pharmaceutical firms increased rapidly, further suggesting that this change in technology resulted in a major structural change in R&D.

The research-based pharmaceutical industry is particularly economically active in production and R&D in certain countries. In 2007, pharmaceutical manufacturing accounted for USD 179 billion in the United States, USD 66 billion in Japan, and USD 52 billion in France.82 In the same year, R&D investments amounted to USD 47 billion in the United States, USD 10.4 billion in Japan, and USD 3.9 billion in France. However, manufacturing and research are not directly linked. Some countries have little research compared to manufacturing capacity, while others have little manufacturing and considerable research (IFPMA, 2013).

In summary, the current structure of R&D in the pharmaceutical industry does not appear to favor large-scale R&D operations. Innovation in the global pharmaceutical industry comes from a range of firms, operating at different points of the innovation funnel. Large numbers of small, specialized firms focus on early stage drug development. Large pharmaceutical firms have their own drug development operations, but also cooperate with smaller firms as well as with organizations focused on more basic research like universities. Nelson and Winter (1982) argued that small firms have superior capabilities in "search" or radical innovation, while large firms have superiority in "routinized" or incremental innovation. More specifically, a large firm may wish to delay introduction of new products to avoid cannibalizing extant revenue streams (Scherer, 1965), while small firms have little fear of cannibalization and thus may undertake highly original projects (variation) that thrive in unstructured environments. The small firms that survive have projects that have progressed to significantly lower levels of uncertainty. Large firms are able to acquire or partner with the survivors that best fit their own creative objectives (selection). The outcome of this joint creative process results in an outcome that is successful if the market accepts it (retention). (Hannigan et al., 2013).

2.2. TURKISH PHARMACEUTICAL INDUSTRY

2.2.1. Characteristics and History

The history of Turkish pharmaceutical industry can be investigated in two periods as before and after the foundation of the Republic. In the first period covering the time of Ottoman Empire, most of the finished pharmaceutical products were imported and sold without any control and dependency to a registration from quality and price aspects. The main characteristic of this period is seen as that the local pharmaceutical production apart from the imported pharmaceutical products, was made in the pharmacy laboratories. Apart from this, the first pharmaceutical production laboratories which can be counted as the pioneers of today's local pharmaceutical industry were founded in İstanbul at the beginning of 20th century, during the time of Ottoman Empire. In the second period after the foundation of the Republic, the first steps to improve local pharmaceutical production were taken and in addition, the control of the government started with the first regulations in the import and sales of finished pharmaceutical products. Even these progresses were achieved from official dimension; the local pharmaceutical industry was not able to develop itself sufficiently because of periodical economic and political conditions, especially in the period of the Second World War between 1939 and 1945. In the years after the Second World War, population increase and accordingly increase in the demand to pharmaceuticals in the urban population has given the local pharmaceutical laboratories the opportunity to improve their production capacities (Abacıoğlu, 2010).

The local number of drug preparations in Turkey in 1930 was about 300, most of which were prepared at pharmacies, while 20 of them were prepared at laboratories. What brought the end of local small pharmacies was the "Foreign Capital Incentive Law" enforced in 1954 paving the way for giant foreign pharmaceutical companies to come to Turkey to establish drug production factories, which coupled with the enforcement of "The Pharmacies and Medical Preparations Laboratories Regulations" dated 1954. The latter one brought heavy financial responsibilities to the companies in question when they established factories and production facilities. Furthermore, the law required the allocation of a separate building for drug production. Legislation of these

requirements was realized mainly with the entry of foreign companies to the market, but caused some small initiatives to get out of business and others to merge with foreign companies, thus maintaining their existence (Üvey et al., 2004).

Until the 1950s, pharmaceutical manufacturing in Turkey was conducted only in pharmaceutical laboratories. Production started to increase with the establishment of domestic and internationally owned plants at the start of the "industrial period" of the Turkish pharmaceutical market in 1952. From 1984, with the introduction of Good Manufacturing Practices - quality control guidelines for the production of foods, pharmaceutical products, and medical devices - the Turkish pharmaceuticals market expanded steadily and reached modern technological levels (Deloitte, 2010).

Within the period after 1984 up to the present, investments of foreign capital companies have increased and especially after the year 1990, 19 foreign capital firms have entered into Turkish pharmaceuticals market. Today, there are 53 manufacturing facilities and approximately 300 entities operating in the sector in Turkey. 39 of the manufacturing facilities are local firms. On the other hand, 14 of the manufacturing facilities and 134 of the entities are owned by multinational firms (Pharmaceutical Industry Report, Ministry of Economy, 2012).

Turkey is one of the fastest growing pharmaceutical markets in Europe. Despite a relatively low per capita spending compared to other European countries, Turkey ranks as the 16th largest pharmaceutical producer worldwide and 6th largest pharmaceutical market in Europe, after Germany, France, the UK, Italy and Spain. In 2009, the Turkish pharmaceuticals market was worth USD 10.84 billion, at ex-factory prices, with per capita spending among the lowest in Europe at USD 150. The low expenditure per capita is to some extent a result of differing price levels, but also is derived from lower sales volume in Turkey, especially for expensive drugs (Deloitte, 2010).

Due to negative pricing regulations, which were consequences of the price legislation that was introduced in late 2009, the value of the pharmaceutical market is calculated to have decreased by 3 percent in 2009. Total pharmaceutical expenditure is expected to reach USD 22.8 billion by the end of 2015 with an expected CAGR of 13.2 percent between 2009 and 2015, but per capita spending is forecast to be still low compared to more developed countries (Deloitte, 2010).

Turkey is a net pharmaceuticals importer. In 2009, imports reached USD 4.07 billion, down by 1.7 percent, while exports rose by 7 percent and reached USD 428 million. The country's export trade was worth around 10.5 percent of drug imports in 2009 up from 9.7 percent in 2007. The country imports pharmaceuticals from various treatment groups, new and hi-tech preparations, vaccines, blood factors, cancer drugs and hormones, as well as APIs. Raw and semi-finished products make up about 25 percent of the total value of pharmaceutical imports and the remainder is the import of finished products. In terms of exports, Turkey markets finished and half-finished products to more than 50 countries. Germany, USA and Switzerland are the leading export destinations for Turkish pharmaceutical products (Deloitte, 2010).

Turkey has a developed pharmaceutical industry in terms of production standards, technology and capacity. The production facilities have been inspected continuously by Ministry of Health, and accredited internationally by International Accreditation Authorities. Turkey's industrial policy is focused on generic production. The industry needs to compete on a global level and particularly in the EU in order to maintain its growth. The investment into modern production technology as well as into technical R&D is a prerequisite for achieving this goal. Turkey looks at the success of Ireland in becoming a European hub for pharmaceutical manufacturing as a role model. Attracting foreign investment is an important part of this strategy and Turkey has had some successes in this area. The important role of the domestic industry in terms of employment and value generation is one of the reasons why cost containment measures - that inevitably have a negative impact on industrial profitability - are not applied to the same extend as in other countries (Çelik and Seiter, 2008).

Pharmaceutical industry is mainly concentrated in the Marmara Region especially in provinces of İstanbul, Kocaeli and Tekirdağ. Better infrastructure, easy supply of packaging materials and technical personnel, telecommunication and transportation facilities and the existence of a high number of health institutions in the region are the main reasons for the concentration. The industry has a production structure which has high level of technology and automation. Approximately 25.000 people are employed in the sector and this is a figure which increased during the last decade as the sector attracts investment in both manufacturing and research activities. Despite distinct challenges in the market in the medium term, favourable long-term macroeconomic

conditions and increased access to medicine will continue to drive demand for medicine and attract foreign drug makers. However, foreign direct investment has faltered in recent times, with the country increasingly becoming more import-dependent (BMI Turkey Pharmaceuticals & Healthcare Report Q4 2012, 2013).

The main characteristics of Turkish pharmaceutical industry are (Sector Research Report of the Competition Authority, 2013):

(a) Dependency on the regulations

(b) Product preferences are made by prescribing physicians on behalf of patients

(c) Reimbursement of pharmaceutical drug expenditures by the Social Security Institution

(d) Intensive marketing and promotion activities

2.2.2. Foreign Direct Investment (FDI) in Turkish Pharmaceutical Industry

Foreign direct investment (FDI) can be simply defined as the transfer of tangible and intangible assets, which occurs in two different ways as inward and outward. It has expanded rapidly and helped to capital movements by removing the national barriers. Foreign direct investment (FDI) takes place when a corporation in one country establishes a business operation in another country, through setting up a new wholly-owned affiliate, or acquiring a local company, or forming a joint venture in the host economy (Dumludağ, 2009).

Since 1980, with the liberalization of developing economies, the volume of FDI has grown significantly. With the increasing globalization, changes in government policies in trade and investment environment facilitate FDI into developing countries. The spread of production activities around the globe has been mainly attributed to the activities of the multinational enterprises (MNEs) in the developed nations as a result of this worldwide liberalization of economic activities and rapid technological change (Dumludağ, 2009; Pamukçu and Erdil, 2011).

In 1980, under pressure from international organizations, the focus of Turkey's economic policy was shifted from import substituting industrialisation (ISI) to an export led growth with structural reforms toward private enterprise, free trade, and market

forces (Dumludağ, 2010; Cetin and Ackrill, 2006). Although significant measures were taken in order to attract FDI inflows in the 1980s, the amount of FDI increased annually but not as expected. Even in the 1990s, inflow of FDI was insignificant due to severe economic crises and inconsistent macroeconomic policies, the level of FDI inflows with current prices as US dollars, continued to remain low. At the end of 1999, Turkey adopted a three-year economic stabilization and structural reform program with the support of the International Monetary Fund (IMF). However, after the subsequent crises of November 2000 and February 2001, the program collapsed. After the governmental change in 2002, a new FDI encouragement law was enacted in 2003, the complicated entrance procedures were simplified, and for the first time, the state accepted to work in accordance with non-governmental organizations and the private sector in order to improve the investment environment for foreign investors (Dumludağ, 2010).

The expectation has been that Turkey will become an attractive destination for FDI. Opposite to this, FDI inflows were weak after 2002, but then experienced an incremental increase and reached a record level of USD 22 billion in 2007. The decrease in 2009 can be explained by the global crisis which lowered FDI all around the world, including Turkey. The volume of FDI inflows directed to Turkey shows a promising recovery. 2012 FDI inflows rose to USD 12.5 billion, compared to USD 8.6 billion in 2009. Moreover, Turkey was able to attract an impressive level of FDI to the chemical industry, which includes pharmaceutical manufacturing as well as other chemical manufacturing. FDI inflows to the industry increased at a CAGR of 27% from 2008 to 2012, exceeding the USD 500 million level in 2012. Since 2006, the FDI came to Turkish pharmaceutical sector through mergers and acquisitions has been worth 1,7 billion USD sourced by 19 investments in total (Deloitte, 2014). As an important sign of attracting FDI to Turkish pharmaceutical sector, the OECD statistics show an increase from 20 million USD in 2011 to 365 million USD in 2012 (WEB_3, 2014).

2.3. SUPPLY CHAIN MANAGEMENT (SCM)

2.3.1. The Concept of Supply Chain

"Competitive advantage" is a position a firm occupies against its competitors. When a firm sustains profits that exceed the average for its industry, the firm is said to possess a competitive advantage over its rivals (Porter, 1985). According to Porter (1996), competitive advantage comes from the way of the company's activities fit and reinforce one another. Thus, fit locks out imitators by creating a chain that is as strong as its strongest link. Competitive advantage is the extent to which an organization is able to create a defensible position over its competitors. It comprises capabilities that allow an organization to differentiate itself from its competitors and is an outcome of critical management decisions (Li etal., 2006).

In the late 1990s, competition began to shift from firm to firm to supply chain against supply chain (Christopher, 2000; Christopher and Towill, 2001), a new approach in the business world has emerged that the competitive advantage lies through the supply chain (Tan, 2001). This shift can be attributed to a business environment that is characterized by constant change, shorter product life cycles, increasing customer requirements, product proliferation, and global sources of supply, manufacturing, and demand that has resulted in longer lead times. To compete in this environment, the firm and other members of the supply chain must be capable of delivering goods and services to consumers as quickly and inexpensively as possible. In addition, firms must be capable of operational excellence in multiple channels of product distribution and customer value must be delivered (Holcomb etal., 2011). Especially the focus has been on the unique set of relations between organizations in a supply network to enable the achievement of competitive advantage through lower costs and/or greater differentiation.

Although the terms "supply chain" and "supply chain management" are relatively new, the related research in the fields of marketing channels, inter-organizational operations, systems integration, operations research, organizational network design existed before. In fact, supply chain has always existed throughout the economic history. Essentially, where a need for production exists there should also exist a supply

chain system. Therefore, all organizations are part of at least one supply chain. Especially, with the development of manufacturing technologies in the 20th century, companies started to seek for greater efficiencies and lower prices. Due to the need of understanding consumer behaviour and responding to the customer demand with the right products, the need for effective supply chain management is accelerated. Also, shorter life cycles of the products and rapid development in information technologies increased customer expectations (Yurt, 2007).

Supply chain and supply chain management requirements have dramatically increased to offer the customers of today. Therefore, the significance of customer service determinants such as delivery performance, order fill rate, product availability has heightened. In order to improve their customer satisfaction levels, supply chain management is being implemented by the firms due to many potential advantages including: reducing cost, increasing market share, sales revenue and effectiveness of customer relations (Yurt, 2007). Accordingly, supply chain approach became a significant tool and guide for the companies. Therefore, the managers understood that their companies' abilities, competences and resources are not enough for their success. Through this realization, companies have focus on the whole supply chain by looking beyond their organizations' external boundaries (Christopher and Ryals, 1999; Simchi-Levi et al., 2003).

Globalization and its related consequences called for interdependency of the various firms along a supply chain. Due to the global competition; many manufacturers tended to collaborate with their suppliers to improve the product quality. Therefore, it was understood by the managers that the competitive advantage could be achieved through the effective management of logistics systems and by being a member of an effective supply chain. Also, it was recognized that a single firm cannot control the entire product flow and operate effectively (Ballou, 1992; Lummus and Vokurka, 1999). Trends in global sourcing, emphasis on time and quality based competition, increasing environmental uncertainty are some other reasons for the popularity of the supply chain concept (Mentzer et al., 2001).

Besides these, it is possible to list other reasons for the popularity of the supply chain concept; for instance, new trends in global sourcing needs for coordinating materials, service and related information flow inside and outside the company, and increasing

uncertainty of the environment. For the businesses that perform in global markets, logistics networks become more important, expansive and complex. Therefore, understanding, analysing, planning and managing these networks become more essential (Yurt, 2007).

Due to its significance, both academicians and practitioners focused on the definition and scope of supply chain concept. As supply chain is a system based on an integrative concept, it is not surprising that it has attracted the attention of different businesses and academic disciplines as well (Rota et al., 2002). Although, supply chain was thought as just a chain or cycle of business with one to one; business to business relationships for many years in time, many definitions and aspects were added to the supply chain literature (Lambert et al., 1998; Laseter and Oliver, 2003),. Also, the supply chain has become a wider concept, as collaboration of the companies enlarges better beyond first-tier suppliers and customers. The concept mainly based on three flows that are materials, services and information (Yurt, 2007).

According to Supply Chain Council (SCC) "the supply chain encompasses every effort involved in producing and delivering a final product or service, from the supplier's supplier to the customer's customer". Thus, supply chain management includes managing supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, and delivery to the customer. (WEB_2, 2013).

A supply chain consists of all stages involved, directly or indirectly, in fulfilling a customer request. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves. Within each organization, the supply chain includes all functions involved in filling a customer request. These functions include, but are not limited to, new product development, marketing, operations, distribution, finance and customer service (Pasutham, 2012).

Various definitions of a supply chain have been offered in the past several years. Since the number of erratic studies in the field of supply chain increase, many different definitions and explanations of the term were proposed. A number of definitions of supply chain are presented in Table 2.1. (Yurt, 2007).

Table 2.1. Definitions of Supply Chain

Author (s)	Year	Definition of "supply chain"
Christopher	1992	"...the network of organizations that are involved, through upstream and downstream linkages, in different processes and activities that produce value in the form of products and services in the hands of ultimate consumer"
Davis	1993	"...is simply a network of material processing cells with the following characteristics: supply, transformation, and demand"
Lee and Billington	1993	"...is a network of facilities that performs the functions of procurement of material, transformation of material to intermediate and finished products, and distribution of finished products to customers"
The Supply Chain Council (cited in Lummus et al., 2001)	1997	"...encompasses every effort involved in producing and delivering a final product, from the supplier's supplier to the customer's customer. Four basic processes-plan, source, make, deliver- broadly define these efforts, which include managing supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, and delivery to the customer"
Institute of Logistics (cited in Waters, 2003)	1998	"...is a sequence of events intended to satisfy a customer. It can include procurement, manufacture, distribution and waste disposal, together with associated transport, storage and information technology"
Beamon	1998	"... an integrated process wherein a number of various business entities (i.e., suppliers, manufacturers, distributors, and retailer) work together in an effort to: (1) acquire raw materials, (2) convert these raw materials into specified final products, and (3) deliver these final products to retailers"
Lummus and Vokurka	1999	"...all the activities involved in delivering a product from raw material through to the customer, including sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, delivery to the customer, and the information systems necessary to monitor all of these activities."
Mentzer et al.	2001	"... a set of three or more entities(organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer"
Harrison and van Hoek	2002	"...is a group of partners who collectively convert a basic commodity (upstream) into a finished product (downstream) that is valued by end-customers, and manage returns at each stage"
Waters	2003	"...consists of the series of activities and organizations that materials move through on their journey from initial suppliers to final customers"

2.3.2. The Concept of Supply Chain Management (SCM)

The emerging paradigm of globalization and increased competition demands a more efficient utilization of every value-adding operation in most companies and within their functional areas. Competition is now viewed at the supply chain level rather than at the individual firm level. At the same time, firms are now more focused on their core competence and operations. The functions of product and process design are no exception to this evolution. These technology-specific areas have matured over the years as companies strive to gain a competitive advantage through comprehensive product and process developments that not only cut down response time, but also address their implications down the value chain. The expanding scope of decision making across temporal, geographical, value chain and functional dimensions provides companies with a sustainable competitive advantage in terms of cost, quality, innovation and delivery performance. Concurrently, through relentless improvements in the manufacturing industry over the past decades, companies have benefitted tremendously through applying different managerial approaches (e.g., JIT, TQM, and FMS). These combined efforts, however, come at the expense of a corresponding increase in the level of logistic activities as needed material, parts and products must be moved from one destination to the next, be it an intra-factory station or an international market. Supply chain management is responsible for maneuvering this flow process through which continued productivity is ensured (Ernst and Kamrad, 2000; Prajogo et al., 2012).

As a result of increased competition among the firms, the traditional purchasing and logistics functions have evolved into a broader strategic approach to materials and distribution management known as supply chain management (Tan, 2001). In the literature, there are many definitions of this management philosophy. The term "supply chain management" is firstly introduced by some consultants in the early 1980s (Oliver and Webber, 1982) to the literature. Supply chain management involves the management and integration of a set of selected key business processes from the end users through original suppliers, that provide products, services and information that add value for customers and other stakeholders through the collaborative efforts of supply chain members (Ho et al., 2002). The goal of supply chain management is the

smooth, seamless flow of goods, services and information across the constituent organizations (Pedroso, Nakano, 2009). Supply Chain Management describes the "systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole (Mentzer et al., 2001).

In order to achieve a competitive advantage, supply chains need to be managed appropriately (Bode et al., 2011; Salvador et al., 2001; Scannel et al., 2000). The set of practices developed by an organization to effectively manage the functioning of a supply chain are known as supply chain management practices (Li et al., 2006).

The concept of SCM first appeared in the literature in the mid-1980's, mostly in the context of 'logistics'. However, the fundamental assumptions which SCM rests are significantly older. They include: managing inter-organizational operations, which can be traced back to channels research in the 1960's; systems integration research in the 1960's; and the more recent ideas of sharing information and exchange of inventory for information (Cooper etal., 1997). The earlier definitions of SCM and logistics operations management were nearly equal, since their focus was on the effective performance of the day-to-day activities associated with the optimization of distribution and manufacturing and accelerating the flow of inventory and information through the channel system (Korpela etal., 2001).

Supply Chain Management (SCM) has been defined as a loop which starts with the customer and ends with the customer and it requires perceiving the business as a continuous process which absorbs such traditionally distinct functions as forecasting, purchasing, manufacturing, distributing and sales and marketing into a continuous flow of business interaction (Gattorna and Walters, 1996).

Council of Logistics Management (CLM) defines SCM as the systemic, strategic coordination of the traditional business functions and tactics across these businesses functions within a particular organization and across businesses within the supply chain for the purposes of improving the long-term performance of the individual organizations and the supply chain as a whole. SCM has been defined to explicitly recognize the strategic nature of coordination between trading partners and to explain the dual purpose of SCM: to improve the performance of an individual organization, and to

improve the performance of the whole supply chain. The goal of SCM is to integrate both information and material flows seamlessly across the supply chain as an effective competitive weapon (Li etal., 2006).

SCM connects, aligns, and coordinates processes in supply chains as well as flows of material and information between suppliers and customers. SCM is the coordination of a strategic and long-term cooperation among co-makers in the global logistics network for the development and production of products, both in production and procurement and in product and process innovation (Schnetzler et al., 2007).

According to Prajogo et al. (2012) and Chase et al. (2001), popularity of SCM is due to the fact that many companies achieve significant competitive advantage by the way they configure and manage their supply chain operations.

The effective SCM may improve the performance of an individual organization and improve the performance of the whole supply chain. But managing supply chain is so complex that often makes the promised improved outcomes go unfulfilled (Ketchen Jr. and Giunipero, 2004). Therefore, understanding what distinguishes effective and ineffective SCM is a critical issue. In order to effectively manage this complexity, resources, communications and processes, companies need to establish their supply chain structures accordingly.

In the last forty years, supply chain management (SCM) notion attracted the attention from researchers and practitioners and has become a visible and popular research area in the field of Operations Management. This is due to the fact that, significance of supply chain management has increased over the past two decades. Globalization, outsourcing, increased volatility of market demand, decreased product life cycles, and developments in information technology contributed to the relevance of supply chain management. Supply chain management deals with the integration of business processes from end customer through original suppliers that provide products, services, and information that add value for customers (Cooper et al., 1997). Porter's study on value chain plays a role as milestone for the supply chain management literature. Supply chain management essentially aims to create competitive advantage for the companies by increasing the value delivered to the customers (Stank et al., 2005). The strategic point of view on supply chain management is based on Porter's study in 1985 which identifies conceptualization of the value chain and value system. In his study (1985), he made a

great contribution to the literature by defining value chain as the basic tool for achieving competitive advantage. The importance of supply chain management notion for competitive positioning is recognized by the value chain concept. He stated that, "...differences among competitor value chains are a key source of competitive advantage". Approximately one decade later, Christopher's (1992) frequently cited statement as "...competition takes place between supply chains rather than between individual companies" supported Porter's view and transmitted his view to the supply chain management literature.

The second important approach that leads to development of supply chain management view is the 'system approach'. Initially, supply chain management was utilized only within the boundaries of a single company. The focus was on the interrelationships and coordination between different departments and operations of a single company such as; production, sales, finance, marketing and distribution, in order to manage the materials flow (Laseter and Oliver, 2003). Also, a particular firm can be a unit of various supply chains. Therefore, the management of such chains is complex. In essence, nobody is able to manage the entire supply chain. Thus, it is impossible for a manager to manage a system from suppliers' supplier to customers' customer. Therefore, it is important to recognize that expectations and required knowledge can vary across supply chains (Fawcett and Magnan, 2002). Accordingly, it is nearly impossible to answer the question of who is in charge to manage the supply chain. Hence, the supply chain management concept can only be realized in terms of individuals' perceptions (Yurt, 2007).

There are many reasons for the popularity of the SCM concept. Specific drivers may be traced to trends in global sourcing, an emphasis on time and quality-based competition, and their respective contributions to greater environmental uncertainty. Corporations have turned increasingly to global sources for their supplies. This globalization of supply has forced companies to look for more effective ways to coordinate the flow of materials into and out of the company. Key to such coordination is an orientation toward closer relationships with suppliers. Further, companies in particular and supply chains in general compete more today on the basis of time and quality. Getting a defect-free product to the customer faster and more reliably than the competition is no longer seen as a competitive advantage, but simply a requirement to

be in the market. Customers are demanding products consistently delivered faster, exactly on time, and with no damage. Each of these necessitates closer coordination with suppliers and distributors. This global orientation and increased performance-based competition, combined with rapidly changing technology and economic conditions, all contribute to marketplace uncertainty. This uncertainty requires greater flexibility on the part of individual companies and supply chains, which in turn demands more flexibility in supply chain relationships (Mentzer etal., 2001).

Although definitions of SCM differ across authors, they can be classified into three categories: a management philosophy, implementation of a management philosophy, and a set of management processes. Monczka et al. (1998) stated that SCM requires traditionally separate materials functions to report to an executive responsible for coordinating the entire materials process, and also requires joint relationships with suppliers across multiple tiers. According to them SCM is a concept, "whose primary objective is to integrate and manage the sourcing, flow, and control of materials using a total systems perspective across multiple functions and multiple tiers of suppliers." Lalonde and Masters (1994) pointed out that supply chain strategy includes: "... two or more firms in a supply chain entering into a long-term agreement; ... the development of trust and commitment to the relationship; ... the integration of logistics activities involving the sharing of demand and sales data; ... the potential for a shift in the locus of control of the logistics process."

The alternative definitions and the categories they represent suggest that the term "supply chain management" presents a source of confusion for those involved in researching the phenomena, as well as those attempting to establish a supply chain approach to management. Research and practice would be improved if a single definition were adopted. SCM as a management philosophy seeks synchronization and convergence of intrafirm and interfirm operational and strategic capabilities into a unified, compelling marketplace force, and as an integrative philosophy it directs supply chain members to focus on developing innovative solutions to create unique, individualized sources of customer value (Mentzer etal., 2001).

Based upon the literature review, Mentzer etal. (2001) proposed that SCM as a management philosophy has the following characteristics:

1. A systems approach to viewing the supply chain as a whole, and to managing the total flow of goods inventory from the supplier to the ultimate customer;
2. A strategic orientation toward cooperative efforts to synchronize and converge intrafirm and interfirm operational and strategic capabilities into a unified whole; and
3. A customer focus to create unique and individualized sources of customer value, leading to customer satisfaction.

Supply chain management is a system in which each firm directly or indirectly affects the performance of all other entities in the chain as well as the performance of the whole chain (Cooper et al., 1997, Lockamy III and McCormack, 2004). Due to the thought that the organizations cannot exist in isolation, the idea of supply chain management was initially along the lines of system approach. Because supply chain is a system in itself, the 'system approach' is the basis of this concept. The system approach, which was proposed by Von Bertalanffy (1976), simply states that "the elements of a system affects each other, and will act differently when isolated from their environment or other components of the system". Different components of the supply chain such as; suppliers, manufacturers, third party logistics firms, wholesalers, retailers and several supply chain activities that should be traded-off can be thought as the components whole system (Yurt from Lambert et al., 2007). The system approach in supply chain management suggests the recognition of interdependencies of major functional areas the within, across, and between firms. Therefore, supply-chain participants should share goals, objectives and strategies of the system-supply chain. Key attributes associated with supply-chain management are 'customer power, long term orientation, leveraging technology, enhanced communication across organizations, inventory control, interactivity, interfunctional and interorganizational coordination' (Yurt from Murphy Jr. and Wood, 2007).

The management and structures of supply chains have changed since 1990's. Both practitioners and academicians are interested in supply chain management notion and cooperation in network relations as well as the assessment of common supply chain practices. In 1990's, managers started to adopt the supply chain perspective and to

identify their business environment according to the supply chain in which they were performing. Also companies started to focus on the best supply chain practices to build ideal supply chains. Cost competitiveness and inventory management were recognized as the basic aims of supply chain management (Yurt from McMullan, 2007; Yurt from Kemppainen and Vepsalainen, 2007). In these years, supply chains were identified as just the chains of companies. In time, the structure of supply chain management changed as multi-tier and collaboration based network (Yurt from Kemppainen and Vepalainen, 2007).

Supply chain management is applied by companies across the globe due to its demonstrated results such as delivery time reduction, improved financial performance, greater customer satisfaction, building trust among suppliers, and others. According to D'Amours, Rönnqvist, and Weintraub (2008), companies resort to supply chain practices to improve their performance.

2.4. SUPPLY CHAIN STRUCTURE

There are a number of existing theories that address the subject of "supply chain structure". Some authors use the phrase "value chain" (Porter 1985), others refer to the "governance structure" (Powell 1990). "Governance structure" was termed during the early work on transactions, when it was first postulated that the way in which the "addition of value" to a product was dispersed amongst contributing firms was important. "Physical structure" (Hines and Rich, 1997) is used to describe the distribution of various types of firm (Raw materials producers first and second tier suppliers etc.) in a supply chain, as well as the amount of value they respectively add to the product.

Supply chain structure can be described as an integral chain where all the elements in the integrated supply chain will work as one synchronized system. Sourcing, making and distributing products and services are stated as the key activities within a supply chain structure (Chang, 2006).

Supply chain structure is consisted in activities related to facilities, transportation, inventory and information, in other words, its drivers. A supply chain structure is affected by those drivers and the decisions made related to them (Chopra and Meindl, 2004). Facilities imply the places where the inventory is stored, assembled or fabricated

such as production sites and storage sites of a supply chain. Inventory signifies the raw materials, work-in-process (WIP), finished goods within a supply chain. They are determined by the inventory policies chosen according to the supply chain priorities. Transportation is moving inventory from one point to another in a supply chain. It is carried out depending on the combinations of transportation modes and the routes. Information driver refers to the data and analysis regarding inventory, transportation, facilities throughout the supply chain.

Supply chain structure refers to an extended enterprise, namely the firm plus its suppliers and customers. Because the supply chain is concerned with coordinating the movement and storage of physical items, geographic characteristics would also be expected to relate how the supply chain is coordinated. Two constructs are specified to define the supply chain structure as geographic dispersion and channel governance. Geographic dispersion of the supply chain is the geographic scope of the locations of suppliers, production facilities, distributors and customers in the supply chain. In the meantime, channel governance is the classification of how the firm's supply and distribution channel is governed. Supply and distribution channel of the firm consists of its suppliers, production facilities, distributors, and customers, and it is classified as a network, hierarchy, or market (Stock et al., 2000).

A firm's global supply chain structure deals with the management and positioning of different elements of its supply chain in multiple global regions, thus geographic dispersion of these facilities is a key issue in operations. Stock et al. (2000) showed that the location of facilities for sourcing supplies, distribution, and manufacturing activities, as well as sales offices, represents elements of a firm's supply chain structure resulting from strategic choices. Additionally, they emphasized three key reasons for using geographic dispersion to define the supply chain structure. First, it impacts how tasks are allocated in the firm. Second, the extent to which the supply chain structure of a firm is geographically dispersed or concentrated has a direct effect on the coordination structure needed by the firm. Third, the degree of geographic dispersion reflects the trend of placing production facilities in different world markets. They investigated the alignment of logistics practices and supply chain structures using the notion of "fit". "Fit" is defined as an appropriate consistency between logistics practices and supply chain structures. Using a configurations approach, they then examined the implications

of the framework to develop and test a set of hypotheses linking logistics–supply chain fit to organizational performance, which is considered as both in terms of operational performance measures and financial performance measures. Their results show a clear positive relationship between operational performance and fit between the firm's supply chain structure consisting of logistics integration and geographic dispersion dimensions, even this was not the fact for the financial performance.

According to Ernst and Kamrad (2000), the supply chain structure consists of three steps as manufacturing, assembly and packaging. They introduced a conceptual framework for evaluating different supply chain structures in the context of modularization and postponement. Toward characterizing the different supply chain structures, they considered the inbound and outbound logistics to capture the degree of modularization and postponement, and pointed out that the modularized structure is the most typical supply chain structure for most industries, in which multiple sources exist for the components but the output of the assembly process is the finished product.

Another study linking supply chain structure and postponement was carried out by Chaudhry (2010), in which supply chain structures and postponement applications in the US textile industry were investigated. A case study based approach was used for this research to understand the impact of interaction among supply chain partners upon the adoption of postponement strategies. The purpose was to develop a decision support model for aligning supply chain strategies with regards to postponement applications. It was found that different types of postponement strategies were adopted in the industry.

Yeung et al. (2007) explored how the supply chain structure and information sharing patterns among the supply chain actors affects the postponement decision. They selected eight companies from China based on their supply chain structures and postponement strategy. On the basis of interdependency between the supply chain actors, they categorized the supply chain relations as balanced and unbalanced. In case of a balanced supply chain relationship, either speculation or production postponement should be adopted. They have argued that to adopt postponement a close relationship is required among the supply chain actors, whereas in case of a balanced structure information exchange tends to be more difficult to be practiced and the players tend to live in their silos. With regard to their other proposition, they observed that observed that in the case of an unbalanced supply chain structure, either purchasing postponement

or product development postponement have served the players better. According to them, an unbalanced supply chain has one company in leading position because of its market power and because of that it can force other players to share information and adapt their processes best suited to its schedules. This enables the supply chain actors to develop close relationships, which in turn makes a high degree of postponement more suitable to be adopted.

The factors determining optimum structure and practice in modern day industrial supply chains were investigated by Coleman (2001). With reference to 24 case study supply chains from European automotive industrial sector, he tested whether existing theory can fully explain the changing structures. From the test results, he postulated and validated a new model and found that existing theory was insufficient to explain the changes in the supply chain structures in the European automotive industry in the mid to late 1990s. The dominant factors that most heavily influenced the supply chain structures in the European automotive industry were stated as criticality of component, the level and pace of technological development for supply chain, the desire to reduce the complexity of logistics and the cost of demand fluctuations, and the capital intensity of the production process.

Cohen and Lee (1989) argued that a firm's performance is determined to a great extent by its resource deployment decisions concerning supply, manufacturing, and distribution facilities along an international dimension and present various global supply chain strategies for the different stages of a global supply chain such as plant, supply, and distribution. Thus, focusing on the geographic dispersion of facilities allows for insights into a firm's supply chain structure.

Based on the literature's dependence on geographic dispersion, Prater and Ghosh (2006) operationalized supply chain structure as the number of R & D facilities, manufacturing plants, distribution centers, suppliers, and sales centers located in Europe by U.S. firms. They investigated the impact of a firm's global operating strategy on its supply chain structure by hypothesizing that the magnitude of impact of a firm's global operating strategy on its global supply chain structure is less for small firms than for larger firms. Using empirical data collected from surveying all U.S.-owned manufacturing firms with operations in Europe, it was shown that for very large firms,

global operating strategy has the strongest impact of any factor on global supply chain structure which is a proof for the validity of abovementioned hypothesis.

In particular, supply chain structure has been a matter of investigation from various dimensions including its relationship with sourcing and supply strategies. The impact of supply chain structure on responsible sourcing was investigated by Guo et al. (2013) by analysing the sourcing decisions of firms that may choose between two types of suppliers, namely responsible suppliers that are costly but adhere to the strictest social and environmental responsibility standards, and normal suppliers that are less expensive but may randomly experience responsibility violations. They considered how three structural elements of the supply chain influence the firm's optimal sourcing decision, which are stated as downstream competition, the concentration of the supplier base, and supply chain flexibility. What they found is that greater downstream competition, a more concentrated supplier base, a less flexible supply chain all make a firm more likely to source responsibly and accordingly they concluded that supply chain characteristics play a key role in determining the optimality of responsible sourcing.

The relationship between supply chain structure and product has been another field of research. Fisher (1997) presented a model specifically about the relationship between product and supply chain by distinguishing between physically efficient supply chains and responsive supply chains; and also functional products and innovative products. He suggested that functional and innovative products require efficient and responsive supply chains, respectively. However Lo and Power (2010) tested Fisher's model using a survey in Australian manufacturing industry and concluded that a hybrid strategy is employed by most organizations irrespective of the nature of the product they supply.

The impact of supply chain structure on the use of supplier socially responsible practices was investigated by Awaysheh and Klassen (2010). They made a multi-dimensional conceptualization of supply chain structure, including transparency, dependency and distance, and identified four dimensions of supplier socially responsible practices as supplier human rights; supplier labour practices; supplier codes of conduct; and supplier social audits. Their major finding was that organizational distance, as measured by the total length of the supply chain (number of tiers in the supply chain), was related to increased use of multiple supplier socially responsible practices.

2.5. SUPPLY CHAIN STRUCTURES IN THE PHARMACEUTICAL INDUSTRY

Historically, in the pharmaceutical industry most management attention has been paid to drug discovery and sales and marketing (the extreme ends of the supply chain), but now much more attention is being paid to supply chain optimization as a means of delivering value. According to Shah from Booth (2004):

- There is a welcome move away from viewing the supply chain as merely having to deliver security of supply at minimum cost, to a recognition of its ability to generate both value for the customer and hence to the shareholder; and
- Restructuring of the supply chain along regional and global lines will require massive reductions in capacity, which was acquired in many cases to propitiate national interest in return for sympathetic pricing.

Cooper and Kleinschmidt (1995), Droge, Jayanth, and Shawnee (2000), Kessler and Chakrabarti (1999) and Nijssen et al. (2002), Spaulding (2002) showed that management of the supply chain is a strategic activity that must be conducted across the entire enterprise, from marketing and product design groups all the way through to the accounts receivable department. Supply chain management must be conducted between enterprises since optimizing entire supply chains will require a level of information sharing and collaboration among enterprises. This is especially important in the pharmaceutical industry. Its supply chain is vitally important to the industry, the patients and physicians it serves and is undergoing more change ever experienced before.

Even though, discovery and product development investments are the focus of attention of the pharmaceutical industry and the investor community, there are significant opportunities for generating economic value that are found in improvements on the operational supply chain side. Improvements in SCM could provide a gain of $65 billion to the pharmaceutical industry if the productivity of the lowest performers could be brought to the level of supply chain productivity of the top drug-makers (Lainez etal., 2012).

According to Shah (2004), a typical pharmaceutical supply chain will consist of the one or more of the following nodes:

(i) primary manufacturing (possibly including contractor sites);

(ii) secondary manufacturing (possibly including contractor sites);

(iii) market warehouses/distribution centres;

(iv) wholesalers; and

(v) retailers/hospitals.

Supply chains in the pharmaceutical industry, one typical industry of products with a high added value per mass unit, comprise two manufacturing stages: primary manufacturing for active ingredient (AI) production and secondary manufacturing for formulation and packaging (Sousa etal., 2011).

The primary manufacturing site is responsible for the production of the active ingredient (AI or API). This normally involves either several chemical synthesis and separation stages to build up the complex molecules involved, or fermentation and product recovery and purification in the case of biochemical processes (Shah, 2004).

Secondary manufacturing is concerned with taking the active ingredient produced at the primary site and adding "excipient" inert materials along with further processing and packaging to produce the final products, usually in stock keeping unit (SKU) form (Shah, 2004).

Warehouses or distribution centers relate to the management of stocks and flows within the physical transfer of final products between manufacturer and wholesaler. Wholesalers are in charge to deliver the final products to retailers, namely pharmacies generally, and hospitals in some cases like tenders (Shah, 2004).

Yu et al. (2010) investigated the evolution of pharmaceutical supply chain in China by considering the pharmaceutical supply chain structure definition of Shah (2004) and determined that the pharmaceutical supply chain in China consists of three nodes as first the supplier including domestic drug manufacturers and importers, second the distributors including drug wholesalers, drug stores and hospitals and third the patients.

In this study, supply chain structures of pharmaceutical companies in Turkey are investigated in the scope of primary manufacturing, secondary manufacturing, and market warehouses / distribution centers in terms of warehousing and distribution.

2.6. BUSINESS PERFORMANCE

Performance is defined as the results of activities of an organization or investment over a given period of time. Increasing competition in various sectors has been forcing companies to show good and consistent business performances. Business performance can be measured through indicators as sales, sales growth and market share (Okoroafo and Kotabe, 1993; Appiah-Adu, 1999; Stock et al., 2000; Dong et al., 2008; Deshpande, 2012; Fugate et al., 2012).

In the literature, business performance has been investigated by both subjective (e.g., self-reported) and objective (e.g., ROI, market share, trend analysis) measures. The distinction between objective and subjective measures of business performance is blurred by the human element. Although most objective measures are based on financial data, the reporting of financial information may be subjectively constructed. For example, some financial data is subject to managerial decisions such as evaluation of investments and assets, reporting of liabilities, costing, and forecasting. Regardless of this characteristic of objective measures, researchers and practitioners continue to discriminate between subjective and objective measures (Rodriguez Cano etal., 2004).

The relationship between supply chain structure and business performance was considered in the study of Randall and Ulrich (2001), in which they investigated the relationship among product variety, supply chain structure and firm performance, using data from the U.S. bicycle industry. They characterized supply chain structure by the degree to which production facilities are scale-efficient and by the distance of the production facility from the target market and hypothesized that firms with scale-efficient production (i.e., high-volume firms) will offer types of variety associated with high production costs, and firms with local production will offer types of variety associated with high market mediation costs. Using both ANOVA and regression techniques in their analyses, they found out that product variety is related to supply chain structure through its effect on production costs and market mediation costs.

Apart from this study including the investigation of the relation between supply chain structure and business performance, various studies were performed to associate supply chain management and performance. The literature of SCM was born on its practical positive impact on firm performance. Early research used to report anecdotal

evidence about firms that had adopted the supply chain management approach and how this resulted in benefits for the firm and other supply chain members. Great part of this literature was descriptive, reporting practices of successful companies. The development of the SCM field was largely practitioner-led with theory following (Miguel and Brito from Voss, Tsikriktsis, and Frohlich, 2011). Relationship between supply chain visibility and firm performance was studied by Holcomb etal. (2011) in which firm performance was taken as perceived, namely as a subjective measure. Conducted correlation analysis indicated that only a few visibility factors significantly affect the firm's performance. Another finding of this study is that the size of the firm does not affect visibility.

Miguel and Brito (2011) investigated the influence of supply chain management on operational performance using structural equation modelling technique to analyse a sample of 103 companies in Brazil. They evaluated the operational performance in four different dimensions as cost, delivery, quality and flexibility. Their findings showed that there is a positive and statistically significant relationship between supply chain management and all dimensions of operational performance. They also found evidence of an operational competence construct mediating the effect of SCM on performance, supported conceptually by the resource-based and relational views of strategy.

Deshpande (2012) stated that organizations seldom achieve the competitive advantage offered by supply chain management technique and pointed out the gap existing in terms of understanding the relationship between supply chain management performance measures and organizational performance measures. Based on a comprehensive literature review, he derived a theoretical framework and propositions and presented an integrative framework to support positive relationships between SCM dimensions, SCM performance measures and organizational performance measures. He argued that increased interaction between important constituents of supply chain management will enhance the organization's ability to meet desired goals.

The study of Agus (2011) consists of the relationship between supply chain management, product quality and business performance, and aimed to understand and determine critical variables of supply chain management that would be able to enhance product quality and business performance in Malaysian manufacturing companies. This study can also be classified as subjective considering that it is based on the perceptions

of senior production or supply chain managers. Relationships between SCM, product quality and business performance and these associations are analysed through structural equation modelling (SEM). The SEM result demonstrates that SCM dimensions namely 'lean production', 'new technology and innovation', 'strategic supplier partnership' and 'postponement concept' appear to be of primary importance and exhibit significant effects on product quality and business performance.

The impact of supply chain management practices on organizational performance was conceptualized in the study of Li etal. (2006) by developing five dimensions of SCM practice (strategic supplier partnership, customer relationship, level of information sharing, quality of information sharing, and postponement) which tested the relationships between SCM practices, competitive advantage, and organizational performance. Organizational performance was investigated in the dimensions of market performance and financial performance. The authors hypothesized that firms with high levels of SCM practices will have high levels of organizational performance and tested this hypothesis via structural equation modelling (SEM) method. The findings of this research showed that SCM practices can have discernible impact on organizational performance. Taking a similar approach, Min and Mentzer (2004) combined seven practices (i.e., vision, leadership, long-term relationship, information sharing, risk and reward sharing, process integration, and cooperation) to form a bundle of SCM practices and show that it has a positive relationship with a set of business performance measures, which include product offering, availability, timeliness, profitability, and growth.

The relationship between just in time, total quality management, and supply chain management and their impact on business performance was investigated by Kannan and Tan (2005) empirically via bivariate correlation analysis. Obtained results demonstrate that at both strategic and operational levels, linkages exist between how just in time, total quality management, and supply chain management are viewed by organizations as part of their operations strategy. Results also indicate that a commitment to quality and an understanding of supply chain dynamics have the greatest effect on performance. It was pointed out that in addition to having a focus on quality, understanding supply chain relationships is a key driver of performance. Whether it is by coordination and integration of activities throughout the supply chain or by recognizing the capabilities of

immediate suppliers, understanding supply chain dynamics has a significant impact on performance.

In today's business environment where competition among firms increases, firms are in the search of how to create a sustainable competitive advantage and therefore they develop new strategies continually. Diversification is one of strategies preferred by the firms either on product and/or on market basis. A firm pursuing diversification strategy needs to proactively seek efficient linkage or integration among its various internal functions, and with its suppliers and customers comprising its supply chain. It is shown that internal integration across the supply chain and external integration with suppliers and customers positively moderate the relationship between product diversification and firm's performance (Narasimhan and Kim, 2002).

Another study covering the relationship between supply chain integration and performance was carried out by Vickery etal. (2003). Using structural equation modelling (SEM) method, they examined the performance implications of an integrated supply chain strategy, with customer service performance followed by financial performance as performance constructs in the automotive industry in North America. Their results showed positive direct relationships between integrated information technologies and supply chain integration, supply chain integration and customer service, and customer service and firm performance. The relationship of supply chain integration to financial performance was indirect, through customer service; i.e., customer service was found to fully (as opposed to partially) mediate the relationship between supply chain integration and firm performance for first tier suppliers in the automotive industry.

Iyer etal. (2009) applied the "fit" concept to the relationship between B2B e-commerce supply chain integration and performance by examining the main effect of B2B supply chain integration on financial, market and operational performance in three multiple regression models where these three performance parameters were subjectively measured. They hypothesized that the greater the level of B2B supply chain integration, the better the financial performance, market performance and operational performance. The results demonstrated that the effect of B2B supply chain integration on financial, market, and operational performance decreased as product turbulence and demand unpredictability jointly increased.

Firms' focus on competitive advantage brought SCM into a strategic position which allows firms to improve their business results. This is particularly the case as more companies link their advantages together and start to operate as supply networks of interdependent supply chain partners as opposed to separate, stand-alone entities (Spekman et al., 1998). Associated with such an approach is the integration of intra and inter-businesses processes in order to achieve such business-to-business linkage. Robertson (2006) investigated the impact of supply chain process integration on business performance using structural equation modelling technique by hypothesizing that the integration of supply chain logistics processes does significantly and positively impact supply chain and business performance. The results of data analysis supported the hypothesis and accordingly a simulation model was developed.

A critical aspect of successfully managing the supply chain lies in measuring and monitoring information about its key operational and performance parameters. Therefore it is important for a firm to adopt information systems that are aligned to its supply chain (Qrunfleh and Tarafdar, 2012). IT-based SCM systems are an investment type to attain specific business objectives when they are well targeted, well timed, well managed and accompanied with complementary investments and actions. The firm performance effects associated with SCM systems have tended to be measured with high-level measures of financial performance or with self-reported, survey-based process performance measures. Dehning etal. (2007) hypothesized the direct impacts of supply chain investments on (supply chain specific) process metrics along with overall financial performance metrics using audited, externally reported financial performance measures. Using audited, externally reported financial performance measures adds an important degree of verifiability, an essential characteristic of a performance metric. To measure the impact of IT-based SCM systems on the firm, performance after implementing the IT-based SCM system must be compared to performance before implementing the SCM system. By examining the change in financial performance pre- and post-adoption controlling for industry median changes in performance, it was found that SCM systems increase gross margin, inventory turnover, market share, return on sales, and reduce selling, general, and administrative expenses. A model was also provided showing how process improvements around supply chain initiatives combine to improve overall performance. Finally, it was shown that contextual effects such as

firms in the high-tech industry and the scope of the supply chain implementation have dramatic effects on the overall financial performance resulting from supply chain implementations.

Qrunfleh and Tarafdar (2012) examined the relationship between supply chain (SC) strategy and supply chain information systems (IS) strategy, and its impact on supply chain performance and firm performance. Theorizing from the supply chain and IS literatures within an overarching framework of the information processing theory (IPT), they developed hypotheses proposing a positive moderating effect of two supply chain IS strategies – IS for Efficiency and IS for Flexibility – on the respective relationships between two SC strategies – Lean and Agile, and supply chain performance. Based on confirmatory analysis and structural equation modelling of survey data from members of senior and executive management in the purchase/materials management/logistics/supply chain functions, from 205 firms, they validated these hypotheses and showed that the IS for Efficiency (IS for Flexibility) IS strategy enhances the relationship between Lean (Agile) SC strategy and supply chain performance. They also showed a positive association between supply chain performance and firm performance, and a full (partial) mediation effect of supply chain performance on the relation between Agile (Lean) SC strategy and firm performance. With this study, instruments for measuring two types of SC strategies and supply chain IS strategies were developed and validated.

With the increasing use of integrated information systems and enabling technologies, it has now become possible to create seamless supply chains linking suppliers to customers in order to eliminate the poor performance of the suppliers, unpredictable customer demands, and uncertain business environment. An integrated supply chain has a clear advantage on the competitiveness of the individual firms. Gaining competitive edge through effective use of SCM and IS practices in a highly competitive environment becomes increasingly difficult and crucial in order to optimize the firm's operational performance. This competitive environment has even greater effect on small and medium size enterprises (SMEs) due to the possible external pressure from large size customers and also internal pressure of resource limitations of most SMEs. SMEs, especially those in emerging countries, tend to have limited skills and resources. Subsequently, this will result in their inability to implement the SCM and IS practices as

intended, which will in turn reduce their operational performance. Within the research framework proposing that SCM and IS practices implemented in SMEs will influence their performance, it was found out that both SCM and IS practices positively and significantly influence the operational performance of sample firms (Bayraktar etal., 2009).

In terms of bottom-line financial impact of SCM, Wagner etal. (2012) investigated the link between supply chain fit and financial performance of the firm. The concept of supply chain fit has been popularized by Fisher's (1997) conceptual supply chain–product match/mismatch framework and has its roots in the manufacturing and operations strategy literature, which comprises strategic consistencies between the products' supply and demand uncertainty and the underlying supply chain design. From a managerial perspective, achieving supply chain fit is challenging and supply chain misfits may be consequential. Wagner etal. (2012) asserted that by developing an understanding of the impact of supply chain fit on performance, firms will be well on their way to build such guidelines and their own models for supply chain excellence. Their findings indicate that the higher the supply chain fit, the higher the Return on Assets (ROA) of the firm, and that firms with a negative misfit show a lower performance than firms with a positive misfit.

Another field of study about the relationship between supply chain and business performance has been the effect of supply chain strategy on business performance. Within the concept of a manufacturer's supply chain strategy, an ambidextrous strategy is defined as a simultaneous pursuit of both exploration and exploitation. For manufacturers, the supply chain exploitation practices typically involve leveraging their current supply chain competencies to achieve lower costs and reliability; whereas with exploration, practitioners would continuously seek new knowledge and ideas within supply chain relationships. Kristal et al. (2010) investigated whether an ambidextrous supply chain strategy coincides with combinative competitive capabilities and business performance. They hypothesized that ambidextrous supply chain strategy has a direct and positive influence on combinative competitive capabilities, which in turn, improve business performance, namely, market share and profit level. Measuring business performance subjectively, and using survey based data gathered from 174 U.S. manufacturers, they found that an ambidextrous supply chain strategy coincides with

combinative competitive capabilities and business performance. In addition, they provided insights regarding the role of combinative capabilities in mediating the relationship between an ambidextrous supply chain strategy and business performance.

Business performance in pharmaceutical industry has been another field of research in which several studies were performed (Deeds and Decarolis, 1999; Decarolis, 2003; Sharabati etal., 2010; Stankeviciene and Sviderske, 2010; Akomea and Yeboah, 2011; Mehralian etal., 2012; Sheela and Karthikeyan, 2012; Sharabati and Nour, 2013; Shabaninejad etal., 2014). In some of the studies, particular pharmaceutical markets on country basis were selected even some of them consist of suggestions for performance measurement models and methods for the general of the pharmaceutical industry.

The study of Deeds and Decarolis (1999) opened a subdimension to biotechnology industry in terms of empirical investigation of firm performance. The relationship between stocks and flows of organizational knowledge and firm performance was tested in a regression model by suggesting that a firm's geographic location, alliances with other institutions and organizations and R&D expenditures are representative of knowledge flows, while products in the pipeline, firm citations and patents are indicative of knowledge stocks. Emphasizing the difficulty of performance measurement for biotechnology companies because of missing history of revenues and earnings, they took market value as the measure of firm performance. Their findings showed that that two variables representing stocks of knowledge, products in the pipeline and firm citations-and only one variable representing knowledge flows geographic location-are important to firm performance.

The enhancement of firm performance by technological competence together with the effect of imitability was investigated by Decarolis (2003). Measures of technological competence and imitability were developed, and these variables, together with measures of marketing and regulatory competence, were tested for their impact on firm performance in the pharmaceutical industry, where firm performance was measured by market to book ratio (MKBK) and return on assets (ROA). It was found that imitability has a negative and significant impact on firm performance, and contrary to expectations, technological competence is inversely related to market-based performance measures and positively related to accounting measures.

It is obvious that the intensivity in globalization increased the competition and there is a widespread recognition that intellectual capital is a critical force that drives economic growth (Sharabati etal.,2010). The relationship between intellectual capital and business performance within the pharmaceutical sector of Jordan was investigated by Sharabati etal. (2010). They conceptualized a research model, in which intellectual capital was examined in three components human capital, structural capital and relational capital, where business performance was subjectively measured in productivity, profitability and market valuation, all in parameters including perceived sales growth and profit growth. Using partial least squares (PLS) technique, this model was tested and the results have shown that there is in fact strong and positive evidence that pharmaceutical firms in Jordan are managing intellectual capital effectively that in turn is influencing business performance positively.

Another study about the relationship between intellectual capital and corporate performance was carried out by Mehralian etal. (2012) covering Iranian pharmaceutical industry. Intellectual capital was examined in three components as human capital, structural capital and physical capital, where the variables of return on assets (ROA), ratio of the total revenue to the book value of the firm (ATO), and market valuation were measured to determine corporate performance. The analysis of correlation, simple linear multiple regression and artificial neural networks (ANNs) were applied and the findings suggest that the performance of a company's intellectual capital can explain profitability but not productivity and market valuation in Iran. Also the empirical analysis found that physical capital (VACA) was the one which was seen to have the major impact on the profitability of the firms over the period of study, in addition the result of ANN method also confirmed findings of multiple regression.

Integration of balanced scorecard as a performance measurement system through economic value added (EVA) in pharmaceutical sector was studied by Stankeviciene and Sviderske (2010). They carried out a case study in a pharmaceutical company using analytical hierarchy processing (AHP) technique to integrate EVA and balanced scorecard. The framework of balanced scorecard consisted of four different objectives as profitability, sales growth, customer retention and satisfaction, and employee retention and satisfaction. As a result, three alternatives as a comprehensive

measurement system for assessing the overall performance of the company were presented and among them, the second alternative was stated to be the best one.

Another topic which has attracted a lot of interest among both academics and industrial practitioners is market orientation in various industries. The relationship between market orientation and firm performance was examined in the study of Akomea and Yeboah (2011) covering Ghana's pharmaceutical industry. By combining correlation and standard multiple regression, analyses were carried out by measuring firm performance with the parameters profitability, sales growth, new product success and return on investment. The findings of the study also indicate a significant relationship between market orientation and performance of firms in the pharmaceutical industry, and further indicate that, the practice of market orientation in the various categories of the sector differs with an increase in size and organizational commitments of the firms involved.

Sheela and Karthikeyan (2012) investigated the financial performance of pharmaceutical industry in India. They took the data of top three companies for a ten years period into account and applied DuPont analyses, which is a technique based on the calculation of return on equity (ROE) and return on investment (ROI). They found that the three companies are significant at their level in terms of financial performance.

Intellectual property rights (IPRs) have become an important trade issue with the increasing share of knowledge-intensive products in international trade. The term intellectual property rights (IPRs) refers to those legal rules, norms and regulations that prevent the unauthorized use of intellectual products. The effect of IPRs implementation on countries' economy is varied from country to country, furthermore; its effect varies from industry to industry within the same country (Sharabati and Nour, 2013). In their study about IPRs and pharmaceutical manufacturing organizations' business performance, Sharabati and Nour (2013) focused on Jordanian Pharmaceutical Manufacturing (JPM) Organizations aiming to provide sound recommendations about performance measurement within IPRs context by identifying and defining the main attributes of quality and productivity of IPRs, i.e. to point out critical factors of IPRs and find suitable ways for measuring and managing them. Measuring business performance subjectively in productivity, profitability and market valuation, all in parameters including perceived sales growth and profit growth, the direct impact of

IPRs on Jordanian Pharmaceutical Manufacturing (JPM) Organizations' business performance was tested using multiple regression techniques. The results of the study indicated a positive significant relationship between IPRs and Jordanian Pharmaceutical Manufacturing (JPM) Organizations' business performance.

In terms of general performance measurement method suggestion, Shabaninejad etal. (2014) proposed an integrated performance measurement model for pharmaceutical companies. They classified the performance measurement indicators in three categories as key result indicators (KRIs), performance indicators (PIs) and key performance indicators (KPIs). For generating the integrated performance measurement model; they first identified the key performance indicators (KPIs) and the key result indicators (KRIs) of a typical pharmaceutical company depending on the data of pharmaceutical companies in Iran. As a result of this study, 25 KPIs and 12 KRIs were determined for measuring the organizational performance.

International Medical Statistics (IMS) provide the standard benchmark used by companies within the pharmaceutical industry to measure both their own individual sales performance and that of their competitors (Leask and Parker, 2004). In this study, business performance was measured based on IMS for the Turkish pharmaceutical market in the period of 2001 and 2013 with the parameters sales in terms of sales volume and sales turnover, sales growth and market share.

2.7. MULTINATIONALITY

Increasing market liberalization around the globe, especially in erstwhile-protected economies, has made it easier and sometimes necessary for firms to expand into foreign markets. This liberalization has coincided with economic integration, success of international organizations such as GATT/WTO and UNCTAD, and advances in information and communication technologies. These environmental trends and the popular buzzwords, such as "globalization of markets," "global economy," and "think global, act local," found in both academic literature and popular press, point toward the growing necessity for firms to find international markets for their products and services as well as configure their value chain activities around the globe in order to achieve scale, learning and location economies – in essence, to increase their multinationality (Kotabe etal., 2002). Multinationality refers to the geographical expansion of a

company's operations with regard to internationalization process and benefit from product and geographical diversifications through economies of scale and scope (e.g., Hitt etal., 1997).

Internationalization occurs as a result of a company's to grow and maximize its benefits across diverse geographic locations. Even the degree of multinationality is a key dimension that spans all theoretical frameworks, levels of empirical analysis and domains of investigation in the research about internationalization, there is no agreed approach to defining or measuring firm-level multinationality. Aggarwal et al. (2011) proposed that instead of searching for the elusive, all-encompassing definition of an multinational corporation (MNC), international business scholars should instead agree on a classification system for the degree of firm level multinationality, and accordingly created the matrix of firm multinationality by classifying a novel sample of over 1000 firms from seven countries and defining four different groups according to the breadth of business activities as domestic (D), regional (R), trans-regional (T) and global (G). To calibrate this, they divided the world into six regions based on the inhabited continents: Africa, Asia, Europe, North and Central America, Oceania, and South America. Asia includes the Middle East and Turkey, and Europe includes countries as far east as Armenia, Azerbaijan, Belarus, Ukraine and the Russian Federation. North and Central America includes Mexico and the other countries of Central America and the Caribbean as well as Canada and the United States. Oceania comprises Australia, New Zealand and the Pacific islands. This continent-based classification was used first to meet the criterion for the groups to be collectively exhaustive and second to keep the groupings stable and not subject to alteration when empirical or other circumstances change (Chrisman etal., 1988).

Pharmaceutical companies in Turkey are be grouped according to this classification in terms of multinationality and relationship between the supply chain structures and multinationality of pharmaceutical companies in Turkey is examined in this study.

In terms of the relationship between multinationality and supply chain, Buckley and Ghauri (2004) stated that globalization process driven by economic forces increase the multinational expansions of the companies which evolved the global supply chains as an important development of last thirty years period. As an impact of this process, disintegration of established supply chains occurred, which was followed by

reintegration and consolidation. International supply chains are created, when different stages of production are located in different countries. From a systems perspective in international business strategy, international supply chains are the basic building blocks of the global production system; an individual supply chain for a particular product is a microcosm of the system as a whole. The more sophisticated the division of labour, the greater will be the degree of specialisation, the proliferation of activities, and the number of locations at which activities can be carried out. A multinational enterprise (MNE) is created when activities based in different locations are integrated within the same firm. On this view, MNEs emerge to coordinate particular portions of supply chains, and they emerge at the same time as other firms which coordinate other parts of the same supply chain. These other firms may be single-country firms, or they may be MNEs as well. Firms controlling one part of a supply chain will have to negotiate with firms controlling adjacent parts of the supply chain, since neither can operate successfully without the other (Casson and Wadeson, 2012).

As an impact of multinational expansion of companies, global production networks (GPNs) occurred, which entail the disaggregation and dispersion of economic activities to multiple geographic locations. This dispersion in turn requires a high degree of coordination and integration of supply chain activities, which often draws on the organizational capacity and geographic reach of MNEs and entails substantial foreign direct investment (FDI) and international trade (Levy, 2008).

The relationship between multinationality and performance is one of the most researched topics in the field of international business. According to Hennart (2007), more than 100 studies have been analysed the relationship in top tier journals. However, the empirical results are mixed. Early research on this topic found a linear relationship between multinationality and performance. The foundation of international business studies rests on the assumption that increased multinationality is good for a firm's performance. Vernon (1971) asserted a positive relationship between performance indicators such as return on investment (ROI) or return on sales (ROS) and the extent of multinationality of the firm. International expansion allows the firm to capture economies of scale, or geographic scope (Kogut, 1985). Dunning (1993) averred that less saturated foreign markets provide companies with the means to maintain and expand distribution and gain overall market share by exploiting their current stock of

assets - that companies with valuable transaction-based ownership advantages can reap internalization benefits, circumvent market failure, and avoid trade barriers, moral hazards, and broken contracts. Doms and Jensen (1998) found that firms establishing overseas activities have an advantage in efficiency compared to the domestic firms. Typical advantages of going international are economies of scale and scope (Caves, 1971, Hymer, 1976; Teece, 1980) and greater market power and operational flexibility (Kogut, 1985; Rugman, 1979).

Rugman and Oh (2010) found that multinationality improved the performance of North American and European firms but did not raise the performance of Pan Asian firms. Besides the positive relationships found between multinationality and performance, Rugman and Oh from Siddharthan and Lall (2010) and Fatemi (2010) found a negative linear relationship. Both positive and negative relationships can be explained by fundamental international business theories. On one hand, the positive relationship (or benefits of internationalization) can be defended by the concepts about economies of scale, economies of scope, the international product life cycle, factor speculation, risk diversification, and learning and knowledge transfer. On the other hand, the negative relationship (or costs of internationalization) can be supported by the concepts about the liability of foreignness, coordination costs, and institutional risks (Rugman and Oh, 2010).

Core international business theory argues for a positive relationship between the performance of the firm (measured by a variety of indicators such as ROI, ROS, ROA, ROE, growth, and Tobin's Q) and its degree of multinationality. For the most part, international expansion is positive for a firm's performance. Yet recent empirical studies have shown both a U-shaped relationship (which suggests an initially negative effect of international expansion on performance, before the positive returns of international expansion are realized) and an inverted U-shaped relationship (which suggests that international expansion beyond an optimal level is detrimental to performance, and again results in a negative slope if firms are excessively internationalized) (Contractor etal., 2003).

For international expansion, a three-stage sigmoid hypothesis was developed. Stage one is called as early internationalization, at which companies have large learning costs

because of unfamiliarity with foreign markets, cultures and environments. At stage one, the initial scale of global operations is small, accordingly it is spoken of insufficient economies of scale. Therefore the relationship between firm performance and degree of multinationality is determined with a negative slope. In stage two, which is called as mid-stage international expansion, further geographical scale makes possible efficiencies that improve performance indicators such as return on global total sales (ROS), or overheads per nation. The fixed costs and overhead burden of headquarters operations and large R&D outlays can be increasingly spread over more nations. The incremental benefits of further international expansion are now greater than the incremental costs of further stage two expansions. The transfer of specialized learning from certain nations - or, in general, the ability to cross-fertilize knowledge across subsidiaries - increases with increased multinationality. Similarly, market-seeking firms are better able to scan for market opportunities. Other benefits of Stage 2 international expansion were determined as the ability of some companies to exercise global market power (Contractor etal. from Grant, 2003) and to extend the product cycle (Contractor etal. from Vernon, 2003). Hence the commonly accepted hypothesis that, ceteris paribus, multinationality is positively associated with performance, in Stage 2 (Contractor etal., 2003). Even the positive impact of multinationality on the performance is obvious, continuous international expansion may lead oppositely to a negative slope between performance and multinationality beyond an optimal threshold. The main reasons for this change are; first, beyond a certain point, having expanded into the most lucrative markets, the firm is then left with minor or peripheral countries with a lower profit potential. Second, beyond an optimum number of nations, the growth of coordination and governance costs may exceed the benefits of further expansion, because of the complexity of global operations (Galbraith and Kazanjian, 1986). This is especially true as the number of different cultural environments that the firm has to deal with increases transaction and governance costs (Gomes and Ramaswamy, 1999). In short, taking an 'incremental benefit = incremental cost' approach, beyond some level of multinationality, 'the coordination required (for multiple transactions among many geographically diverse units) may cost more than the benefits derived from sharing resources and exploiting market opportunities' (Hitt et al., 1997). That is to say, stage

three hypothesizes, once again, a negative relationship for the link between performance and multinationality (Contractor etal., 2003).

Ramaswamy (1993) measured multinationality in terms of the number of overseas plants, and found a significant positive relationship to performance. Shaked (1986) defined multinational corporations as having 20% of sales outside the home country and direct investment in at least six countries.

According to Sullivan (1994) the link between internationalization and firm performance is the key issue in international business research. This relationship has been researched by several authors trying to provide empirical and theoretical evidence. Among others, Annavarjula and Beldona (2000) and Ruigrok and Wagner (2003) provide evidence to support such a relationship which appears to be the main element of firms' superior financial success.

Using Data Envelopment Analysis (DEA) method, Halkos and Tzeremes (2007a) investigated the effect of internationalization on firm performance by investigating the top 10 non-financial transnational corporations from South-East Europe ranked by their foreign assets. In order to measure the effect of internationalization on firm's performance Transnationality Index (TNI) has been used. According to UNCTAD, TNI is calculated as the average of the following three ratios: foreign to total assets, foreign to total sales and foreign to total employment. It was found that the corporations with the highest levels of transnationality are tending to lead to higher efficiency scores than those with lower levels of transnationality. The results indicate that there is a positive link between the internationalization of the firm and firm performance, with higher levels of efficiency are the ones with higher levels of internationalization.

Some recent studies have found a non-linear relationship between multinationality and performance. Geringer, Beamish, and daCosta (1989) and Hitt, Hoskisson, and Kim (1997) found an inverted U-shaped relationship. The logic behind the inverted U-shape relationship is that the initial benefits of internationalization are overwhelmed by the costs of internationalization (the end of scale and scope economies) as the level of internationalization increases further. In a related study, Mauri and Sambharya (2001) found that the global integration index, which is measured by intra-firm sales in different geographic regions over total sales, has an inverted-U relationship with firm performance. Lu and Beamish (2001) and Ruigrok and Wagner (2003) found a U-shape

relationship. The U-shape relationship emphasizes learning and experience effects, which outweighs the liability of foreignness of initial internationalization. Thomas and Eden (2004) argued that there were three partial explanations for these mixed results in the literature. First, the term 'multinationality' means different things to different people, so that conflicting results are partly due to different understandings and proxy measures. Second, the theoretical benefits and costs of multinationality to firms, and how they are reflected in firm performance, are not well understood. Third, time matters which means that the relationship between multinationality and performance is different for short run, as compared to long run, performance. They showed that the multinationality-performance relationship is non-linear but most importantly in the long term. Indeed, their results indicate that there are initial benefits from multinationality that are then outweighed by rising costs of going abroad; however, over time, the long-run benefits dominate the costs, suggesting a significant, positive relationship between multinationality and long-run market performance.

The effect of the regional nature of multinational companies on the multinationality and performance relationship was investigated by Rugman and Oh (2010). Using the data of US multinational enterprises (MNEs) that are included in the list of the world's 500 largest firms in 2001 as a base set, they analysed the relationship between multinationality and performance for 5 years, 2001–2005. Together with the traditional variable of the ratio of foreign (F) to total (T) sales (F/T), they developed and used a new regional variable as the ratio of regional (R) to total (T) sales (R/T). Performance was measured by the dependent variables of return on assets (ROA), return on sales (ROS), and Tobin's Q. Their results are consistent with the theoretic rational of Hennart (2007) regarding the relationship between multinationality and performance. He emphasizes the importance of scale and scope economies in the relationship. MNEs may achieve the scale and scope economies faster when they operate within their home region than when they operate outside of the home region. First, corporate-level assets, that are concentrated in their headquarters, do not diffuse as efficiently into foreign regions as they do into home region. Second the economic, geographic, political, and institutional integration accelerate the scale and scope economies. They conclude that there is substantial evidence that MNEs perform on an intra-regional basis, but there is no support for a trend towards globalization, or the need for a global strategy for MNEs.

International diversification is a dimension of multinationality, which has been the scope of various studies in which the relationship between the level of diversification and financial performances of firms were investigated. In search of more in-depth explanations of international diversification many researchers have turned to two distinct bodies of literature. The resource-based view (RBV) (Barney, 1991; Grant, 1991) argues that it is more optimal for firms to diversify their operations by transferring resources from the core to other activities than to sell or rent them on the open market (Fladmoe-Lindquist and Tallman, 1994). Furthermore, RBV also argues that in principle diversification will continue as long as the cost of transferring and using resources from the core is negligible relative to financial returns. The second body of literature, transaction costs economics (TCE), points to factors that limit this process (Bartlett and Ghoshal, 1989). TCE argues that firms face escalating organizational costs as they expand and diversify their manufacturing activities (Teece, 1986). The escalating costs of overseeing and coordinating manufacturing across a wide variety of geographic locations will depress financial performance to the point where firms must halt, or even reverse, diversification. These studies focused on relationship between international diversification and financial performance for the entire firm, including, but not specifically to the relationship between international manufacturing diversification and the financial performance of the firm. Gupta and Govindaiajan (2001) provide a good starting point for making a distinction between two types of relationship: the relationship between international diversification and performance in general, and the relationship between international manufacturing diversification and performance in particular. They point out that —building global presence automatically expands a company's scale of operations, giving it larger revenues and a larger asset base. However, larger scale will create competitive advantage only if the company systematically undertakes the tough actions needed to convert scale into economies of scale (Gupta and Govindaiajan, 2001).In order to determine the relationship between the diversification of international manufacturing operations and financial performance of the firm, Lampel (2013) carried out a study about global automotive industry by implying that manufacturing is part of the firm's local and global value chain architecture. International manufacturing diversification processes were examined in the context of both resource-based view (RBV) and transaction costs economics (TCE) and

it was found that the relationship of international manufacturing diversification with financial performance is inverted U-shaped, and this relationship is positively moderated by product diversification and co-location of manufacturing and sales activities in the same geographic market (Lampel, 2013).

An important question concerning the international diversification of a firm involves the relationship between geographic scope and performance. Increasingly, managers are being urged to increase the firm's geographic scope, presumably to increase its competitiveness and profitability. Research in strategic management and international business has addressed the issue of geographic scope and performance in several ways, but with a common objective which is set as to identify the nature of the relationship between the two. In general, the consensus in the literature is that (1) international diversification decreases the variability, or risk, of a firm's revenue stream (Rugman, 1979; Hisey and Caves, 1985; Kim, Hwang and Burgers, 1993), and (2) geographic scope is positively, although not necessarily linearly, related to performance (Beamish and daCosta, 1984; Tallman and Li, 1996; Hitt, Hoskisson and Kim, 1997). Delios and Beamish (1999) showed that performance is higher in more multinational firms. They concluded that there is value in internationalization itself because geographic scope was found to be related to higher firm profitability.

The findings of different studies performed about the relationship between multinationality and performance show that this relationship is complex because it is determined that its strength and direction is moderated by individual firm strategies. In this context, the moderating roles of both marketing intensity and research and development intensity in the relationship between multinationality and firm performance were studied and based on a time series cross-sectional analysis, it was found that both factors have these moderating roles in this relationship, which indicates that this relationship depends on firm specific factors (Kotabe etal., 2002).

2.8. PRODUCT ORIGINALITY

Product originality was described by Gatignon and Xuereb (1997) as the level of newness to the consumer or to the firm. In the pharmaceutical sector, it refers to the classification of the pharmaceutical companies according to their product properties as innovator and generics. Perhaps the most important classification criteria applicable to medicines is whether they enter the market as a result of original research, or whether after patent protection of the original product expired, it is marketed as a copy, a generic product (Danko, 2011).

The pharmaceutical industry bifurcated beginning with the antibiotics revolution in the 1940s, into what became the branded and generic strategic groups (Galambos and Sewell, 1997; Lee, 2003). During the 1940s and 1950s, large-scale research and development became increasingly important, as firms rapidly churned out new therapies. The branded groups consisted of the firms that increased the scale of their R&D operations, while the generic firms were those who elected to imitate the products of the branded firms. Lee (2003) also notes that turnover during this period was considerable - the top 5 firms often did not retain their position in the top 5 for long. Despite the rapid changes in market share, however, the antibiotic revolution did not significantly change the number of firms in the market (Munos, 2009).

In the literature, the relation between originality and market performance of medical innovations was examined by Achilladelis and Antonakis (2001). They classified the pharmaceutical companies into two groups as innovator company and generics company, implying that product innovations are new drugs which are defined as new chemical entities (NCEs) differing in chemical composition and structure, and in terms of technological innovation, pharmaceutical companies consider product innovation mostly and generally. The originality of the product innovation is based on the chemical composition, therapeutic action and effectiveness, timing of commercialization and the extent to which the product is imitated. Their main findings showed that highly original drugs in composition and therapeutic action catalysed the interaction and accelerated the advance of both science and technology, created strong demand by opening new markets, and contributed to the growth of innovating companies.

According to Prašnikar and Skerlj (2006), a product enters the pool of available substances when its originator loses its exclusivity through the expiry of a patent, so generics are generally accepted as products that are no longer patent-protected and which are therefore available in an unbranded version.

Prescription drugs are generally divided into two key categories: innovator drugs and generic drugs. Innovator drugs -also referred to as brand-name drugs- enjoy patent protection on their chemical formulations and are approved following extensive clinical testing under an original new drug application (NDA). Therapeutically similar patented brand-name drugs can exist, though each with a different chemical formulation. Originator drugs which are still under patent protection are called single-source-drugs. Generic drugs obtain regulatory approval under a relatively shorter process than innovator drugs, whereby they rely on the demonstration of "bioequivalence" to an innovator drug. They are, therefore, not patentable (El Shinnawy from CBO, 2012).

Generic pharmaceuticals are defined as the drugs which have the same active pharmaceutical ingredient (API) as the original pharmaceuticals and are comparable to original pharmaceuticals in dosage form, strength, route of administration, quality, safety and performance characteristics, and intended use. According to the U.S. Food and Drug Administration (FDA), generic drugs are identical or within an acceptable bioequivalent range to the brand-name counterpart with respect to pharmacokinetic and pharmacodynamic properties. By extension, therefore, generics are considered (by the FDA) identical in dose, strength, route of administration, safety, efficacy, and intended use (WEB_1, 2013). Danko (2011) mentioned that the most important feature of generics is their essential similarity to the original drug in the market: the generics 'are preparations of identical quality and quantity as regards their active ingredient, and of an identical formulation, which, if required, are submitted to appropriate bioavailability trials.

A product enters the pool of available substances when its originator loses its exclusivity through the expiry of a patent. Consequently, generics are generally accepted as products that are no longer patent-protected and which are therefore available in an unbranded version. These types of generic products are called "pure generics". However, even this categorization has become distorted over the passage of time with the introduction of products being referred to as "branded generics". This

term refers to products not issued by the originator but those that may be allied to the name of the producer. There is also a relatively new area of activity concerned with patent-expired molecules. They are re-invented by reformulation and sometimes also allied with new drug delivery methods (Prašnikar and Skerlj, 2006). Branded generic drugs have names derived from a combination of the manufacturer's name and the non-proprietary name. This enables the manufacturer to market the product in a way similar to the proprietary product (King and Kanavos, 2002).

Branded products accounted for nearly two-thirds of global pharmaceutical spending in 2011. However, as patents expire in developed markets, that share is expected to decline. Spending on generic drugs is driving most of the growth in the leading emerging markets, which will contribute to the increase in the share of generic spending. The revenues from generics in 2016 are expected to reach USD 400–430 billion, approximately 70% of which will be outside developed markets (IFPMA, 2013). The use of generic pharmaceuticals is most frequent in industrialized countries, where price levels for pharmaceuticals are usually high, the latter being a necessary but not sufficient condition for the promotion and use of generic medicines (King and Kanavos, 2002).

In the pharmaceutical industry, the timing of introducing a new product and therefore the speed to market is a key issue for all manufacturers without differentiating them as innovators and generics (Henderson, 2000). The formation of a generic company generally depends on its proximity to major markets and local prevailing conditions inviting generic production. For example, Canada's governmental support favouring generics and its geographical proximity to the US, which is the world's largest generics market, has dictated Canadian involvement. Germany, the largest European generics market, with government action actively favouring generics, expects German generic companies to dominate Europe. Teva from Israel is a unique example of a successful local company targeting the world in an aggressive fashion and thereby achieving its position as a top generics producer by acquisition.

The generic pharmaceutical industry depends very much on local market conditions and it is often easier to launch new products in already existing markets than to launch existing products in new markets. Since generic companies often build their competencies in the market rather than on the technology used, strategic alliances and

early supplier involvement in the new product development are important factors of their market success (Prašnikar and Skerlj, 2006).

In the case of original and generic manufacturers, it is more appropriate to speak of two segments of the pharmaceutical industry and to note that the sizes, cost structures, processes and human resources of companies in the two segments should not be compared against each other. If a single group of companies makes both original and generic products, the lines of original and generic products are handled in separate divisions, as separate strategic business areas (West, 2002).

Based on all above definitions, differentiation as innovator and generics is considered in the examination of pharmaceutical companies in Turkey in terms of product originality.

2.9. OWNERSHIP STRUCTURE

It is possible to define the concept of ownership generally as having the freedom of using an asset within a legal context (Sayman, 2012). Ownership of a firm can be defined as possessing the residual control rights over that firm's assets , i.e. "the rights to deploy those assets in any ways which do not violate any initial contracts (Currie and Messori, 1998). Legally, ownership is a combination of rights and responsibilities to property, where (1) the owner can use property as he desires, (2) the owner can regulate another's use of property, (3) the owner can transfer rights to property to another and restrict its use, and (4) the owner must prevent own use of property from damaging others – e.g. by polluting / contaminating property (Dinga, 2005).

Ownership structure is defined as "the relative amounts of ownership claims held by insiders (management) and outsiders (investors with no direct role in the management of the firm)" (Jensen and Meckling, 1976). The definition of ownership structure does not include only the monetary value of the moveables, on the contrary it includes all the features about the entity like the characteristic of being a family company or not, having an institutional investor or not, having foreign investors as shareholders or not, and having the insiders among shareholders or not (Sayman, 2012).

The relationship between ownership structure and supply chain structure was covered in the study of Barragan and Usher (2009), in which they investigated the possible spill over effects of multinational companies on auto parts suppliers in Mexico.

They categorized the suppliers in three different types according to their ownership structures as foreign-owned firms, subsidiaries, indigenous conglomerates, and local-owned firms., By focusing on two different analyses, first they examined the sources of competitiveness of the Mexican automotive industry in general and using the case study method, they investigated relationship between a multinational original equipment manufacturer (OEM) and its suppliers in the local cluster of Puebla. Their findings indicate that the foreign-owned firms as supplier play an important role in the substantial growth and development of the industry, but considering the local cluster in Puebla, local-owned suppliers have not been fully integrated to the supply chain structure of the multinational original equipment manufacturer (OEM).

The relationship between ownership structure and firm performance dates back to Berle and Means (1932) who assert that as the diffuseness of ownership increases, shareholders become powerless to control professional managers. Further, they argue that, given the interests of management and shareholders are not generally aligned, corporate resources are not used efficiently in maximising corporate profit. Therefore, Berle and Means (1932) suggest that the relationship between ownership concentration and performance should be a negative one.

Morck et al. (1988) suggested that the relationship between ownership structure and firm performance is likely to vary across industries by the relationship between management ownership and market valuation of the firm, as measured by Tobin's Q. In a 1980 cross-section of 371 Fortune 500 firms, they found evidence of a significant nonmonotonic relationship as Tobin's Q first increases, then declines, and finally rises slightly as ownership by the board of directors rises. For older firms, there is evidence that Q is lower when the firm is run by a member of the founding family than when it is ran by an officer unrelated to the founder.

In most of the previous studies, by examining the relationship between ownership structure and corporate performance, ownership structure was taken into evaluation in terms of ownership concentration as a measure which is determined as the percentage of shares held by different shareholders as families and individuals, CEO, company directors and officers, insiders and managers, blockholders, and institutional investors (Demsetz and Lehn, 1985; Morck et al., 1988; Mc Connell and Servaes, 1990; Hermalin and Weisbach, 1991; Loderer and Martin, 1997; Craswell et al., 1997; Cho, 1998;

Himmelberg et al., 1999; Holderness et al., 1999; Demsetz and Villalonga, 2001; Hu and Izumida, 2008). Demsetz and Lehn (1985) examined the relationship between ownership concentration and accounting performance. They find evidence that ownership structure is endogenous and they find no relationship between profitability and ownership concentration. Loderer and Martin (1997), Cho (1998), and Demsetz and Villalonga (2001) examined the relationship between firm value and ownership concentration, while treating ownership concentration as an endogenous variable. They found that ownership concentration does not have a significant influence on Q in a simultaneous equations setting. However, in their measures of ownership concentration, these studies do not distinguish between inside and outside shareholders.

Modelling ownership as a multi-dimensional variable that separately reflects the fraction of shares owned by outsiders and management and performance, Demsetz and Villalonga (2001) found ordinary least squares testing suggests that firm performance is always dependent on at least one measure of ownership structure. However, when testing is performed using a two-stage least squares approach, which accounts for the possible endogeneity of ownership structure, neither measure of ownership structure is statistically significant in explaining variation in performance. They argued that these results are consistent with the view that ownership structure is chosen so as to maximise firm performance, and that the greater diffuseness in ownership, although it makes the agency problem more severe, conveys compensating advantages on firms that choose to rely on a diffuse ownership structure.

A further expansion of the study of Demsetz and Villalonga (2001) was carried out by Welch (2003) by adopting their variable definitions and specifically adding two variables as the shareholdings of the firm's five largest shareholders and, the shareholdings of the firm's top management and board of directors. The sample comprised data for Australian public companies. To test the results provided by previous studies as that the relationship between managerial share ownership and firm performance may be a non-linear one, she fitted a generalised nonlinear model that nests models advanced in earlier research. Results provide limited evidence of a nonlinear relationship between managerial share ownership and firm performance.

Margaritis and Psillaki (2010) investigated the relationship between capital structure, ownership structure and firm performance using a sample of French manufacturing firms in textiles, chemicals and computers industries by dividing the owners into three groups as family ownership, financial ownership (firms owned by banks, mutual funds, investment and insurance companies) and others. Using data envelopment analysis (DEA) technique, they found that ownership concentration has a positive and significant effect on firm performance across different concentration ratios in the chemicals industry. On the other hand for firms in the computers industry their findings showed that low ownership concentration has a negative effect on firm performance. Higher ownership concentration has an insignificant effect in this industry suggesting the presence of offsetting entrenchment and incentive alignment effects. For firms in the textiles industry they found no evidence that ownership concentration has a significant effect on performance across the three concentration segments. The outcomes of their study showed quite consistently that family firms perform better on average in comparison to non-family firms. However, the results obtained by Arosa et al. (2010) showed that there is no relationship between ownership concentration and performance regardless of whether firms are family or non-family owned.

Minguez-Vera and Martin-Ugedo (2007) analysed the influence of ownership structure on the values of firms operating in Spanish market by considering three groups as shareholder ownership, family ownership and institutional ownership. Their study presents new evidence on the corporate ownership structure as a mechanism of corporate governance in Spain. First, they examined the influence of major shareholders on firm value, in terms of different variables, with special attention to non-linear and piecewise relationships. Second, they analysed the impact of the degree of control, as measured in Tobin's Q. They also examined the influence of the type of major investor on the value of the firm. Their results offer evidence of a non-significant relationship between the ownership of shareholders holding large blocks and firm value. The degree of control has a significant positive influence on firm value. The presence of an individual or family investor as the major shareholder also has a favourable influence on the value of the firm.

Foreign ownership has also been found to have an important contributory influence on firms' performances. Halkos and Tzeremes (2007b) found that foreign ownership has a positive effect on medium size firms' productivity.

Thomsen and Pedersen (1998) examined the relationship between main industry and corporate ownership structures by taking six different ownership categories into account as personal/family majority ownership, dispersed ownership, dominant minority ownership, subsidiaries of foreign multinationals, government ownership and cooperatives. This study has found a significant industry effect on corporate ownership structures, which is in accordance with general ownership theory the industry effect can be attributed at least in part to determinants suggested by economic ownership theory: factors such as firm size, industry growth, capital, and research intensity of firms.

In the study of Sayman (2012) about the effect of the ownership structure on the firm performance and capital structure, ownership structures were classified as family ownership, institutional investor ownership, public ownership, foreign investor ownership, insider ownership, employee ownership, and broad-based capital ownership.

With regard to these different classifications of ownership structure and existing situation, ownership structures of pharmaceutical companies in Turkey is analysed in four different categories as family/personal, shareholder, institutional and subsidiaries of foreign multinationals.

CHAPTER 3. RESEARCH DESIGN AND METHODOLOGY

In this chapter, information about the research design and used methodology are provided. The objective of the research, research model, research questions, hypotheses, research design, sampling method, data collection instrument and method, pilot study with its validity and reliability analyses, update of the questionnaire, operationalization of variables and data analysis method are indicated in this chapter.

The methodological structure of the study is given in the following table.

Table 3.1. The Methodological Structure of the Study

Research type	Quantitative research
Research design	Exploratory / Descriptive Research Design
Type of data	Primary data
Study setting	Turkish pharmaceutical sector
Time horizon	Cross-sectional
Data collection method	Questionnaire
Sampling method	Convenience sampling
Sampling units	Companies in Turkish pharmaceutical sector
Sample size	56
Data analysis method	Confirmatory data analysis

3.1. OBJECTIVE OF THE RESEARCH

The objective of this research is to fill the gaps existing in the literature about the impact of supply chain structure on business performance, relationship between product originality and supply chain structure, relationship between product originality and business performance, relationship between multinationality and supply chain structure, and relationship between ownership structure and supply chain structure; examine the supply chain structures of pharmaceutical companies in Turkey by investigating the impact of supply chain structures of companies on their business performances, and classify the companies according to their supply chain structures, as well as examining of significant differences between supply chain structures and multinationality, product originality and ownership structure, and between business performances and multinationality, product originality and ownership structure in a conceptual model. With regard to these research topics, the research model was established as follows.

3.2. RESEARCH MODEL

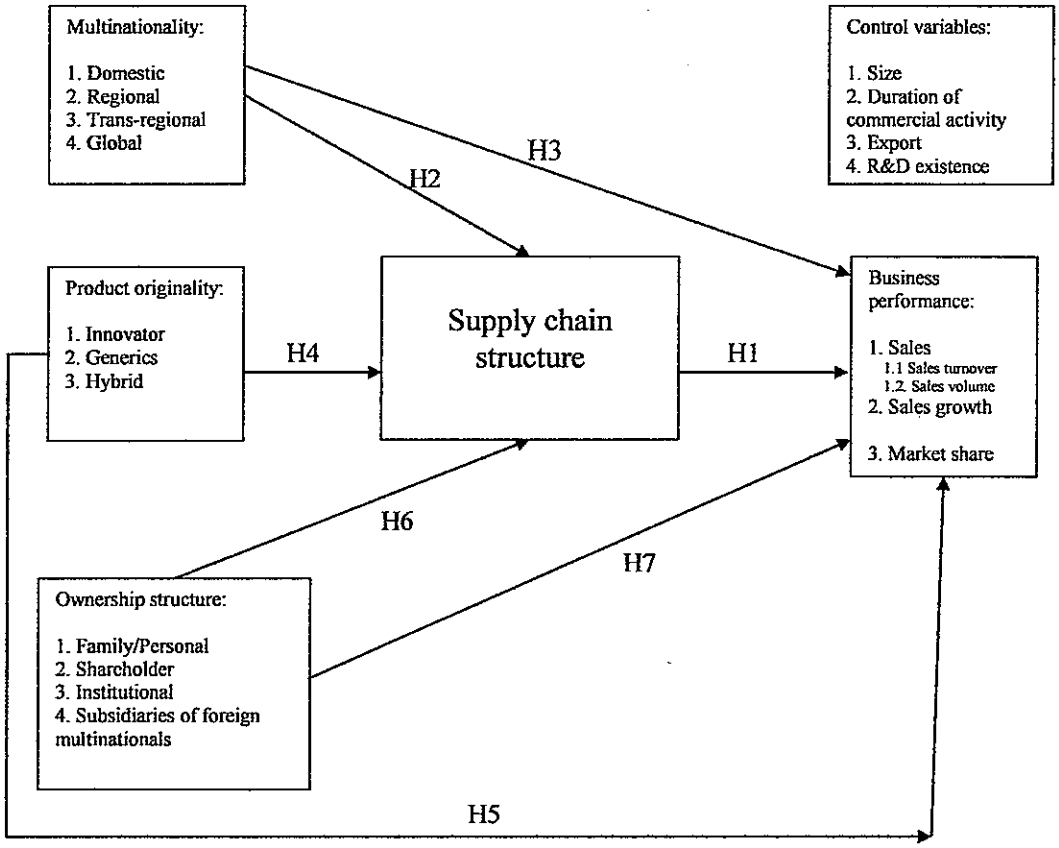

Figure 3.1. Research Model

3.3. RESEARCH QUESTIONS

This study is motivated by the following research questions, which are listed in six different groups. Among them, four groups are based on the constructs of the research model. In addition, there are two other groups of research questions established. First group includes research questions about the changes in the nodes of supply chain structure, multinationality and ownership structure and their relationships with business performance. Second group consists of research questions about percentage contribution of domestic manufactured products to sales.

3.3.1. Research Questions About Supply Chain Structure

1. Is there a significant impact of supply chain structures on the business performances of pharmaceutical companies in Turkey?

1a. Is there a significant impact of supply chain structures on the sales turnovers of pharmaceutical companies in Turkey?

1b. Is there a significant impact of supply chain structures on the sales volumes of pharmaceutical companies in Turkey?

1c. Is there a significant impact of supply chain structures on the sales growths of pharmaceutical companies in Turkey?

1d. Is there a significant impact of supply chain structures on the market shares of pharmaceutical companies in Turkey?

1e. Is there a significant difference between business performances of pharmaceutical companies in Turkey having primary manufacturing sites in their supply chain structures and having no primary manufacturing site in their supply chain structures?

1f. Is there a significant difference between business performances of pharmaceutical companies in Turkey having secondary manufacturing sites in their supply chain structures and having no secondary manufacturing site in their supply chain structures?

1g. Is there a significant difference between business performances of pharmaceutical companies in Turkey having own manufacturing sites in their supply chain structures and having not own manufacturing sites in their supply chain structures?

1h. Is there a significant difference between business performances of pharmaceutical companies in Turkey having toll manufacturing sites in their supply chain structures and having no toll manufacturing site in their supply chain structures?

1i. Is there a significant difference between business performances of pharmaceutical companies in Turkey getting the warehousing and distribution services rendered by 3PL companies and having and operating their own warehousing and distribution centers?

3.3.2. Research Questions About Multinationality

2. Is there a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of multinationality?

3. Is there a significant difference between business performances of pharmaceutical companies in Turkey in terms of multinationality?

3a. Is there a significant difference between sales turnovers of pharmaceutical companies in Turkey in terms of multinationality?

3b. Is there a significant difference between sales volumes of pharmaceutical companies in Turkey in terms of multinationality?

3c. Is there a significant difference between sales growths of pharmaceutical companies in Turkey in terms of multinationality?

3d. Is there a significant difference between market shares of pharmaceutical companies in Turkey in terms of multinationality?

3.3.3. Research Questions About Product Originality

4. Is there a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of product originality?

5. Is there a significant difference between business performances of pharmaceutical companies in Turkey in terms of product originality?

5a. Is there a significant difference between sales turnovers of pharmaceutical companies in Turkey in terms of product originality?

5b. Is there a significant difference between sales volumes of pharmaceutical companies in Turkey in terms of product originality?

5c. Is there a significant difference between sales growths of pharmaceutical companies in Turkey in terms of product originality?

5d. Is there a significant difference between market shares of pharmaceutical companies in Turkey in terms of product originality?

3.3.4. Research Questions About Ownership Structure

6. Is there a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of ownership structure?

7. Is there a significant difference between business performances of pharmaceutical companies in Turkey in terms of ownership structure?

7a. Is there a significant difference between sales turnovers of pharmaceutical companies in Turkey in terms of ownership structure?

7b. Is there a significant difference between sales volumes of pharmaceutical companies in Turkey in terms of ownership structure?

7c. Is there a significant difference between sales growths of pharmaceutical companies in Turkey in terms of ownership structure?

7d. Is there a significant difference between market shares of pharmaceutical companies in Turkey in terms of ownership structure?

3.3.5. Research Questions About Changes in Supply Chain Structure, Multinationality and Ownership Structure

8. Is there a significant relationship between the change in the primary (API) manufacturing node of supply chain structure and business performance?

9. Is there a significant relationship between the change in the secondary (finished goods) manufacturing node of supply chain structure and business performance?

10. Is there a significant relationship between the change in the toll manufacturing node of supply chain structure and business performance?

11. Is there a significant relationship between the change in warehousing and distribution node of supply chain structure and business performance?

12. Is there a significant relationship between the change in multinationality and business performance?

13. Is there a significant relationship between the change in ownership structure and business performance?

3.3.6. Research Questions About Percentage (%) Contribution of Domestic Manufactured Products to Sales

14. Is there a significant relationship between the percentage (%) contribution of domestic primary (API) manufactured products to sales volume and business performance?

15. Is there a significant relationship between the percentage (%) contribution of domestic primary (API) manufactured products to sales turnover and business performance?

16. Is there a significant relationship between the percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales volume and business performance?

17. Is there a significant relationship between the percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales turnover and business performance?

18. Is there a significant relationship between the percentage (%) contribution of domestic toll manufactured products to sales volume and business performance?

19. Is there a significant relationship between the percentage (%) contribution of domestic toll manufactured products to sales turnover and business performance?

3.4. HYPOTHESES

Based on the research questions, below listed hypotheses have been determined to be tested in this study. These hypotheses are grouped in the same manner like the research questions.

3.4.1.Hypotheses About Supply Chain Structure

H1. Supply chain structures of pharmaceutical companies in Turkey have a significant impact on their business performances.

H1a. Supply chain structures of pharmaceutical companies in Turkey have a significant impact on their sales turnovers.

H1b. Supply chain structures of pharmaceutical companies in Turkey have a significant impact on their sales volumes.

H1c. Supply chain structures of pharmaceutical companies in Turkey have a significant impact on their sales growths.

H1d. Supply chain structures of pharmaceutical companies in Turkey have a significant impact on their market shares.

H1e. Pharmaceutical companies having primary manufacturing sites in their supply chain structures have significantly different business performances than pharmaceutical companies having no primary manufacturing site in their supply chain structures.

H1f. Pharmaceutical companies having secondary manufacturing sites in their supply chain structures have significantly different business performances than pharmaceutical companies having no secondary manufacturing site in their supply chain structures.

H1g. Pharmaceutical companies having own manufacturing sites in their supply chain structures have significantly different business performances than pharmaceutical companies having not own manufacturing sites in their supply chain structures.

H1h. Pharmaceutical companies having toll manufacturing sites in their supply chain structures have significantly different business performances than pharmaceutical companies having no toll manufacturing site in their supply chain structure.

H1i. Pharmaceutical companies getting the warehousing and distribution services rendered by 3PL companies have significantly different business performances than pharmaceutical companies having and operating their own warehousing and distribution centers.

3.4.2. Hypotheses About Multinationality

H2. There is a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of multinationality.

H3. There is a significant difference between business performances of pharmaceutical companies in terms of multinationality.

H3a. There is a significant difference between sales turnovers of pharmaceutical companies in terms of multinationality.

H3b. There is a significant difference between sales volumes of pharmaceutical companies in terms of multinationality.

H3c. There is a significant difference between sales growths of pharmaceutical companies in terms of multinationality.

H3d. There is a significant difference between market shares of pharmaceutical companies in terms of multinationality.

3.4.3. Hypotheses About Product Originality

H4. There is a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of product originality.

H5. There is a significant difference between business performances of pharmaceutical companies in Turkey in terms of product originality.

H5a. There is a significant difference between sales turnovers performances of pharmaceutical companies in Turkey in terms of product originality.

H5b. There is a significant difference between sales volumes performances of pharmaceutical companies in Turkey in terms of product originality.

H5c. There is a significant difference between sales growths performances of pharmaceutical companies in Turkey in terms of product originality.

H5d. There is a significant difference between market shares performances of pharmaceutical companies in Turkey in terms of product originality.

3.4.4. Hypotheses About Ownership Structure

H6. There is a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of ownership structure.

H7. There is a significant difference between business performances of pharmaceutical companies in terms of ownership structure.

H7a. There is a significant difference between sales turnovers of pharmaceutical companies in terms of ownership structure.

H7b. There is a significant difference between sales volumes of pharmaceutical companies in terms of ownership structure.

H7c. There is a significant difference between sales growths of pharmaceutical companies in terms of ownership structure.

H7d. There is a significant difference between market shares of pharmaceutical companies in terms of ownership structure.

3.4.5. Hypotheses About Changes in Supply Chain Structure, Multinationality and Ownership Structure

H8. There is a significant relationship between the change in the primary (API) manufacturing node of supply chain structure and business performance.

H9. There is a significant relationship between the change in the secondary (finished goods) manufacturing node of supply chain structure and business performance.

H10. There is a significant relationship between the change in the toll manufacturing node of supply chain structure and business performance.

H11. There is a significant relationship between the change in warehousing and distribution node of supply chain structure, and business performance.

H12. There is a significant relationship between the change in multinationality and business performance.

H13. There is a significant relationship between the change in ownership structure and business performance.

3.4.6. Hypotheses About Percentage (%) Contribution of Domestic Manufactured Products to Sales

H14. There is a significant relationship between the percentage (%) contribution of domestic primary (API) manufactured products to sales volume and business performance.

H15. There is a significant relationship between the percentage (%) contribution of domestic primary (API) manufactured products to sales turnover and business performance.

H16. There is a significant relationship between the percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales volume and business performance.

H17. There is a significant relationship between the percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales turnover and business performance.

H18. There is a significant relationship between the percentage (%) contribution of domestic toll manufactured products to sales volume and business performance.

H19. There is a significant relationship between the percentage (%) contribution of domestic toll manufactured products to sales turnover and business performance.

3.5. RESEARCH DESIGN

In the design of this research, survey methodology was selected to collect the data which is necessary for hypothesis testing. Principally, survey is an efficient method of collecting data to obtain information which is relatively accurate within sampling error

(Yurt from Kerlinger, 2007). In addition, data collected using survey methodology is easily quantifiable, appropriate to statistical analysis and hypothesis testing (Yurt from Marshall and Rossman, 2007).

3.6. SAMPLING METHOD

Convenience sampling technique was used during the research, which is frequently preferred by the researchers due to the advantages of being least expensive and least time consuming (Yurt from Malhotra, 2007). The sampling frame is determined based on IMS Healthcare's 2013 figures and applying the Pareto principle. Companies establishing 91 % of the Turkish pharmaceutical sector according to yearly sales turnovers in 2013 were selected as the sampling group, which consists of 56 companies in total.

3.7. DATA COLLECTION INSTRUMENT AND METHOD

A questionnaire including both dichotomous and multiple item scales was utilized as data collection instrument in this study. In the context of data collection, it was decided to contact the authorized persons for supply chain management (Directors/Managers/Executives) in each of the targeted companies and request them to fill in this questionnaire. The principle was followed as that one questionnaire to be filled in per company. The questionnaire was sent to each of them via e-mail and they were requested to return the questionnaire in the same way after having filled it in.

The questionnaire was first constructed according to the research questions. Because there was no study about supply chain structures in Turkish pharmaceutical industry made before, and accordingly no previous measurement instrument that could serve as a guide could be found, it was decided to design a unique questionnaire and then to conduct a pilot study to test its validity and reliability. Initial version of the questionnaire is given in Annex 1.

3.8. PILOT STUDY

In order to conduct the pilot study, 18 pharmaceutical companies have been randomly selected among the sample. Considering that there are examples of pilot studies in the literature made with 15 participants as number of experts (Chien and Norman, 2004), number of participants has 18 has been found appropriate.

Designed questionnaire has been sent to the authorized persons for supply chain management (Directors/Managers/Executives) in each of these 18 companies directly via e-mail considering the requirement of expertise and they were requested to return the questionnaires via e-mail after filling it in. When sending the questionnaire an additional request was made to them to evaluate the intelligibility of each question being the experts and give feedback accordingly. All of 18 questionnaires were received back and then analysed sequentially for validity and reliability.

3.8.1. Validity Analysis

In order to conduct analyse the validity of the questionnaire, item-level content validity index (I-CVI) method has been selected. Content validity was undertaken to ascertain whether the content of the questionnaire was appropriate and relevant to the study purpose. Content validity indicates the content reflects a complete range of the attributes under study and is usually undertaken by seven or more experts (Pilot and Hunger 1999; DeVon et al. 2007).

Other definitions for content validity have been given as follows:

(1) ". . .the degree to which an instrument has an appropriate sample of items for the construct being measured" (Polit and Beck, 2004);

(2) ". . .whether or not the items sampled for inclusion on the tool adequately represent the domain of content addressed by the instrument"(Waltz, Strickland and Lenz, 2005); and

(3) ". . .the extent to which an instrument adequately samples the research domain of interest when attempting to measure phenomena" (Wynd, Schmidt and Schaefer, 2003).

Content validity index (CVI) is a commonly used method to measure content validity (Polit and Beck, 2006). The CVI, a proportion agreement procedure, allows two or more raters to independently review and evaluate the relevance of a sample of items to the domain of content represented in an instrument. A researcher then tallies the proportion of cases in which the raters agree and determines the stability of their agreement. It is recommended I-CVIs no lower than 0,78 (Lynn, 1986).

According to the feedback received from the experts per each item in the questionnaire, the item-level content validity index (I-CVI) table given in Annex 2 has been established.

As seen in this table, in the first section of the questionnaire the I-CVI values have been obtained as 0,78 for item 4; 0,83 for item 5, and 0,94 for item 7. In addition to this, in the third section of the questionnaire the I-CVI values have been obtained as 0,83 for items 1 and 2 sequentially, and 0,89 for item 3.

Even these all meet the criteria of being no lower than 0,78; all of these questions have been worked on and revisions have been made considering the outcomes of face validity too. Feedback received in terms of face validity shows that illegibility of the items 4 and 5 in the first section and the items 1 and 3 in the third section needs to be improved. Therefore, these items have been checked and revised as seen in the updated version of the questionnaire which is given in Annex 3.

3.8.2. Reliability Analysis

Reliability analysis was run for internal consistency of items. Malhotra (2007) states that internal consistency reliability is a means to assess the reliability of a summated scale. As many of the constructs in this study are summated scale items where several items are summed to form a total score, it is important that to verify that each item measures some aspect of the construct measured by the entire scale and the items are consistent (Malhotra, 2007). According to Malhotra (2007), a Cronbach's alpha coefficient of value greater than 0,60 indicates satisfactory internal consistency. Some of the dimensions in the questionnaire are represented by one-item scales. Therefore the reliabilities of those could not be examined. Among the other items, reliability analysis was conducted using Cronbach's alpha coefficient for both items, namely "share of secondary production made in own factory in the sales" and "share of secondary

production made as toll manufacturing in the sales". Cronbach's alpha based on standardized items were obtained as 0,891 and 0,839 sequentially. All results are given in the reliability analysis table (Annex 4).

3.9. UPDATE OF THE QUESTIONNAIRE

Considering the outcomes of the pilot study and the validity analysis performed, in the first section of the questionnaire, questions 4, 5 and 7 have been revised. Five new questions have been added to the first section. Two of them are about the changes and timings of factory ownerships, and three of them are about the purposes and timings of new factory start-ups. Updated version of the questionnaire is given in Annex 3.

3.10. OPERATIONALIZATION OF VARIABLES

The constructs were measured using both dichotomous and multiple item scales. Among the independent variables, supply chain structure was determined according to the existence of primary (API) manufacturing node, secondary (finished goods) manufacturing node as both manufacturing in own factory or toll manufacturing and warehousing and distribution node as getting these services rendered by a 3PL company or not, or mixed, which means that these services are partly rendered by a 3PL company. In order to categorize the supply chain structures according to these nodes, questions in the first part of the questionnaire are used. This first part consists of 15 questions, among which 13 questions are answered on dichotomous scale. With these 13 questions, the existence of primary manufacturing and secondary manufacturing together with the possible changes in these existences in the determined period, in addition, the situation of warehousing and distribution node as whether it is rendered as a service by a 3PL company or not, or mixed, were asked to the companies. The remaining two questions are to bring out the reasons of the start of operating both primary (API) and secondary (finished goods) manufacturing sites, if occurred.

In the third part of the questionnaire, independent variables of ownership structure and multinationality are addressed in three questions. In order to determine the status of ownership structure, one question was formulated including the determined four different categories, among which the respondent was requested to select one. Second

question about ownership structure is a dichotomous one to determine whether it has been change in this variable in the determined period.

Multinationality is covered in one single question which was generated to determine the status of multinationality according to four different categories, among which the respondent was requested to select one again.

Product originality was determined through one question in the fourth part of the questionnaire, in which one of two categories is asked to be selected.

3.11. DATA ANALYSIS METHOD

The data collected via this questionnaire were analysed using MANOVA, independent sample t test, Kruskal-Wallis test and chi-square test methods respectively, according to the characteristics they have. All these tests were performed using SPSS 22.0 statistical package program. In the analyses, level of statistical significance was determined as 0,05.

In the meantime, data collected about the changes in the independent variables of supply chain structure, multinationality, and ownership structure were analysed using structural break analysis method. For structural break analysis E-views 7.0 statistical package program was used.

In the modelling of time series, structural stability is of prime importance. To assess structural stability, it is of practical interest to test for change points in a time series in view of the often empirical evidence for structural change (Shao and Zhang, 2010). A structural break occurs, if one of the parameters in the research model has changed at some date in the sample period (Hansen, 2009).

It is customary to test for the existence of a structural break using Chow's test (1960). This test may be regarded as a special case of the general test for linear constraints on the coefficients through a Fisher test, with the structural break date being given a priori. Another statistic which has played an important role in theory and applications is the CUSUM test proposed by Brown, Durbin and Evans (1975). This test is based on the maximum of partial sums of recursive residuals (Perron, 2005).

CHAPTER 4. RESEARCH FINDINGS

4.1. SAMPLE CHARACTERISTICS

The sample of this study consists of 56 companies still operating in the Turkish pharmaceutical sector, which constitute 91 % of Turkish pharmaceutical sector according to yearly sales turnovers in 2013. Among these 56 companies, 48 have returned the questionnaire, which reflects a response rate of 86 %. These 48 companies constitute 81 % of Turkish pharmaceutical sector according to yearly sales turnovers in 2013, and this is a ratio in accordance with Pareto approach.

30 of the questionnaires were received through the initial contact, which indicates a rate of 62,5 % and it was possible to receive 18 questionnaires after the second contact. This means a rate of 37,5 %.

The characteristics of the sample according to variables and control variables are given in Table 4.1. as follows.

Table 4.1. Characteristics of the Sample

Variable	Category	Number of companies	% frequency
Supply chain structure	1	1	2,1
	2	1	2,1
	3	4	8,3
	4	1	2,1
	5	3	6,2
	6	14	29,1
	7	1	2,1
	8	4	8,3
	9	9	18,7
	10	10	21
Multinationality	Domestic	3	6,2
	Regional	4	8,3
	Trans-regional	12	25
	Global	29	60,5
Product originality	Innovator	27	56,3
	Generics	16	33,3
	Hybrid	5	10,4
Ownership structure	Family / Personal	14	29,1
	Shareholder	2	4,2
	Institutional	2	4,2
	Subsidiaries of foreign multinationals	30	62,5
Company size	0 – 250	18	37,5
	251 – 500	10	21
	501 – 750	7	14,5
	> 750	13	27
Duration of commercial activity	0 -10 years	7	14,5
	11 – 20 years	9	19
	21 – 30 years	7	14,5
	31 years and more	25	52
Exporting	Yes	24	50
	No	24	50
Local R&D existence	Yes	20	42
	No	28	58

4.2. DETERMINATION OF SUPPLY CHAIN STRUCTURE CATEGORIES

According to the different alternatives in each node of the pharmaceutical supply chain structure, 18 combinations can be derived theoretically. With regard to the answers of the questionnaire, ten different categories of supply chain structure were determined, but because only one element was existing in the categories 1, 2 and 4, there was not possible to conduct a test. Therefore, considering the common nodes in the supply chain structures, these three categories were combined with other categories, namely category 1 was included to category 9, and categories 2 and 4 were included to category 7. In this way, seven different categories of supply chain structures were precisely determined and taken into consideration for the analyses.

4.3. FINDINGS ON HYPOTHESES

In this section, findings on hypotheses are given consecutively, starting with the hypotheses about supply chain structure and then continuing with the hypotheses about multinationality, hypotheses about product originality, hypotheses about ownership structure. In addition to these constructs, hypotheses about the changes in the nodes of the supply chain structure, multinationality and ownership structure, together with the hypotheses which are testing percentage (%) contribution of domestic manufactured products to sales are included.

4.3.1. Findings on Hypotheses About Supply Chain Structure

H1. Supply chain structures of pharmaceutical companies in Turkey have a significant impact on their business performances.

$H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6 = \mu_7$

$H_1 : \mu_I \neq \mu_J$ (At least two means are not equal)

$$H_o : \begin{pmatrix} \mu_{11} \\ \mu_{12} \\ \mu_{13} \end{pmatrix} = \begin{pmatrix} \mu_{21} \\ \mu_{22} = \\ \mu_{23} \end{pmatrix} = \begin{pmatrix} \mu_{61} \\ \mu_{62} \\ \mu_{63} \end{pmatrix} = \begin{pmatrix} \mu_{71} \\ \mu_{72} \\ \mu_{73} \end{pmatrix}$$

μ_{11}, μ_{12}, μ_{13}= Mean of business performances (sales volume, sales turnover, sales growth) of pharmaceutical companies having supply chain structure category no.3

μ_{21}, μ_{22}, μ_{23}= Mean of business performances (sales volume, sales turnover, sales growth) of pharmaceutical companies having supply chain structure category no.5

...

μ_{71}, μ_{72}, μ_{73}= Mean of business performances (sales volume, sales turnover, sales growth) of pharmaceutical companies having supply chain structure category no.10

Supply chain structure (SCS) is the independent variable and dependent variables are sales turnover, sales volume and sales growth. The variable market share was excluded from the analysis because of the expected multicollinearity between it and sales volume which is typical considering that market share figures are obtained directly from sales volume figures. The correlation table for the dependent variables is given below.

Table 4.2. Correlation Table for H1

		Sales Volume	Market Share	Sales Turnover	Sales Growth
Sales Volume	Pearson Correlation	1	,998**	,856**	,836**
	Sig. (2-tailed)		,000	,000	,000
	N	48	48	48	48
Market Share	Pearson Correlation	,998**	1	,857**	,804**
	Sig. (2-tailed)	,000		,000	,000
	N	48	48	48	48
Sales Turnover	Pearson Correlation	,856**	,857**	1	,709**
	Sig. (2-tailed)	,000	,000		,000
	N	48	48	48	48
Sales Growth	Pearson Correlation	,836**	,804**	,709**	1
	Sig. (2-tailed)	,000	,000	,000	
	N	48	48	48	48

**. Correlation is significant at the 0.01 level (2-tailed).

First, outlier detection was made using Mahalanobis distance method and no outlier was found. Equality of covariance matrices was checked using Box's test. p value is obtained as 0,004 which is lower than the required level of significance as 0,05. This indicates that the covariance matrices are not equal. In conjunction with this, no linearity was observed between the dependent variables according to supply chain

structure categories. Because of these both results, Pillai's trace value needs to be considered to test the hypothesis. MANOVA was carried out to measure the hypothesis and the result of this analysis is given in the following table:

Table 4.3. MANOVA Result of H1

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	,625	21,633[b]	3,000	39,000	,000	,625
	Wilks' Lambda	,375	21,633[b]	3,000	39,000	,000	,625
	Hotelling's Trace	1,664	21,633[b]	3,000	39,000	,000	,625
	Roy's Largest Root	1,664	21,633[b]	3,000	39,000	,000	,625
Supply Chain Structure (SCS)	Pillai's Trace	,710	2,119	18,000	123,000	,009	,237
	Wilks' Lambda	,369	2,601	18,000	110,794	,001	,283
	Hotelling's Trace	1,501	3,140	18,000	113,000	,000	,333
	Roy's Largest Root	1,354	9,252[c]	6,000	41,000	,000	,575

In the MANOVA result, Pillai's trace value for the independent variable of supply chain structure was obtained with p value 0,009 which is lower than the required level of significance as α=0,05. Accordingly, H0 is rejected. This result shows that means of business performances are different to each other according to supply chain structure categories. With regard to this result, it is possible to indicate that at the significance level of 5 %, supply chain structures of pharmaceutical companies in Turkey have a significant impact on their business performances.

As a further step, between-subject effects were tested for the elements of business performance, namely, sales volume, sales turnover and sales growth, respectively. The results are given in Table 4.4. as follows.

Table 4.4. Tests of Between – Subject Effects for H1

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Sales Volume	14844308237872630,000[a]	6	2474051372978772,000	5,916	,000	,464
	Sales Turnover	31492638713331048,000[b]	6	5248773118888509,000	1,930	,099	,220
	Sales Growth	44534876550747,640[c]	6	7422479425124,606	2,348	,048	,256

Table 4.4. Tests of Between – Subject Effects for H1, continued

Intercept	Sales Volume	28036265590334568,000	1	28036265590334568,000	67,046	,000	,621
	Sales Turnover	146159932334421600,000	1	146159932334421600,000	53,746	,000	,567
	Sales Growth	119016057704499,020	1	119016057704499,020	37,656	,000	,479
SCS	Sales Volume	14844308237872630,000	6	2474051372978772,000	5,916	**,000**	,464
	Sales Turnover	31492638713330928,000	6	5248773118888488,000	1,930	**,099**	,220
	Sales Growth	44534876550747,770	6	7422479425124,629	2,348	**,048**	,256
Error	Sales Volume	17144868065231850,000	41	418167513786142,750			
	Sales Turnover	111498604453058800,000	41	2719478157391679,000			
	Sales Growth	129584774633591,110	41	3160604259355,881			
Total	Sales Volume	*59402688387099768,000*	*48*				
	Sales Turnover	316201185722815490,000	48				
	Sales Growth	288383906795193,750	48				
Corrected Total	Sales Volume	31989176303104480,000	47				
	Sales Turnover	142991243166389904,000	47				
	Sales Growth	1741196511843 38,750	47				

The results indicate that within the components of business performance, there was a significant difference observed in the sales volume only, in disagreement to sales turnover and sales growth.

H1a. Supply chain structures of pharmaceutical companies in Turkey have a significant impact on their sales turnovers.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out considering the number of data. Obtained results are given as follows:

Table 4.5. Ranks of Kruskal-Wallis Test for H1a

	SCS category	N	Mean Rank
Sales turnover	3	4	32,00
	5	3	20,00
	6	14	22,79
	7	3	20,33
	8	4	39,25

Table 4.5. Ranks of Kruskal-Wallis Test for H1a, continued

	9	10	27,70
	10	10	17,40
	Total	48	

Table 4.6. Statistics of Kruskal-Wallis Test for H1a

	Sales turnover
Chi-Square	9,468
df	6
Asymp. Sig.	,149

Because the obtained p value 0,149 is greater than the required level of significance α=0,05, H0 cannot be rejected. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of pharmaceutical companies' sales turnovers according to their supply chain structure categories. Accordingly it can be indicated that supply chain structures of pharmaceutical companies in Turkey have no significant impact on their sales turnovers.

H1b. Supply chain structures of pharmaceutical companies in Turkey have a significant impact on their sales volumes.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out considering the number of data. Obtained results are given as follows:

Table 4.7. Ranks of Kruskal-Wallis Test for H1b

	SCS category	N	Mean Rank
Sales volume	3	4	38,75
	5	3	16,67
	6	14	22,07
	7	3	23,67

Table 4.7. Ranks of Kruskal-Wallis Test for H1b, continued

	8	4	41,00
	9	10	31,60
	10	10	11,10
	Total	48	

Table 4.8. Statistics of Kruskal-Wallis Test for H1b

	Sales volume
Chi-Square	22,805
df	6
Asymp. Sig.	,001

H0 is rejected because p=0,001 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, there is a significant difference between the distributions of pharmaceutical companies' sales volumes according to their supply chain structure categories. Accordingly it can be indicated that supply chain structures of pharmaceutical companies in Turkey have a significant impact on their sales volumes.

H1c. Supply chain structures of pharmaceutical companies in Turkey have a significant impact on their sales growths.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out considering the number of data. Obtained results are given as follows:

Table 4.9. Ranks of Kruskal-Wallis Test for H1c

	SCS category	N	Mean Rank
Sales growth	3	4	33,00
	5	3	20,67
	6	14	23,14
	7	3	28,67
	8	4	33,50
	9	10	28,80
	10	10	15,00
	Total	48	

Table 4.10. Statistics of Kruskal-Wallis Test for H1c

	Sales growth
Chi-Square	9,298
df	6
Asymp. Sig.	,158

H0 cannot be rejected because p=0,158 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of pharmaceutical companies' sales growths according to their supply chain structure categories. Accordingly it can be indicated that supply chain structures of pharmaceutical companies in Turkey have no significant impact on their sales growths.

H1d. Supply chain structures of pharmaceutical companies in Turkey have a significant impact on their market shares.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out considering the number of data. Obtained results are given as follows:

Table 4.11. Ranks of Kruskal-Wallis Test for H1d

	SCS category	N	Mean Rank
Market share	3	4	39,25
	5	3	16,67
	6	14	22,00
	7	3	23,33
	8	4	41,50
	9	10	31,30
	10	10	11,20
	Total	48	

Table 4.12. Statistics of Kruskal-Wallis Test for H1d

	Market share
Chi-Square	23,129
df	6
Asymp. Sig.	,001

H0 is rejected because p=0,001 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, there is a significant difference between the distributions of pharmaceutical companies' market shares according to their supply chain structure categories. Accordingly it can be indicated that supply chain structures of pharmaceutical companies in Turkey have a significant impact on their market shares.

H1e. Pharmaceutical companies having primary manufacturing sites in their supply chain structures have significantly different business performances than pharmaceutical companies having no primary manufacturing site in their supply chain structures.

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$ (Means are not equal)

$$H_o : \begin{pmatrix} \mu_{11} \\ \mu_{12} \\ \mu_{13} \end{pmatrix} = \begin{pmatrix} \mu_{21} \\ \mu_{22} \\ \mu_{23} \end{pmatrix}$$

μ_{11}, μ_{12}, μ_{13}= Mean of business performances (sales volume, sales turnover, sales growth) of pharmaceutical companies having primary manufacturing sites in their supply chain structures

μ_{21}, μ_{22}, μ_{23}= Mean of business performances (sales volume, sales turnover, sales growth) of pharmaceutical companies having no primary manufacturing sites in their supply chain structures

Primary manufacturing is the independent variable, which is considered as having or not having for the pharmaceutical companies in their supply chain structures. Dependent variables are sales turnover, sales volume and sales growth. The variable

market share was excluded from the analysis because of the expected multicollinearity between it and sales volume which is typical considering that market share figures are obtained directly from sales volume figures. The correlation table for the dependent variables is given below.

Table 4.13. Correlation Table for H1e

		Sales Volume	Market Share	Sales Turnover	Sales Growth
Sales Volume	Pearson Correlation	1	,998**	,856**	,836**
	Sig. (2-tailed)		,000	,000	,000
	N	48	48	48	48
Market Share	Pearson Correlation	,998**	1	,857**	,804**
	Sig. (2-tailed)	,000		,000	,000
	N	48	48	48	48
Sales Turnover	Pearson Correlation	,856**	,857**	1	,709**
	Sig. (2-tailed)	,000	,000		,000
	N	48	48	48	48
Sales Growth	Pearson Correlation	,836**	,804**	,709**	1
	Sig. (2-tailed)	,000	,000	,000	
	N	48	48	48	48

**. Correlation is significant at the 0.01 level (2-tailed).

First, outlier detection was made using Mahalanobis distance method and no outlier was found. Equality of covariance matrices was checked using Box's test. p value is obtained as 0,207 which is higher than the required level of significance as 0,05. This indicates that the covariance matrices are equal. In conjunction with this, linearity was observed between the dependent variables in the pharmaceutical companies having no primary manufacturing sites in their supply chain structures, even no linearity was observed between the dependent variables in the pharmaceutical companies having primary manufacturing sites in their supply chain structures. Therefore it was not possible to come to a certain decision. MANOVA was carried out to measure the hypothesis and the result of this analysis is given in the following table:

Table 4.14. MANOVA Result of H1e

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[c]
Intercept	Pillai's Trace	,376	8,831[b]	3,000	44,000	,000	,376	26,492	,992
	Wilks' Lambda	,624	8,831[b]	3,000	44,000	,000	,376	26,492	,992
	Hotelling's Trace	,602	8,831[b]	3,000	44,000	,000	,376	26,492	,992
	Roy's Largest Root	,602	8,831[b]	3,000	44,000	,000	,376	26,492	,992
Primary (API) manufac-turing	Pillai's Trace	,144	2,459[b]	3,000	44,000	,075	,144	7,376	,572
	Wilks' Lambda	,856	2,459[b]	3,000	44,000	,075	,144	7,376	,572
	Hotelling's Trace	,168	2,459[b]	3,000	44,000	,075	,144	7,376	,572
	Roy's Largest Root	,168	2,459[b]	3,000	44,000	,075	,144	7,376	,572

In the MANOVA result, Pillai's trace value for the independent variable of supply chain structure was obtained with p value 0,075 which is greater than the required level of significance as α=0,05. Accordingly, H0 cannot rejected. This result shows that means of business performances are equal to each other according to both categories of pharmaceutical companies as having primary manufacturing and having no primary manufacturing in their supply chain structures. With regard to this result, it is possible to indicate that within the significance level of 5 %, there is no significant difference between business performances of pharmaceutical companies having primary manufacturing sites in their supply chain structures and the ones having no primary manufacturing sites in their supply chain structures. This means that having primary manufacturing sites in their supply chain structures has no significant impact on the business performances of pharmaceutical companies in Turkey.

H1f. Pharmaceutical companies having secondary manufacturing sites in their supply chain structures have significantly different business performances than pharmaceutical companies having no secondary manufacturing site in their supply chain structures.

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$ (Means are not equal)

$$H_o : \begin{pmatrix} \mu_{11} \\ \mu_{12} \\ \mu_{13} \end{pmatrix} = \begin{pmatrix} \mu_{21} \\ \mu_{22} \\ \mu_{23} \end{pmatrix}$$

μ_{11}, μ_{12}, μ_{13}= Mean of business performances (sales volume, sales turnover, sales growth) of pharmaceutical companies having secondary manufacturing sites in their supply chain structures

μ_{21}, μ_{22}, μ_{23}= Mean of business performances (sales volume, sales turnover, sales growth) of pharmaceutical companies having no secondary manufacturing sites in their supply chain structures

Secondary manufacturing is the independent variable, which is considered as having or not having for the pharmaceutical companies in their supply chain structures. Dependent variables are sales turnover, sales volume and sales growth. The variable market share was excluded from the analysis because of the expected multicollinearity between it and sales volume which is typical considering that market share figures are obtained directly from sales volume figures. The correlation table for the dependent variables is given as follows.

Table 4.15. Correlation Table for H1f

		Sales Volume	Market Share	Sales Turnover	Sales Growth
Sales Volume	Pearson Correlation	1	,998**	,856**	,836**
	Sig. (2-tailed)		,000	,000	,000
	N	48	48	48	48
Market Share	Pearson Correlation	,998**	1	,857**	,804**
	Sig. (2-tailed)	,000		,000	,000
	N	48	48	48	48

Table 4.15. Correlation Table for H1f, continued

Sales Turnover	Pearson Correlation	,856**	,857**	1	,709**
	Sig. (2-tailed)	,000	,000		,000
	N	48	48	48	48
Sales Growth	Pearson Correlation	,836**	,804**	,709**	1
	Sig. (2-tailed)	,000	,000	,000	
	N	48	48	48	48

**. Correlation is significant at the 0.01 level (2-tailed).

First, outlier detection was made using Mahalanobis distance method and no outlier was found. Equality of covariance matrices was checked using Box's test. p value is obtained as 0,001 which is less than the required level of significance as 0,05. This indicates that the covariance matrices are not equal. In conjunction with this, linearity was observed between the dependent variables in the pharmaceutical companies having secondary manufacturing sites in their supply chain structures, even no linearity was observed between the dependent variables in the pharmaceutical companies having no secondary manufacturing sites in their supply chain structures. MANOVA was carried out to measure the hypothesis and the result of this analysis is given in the following table:

Table 4.16. MANOVA Result of H1f

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[c]
Intercept	Pillai's Trace	,609	22,821[b]	3,000	44,000	,000	,609	68,463	1,000
	Wilks' Lambda	,391	22,821[b]	3,000	44,000	,000	,609	68,463	1,000
	Hotelling's Trace	1,556	22,821[b]	3,000	44,000	,000	,609	68,463	1,000
	Roy's Largest Root	1,556	22,821[b]	3,000	44,000	,000	,609	68,463	1,000
Secondary manufacturing	Pillai's Trace	,360	8,262[b]	3,000	44,000	,000	,360	24,787	,987
	Wilks' Lambda	,640	8,262[b]	3,000	44,000	,000	,360	24,787	,987
	Hotelling's Trace	,563	8,262[b]	3,000	44,000	,000	,360	24,787	,987
	Roy's Largest Root	,563	8,262[b]	3,000	44,000	,000	,360	24,787	,987

In the MANOVA result, Pillai's trace value for the independent variable of supply chain structure was obtained with p value 0,000 which is less than the required level of significance as α=0,05. Accordingly, H0 is rejected. This result shows that means of business performances are not equal to each other according to both categories of pharmaceutical companies as having secondary manufacturing and having no secondary manufacturing in their supply chain structures. With regard to this result, it is possible to indicate that within the significance level of 5 %, there is a significant difference between business performances of pharmaceutical companies having secondary manufacturing sites in their supply chain structures and the ones having no secondary manufacturing sites in their supply chain structures. This means that having secondary manufacturing sites in their supply chain structures has a significant impact on the business performances of pharmaceutical companies in Turkey.

As a further step, between-subject effects were tested for the elements of business performance, namely, sales volume, sales turnover and sales growth, respectively. The results are given in Table 4.17. as follows.

Table 4.17. Tests of Between-Subject Effects for H1f

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[d]
Corrected Model	Sales Volume	9643982304248600,000[a]	1	9643982304248600,000	19,853	,000	,301	19,853	,992
	Sales Turnover	17712365330015000,000[b]	1	17712365330015000,000	6,504	,014	,124	6,504	,704
	Sales Growth	30253997669456,156[c]	1	30253997669456,156	9,673	,003	,174	9,673	,861
Intercept	Sales Volume	31168887476093460,000	1	31168887476093460,000	64,165	,000	,582	64,165	1,000
	Sales Turnover	184518972208816192,000	1	184518972208816192,000	67,752	,000	,596	67,752	1,000
	Sales Growth	127535267002616,230	1	127535267002616,230	40,778	,000	,470	40,778	1,000
Secondary manufacturing	Sales Volume	9643982304248562,000	1	9643982304248562,000	19,853	,000	,301	19,853	,992
	Sales Turnover	17712365330014880,000	1	17712365330014880,000	6,504	,014	,124	6,504	,704
	Sales Growth	30253997669456,055	1	30253997669456,055	9,673	,003	,174	9,673	,861
Error	Sales Volume	22345193998855880,000	46	485765086931649,750					
	Sales Turnover	125278877836374896,000	46	2723453866008150,000					
	Sales Growth	143865653514882,600	46	3127514206845,274					
Total	Sales Volume	59402688387099768,000	48						

Table 4.17. Tests of Between-Subject Effects for H1f, continued

	Sales Turnover	316201185722815490,000	48						
	Sales Growth	288383906795193,750	48						
Corrected Total	Sales Volume	31989176303104480,000	47						
	Sales Turnover	142991243166389904,000	47						
	Sales Growth	174119651184338,750	47						

Results of between-subject effect test indicate the following. Significant differences were observed in sales volume, sales turnover and sales growth of the pharmaceutical companies having secondary manufacturing sites in their supply chain structures and the ones having no secondary manufacturing sites in their supply chain structures, separately. This is an indication supporting and strengthening the validity of hypothesis 1f, meaning that having secondary manufacturing site in the supply chain structure of the pharmaceutical company has an impact on its business performance. According to the p value obtained as 0,014 for sales turnover, it is possible to indicate that the impact on this dependent variable is less than the impacts on sales volume, for which p=0,000 and on sales growth, for which p=0,003.

H1g. Pharmaceutical companies having own manufacturing sites in their supply chain structures have significantly different business performances than pharmaceutical companies having not own manufacturing sites in their supply chain structures.

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$ (Means are not equal)

$$H_o : \begin{pmatrix} \mu_{11} \\ \mu_{12} \\ \mu_{13} \end{pmatrix} = \begin{pmatrix} \mu_{21} \\ \mu_{22} \\ \mu_{23} \end{pmatrix}$$

μ_{11}, μ_{12}, μ_{13}= Mean of business performances (sales volume, sales turnover, sales growth) of pharmaceutical companies having own manufacturing sites in their supply chain structures

μ_{21}, μ_{22}, μ_{23}= Mean of business performances (sales volume, sales turnover, sales growth) of pharmaceutical companies having no manufacturing site in their supply chain structures

Own manufacturing is the independent variable, which is considered as having or not having for the pharmaceutical companies in their supply chain structures. Dependent variables are sales turnover, sales volume and sales growth. The variable market share was excluded from the analysis because of the expected multicollinearity between it and sales volume which is typical considering that market share figures are obtained directly from sales volume figures. The correlation table for the dependent variables is given as follows.

Table 4.18. Correlation Table for H1g

		Sales Volume	Market Share	Sales Turnover	Sales Growth
Sales Volume	Pearson Correlation	1	,998**	,856**	,836**
	Sig. (2-tailed)		,000	,000	,000
	N	48	48	48	48
Market Share	Pearson Correlation	,998**	1	,857**	,804**
	Sig. (2-tailed)	,000		,000	,000
	N	48	48	48	48
Sales Turnover	Pearson Correlation	,856**	,857**	1	,709**
	Sig. (2-tailed)	,000	,000		,000
	N	48	48	48	48
Sales Growth	Pearson Correlation	,836**	,804**	,709**	1
	Sig. (2-tailed)	*,000*	*,000*	*,000*	
	N	48	48	48	48

**. Correlation is significant at the 0.01 level (2-tailed).

First, outlier detection was made using Mahalanobis distance method and no outlier was found. Equality of covariance matrices was checked using Box's test. p value is obtained as 0,000 which is less than the required level of significance as 0,05. This indicates that the covariance matrices are not equal. In conjunction with this, no linearity was observed both between the dependent variables in the pharmaceutical companies having own manufacturing sites in their supply chain structures, between the dependent variables in the pharmaceutical companies having not own secondary

manufacturing sites in their supply chain structures. MANOVA was carried out to measure the hypothesis and the result of this analysis is given in the following table:

Table 4.19. MANOVA Result of H1g

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	,601	22,109[a]	3,000	44,000	,000
	Wilks' Lambda	,399	22,109[a]	3,000	44,000	,000
	Hotelling's Trace	1,507	22,109[a]	3,000	44,000	,000
	Roy's Largest Root	1,507	22,109[a]	3,000	44,000	,000
Own manufacturing	Pillai's Trace	,375	8,818[a]	3,000	44,000	**,000**
	Wilks' Lambda	,625	8,818[a]	3,000	44,000	,000
	Hotelling's Trace	,601	8,818[a]	3,000	44,000	,000
	Roy's Largest Root	,601	8,818[a]	3,000	44,000	,000

In the MANOVA result, Pillai's trace value for the independent variable of supply chain structure was obtained with p value 0,000 which is less than the required level of significance as α=0,05. Accordingly, H0 is rejected. This result shows that means of business performances are not equal to each other according to both categories of pharmaceutical companies as having own manufacturing and having not own manufacturing in their supply chain structures. With regard to this result, it is possible to indicate that within the significance level of 5 %, there is a significant difference between business performances of pharmaceutical companies having own manufacturing sites in their supply chain structures and the ones having not own manufacturing sites in their supply chain structures. This means that having own manufacturing sites in their supply chain structures has a significant impact on the business performances of pharmaceutical companies in Turkey.

H1h. Pharmaceutical companies having toll manufacturing sites in their supply chain structures have significantly different business performances than pharmaceutical companies having no toll manufacturing site in their supply chain structures.

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$ (Means are not equal)

$$H_0 : \begin{pmatrix} \mu_{11} \\ \mu_{12} \\ \mu_{13} \end{pmatrix} = \begin{pmatrix} \mu_{21} \\ \mu_{22} \\ \mu_{23} \end{pmatrix}$$

μ_{11}, μ_{12}, μ_{13}= Mean of business performances (sales volume, sales turnover, sales growth) of pharmaceutical companies having toll manufacturing sites in their supply chain structures

μ_{21}, μ_{22}, μ_{23}= Mean of business performances (sales volume, sales turnover, sales growth) of pharmaceutical companies having no toll manufacturing site in their supply chain structures

Toll manufacturing is the independent variable, which is considered as having or not having for the pharmaceutical companies in their supply chain structures. Dependent variables are sales turnover, sales volume and sales growth. The variable market share was excluded from the analysis because of the expected multicollinearity between it and sales volume which is typical considering that market share figures are obtained directly from sales volume figures. The correlation table for the dependent variables is given as follows.

Table 4.20. Correlation Table for H1h

		Sales Volume	Market Share	Sales Turnover	Sales Growth
Sales Volume	Pearson Correlation	1	,998**	,856**	,836**
	Sig. (2-tailed)		,000	,000	,000
	N	48	48	48	48
Market Share	Pearson Correlation	,998**	1	,857**	,804**
	Sig. (2-tailed)	,000		,000	,000
	N	48	48	48	48

Table 4.20. Correlation Table for H1h, continued

Sales Turnover	Pearson Correlation	,856**	,857**	1	,709**
	Sig. (2-tailed)	,000	,000		,000
	N	48	48	48	48
Sales Growth	Pearson Correlation	,836**	,804**	,709**	1
	Sig. (2-tailed)	,000	,000	,000	
	N	48	48	48	48

*. Correlation is significant at the 0.01 level (2-tailed).

First, outlier detection was made using Mahalanobis distance method and no outlier was found. Equality of covariance matrices was checked using Box's test. p value is obtained as 0,000 which is less than the required level of significance as 0,05. This indicates that the covariance matrices are not equal. In conjunction with this, linearity was observed between the dependent variables in the pharmaceutical companies having no toll manufacturing sites in their supply chain structures, even no linearity was observed between the dependent variables in the pharmaceutical companies having toll manufacturing sites in their supply chain structures. MANOVA was carried out to measure the hypothesis and the result of this analysis is given in the following table:

Table 4.21. MANOVA Result of H1h

Effect		**Value**	**F**	**Hypothesis df**	**Error df**	**Sig.**	**Partial Eta Squared**	**Noncent. Parameter**	**Observed Power[b]**
Intercept	Pillai's Trace	,440	11,538[a]	3,000	44,000	,000	,440	34,614	,999
	Wilks' Lambda	,560	11,538[a]	3,000	44,000	,000	,440	34,614	,999
	Hotelling's Trace	,787	11,538[a]	3,000	44,000	,000	,440	34,614	,999
	Roy's Largest Root	,787	11,538[a]	3,000	44,000	,000	,440	34,614	,999
Toll manufacturing	Pillai's Trace	,182	3,265[a]	3,000	44,000	,030	,182	9,795	,709
	Wilks' Lambda	,818	3,265[a]	3,000	44,000	,030	,182	9,795	,709
	Hotelling's Trace	,223	3,265[a]	3,000	44,000	,030	,182	9,795	,709
	Roy's Largest Root	,223	3,265[a]	3,000	44,000	,030	,182	9,795	,709

In the MANOVA result, Pillai's trace value for the independent variable of supply chain structure was obtained with p value 0,03 which is less than the required level of significance as α=0,05. Accordingly, H0 is rejected. This result shows that means of business performances are not equal to each other according to both categories of pharmaceutical companies as having toll manufacturing and having no toll manufacturing in their supply chain structures. With regard to this result, it is possible to indicate that within the significance level of 5 %, there is a significant difference between business performances of pharmaceutical companies having toll manufacturing sites in their supply chain structures and the ones having no toll manufacturing sites in their supply chain structures. This means that having toll manufacturing sites in their supply chain structures has a significant impact on the business performances of pharmaceutical companies in Turkey.

As a further step, between-subject effects were tested for the elements of business performance, namely, sales volume, sales turnover and sales growth, respectively. The results are given in Table 4.22 as follows.

Table 4.22. Tests of Between-Subject Effects for H1h

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	Sales volume	4,281E15[a]	1	4,281E15	7,107	,011	,134	7,107	,742
	Sales turnover	6,243E15[c]	1	6,243E15	2,100	,154	,044	2,100	,295
	Sales growth	1,180E13[d]	1	1,180E13	3,345	,074	,068	3,345	,433
Intercept	Sales volume	1,225E16	1	1,225E16	20,335	,000	,307	20,335	,993
	Sales turnover	1,030E17	1	1,030E17	34,644	,000	,430	34,644	1,000
	Sales growth	5,684E13	1	5,684E13	16,110	,000	,259	16,110	,976
Toll manufacturing	Sales volume	4,281E15	1	4,281E15	7,107	**,011**	,134	7,107	,742
	Sales turnover	6,243E15	1	6,243E15	2,100	**,154**	,044	2,100	,295
	Sales growth	1,180E13	1	1,180E13	3,345	**,074**	,068	3,345	,433
Error	Sales volume	2,771E16	46	6,024E14					
	Sales turnover	1,367E17	46	2,973E15					
	Sales growth	1,623E14	46	3,529E12					
Total	Sales volume	5,940E16	48						
	Sales turnover	3,162E17	48						

Table 4.22. Tests of Between-Subject Effects for H1h, continued

	Sales growth	2,884E14	48						
Corrected Total	Sales volume	3,199E16	47						
	Sales turnover	1,430E17	47						
	Sales growth	1,741E14	47						

Results of between-subject effect test indicate the following. A significant difference was observed between sales volumes of the pharmaceutical companies having toll manufacturing sites in their supply chain structures and the ones having no toll manufacturing sites in their supply chain structures, even no difference was observed between both sales turnovers and sales growths of the pharmaceutical companies having toll manufacturing sites in their supply chain structures and the ones having no toll manufacturing sites in their supply chain structures. According to the p value obtained as 0,011 for sales volume, it is possible to indicate that there is an impact only on this dependent variable, and there is no impact on sales turnover according to the p value of 0,154 and on sales growth according to the p value of 0,074.

H1i. Pharmaceutical companies getting the warehousing and distribution services rendered by 3PL companies have significantly different business performances than pharmaceutical companies having and operating their own warehousing and distribution centers.

$H_0 : \mu_1 = \mu_2 = \mu_3$

$H_1 : \mu_i \neq \mu_j$ (Means are not equal)

$$H_o : \begin{pmatrix} \mu_{11} \\ \mu_{12} \\ \mu_{13} \end{pmatrix} = \begin{pmatrix} \mu_{21} \\ \mu_{22} \\ \mu_{23} \end{pmatrix} = \begin{pmatrix} \mu_{31} \\ \mu_{32} \\ \mu_{33} \end{pmatrix}$$

μ_{11}, μ_{12}, μ_{13}= Mean of business performances (sales volume, sales turnover, sales growth) of pharmaceutical companies having their own warehousing and distribution centers

μ_{21}, μ_{22}, μ_{23}= Mean of business performances (sales volume, sales turnover, sales growth) of pharmaceutical companies getting the warehousing and distribution service rendered by 3PL companies

μ_{31}, μ_{32}, μ_{33}= Mean of business performances (sales volume, sales turnover, sales growth) of pharmaceutical companies having hybrid warehousing and distribution services

Warehousing and distribution is the independent variable, which is considered as 3PL service, own service or mixed service, which means that services are partially rendered by 3PL companies, for the pharmaceutical companies in their supply chain structures. Dependent variables are sales turnover, sales volume and sales growth. The variable market share was excluded from the analysis because of the expected multicollinearity between it and sales volume which is typical considering that market share figures are obtained directly from sales volume figures. The correlation table for the dependent variables is given as follows.

Table 4.23. Correlation Table for H1i

		Sales Volume	Market Share	Sales Turnover	Sales Growth
Sales Volume	Pearson Correlation	1	,998**	,856**	,836**
	Sig. (2-tailed)		,000	,000	,000
	N	48	48	48	48
Market Share	Pearson Correlation	,998**	1	,857**	,804**
	Sig. (2-tailed)	,000		,000	,000
	N	48	48	48	48
Sales Turnover	Pearson Correlation	,856**	,857**	1	,709**
	Sig. (2-tailed)	,000	,000		,000
	N	48	48	48	48
Sales Growth	Pearson Correlation	,836**	,804**	,709**	1
	Sig. (2-tailed)	,000	,000	,000	
	N	48	48	48	48

*. Correlation is significant at the 0.01 level (2-tailed).

First, outlier detection was made using Mahalanobis distance method and no outlier was found. Equality of covariance matrices was checked using Box's test. p value is obtained as 0,571 which is greater than the required level of significance as 0,05. This indicates that the covariance matrices are equal. In conjunction with this, linearity was observed between the dependent variables in all of the three categories of the

warehousing and distribution node in the supply chain structures of pharmaceutical companies. MANOVA was carried out to measure the hypothesis and the result of this analysis is given in the following table:

Table 4.24. MANOVA Result for H1i

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Intercept	Pillai's Trace	,458	12,097[a]	3,000	43,000	,000	,458	36,291	,999
	Wilks' Lambda	,542	12,097[a]	3,000	43,000	,000	,458	36,291	,999
	Hotelling's Trace	,844	12,097[a]	3,000	43,000	,000	,458	36,291	,999
	Roy's Largest Root	,844	12,097[a]	3,000	43,000	,000	,458	36,291	,999
Warehousing and distribution	Pillai's Trace	,098	,753	6,000	88,000	,609	,049	4,517	,284
	Wilks' Lambda	,904	,740[a]	6,000	86,000	,619	,049	4,438	,278
	Hotelling's Trace	,104	,726	6,000	84,000	,630	,049	4,357	,273
	Roy's Largest Root	,076	1,108[c]	3,000	44,000	,356	,070	3,325	,278

In the MANOVA result, Pillai's trace value for the independent variable warehousing and distribution node of supply chain structure was obtained with p value 0,609 which is greater than the required level of significance as α=0,05. Accordingly, H0 cannot be rejected. This result shows that means of business performances are equal to each other according to all three categories of warehousing and distribution node in the supply chain structures of pharmaceutical companies. With regard to this result, it is possible to indicate that within the significance level of 5 %, there is no significant difference between business performances of pharmaceutical companies according to all three categories of warehousing and distribution node in their supply chain structures. This means that differences in the warehousing and distribution node of their supply chain structures have no significant impact on the business performances of pharmaceutical companies in Turkey.

4.3.2. Findings on Hypotheses About Multinationality

H2. There is a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of multinationality.

H_0 : There is no relationship between multinationality and supply chain structure (SCS)

H_1 : There is a relationship between multinationality and supply chain structure (SCS)

Chi-square test was carried out to measure the hypothesis and the results of this analysis is given in the following tables:

Table 4.25. Crosstabulation for H2

		Supply chain structures (SCS)							Total
		3	5	6	7	8	9	10	
Multinationality	Local	0	0	1	2	0	0	0	3
	Regional	0	1	0	0	1	2	0	4
	Trans-regional	2	0	3	1	1	5	0	12
	Global	2	2	10	0	2	3	10	29
Total		4	3	14	3	4	10	10	48

Table 4.26. Result of Chi-square Test for H2

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	40,562[a]	18	,002	,003		
Likelihood Ratio	35,668	18	,008	,003		
Fisher's Exact Test	28,494			,003		
Linear-by-Linear Association	,358[b]	1	,550	,575	,287	,025
N of Valid Cases	48					

Because in 89,3 % (25/28) of the cells in Table 4.25, expected number of observations is less than 5, results of Fisher's Exact Test were taken into consideration. p value was obtained as 0,003 which is less than the required level of significance as

α=0,05. Accordingly, H0 is rejected. This result shows that there is a relationship between multinationality and supply chain structure. With regard to this result, it is possible to indicate that within the significance level of 5 %, there is a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of multinationality.

H3. There is a significant difference between business performances of pharmaceutical companies in terms of multinationality.

$H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4$

$H_1 : \mu_i \neq \mu_j$ (At least two means are not equal)

$$H_0 : \begin{pmatrix} \mu_{11} \\ \mu_{12} \\ \mu_{13} \end{pmatrix} = \begin{pmatrix} \mu_{21} \\ \mu_{22} \\ \mu_{23} \end{pmatrix} = \begin{pmatrix} \mu_{31} \\ \mu_{32} \\ \mu_{33} \end{pmatrix} = \begin{pmatrix} \mu_{41} \\ \mu_{42} \\ \mu_{43} \end{pmatrix}$$

μ_{11}, μ_{12}, μ_{13}= Mean of local companies' business performances (sales volume, sales turnover, sales growth)

μ_{21}, μ_{22}, μ_{23}= Mean of regional companies' business performances (sales volume, sales turnover, sales growth)

μ_{31}, μ_{32}, μ_{33}= Mean of transregional companies' business performances (sales volume, sales turnover, sales growth)

μ_{41}, μ_{42}, μ_{43}= Mean of global companies' business performances (sales volume, sales turnover, sales growth)

Multinationality is the independent variable, which is categorized as local, regional, transregional and global. Dependent variables are sales turnover, sales volume and sales growth. The variable market share was excluded from the analysis because of the expected multicollinearity between it and sales volume which is typical considering that market share figures are obtained directly from sales volume figures. The correlation table for the dependent variables is given as follows.

Table 4.27. Correlation Table for H3

		Sales Volume	Market Share	Sales Turnover	Sales Growth
Sales Volume	Pearson Correlation	1	,998**	,856**	,836**
	Sig. (2-tailed)		,000	,000	,000
	N	48	48	48	48
Market Share	*Pearson Correlation*	,998**	1	,857**	,804**
	Sig. (2-tailed)	,000		,000	,000
	N	48	48	48	48
Sales Turnover	Pearson Correlation	,856**	,857**	1	,709**
	Sig. (2-tailed)	,000	,000		,000
	N	48	48	48	48
Sales Growth	Pearson Correlation	,836**	,804**	,709**	1
	Sig. (2-tailed)	,000	,000	,000	
	N	48	48	48	48

**. Correlation is significant at the 0.01 level (2-tailed).

First, outlier detection was made using Mahalanobis distance method and no outlier was found. Equality of covariance matrices was checked using Box's test. p value is obtained as 0,026 which is less than the required level of significance as 0,05. This indicates that the covariance matrices are not equal. In conjunction with this, linearity was observed between the dependent variables in all of the three categories of multinationality as regional, transregional and global, even it was not necessary to check the linearity for the category of local because of low number of data. MANOVA was carried out to measure the hypothesis and the result of this analysis is given in the following table:

Table 4.28. MANOVA Result of H3

Effect		**Value**	**F**	**Hypothesis df**	**Error df**	**Sig.**
Intercept	Pillai's Trace	,290	5,719[a]	3,000	42,000	,002
	Wilks' Lambda	,710	5,719[a]	3,000	42,000	,002
	Hotelling's Trace	,408	5,719[a]	3,000	42,000	,002
	Roy's Largest Root	,408	5,719[a]	3,000	42,000	,002

Table 4.28. MANOVA Result of H3, continued

Multinationality	Pillai's Trace	,132	,677	9,000	132,000	,729
	Wilks' Lambda	,871	,664	9,000	102,368	,740
	Hotelling's Trace	,144	,652	9,000	122,000	,751
	Roy's Largest Root	,110	1,610[b]	3,000	44,000	,201

In the MANOVA result, Pillai's trace value for the independent variable of multinationality was obtained with p value 0,729 which is greater than the required level of significance as α=0,05. Accordingly, H0 cannot be rejected. This result shows that means of business performances are equal to each other according to all four categories of multinationality. With regard to this result, it is possible to indicate that within the significance level of 5 %, there is no significant difference between business performances of pharmaceutical companies in terms of multinationality. This means that differences in multinationality have no significant impact on the business performances of pharmaceutical companies in Turkey.

H3a. There is a significant difference between sales turnovers of pharmaceutical companies in terms of multinationality.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out with multinationality as grouping variable considering the number of data. Obtained results are given as follows:

Table 4.29. Ranks of Kruskal-Wallis Test for H3a

	Multinationality	N	Mean Rank
Sales turnover	Local	3	13,00
	Regional	4	24,25
	Transregional	12	23,42
	Global	29	26,17
	Total	48	

Table 4.30. Statistics of Kruskal-Wallis Test for H3a

	Sales turnover
Chi-Square	2,511
df	3
Asymp. Sig.	,473

H0 cannot be rejected because p=0,473 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of pharmaceutical companies' sales turnovers in terms of multinationality. Accordingly it can be indicated that multinationality categories of pharmaceutical companies in Turkey have no significant impact on their sales turnovers.

H3b. There is a significant difference between sales volumes of pharmaceutical companies in terms of multinationality.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out with multinationality as grouping variable considering the number of data. Obtained results are given as follows:

Table 4.31. Ranks of Kruskal-Wallis Test for H3b

	Multinationality	N	Mean Rank
Sales volume	Local	3	20,00
	Regional	4	25,00
	Transregional	12	28,00
	Global	29	23,45
	Total	48	

Table 4.32. Statistics of Kruskal-Wallis Test for H3b

	Sales volume
Chi-Square	1,229
df	3
Asymp. Sig.	,746

H0 cannot be rejected because p=0,746 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of pharmaceutical companies' sales volumes in terms of multinationality. Accordingly it can be indicated that multinationality categories of pharmaceutical companies in Turkey have no significant impact on their sales volumes.

H3c. There is a significant difference between sales growths of pharmaceutical companies in terms of multinationality.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out with multinationality as grouping variable considering the number of data. Obtained results are given as follows:

Table 4.33. Ranks of Kruskal-Wallis Test for H3c

	Multinationality	N	Mean Rank
Sales growth	Local	3	19,00
	Regional	4	26,50
	Transregional	12	26,33
	Global	29	24,03
	Total	48	

Table 4.34. Statistics of Kruskal-Wallis Test for H3c

	Sales growth
Chi-Square	,782
df	3
Asymp. Sig.	,854

H0 cannot be rejected because p=0,854 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of pharmaceutical companies' sales growths in terms of multinationality. Accordingly it can be indicated that multinationality categories of pharmaceutical companies in Turkey have no significant impact on their sales growths.

H3d. There is a significant difference between market shares of pharmaceutical companies in terms of multinationality.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out with multinationality as grouping variable considering the number of data. Obtained results are given as follows:

Table 4.35. Ranks of Kruskal-Wallis Test for H3d

	Multinationality	N	Mean Rank
Market share	Local	3	19,67
	Regional	4	24,50
	Transregional	12	28,50
	Global	29	23,34
	Total	48	

Table 4.36. Statistics of Kruskal-Wallis Test for H3d

	Market share
Chi-Square	1,535
df	3
Asymp. Sig.	,674

H0 cannot be rejected because p=0,674 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of pharmaceutical companies' market shares in terms of multinationality. Accordingly it can be indicated that multinationality categories of pharmaceutical companies in Turkey have no significant impact on their market shares.

4.3.3. Findings on Hypotheses About Product Originality

H4. There is a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of product originality.

H_0 : There is no relationship between product originality and supply chain structure

H_1 : There is a relationship between product originality and supply chain structure

Chi-square test was carried out to measure the hypothesis and the results of this analysis is given in the following tables:

Table 4.37. Crosstabulation for H4

		Supply chain structures (SCS)							Total
		3	**5**	**6**	**7**	**8**	**9**	**10**	
Product originality	Innovator	0	2	10	1	1	3	10	27
	Generics	3	1	3	1	2	6	0	16
	Hybrid	1	0	1	1	1	1	0	5
Total		4	3	14	3	4	10	10	48

Table 4.38. Result of Chi-square Test for H4

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	21,608[a]	12	,042	,037		
Likelihood Ratio	26,407	12	,009	,012		
Fisher's Exact Test	22,608			**,003**		
Linear-by-Linear Association	2,769[b]	1	,096	,102	,055	,010
N of Valid Cases	48					

Because in 85,7 % (18/21) of the cells in Table 4.36, expected number of observations is less than 5, results of Fisher's Exact Test were taken into consideration. p value was obtained as 0,003 which is less than the required level of significance as α=0,05. Accordingly, H0 is rejected. This result shows that there is a relationship between product originality and supply chain structure. With regard to this result, it is possible to indicate that within the significance level of 5 %, there is a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of product originality.

H5. There is a significant difference between business performances of pharmaceutical companies in Turkey in terms of product originality.

$H_0 : \mu_1 = \mu_2 = \mu_3$

$H_1 : \mu_i \neq \mu_j$ (At least two means are not equal)

$$H_o : \begin{pmatrix} \mu_{11} \\ \mu_{12} \\ \mu_{13} \end{pmatrix} = \begin{pmatrix} \mu_{21} \\ \mu_{22} \\ \mu_{23} \end{pmatrix} = \begin{pmatrix} \mu_{31} \\ \mu_{32} \\ \mu_{33} \end{pmatrix}$$

$\mu_{11}, \mu_{12}, \mu_{13}$= Mean of innovator companies' business performances (sales volume, sales turnover, sales growth)

$\mu_{21}, \mu_{22}, \mu_{23}$= Mean of generics companies' business performances (sales volume, sales turnover, sales growth)

$\mu_{31}, \mu_{32}, \mu_{33}$= Mean of hybrid companies' business performances (sales volume, sales turnover, sales growth)

Product originality is the independent variable, which is categorized as innovator, generics, and hybrid. Dependent variables are sales turnover, sales volume and sales growth. The variable market share was excluded from the analysis because of the expected multicollinearity between it and sales volume which is typical considering that market share figures are obtained directly from sales volume figures. The correlation table for the dependent variables is given as follows.

Table 4.39. Correlation Table for H5

		Sales Volume	Market Share	Sales Turnover	Sales Growth
Sales Volume	Pearson Correlation	1	,998**	,856**	,836**
	Sig. (2-tailed)		,000	,000	,000
	N	48	48	48	48
Market Share	Pearson Correlation	,998**	1	,857**	,804**
	Sig. (2-tailed)	,000		,000	,000
	N	48	48	48	48
Sales Turnover	Pearson Correlation	,856**	,857**	1	,709**
	Sig. (2-tailed)	,000	,000		,000
	N	48	48	48	48
Sales Growth	Pearson Correlation	,836**	,804**	,709**	1
	Sig. (2-tailed)	,000	,000	,000	
	N	48	48	48	48

**. Correlation is significant at the 0.01 level (2-tailed).

First, outlier detection was made using Mahalanobis distance method and no outlier was found. Equality of covariance matrices was checked using Box's test. p value is obtained as 0,143 which is greater than the required level of significance as 0,05. This indicates that the covariance matrices are equal. In conjunction with this, linearity was observed between the dependent variables in both of the categories innovator and generics, even no linearity was observed between the dependent variables in hybrid category. MANOVA was carried out to measure the hypothesis and the result of this analysis is given in the following table:

Table 4.40. MANOVA Result of H5

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	,516	15,251[a]	3,000	43,000	,000
	Wilks' Lambda	,484	15,251[a]	3,000	43,000	,000
	Hotelling's Trace	1,064	15,251[a]	3,000	43,000	,000
	Roy's Largest Root	1,064	15,251[a]	3,000	43,000	,000
Product Originality	Pillai's Trace	,318	2,774	6,000	88,000	**,016**
	Wilks' Lambda	,687	2,957[a]	6,000	86,000	,011
	Hotelling's Trace	,447	3,132	6,000	84,000	,008
	Roy's Largest Root	,429	6,298[b]	3,000	44,000	,001

In the MANOVA result, Pillai's trace value for the independent variable of multinationality was obtained with p value 0,016 which is less than the required level of significance as α=0,05. Accordingly, H0 is rejected. This result shows that means of business performances are not equal to each other according to all three categories of product originality. With regard to this result, it is possible to indicate that within the significance level of 5 %, there is a significant difference between business performances of pharmaceutical companies according to product originality. This means that differences in product originality have a significant impact on the business performances of pharmaceutical companies in Turkey.

H5a. There is a significant difference between sales turnovers of pharmaceutical companies in Turkey in terms of product originality.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out with product originality as grouping variable considering the number of data. Obtained results are given as follows:

Table 4.41. Ranks of Kruskal-Wallis Test for H5a

	Product originality	N	Mean Rank
Sales turnover	Innovator	27	22,52
	Generics	16	24,44
	Hybrid	5	35,40
	Total	48	

Table 4.42. Statistics of Kruskal-Wallis Test for H5a

	Sales turnover
Chi-Square	3,572
df	2
Asymp. Sig.	,168

H0 cannot be rejected because p=0,168 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of pharmaceutical companies' sales turnovers in terms of product originality. Accordingly it can be indicated that product originality categories of pharmaceutical companies in Turkey have no significant impact on their sales turnovers.

H5b. There is a significant difference between sales volumes of pharmaceutical companies in Turkey in terms of product originality.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out with product originality as grouping variable considering the number of data. Obtained results are given as follows:

Table 4.43. Ranks of Kruskal-Wallis Test for H5b

	Product originality	N	Mean Rank
Sales volume	Innovator	27	19,15
	Generics	16	29,38
	Hybrid	5	37,80
	Total	48	

Table 4.44. Statistics of Kruskal-Wallis Test for H5b

	Sales volume
Chi-Square	10,398
df	2
Asymp. Sig.	,006

H0 is rejected because p=0,006 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, there is a significant difference between the distributions of pharmaceutical companies' sales volumes in terms of product originality. Accordingly it can be indicated that product originality categories of pharmaceutical companies in Turkey have a significant impact on their sales volumes.

H5c. There is a significant difference between sales growths of pharmaceutical companies in Turkey in terms of product originality.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out with product originality as grouping variable considering the number of data. Obtained results are given as follows:

Table 4.45. Ranks of Kruskal-Wallis Test for H5c

	Product originality	N	Mean Rank
Sales growth	Innovator	27	21,00
	Generics	16	27,38
	Hybrid	5	34,20
	Total	48	

Table 4.46. Statistics of Kruskal-Wallis Test for H5c

	Sales growth
Chi-Square	4,762
df	2
Asymp. Sig.	,092

H0 cannot be rejected because p=0,092 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of pharmaceutical companies' sales growths in terms of product originality. Accordingly it can be indicated that product originality categories of pharmaceutical companies in Turkey have no significant impact on their sales growths.

H5d. There is a significant difference between market shares of pharmaceutical companies in Turkey in terms of product originality.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out with product originality as grouping variable considering the number of data. Obtained results are given as follows:

Table 4.47. Ranks of Kruskal-Wallis Test for H5d

	Product originality	N	Mean Rank
Market share	Innovator	27	19,07
	Generics	16	29,50
	Hybrid	5	37,80
	Total	48	

Table 4.48. Statistics of Kruskal-Wallis Test for H5d

	Market share
Chi-Square	10,609
df	2
Asymp. Sig.	,005

H0 is rejected because p=0,005 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, there is a significant difference between the distributions of pharmaceutical companies' market shares in terms of product originality. Accordingly it can be indicated that product originality categories of pharmaceutical companies in Turkey have a significant impact on their market shares.

4.3.4. Findings on Hypotheses About Ownership Structure

H6. There is a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of ownership structure.

H_0 : There is no relationship between ownership structure and supply chain structure

H_1 : There is a relationship between ownership structure and supply chain structure

Chi-square test was carried out to measure the hypothesis and the results of this analysis are given in the following tables:

Table 4.49. Crosstabulation for H6

		Supply chain structures							Total
		3	5	6	7	8	9	10	
Ownership structure	Family / Personal	1	1	1	3	2	6	0	3
	Institutional	1	0	0	0	0	1	0	4
	Shareholder	0	1	1	0	0	0	0	12
	Subsidiaries of foreign multinationals	2	1	12	0	2	3	10	29
Total		4	3	14	3	4	10	10	48

Table 4.50. Result of Chi-square Test for H6

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	36,047[a]	18	,007	,018		
Likelihood Ratio	35,455	18	,008	,001		
Fisher's Exact Test	33,104			,000		
Linear-by-Linear Association	,039[b]	1	,843	,864	,429	,019
N of Valid Cases	48					

Because in 89,3 % (25/28) of the cells in Table 4.49, expected number of observations is less than 5, results of Fisher's Exact Test were taken into consideration. p value was obtained as 0,000 which is less than the required level of significance as α=0,05. Accordingly, H0 is rejected. This result shows that there is a relationship between ownership structure and supply chain structure. With regard to this result, it is possible to indicate that within the significance level of 5 %, there is a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of ownership structure.

H7. There is a significant difference between business performances of pharmaceutical companies in terms of ownership structure.

$H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4$

$H_1 : \mu_i \neq \mu_j$ (At least two means are not equal)

$$H_o : \begin{pmatrix} \mu_{11} \\ \mu_{12} \\ \mu_{13} \end{pmatrix} = \begin{pmatrix} \mu_{21} \\ \mu_{22} \\ \mu_{23} \end{pmatrix} = \begin{pmatrix} \mu_{31} \\ \mu_{32} \\ \mu_{33} \end{pmatrix} = \begin{pmatrix} \mu_{41} \\ \mu_{42} \\ \mu_{43} \end{pmatrix}$$

$\mu_{11}, \mu_{12}, \mu_{13}$= Mean of business performances of companies in family/personal category (sales volume, sales turnover, sales growth)

$\mu_{21}, \mu_{22}, \mu_{23}$= Mean of business performances of companies in institutional category (sales volume, sales turnover, sales growth)

μ_{31}, μ_{32}, μ_{33}= Mean of business performances of companies in shareholder category (sales volume, sales turnover, sales growth)

μ_{41}, μ_{42}, μ_{43}= Mean of business performances of companies in subsidiaries of foreign multinationals category (sales volume, sales turnover, sales growth)

Ownership structure is the independent variable, which is categorized as family/personal, institutional, shareholder and subsidiaries of foreign multinationals. Dependent variables are sales turnover, sales volume and sales growth. The variable market share was excluded from the analysis because of the expected multicollinearity between it and sales volume which is typical considering that market share figures are obtained directly from sales volume figures. The correlation table for the dependent variables is given as follows.

Table 4.51. Correlation Table for H7

		Sales Volume	Market Share	Sales Turnover	Sales Growth
Sales Volume	Pearson Correlation	1	,998**	,856**	,836**
	Sig. (2-tailed)		,000	,000	,000
	N	48	48	48	48
Market Share	Pearson Correlation	,998**	1	,857**	,804**
	Sig. (2-tailed)	,000		,000	,000
	N	48	48	48	48
Sales Turnover	Pearson Correlation	,856**	,857**	1	,709**
	Sig. (2-tailed)	,000	,000		,000
	N	48	48	48	48
Sales Growth	Pearson Correlation	,836**	,804**	,709**	1
	Sig. (2-tailed)	,000	,000	,000	
	N	48	48	48	48

**. Correlation is significant at the 0.01 level (2-tailed).

First, outlier detection was made using Mahalanobis distance method and no outlier was found. Equality of covariance matrices was checked using Box's test. p value is obtained as 0,072 which is greater than the required level of significance as 0,05. This indicates that the covariance matrices are equal. In conjunction with this, linearity was observed between all dependent variables in all categories of ownership structure,

anyway the low number of data in both institutional and shareholder categories prevents us to reason exactly. MANOVA was carried out to measure the hypothesis and the result of this analysis is given in the following table:

Table 4.52. MANOVA Result for H7

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	,249	7,146[a]	2,000	43,000	,002
	Wilks' Lambda	,751	7,146[a]	2,000	43,000	,002
	Hotelling's Trace	,332	7,146[a]	2,000	43,000	,002
	Roy's Largest Root	,332	7,146[a]	2,000	43,000	,002
Ownership structure	Pillai's Trace	,157	1,252	6,000	88,000	**,288**
	Wilks' Lambda	,849	1,225[a]	6,000	86,000	,302
	Hotelling's Trace	,171	1,198	6,000	84,000	,316
	Roy's Largest Root	,099	1,447[b]	3,000	44,000	,242

In the MANOVA result, Pillai's trace value for the independent variable of ownership structure was obtained with p value 0,288 which is greater than the required level of significance as α=0,05. Accordingly, H0 cannot be rejected. This result shows that means of business performances are equal to each other according to all four categories of ownership structure. With regard to this result, it is possible to indicate that within the significance level of 5 %, there is no significant difference between business performances of pharmaceutical companies according to ownership structure. This means that differences in ownership structure have no significant impact on the business performances of pharmaceutical companies in Turkey.

H7a. There is a significant difference between sales turnovers of pharmaceutical companies in terms of ownership structure.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out with ownership structure as grouping variable considering the number of data. Obtained results are given as follows:

Table 4.53. Ranks of Kruskal-Wallis Test for H7a

	Multinationality	N	Mean Rank
Sales turnover	Family / Personal	14	23,71
	Institutional	2	32,50
	Shareholder	2	12,00
	Subsidiaries of foreign multinationals	30	25,17
	Total	48	

Table 4.54. Statistics of Kruskal-Wallis Test for H7a

	Sales turnover
Chi-Square	2,360
df	3
Asymp. Sig.	**,501**

H0 cannot be rejected because p=0,501 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of pharmaceutical companies' sales turnovers in terms of ownership structure. Accordingly it can be indicated that ownership structure categories of pharmaceutical companies in Turkey have no significant impact on their sales turnovers.

H7b. There is a significant difference between sales volumes of pharmaceutical companies in terms of ownership structure.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out with ownership structure as grouping variable considering the number of data. Obtained results are given as follows:

Table 4.55. Ranks of Kruskal-Wallis Test for H7b

	Multinationality	N	Mean Rank
Sales volume	Family / Personal	14	26,57
	Institutional	2	37,50
	Shareholder	2	11,50
	Subsidiaries of foreign multinationals	30	23,53
	Total	48	

Table 4.56. Statistics of Kruskal-Wallis Test for H7b

	Sales volume
Chi-Square	3,898
df	3
Asymp. Sig.	,273

H0 cannot be rejected because p=0,273 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of pharmaceutical companies' sales volumes in terms of ownership structure. Accordingly it can be indicated that ownership structure categories of pharmaceutical companies in Turkey have no significant impact on their sales volumes.

H7c. There is a significant difference between sales growths of pharmaceutical companies in terms of ownership structure.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out with ownership structure as grouping variable considering the number of data. Obtained results are given as follows:

Table 4.57. Ranks of Kruskal-Wallis Test for H7c

	Multinationality	N	Mean Rank
Sales growth	Family / Personal	14	27,29
	Institutional	2	35,00
	Shareholder	2	16,50
	Subsidiaries of foreign multinationals	30	23,03
	Total	48	

Table 4.58. Statistics of Kruskal-Wallis Test for H7c

	Sales growth
Chi-Square	2,662
df	3
Asymp. Sig.	,447

H0 cannot be rejected because p=0,447 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of pharmaceutical companies' sales growths in terms of ownership structure. Accordingly it can be indicated that ownership structure categories of pharmaceutical companies in Turkey have no significant impact on their sales growths.

H7d. There is a significant difference between market shares of pharmaceutical companies in terms of ownership structure.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out with ownership structure as grouping variable considering the number of data. Obtained results are given as follows:

Table 4.59. Ranks of Kruskal-Wallis Test for H7d

	Multinationality	N	Mean Rank
Market share	Family / Personal	14	26,43
	Institutional	2	37,50
	Shareholder	2	12,00
	Subsidiaries of foreign multinationals	30	23,57
	Total	48	

Table 4.60. Statistics of Kruskal-Wallis Test for H7d

	Market share
Chi-Square	3,718
df	3
Asymp. Sig.	**,294**

H0 cannot be rejected because p=0,294 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of pharmaceutical companies' market shares in terms of ownership structure. Accordingly it can be indicated that ownership structure categories of pharmaceutical companies in Turkey have no significant impact on their market shares.

4.3.5. Findings on Hypotheses About Changes in Supply Chain Structure, Multinationality and Ownership Structure

H8. There is a significant relationship between the change in the primary (API) manufacturing node of supply chain structure and business performance.

H_0: No structural break happened in a specific year according to the change in the primary (API) manufacturing node of the supply chain structure.

H_1: A structural break happened in a specific year according to the change in the primary (API) manufacturing node of the supply chain structure.

Table 4.61. Companies and Years of Changes in Primary (API) Manufacturing Node

Companies	Year of change
Company A	2011

CUSUM of squares and Chow tests were carried out to detect the structural break. Obtained results are given as follows:

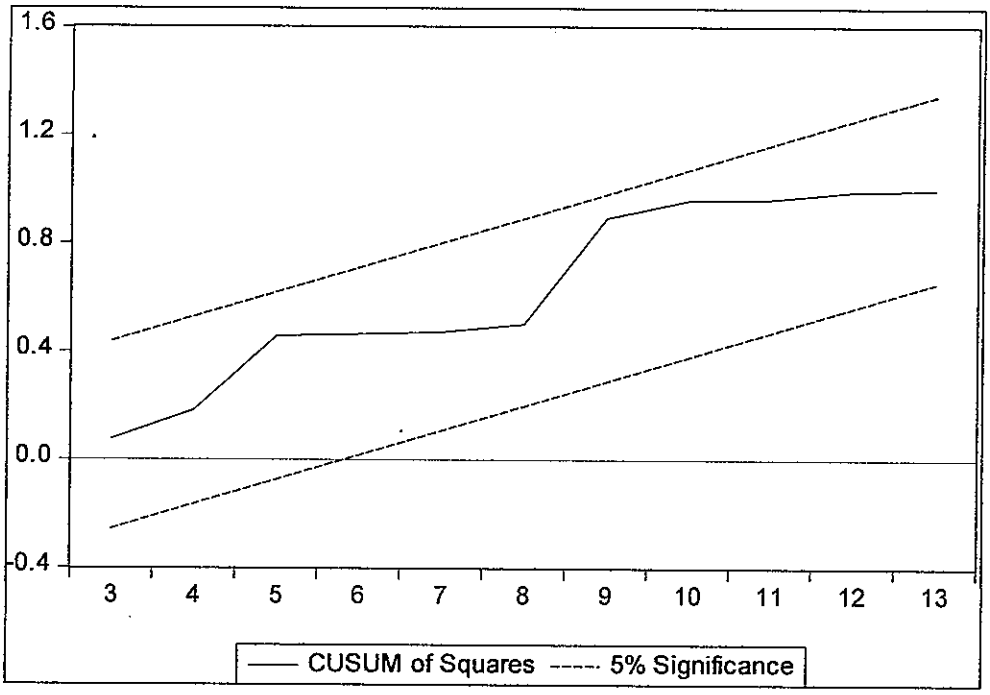

Figure 4.1. Result of CUSUM of Squares Test for the Structural Break in Company A (1)

There is no structural break seen in the graph of CUSUM of squares test.

Table 4.62. Result of Chow Test for the Structural Break in Company A (1)

Chow Breakpoint Test: 2011			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	0.179870	Prob. F(2,9)	**0.8383**
Log likelihood ratio	0.509509	Prob. Chi-Square(2)	0.7751
Wald Statistic	0.359741	Prob. Chi-Square(2)	0.8354

H0 cannot be rejected because p=0,8383 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in the primary (API) manufacturing node of supply chain structure and business performance for Company A.

H9. There is a significant relationship between the change in the secondary (finished goods) manufacturing node of supply chain structure and business performance.

H_0: No structural break happened in a specific year according to the change in the secondary (finished goods) manufacturing node of the supply chain structure.

H_1: A structural break happened in a specific year according to the change in the secondary (finished goods) manufacturing node of the supply chain structure.

Table 4.63. Companies and Years of Changes in Secondary (Finished Goods) Manufacturing Node

Companies	**Year of change**
Company A	2008
Company B	2005
Company C	2008
Company D	2010
Company E	2006

Table 4.63. Companies and Years of Changes in Secondary (Finished Goods) Manufacturing Node, continued

Company F	2005 & 2007
Company G	2003
Company H	2007
Company I	2010
Company J	2012
Company K	2007

CUSUM of squares and Chow tests were carried out severally to detect the structural breaks in each of these companies . Obtained results are given as follows:

Company A:

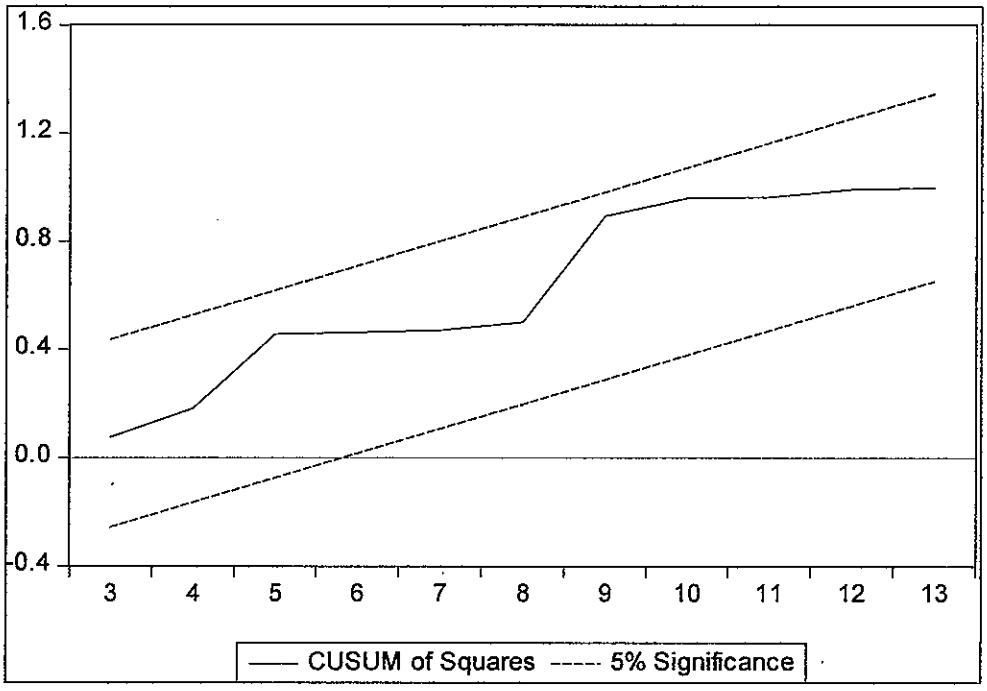

Figure 4.2. Result of CUSUM of Squares Test for the Structural Break in Company A (2)

There is no structural break seen in the graph of CUSUM of squares test.

Table 4.64. Result of Chow Test for the Structural Break in Company A (2)

Chow Breakpoint Test: 2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	3.067555	Prob. F(2,9)	**0.0964**
Log likelihood ratio	6.757305	Prob. Chi-Square(2)	0.0341
Wald Statistic	6.135111	Prob. Chi-Square(2)	0.0465

H0 cannot be rejected because p=0,0964 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in the secondary (finished goods) manufacturing node of supply chain structure and business performance for Company A.

Company B:

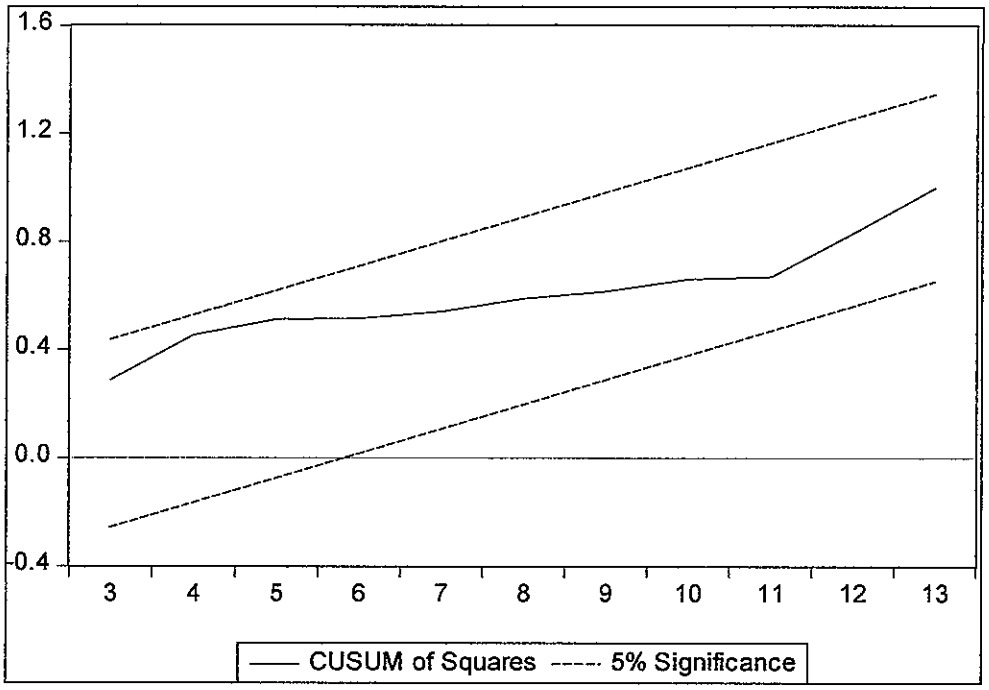

Figure 4.3. Result of CUSUM of Squares Test for the Structural Break in Company B (1)

There is no structural break seen in the graph of CUSUM of squares test.

Table 4.65. Result of Chow Test for the Structural Break in Company B (1)

Chow Breakpoint Test: 2005			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	0.808259	Prob. F(2,9)	**0.4755**
Log likelihood ratio	2.147425	Prob. Chi-Square(2)	0.3417
Wald Statistic	1.616518	Prob. Chi-Square(2)	0.4456

H0 cannot be rejected because p=0,4755 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in the secondary (finished goods) manufacturing node of supply chain structure and business performance for Company B.

Company C:

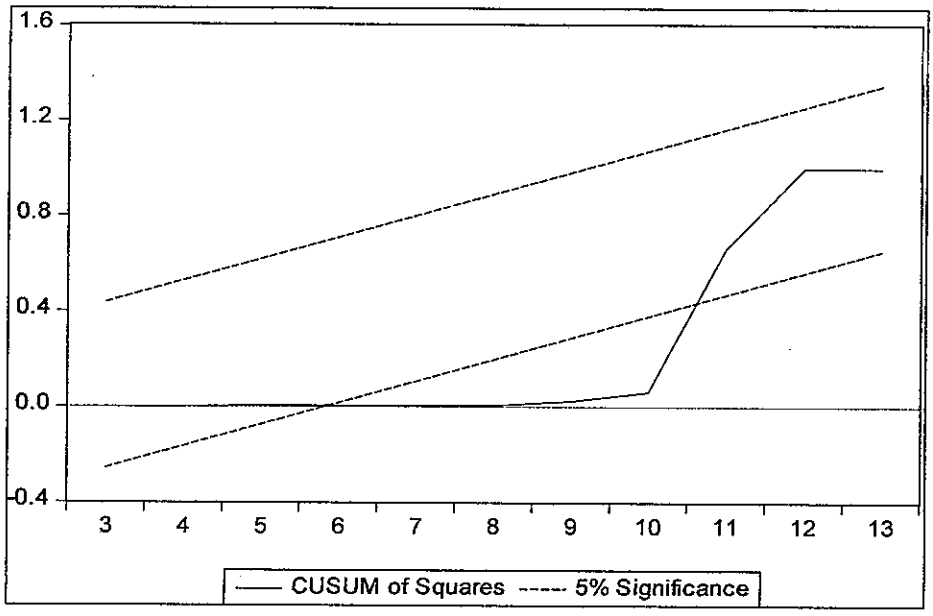

Figure 4.4. Result of CUSUM of Squares Test for the Structural Break in Company C (1)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.66. Result of Chow Test for the Structural Break in Company C (1)

Chow Breakpoint Test: 2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	63.74385	Prob. F(2,9)	**0.0000**
Log likelihood ratio	35.34713	Prob. Chi-Square(2)	0.0000
Wald Statistic	127.4877	Prob. Chi-Square(2)	0.0000

H0 is rejected because p=0,0000 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in the secondary (finished goods) manufacturing node of supply chain structure and business performance for Company C.

Company D:

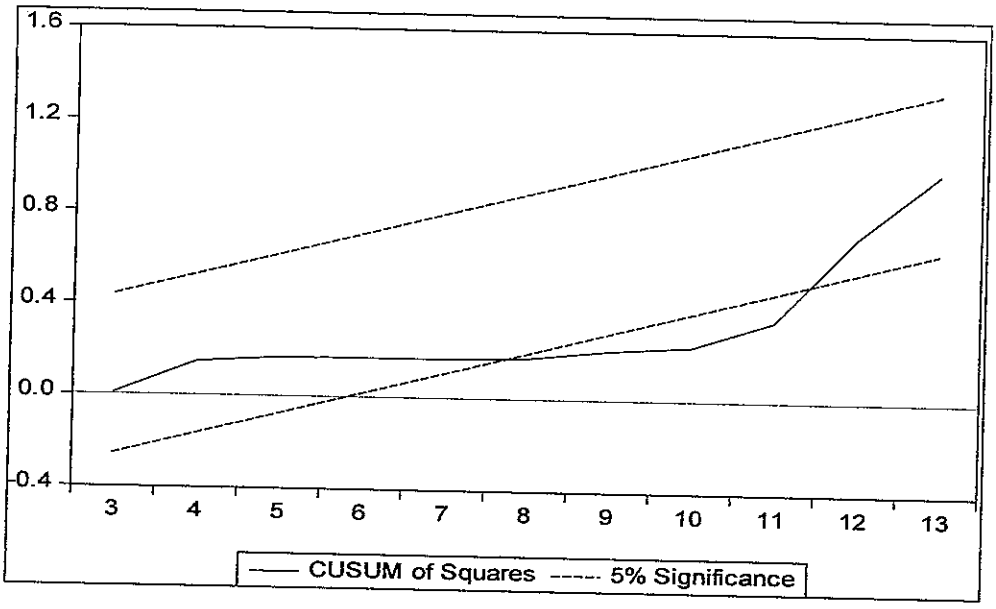

Figure 4.5. Result of CUSUM of Squares Test for the Structural Break in Company D (1)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.67. Result of Chow Test for the Structural Break in Company D (1)

Chow Breakpoint Test: 2010			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	13.78001	Prob. F(2,9)	**0.0018**
Log likelihood ratio	18.22250	Prob. Chi-Square(2)	0.0001
Wald Statistic	27.56001	Prob. Chi-Square(2)	0.0000

H0 is rejected because p=0,0018 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in the secondary (finished goods) manufacturing node of supply chain structure and business performance for Company D.

Company E:

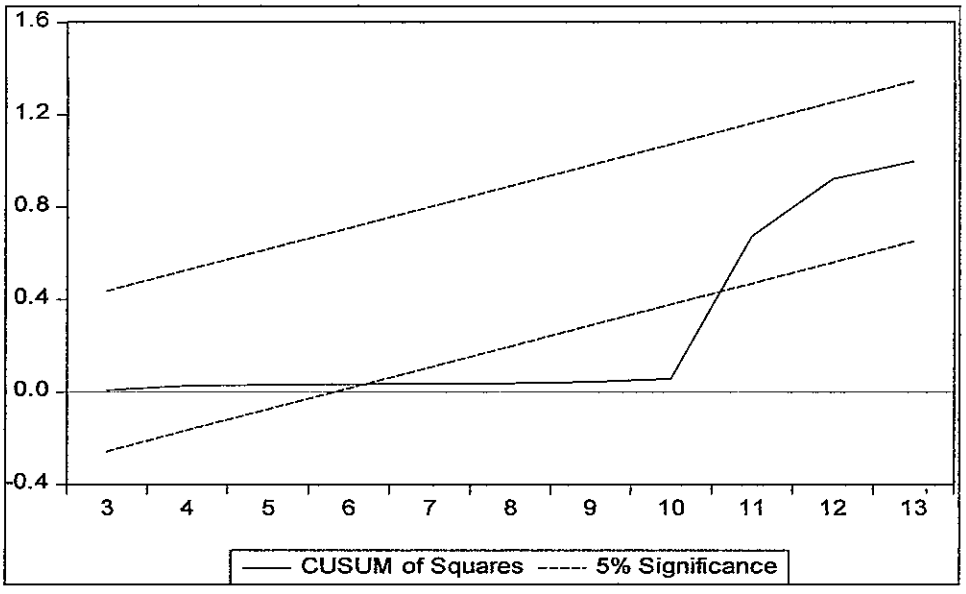

Figure 4.6. Result of CUSUM of Squares Test for the Structural Break in Company E (1)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.68. Result of Chow Test for the Structural Break in Company E (1)

Chow Breakpoint Test: 2006			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	77.43201	Prob. F(2,9)	**0.0000**
Log likelihood ratio	37.72356	Prob. Chi-Square(2)	0.0000
Wald Statistic	154.8640	Prob. Chi-Square(2)	0.0000

H0 is rejected because p=0,0000 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in the secondary (finished goods) manufacturing node of supply chain structure and business performance for Company E.

Company F:

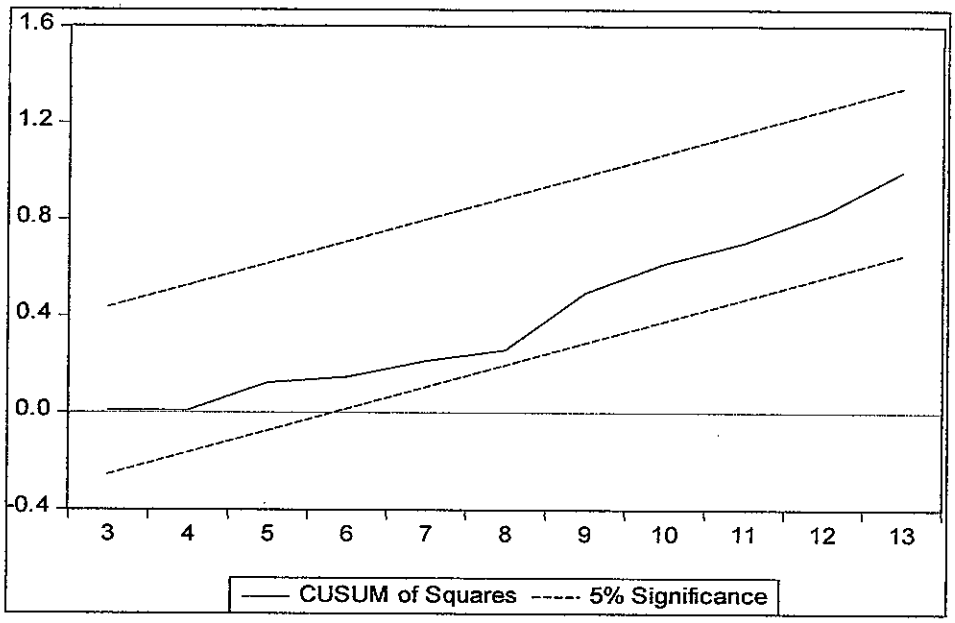

Figure 4.7. Result of CUSUM of Squares Test for the Structural Break in Company F (1)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.69. Result of Chow Test for the Structural Break in Company F (1)

Chow Breakpoint Test: 2005 and 2007			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	30.26386	Prob. F(4,7)	**0.0002**
Log likelihood ratio	37.78519	Prob. Chi-Square(4)	0.0000
Wald Statistic	121.0555	Prob. Chi-Square(4)	0.0000

Even there was no structural break seen in the result of CUSUM of squares test, the result of the Chow test indicates the opposite. H0 is rejected because p=0,0000 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, structural breaks happened in the specified years. Accordingly it can be indicated that there is a significant relationship between the changes in the secondary (finished goods) manufacturing node of supply chain structure and business performance for Company F.

Company G:

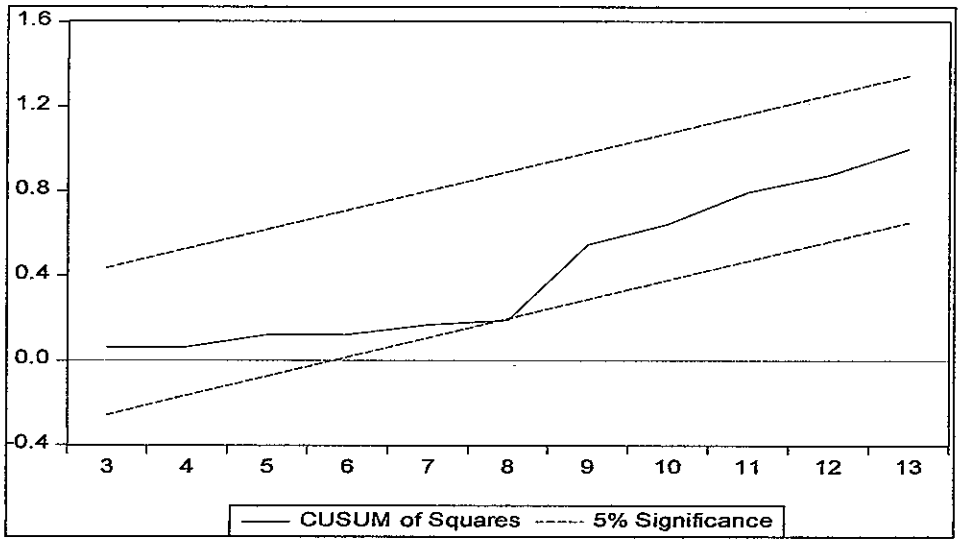

Figure 4.8. Result of CUSUM of Squares Test for the Structural Break in Company G (1)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.70. Result of Chow Test for the Structural Break in Company G (1)

Chow Breakpoint Test: 2003			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	0.208691	Prob. F(2,9)	**0.8155**
Log likelihood ratio	0.589324	Prob. Chi-Square(2)	0.7448
Wald Statistic	0.417383	Prob. Chi-Square(2)	0.8116

H0 cannot be rejected because p=0,8155 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in the secondary (finished goods) manufacturing node of supply chain structure and business performance for Company G.

Company H:

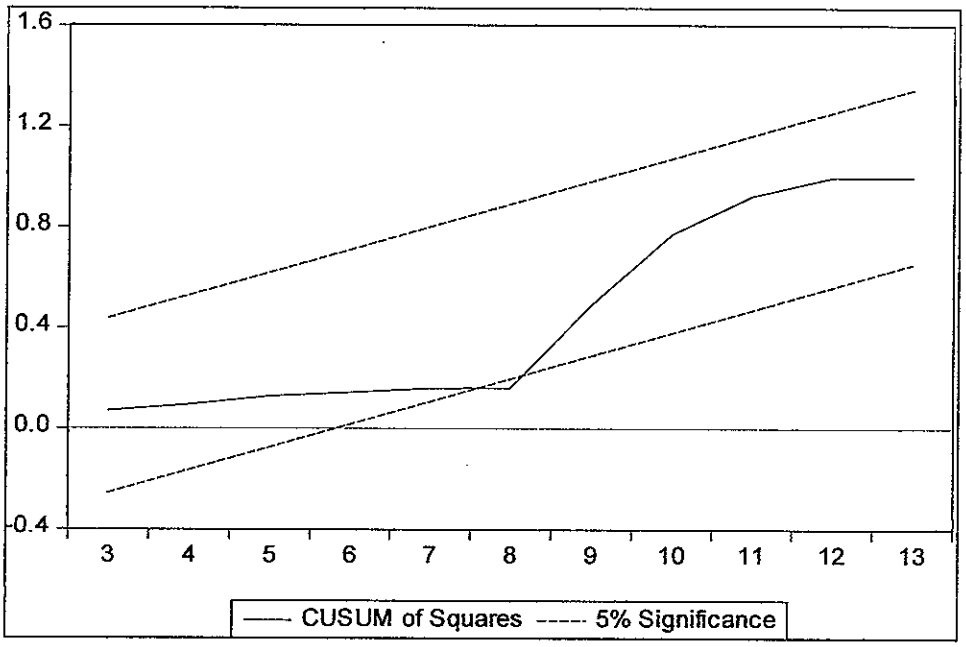

Figure 4.9. Result of CUSUM of Squares Test for the Structural Break in Company H (1)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.71. Result of Chow Test for the Structural Break in Company H (1)

Chow Breakpoint Test: 2007			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	6.756065	Prob. F(2,9)	**0.0162**
Log likelihood ratio	11.91879	Prob. Chi-Square(2)	0.0026
Wald Statistic	13.51213	Prob. Chi-Square(2)	0.0012

H0 is rejected because p=0,0162 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in the secondary (finished goods) manufacturing node of supply chain structure and business performance for Company H.

Company I:

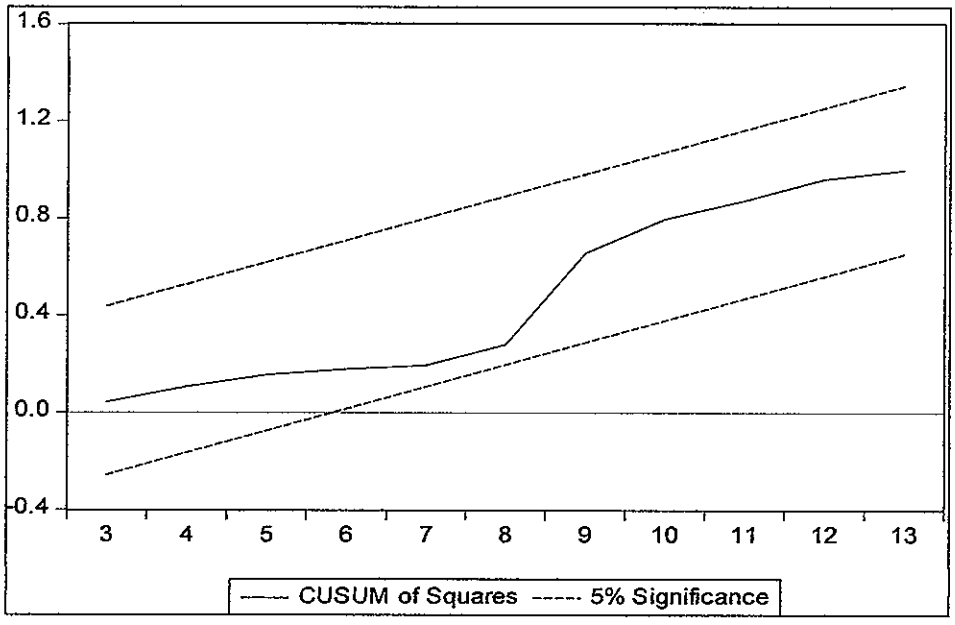

Figure 4.10. Result of CUSUM of Squares Test for the Structural Break in Company I (1)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.72. Result of Chow Test for the Structural Break in Company I (1)

Chow Breakpoint Test: 2010			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	*2.302549*	Prob. F(2,9)	**0.1558**
Log likelihood ratio	5.371861	Prob. Chi-Square(2)	0.0682
Wald Statistic	4.605099	Prob. Chi-Square(2)	0.1000

H0 cannot be rejected because p=0,1558 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in the secondary (finished goods) manufacturing node of supply chain structure and business performance for Company I.

Company J:

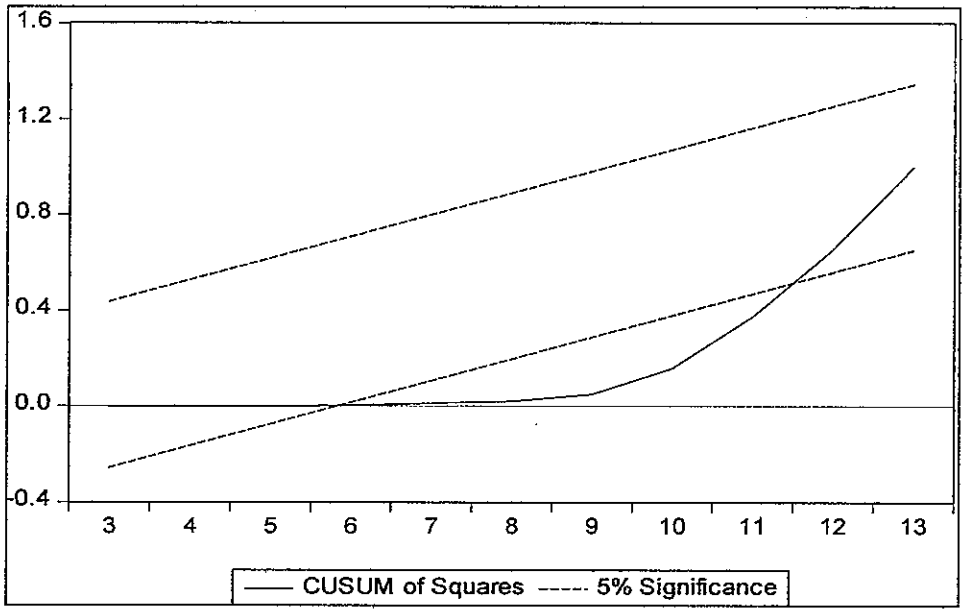

Figure 4.11. Result of CUSUM of Squares Test for the Structural Break in Company J (1)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.73. Result of Chow Test for the Structural Break in Company J (1)

Chow Breakpoint Test: 2012			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	7.487507	Prob. F(2,9)	**0.0122**
Log likelihood ratio	12.73724	Prob. Chi-Square(2)	0.0017
Wald Statistic	14.97501	Prob. Chi-Square(2)	0.0006

H0 is rejected because p=0,0122 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in the secondary (finished goods) manufacturing node of supply chain structure and business performance for Company J.

Company K:

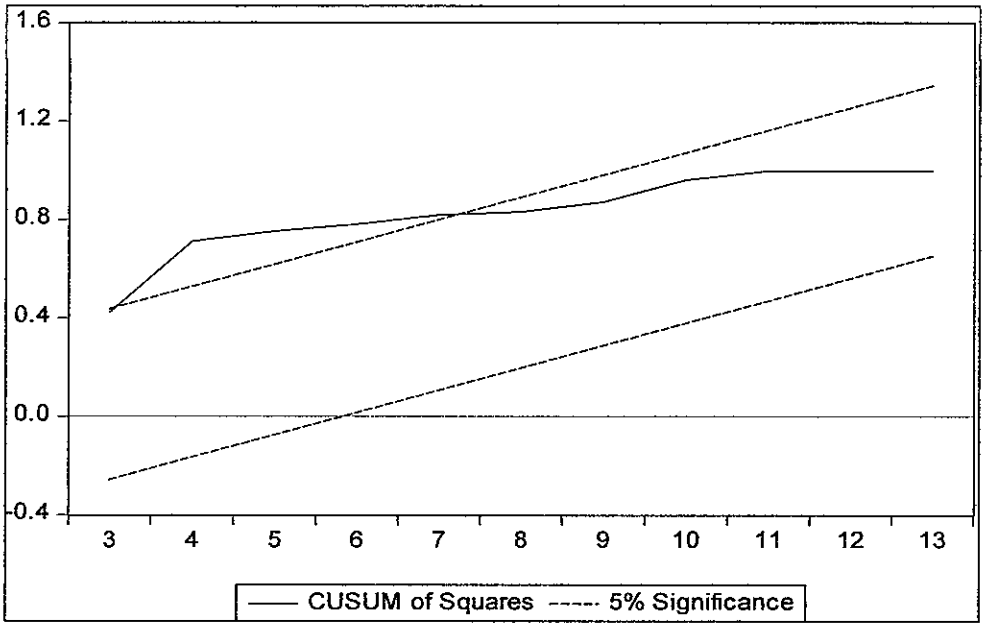

Figure 4.12. Result of CUSUM of Squares Test for the Structural Break in Company K (1)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.74. Result of Chow Test for the Structural Break in Company K (1)

Chow Breakpoint Test: 2007			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	0.733875	Prob. F(2,9)	**0.5067**
Log likelihood ratio	1.963970	Prob. Chi-Square(2)	0.3746
Wald Statistic	1.467751	Prob. Chi-Square(2)	0.4800

Even there was a structural break seen in the result of CUSUM of squares test, the result of the Chow test indicates the opposite. H0 cannot be rejected because p=0,5067 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the changes in the secondary (finished goods) manufacturing node of supply chain structure and business performance for Company K.

In total, 11 different companies, for which changes in the secondary manufacturing node of the supply chain structure happened, were investigated severally using structural break analysis. The results showed that structural breaks were determined in 6 companies and there were no structural breaks seen in 5 companies. According to these outcomes, it is not possible to make a generalization for the group and reason concretely whether there is a significant relationship between the change in the secondary manufacturing node of the supply chain structure and business performance or not, on the contrary it can be indicated that it is possible to observe both a significant relationship and no significant relationship as changing per company.

Table 4.75. Companies and Statuses of Structural Breaks in Secondary (Finished Goods) Manufacturing Node

Companies	Statuses of structural breaks
Company A	No
Company B	No
Company C	Yes
Company D	Yes
Company E	Yes
Company F	Yes
Company G	No
Company H	Yes
Company I	No
Company J	Yes
Company K	No

H10. There is a significant relationship between the change in the toll manufacturing node of supply chain structure and business performance.

H_0: No structural break happened in a specific year according to the change in the toll manufacturing node of the supply chain structure.

H_1: A structural break happened in a specific year according to the change in the toll manufacturing node of the supply chain structure.

Table 4.76. Companies and Years of Changes in the Toll Manufacturing Node

Companies	Year of change
Company A	2007
Company F	2008
Company L	2012
Company M	2010
Company N	2012

CUSUM of squares and Chow tests were carried out severally to detect the structural breaks in each of these companies . Obtained results are given as follows:

Company A:

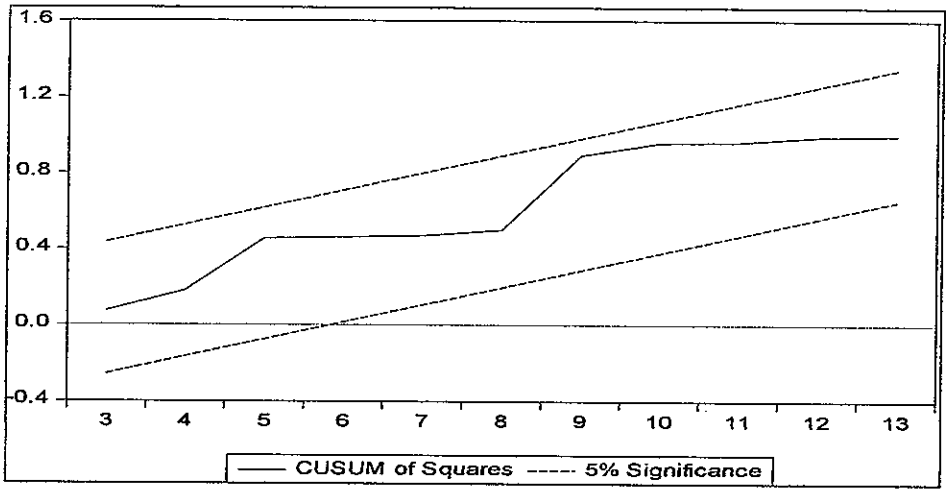

Figure 4.13. Result of CUSUM of Squares Test for the Structural Break in Company A (3)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.77. Result of Chow Test for the Structural Break in Company A (3)

Chow Breakpoint Test: 2007			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	3.006760	Prob. F(2,9)	**0.1000**
Log likelihood ratio	6.652445	Prob. Chi-Square(2)	0.0359
Wald Statistic	6.013520	Prob. Chi-Square(2)	0.0495

H0 cannot be rejected because p=0,1 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in the toll manufacturing node of supply chain structure and business performance for Company A.

Company F:

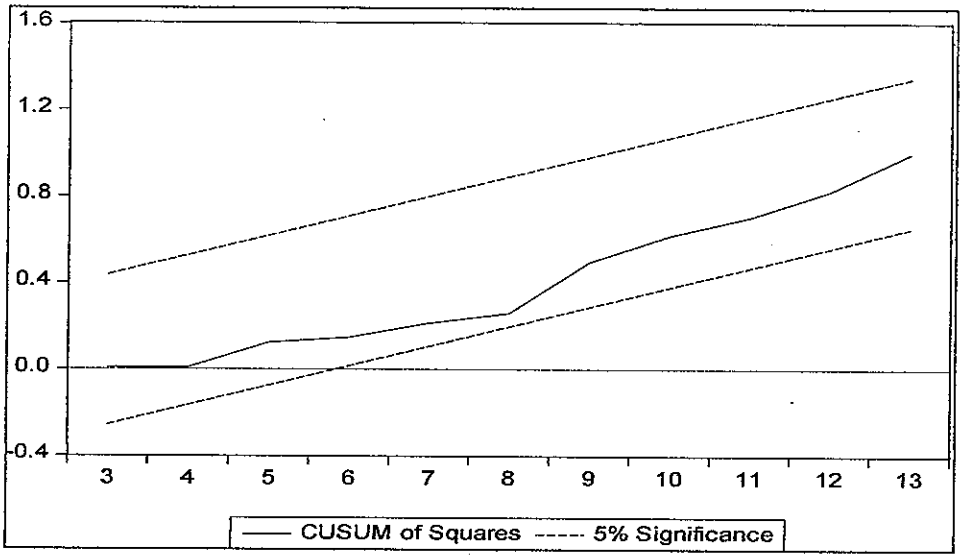

Figure 4.14. Result of CUSUM of Squares Test for the Structural Break in Company F (2)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.78. Result of Chow Test for the Structural Break in Company F (2)

Chow Breakpoint Test: 2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	13.95381	Prob. F(2,9)	**0.0017**
Log likelihood ratio	18.34551	Prob. Chi-Square(2)	0.0001
Wald Statistic	27.90762	Prob. Chi-Square(2)	0.0000

Even there was no structural break seen in the result of CUSUM of squares test, the result of the Chow test indicates the opposite. H0 is rejected because p=0,0017 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the changes in the toll manufacturing node of supply chain structure and business performance for Company F.

Company L:

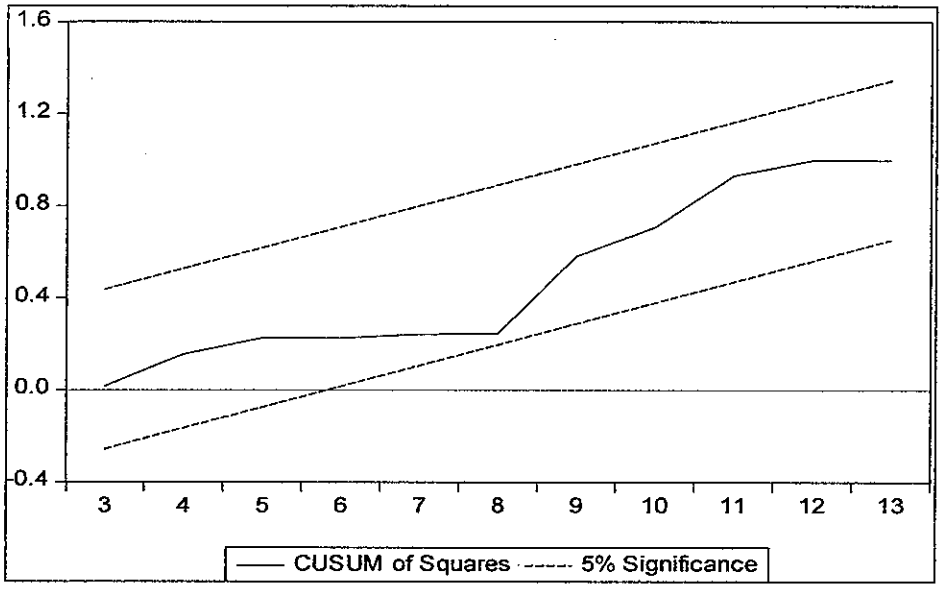

Figure 4.15. Result of CUSUM of Squares Test for the Structural Break in Company L (1)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.79. Result of Chow Test for the Structural Break in Company L (1)

Chow Breakpoint Test: 2012			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	0.323641	Prob. F(2,9)	**0.7316**
Log likelihood ratio	0.902871	Prob. Chi-Square(2)	0.6367
Wald Statistic	0.647282	Prob. Chi-Square(2)	0.7235

H0 cannot be rejected because p=0,7316 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in the toll manufacturing node of supply chain structure and business performance for Company L.

Company M:

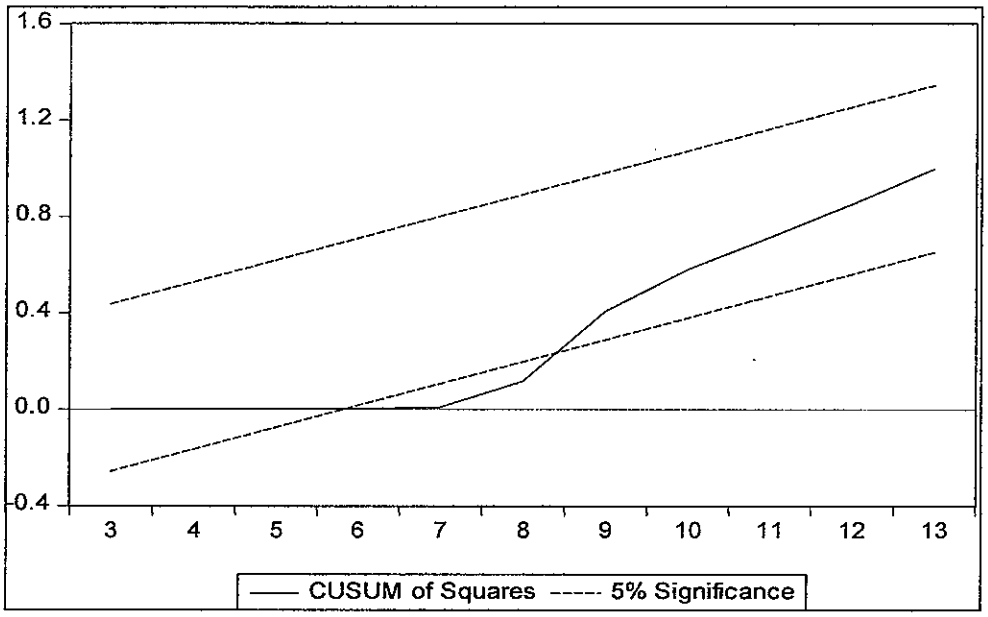

Figure 4.16. Result of CUSUM of Squares Test for the Structural Break in Company M (1)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.80. Result of Chow Test for the Structural Break in Company M (1)

Chow Breakpoint Test: 2010			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	6.514920	Prob. F(2,9)	**0.0178**
Log likelihood ratio	11.63725	Prob. Chi-Square(2)	0.0030
Wald Statistic	13.02984	Prob. Chi-Square(2)	0.0015

H0 is rejected because p=0,0178 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in the toll manufacturing node of supply chain structure and business performance for Company M.

Company N:

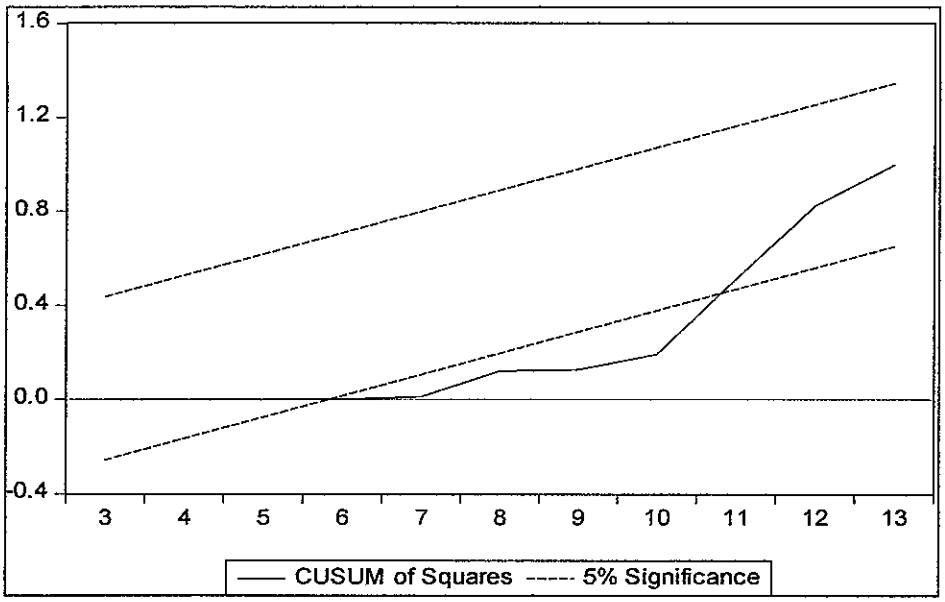

Figure 4.17. Result of CUSUM of Squares Test for the Structural Break in Company N (1)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.81. Result of Chow Test for the Structural Break in Company N (1)

Chow Breakpoint Test: 2012			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	4.253459	Prob. F(2,9)	**0.0501**
Log likelihood ratio	8.649830	Prob. Chi-Square(2)	0.0132
Wald Statistic	8.506917	Prob. Chi-Square(2)	0.0142

Even there was a structural break seen in the result of CUSUM of squares test, the result of the Chow test indicates the opposite. H0 cannot be rejected because p=0,0501 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the changes in the toll manufacturing node of supply chain structure and business performance for Company N, but it should be

considered that H0 is rejected in the Chow test with a very little difference in the probability.

In total, 5 different companies, for which changes in the toll manufacturing node of the supply chain structure happened, were investigated severally using structural break analysis. The results showed that structural breaks were determined in 2 companies and there were no structural breaks seen in 3 companies. According to these outcomes, it is not possible to make a generalization for the group and reason concretely whether there is a significant relationship between the change in the toll manufacturing node of the supply chain structure and business performance or not, on the contrary it can be indicated that it is possible to observe both a significant relationship and no significant relationship as changing per company.

Table 4.82. Companies and Statuses of Structural Breaks in Toll Manufacturing Node

Companies	**Statuses of structural breaks**
Company A	No
Company F	Yes
Company L	No
Company M	Yes
Company N	No

H11. There is a *significant relationship between the change in warehousing and* distribution node of supply chain structure, and business performance.

H0: No structural break happened in a specific year according to the change in the warehousing and distribution node of the supply chain structure.

H1: A structural break happened in a specific year according to the change in the warehousing and distribution node of the supply chain structure.

Table 4.83. Companies and Years of Changes in Warehousing and Distribution Node

Companies	Year of change
Company Z	2008 and 2013
Company I	2010
Company C	2008
Company A	2011
Company Q	2011
Company R	2011
Company D	2010
Company E	2012
Company P	2011
Company H	2007
Company S	2009
Company T	2010

CUSUM of squares and Chow tests were carried out severally to detect the structural breaks in each of these companies. Obtained results are given as follows:

Company Z:

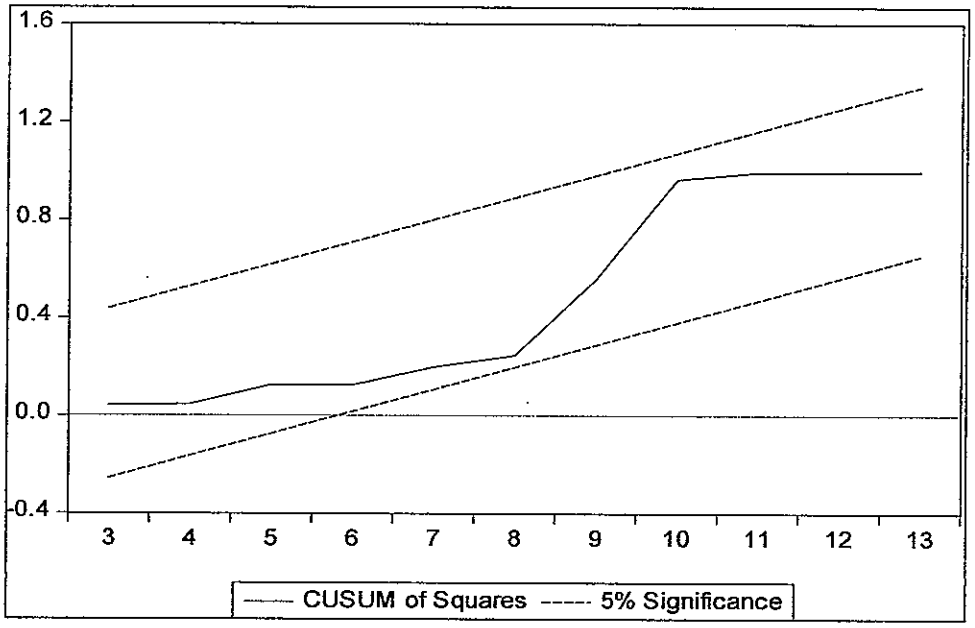

Figure 4.18. Result of CUSUM of Squares Test for the Structural Break in Company Z (1)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.84. Result of Chow Test for the Structural Break in Company Z (1)

Chow Breakpoint Test: 2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	6.620668	Prob. F(2,9)	**0.0171**
Log likelihood ratio	11.76146	Prob. Chi-Square(2)	0.0028
Wald Statistic	13.24134	Prob. Chi-Square(2)	0.0013

Even there was no structural break seen in the result of CUSUM of squares test, the result of the Chow test indicates the opposite. H0 is rejected because p=0,0171 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the changes in the warehousing and distribution node of supply chain structure and business performance for Company Z.

Company I:

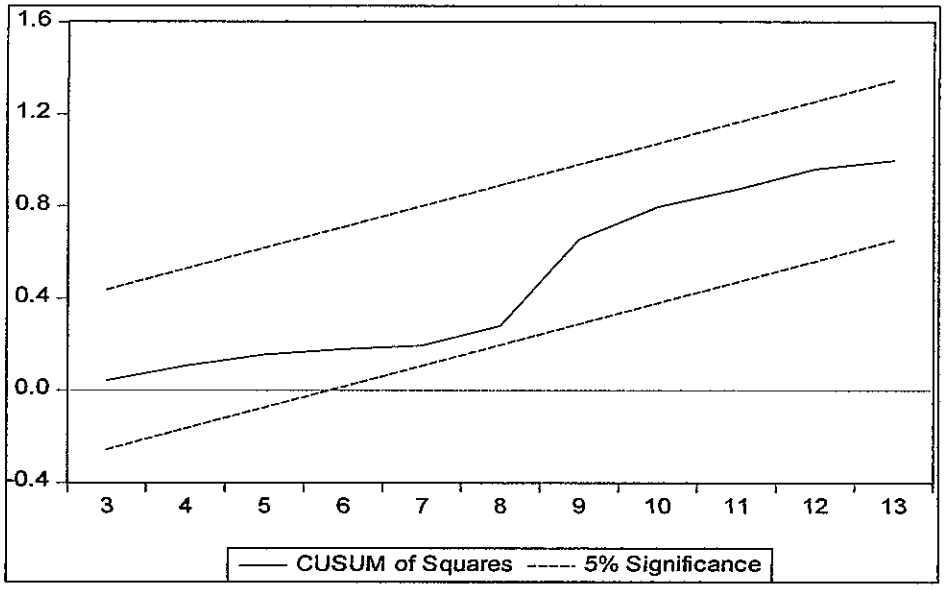

Figure 4.19. Result of CUSUM of Squares Test for the Structural Break in Company I (2)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.85. Result of Chow Test for the Structural Break in Company I (2)

Chow Breakpoint Test: 2010			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	2.302549	Prob. F(2,9)	**0.1558**
Log likelihood ratio	5.371861	Prob. Chi-Square(2)	0.0682
Wald Statistic	4.605099	Prob. Chi-Square(2)	0.1000

H0 cannot be rejected because p=0,1558 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in the warehousing and distribution node of supply chain structure and business performance for Company I.

Company C:

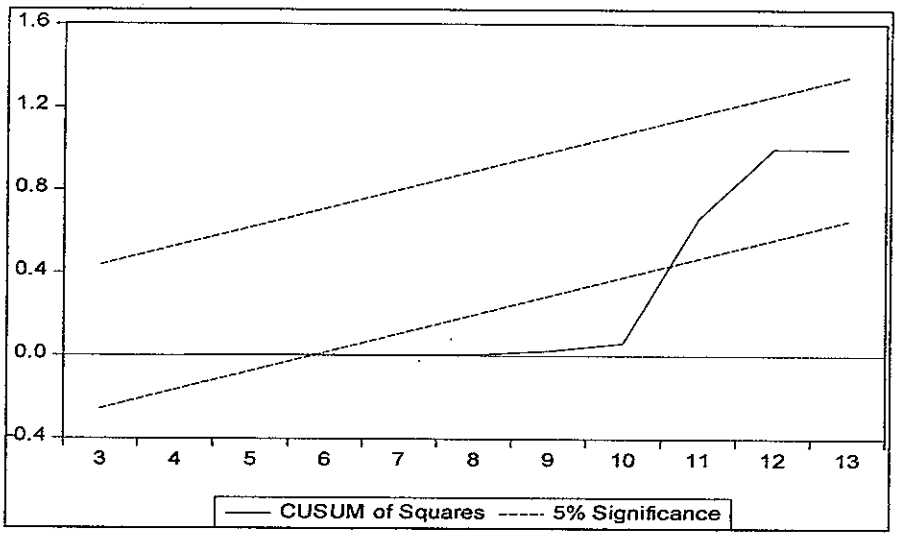

Figure 4.20. Result of CUSUM of Squares Test for the Structural Break in Company C (2)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.86. Result of Chow Test for the Structural Break in Company C (2)

Chow Breakpoint Test: 2008			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	63.74385	Prob. F(2,9)	**0.0000**
Log likelihood ratio	35.34713	Prob. Chi-Square(2)	0.0000
Wald Statistic	127.4877	Prob. Chi-Square(2)	0.0000

H0 is rejected because p=0,0000 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in the warehousing and distribution node of supply chain structure and business performance for Company C.

Company A:

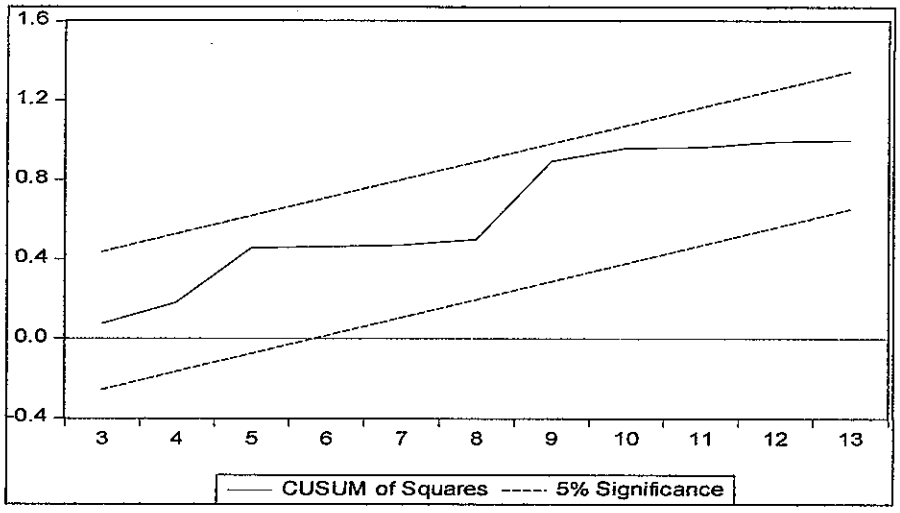

Figure 4.21. Result of CUSUM of Squares Test for the Structural Break in Company A (4)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.87. Result of Chow Test for the Structural Break in Company A (4)

Chow Breakpoint Test: 2011			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	0.179870	Prob. F(2,9)	**0.8383**
Log likelihood ratio	0.509509	Prob. Chi-Square(2)	0.7751
Wald Statistic	0.359741	Prob. Chi-Square(2)	0.8354

H0 cannot be rejected because p=0,8383 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in the warehousing and distribution node of supply chain structure and business performance for Company A.

Company Q:

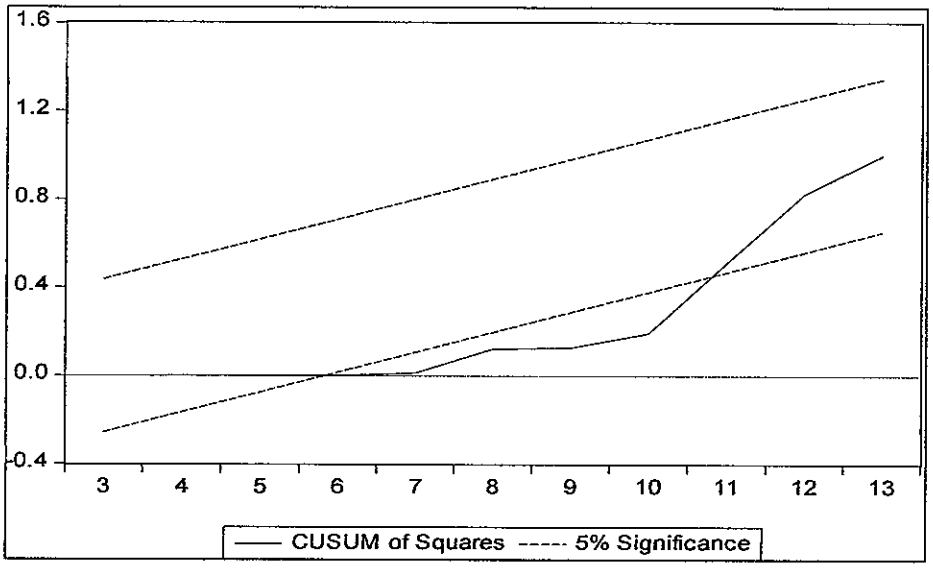

Figure 4.22. Result of CUSUM of Squares Test for the Structural Break in Company Q (1)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.88. Result of Chow Test for the Structural Break in Company Q (1)

Chow Breakpoint Test: 2011			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	5.855476	Prob. F(2,9)	**0.0235**
Log likelihood ratio	10.83469	Prob. Chi-Square(2)	0.0044
Wald Statistic	11.71095	Prob. Chi-Square(2)	0.0029

H0 is rejected because p=0,0235 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in the warehousing and distribution node of supply chain structure and business performance for Company Q.

Company R:

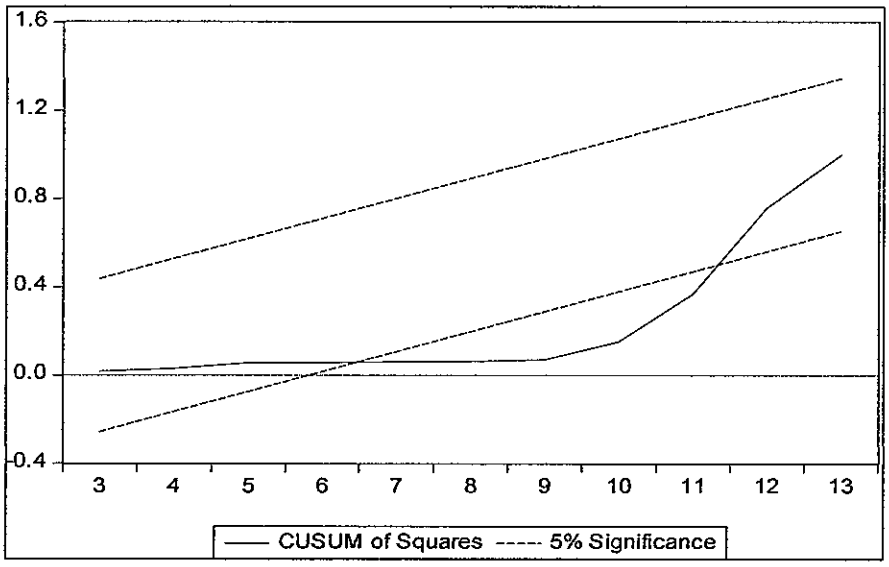

Figure 4.23. Result of CUSUM of Squares Test for the Structural Break in Company R (1)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.89. Result of Chow Test for the Structural Break in Company R (1)

Chow Breakpoint Test: 2011			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	21.37825	Prob. F(2,9)	**0.0004**
Log likelihood ratio	22.74123	Prob. Chi-Square(2)	0.0000
Wald Statistic	42.75650	Prob. Chi-Square(2)	0.0000

H0 is rejected because p=0,0004 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in the warehousing and distribution node of supply chain structure and business performance for Company R.

Company D:

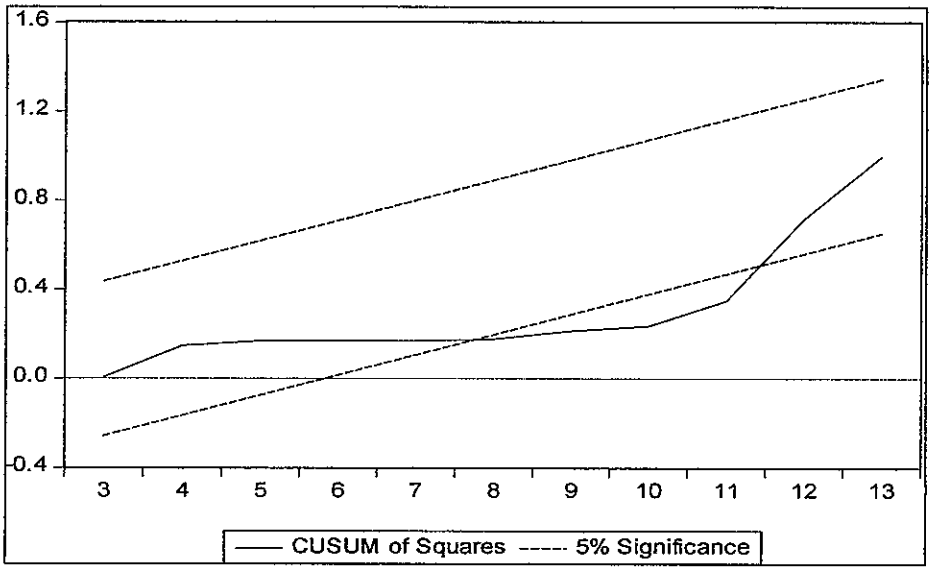

Figure 4.24. Result of CUSUM of Squares Test for the Structural Break in Company D (2)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.90. Result of Chow Test for the Structural Break in Company D (2)

Chow Breakpoint Test: 2010			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	*13.78001*	Prob. F(2,9)	***0.0018***
Log likelihood ratio	18.22250	Prob. Chi-Square(2)	0.0001
Wald Statistic	27.56001	Prob. Chi-Square(2)	0.0000

H0 is rejected because p=0,0018 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in the warehousing and distribution node of supply chain structure and business performance for Company D.

Company E:

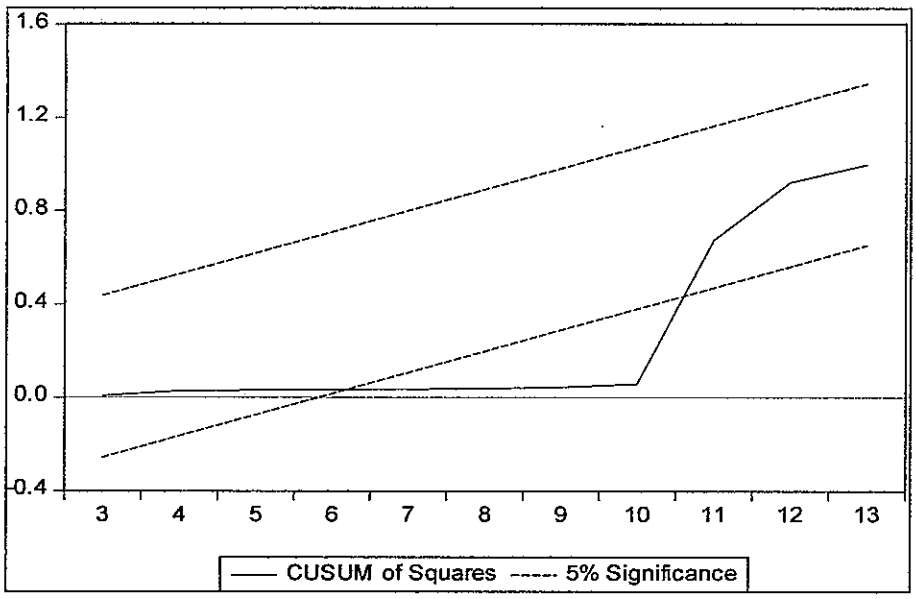

Figure 4.25. Result of CUSUM of Squares Test for the Structural Break in Company E (2)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.91. Result of Chow Test for the Structural Break in Company E (2)

Chow Breakpoint Test: 2012			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	*2.154827*	Prob. *F(2,9)*	***0.1719***
Log likelihood ratio	5.086447	Prob. Chi-Square(2)	0.0786
Wald Statistic	4.309655	Prob. Chi-Square(2)	0.1159

Even there was a structural break seen in the result of CUSUM of squares test, the result of the Chow test indicates the opposite. H0 cannot be rejected because p=0,1719 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the changes in the warehousing and distribution node of supply chain structure and business performance for Company E.

Company P:

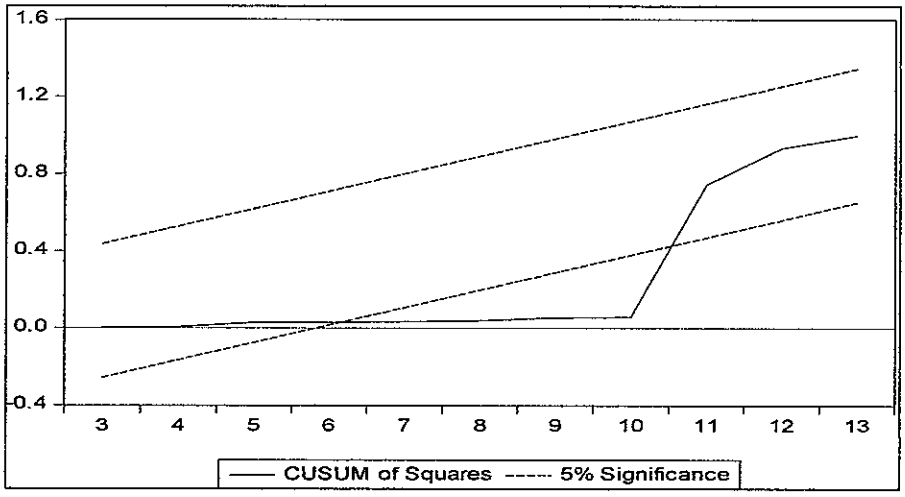

Figure 4.26. Result of CUSUM of Squares Test for the Structural Break in Company P (1)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.92. Result of Chow Test for the Structural Break in Company P (1)

Chow Breakpoint Test: 2011			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	*69.49574*	Prob. F(2,9)	**0.0000**
Log likelihood ratio	36.39909	Prob. Chi-Square(2)	0.0000
Wald Statistic	138.9915	Prob. Chi-Square(2)	0.0000

H0 is rejected because p=0,0000 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in the warehousing and distribution node of supply chain structure and business performance for Company P.

Company H:

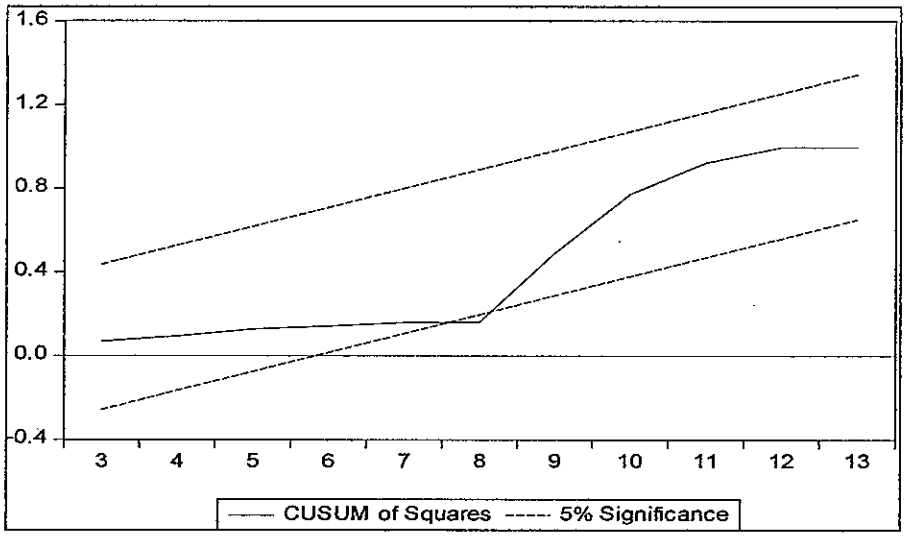

Figure 4.27. Result of CUSUM of Squares Test for the Structural Break in Company H (2)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.93. Result of Chow Test for the Structural Break in Company H (2)

Chow Breakpoint Test: 2007			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	6.756065	Prob. F(2,9)	**0.0162**
Log likelihood ratio	11.91879	Prob. Chi-Square(2)	0.0026
Wald Statistic	13.51213	Prob. Chi-Square(2)	0.0012

H0 is rejected because p=0,0162 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in the warehousing and distribution node of supply chain structure and business performance for Company H.

Company S:

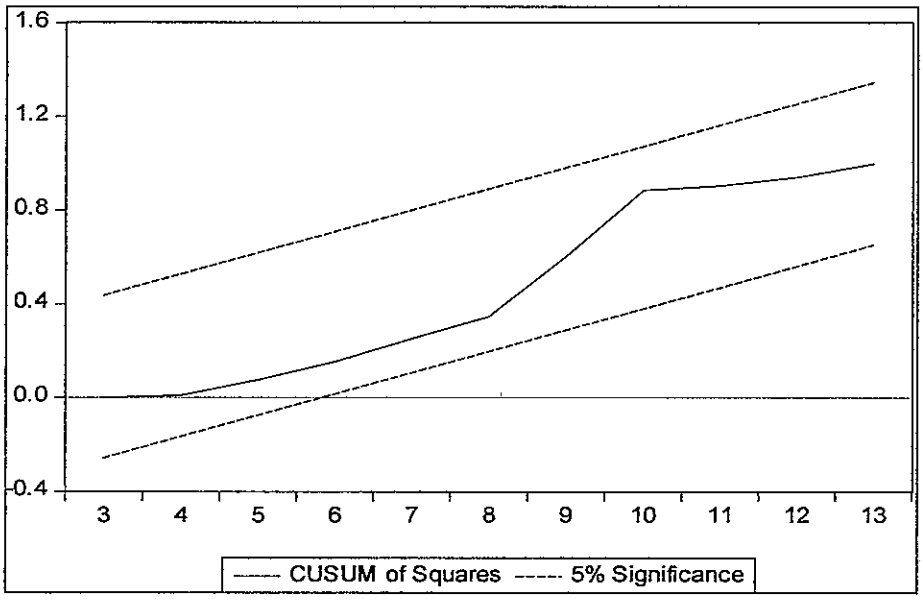

Figure 4.28. Result of CUSUM of Squares Test for the Structural Break in Company S (1)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.94. Result of Chow Test for the Structural Break in Company S (1)

Chow Breakpoint Test: 2009			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	*7.468574*	Prob. F(2,9)	**0.0123**
Log likelihood ratio	12.71669	Prob. Chi-Square(2)	0.0017
Wald Statistic	14.93715	Prob. Chi-Square(2)	0.0006

H0 is rejected because p=0,0123 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in the warehousing and distribution node of supply chain structure and business performance for Company S.

Company T:

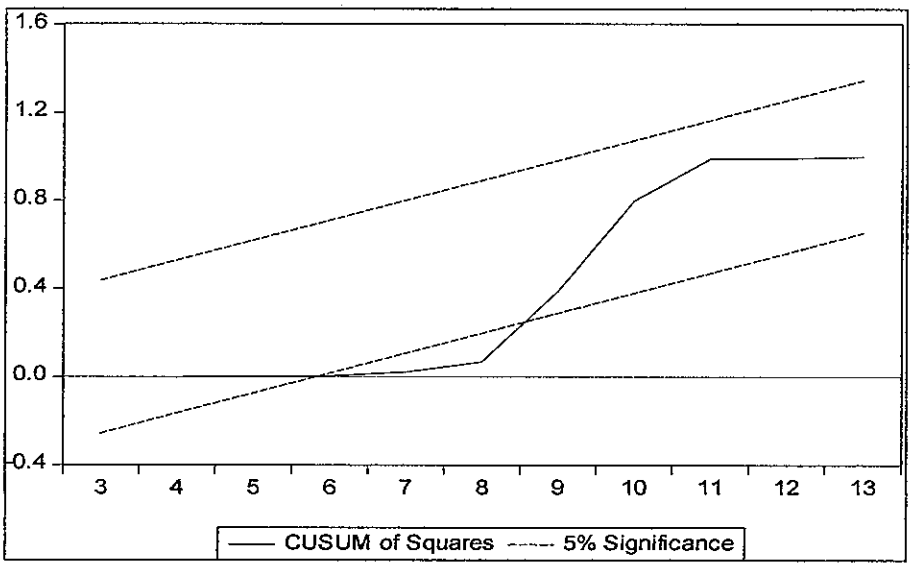

Figure 4.29. Result of CUSUM of Squares Test for the Structural Break in Company T (1)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.95. Result of Chow Test for the Structural Break in Company T (1)

Chow Breakpoint Test: 2010			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	5.633522	Prob. F(2,9)	**0.0259**
Log likelihood ratio	10.55303	Prob. Chi-Square(2)	0.0051
Wald Statistic	11.26704	Prob. Chi-Square(2)	0.0036

H0 is rejected because p=0,0259 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in the warehousing and distribution node of supply chain structure and business performance for Company T.

In total, 12 different companies, for which changes in the warehousing and distribution node of the supply chain structure happened, were investigated severally using structural break analysis. The results showed that structural breaks were determined in 9 companies and there were no structural breaks seen in 3 companies. According to these outcomes, it is not possible to make a generalization for the group and reason concretely whether there is a significant relationship between the change in the warehousing and distribution node of the supply chain structure and business performance or not, on the contrary it can be indicated that it is possible to observe both a significant relationship and no significant relationship as changing per company.

Table 4.96. Companies and Statuses of Structural Breaks in Warehousing and Distribution Node

Companies	Statuses of structural breaks
Company Z	Yes
Company I	No
Company C	Yes
Company A	No
Company Q	Yes
Company R	Yes
Company D	Yes
Company E	No
Company P	Yes
Company H	Yes
Company S	Yes
Company T	Yes

H12. There is a significant relationship between the change in multinationality and business performance.

H_0: No structural break happened in a specific year according to the change in multinationality

H_1: A structural break happened in a specific year according to the change in multinationality

Table 4.97. Companies and Years of Changes in Multinationality

Companies	Year of change
Company I	2003
Company G	2012
Company A	2006
Company Q	2007
Company Y	2006
Company T	2011

CUSUM of squares and Chow tests were carried out severally to detect the structural breaks in each of these companies. Obtained results are given as follows:

Company I:

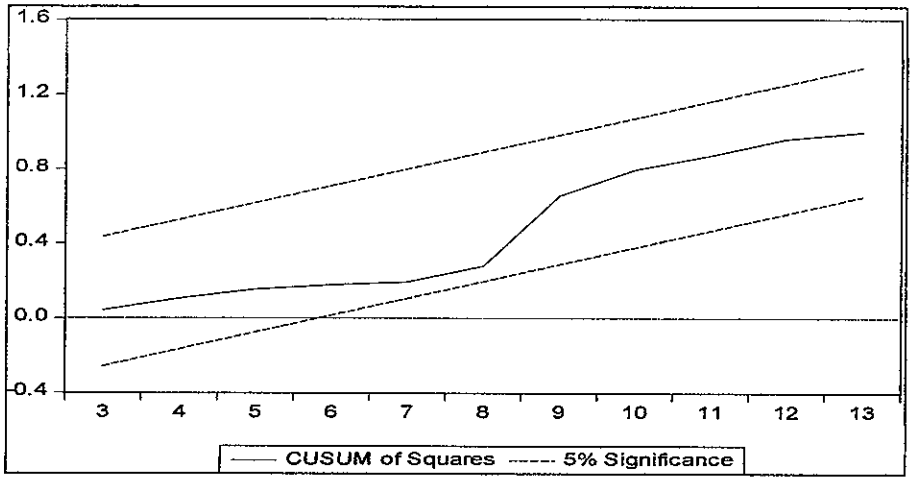

Figure 4.30. Result of CUSUM of Squares Test for the Structural Break in Company I (3)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.98. Result of Chow Test for the Structural Break in Company I (3)

Chow Breakpoint Test: 2003			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	8.867905	Prob. F(2,9)	**0.0075**
Log likelihood ratio	14.15413	Prob. Chi-Square(2)	0.0008
Wald Statistic	17.73581	Prob. Chi-Square(2)	0.0001

Even there was no structural break seen in the result of CUSUM of squares test, the result of the Chow test indicates the opposite. H0 is rejected because p=0,0075 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in multinationality and business performance for Company I.

Company G:

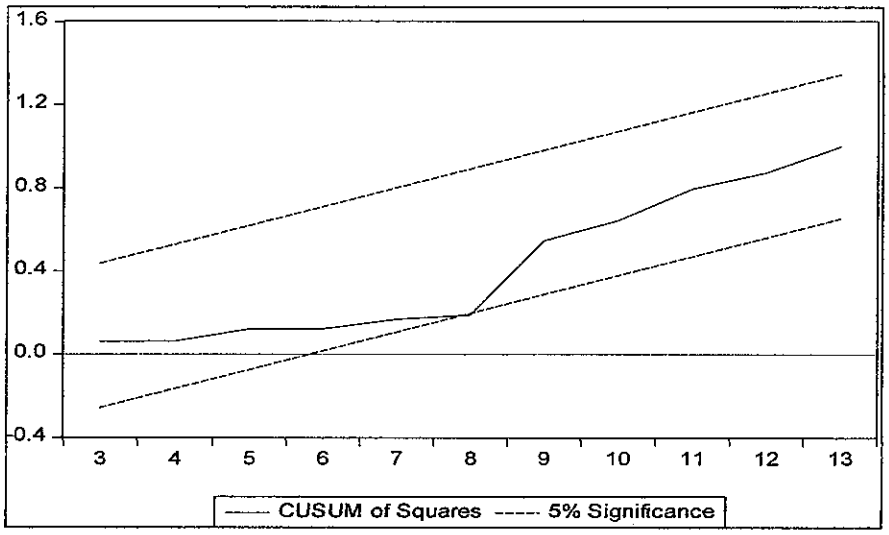

Figure 4.31. Result of CUSUM of Squares Test for the Structural Break in Company G (2)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.99. Result of Chow Test for the Structural Break in Company G (2)

Chow Breakpoint Test: 2012			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	1.144379	Prob. F(2,9)	**0.3607**
Log likelihood ratio	2.945575	Prob. Chi-Square(2)	0.2293
Wald Statistic	2.288757	Prob. Chi-Square(2)	0.3184

H0 cannot be rejected because p=0,3607 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in multinationality and business performance for Company G.

Company A:

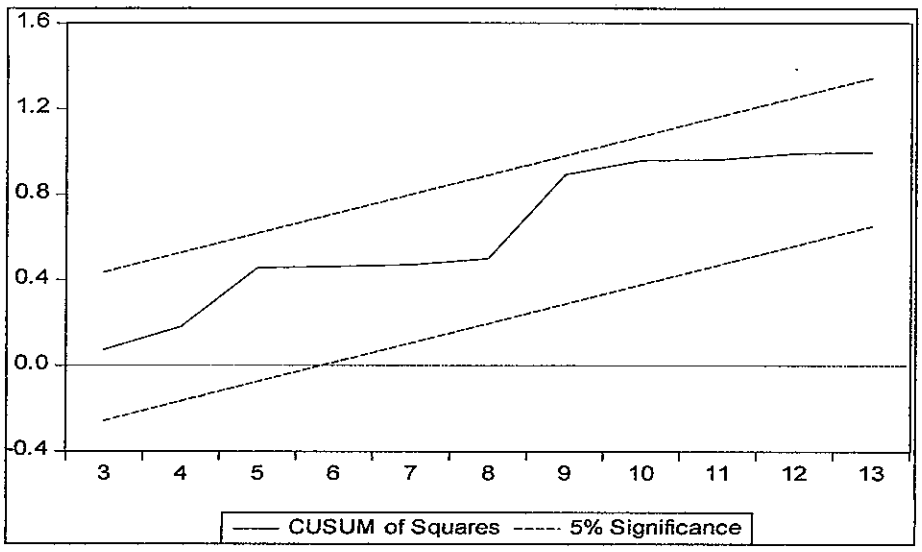

Figure 4.32. Result of CUSUM of Squares Test for the Structural Break in Company A (5)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.100. Result of Chow Test for the Structural Break in Company A (5)

Chow Breakpoint Test: 2006			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	1.932428	Prob. F(2,9)	**0.2003**
Log likelihood ratio	4.644571	Prob. Chi-Square(2)	0.0980
Wald Statistic	3.864856	Prob. Chi-Square(2)	0.1448

H0 cannot be rejected because p=0,2003 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in multinationality and business performance for Company A.

Company Q:

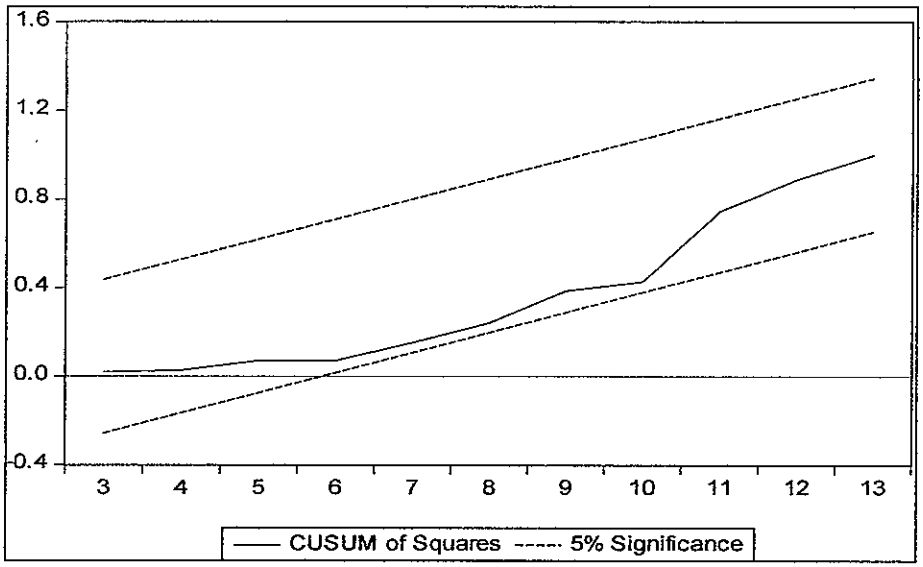

Figure 4.33. Result of CUSUM of Squares Test for the Structural Break in Company Q (2)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.101. Result of Chow Test for the Structural Break in Company Q (2)

Chow Breakpoint Test: 2007			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	36.02686	Prob. F(2,9)	**0.0001**
Log likelihood ratio	28.57254	Prob. Chi-Square(2)	0.0000
Wald Statistic	72.05373	Prob. Chi-Square(2)	0.0000

Even there was no structural break seen in the result of CUSUM of squares test, the result of the Chow test indicates the opposite. H0 is rejected because p=0,0001 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in multinationality and business performance for Company Q.

Company Y:

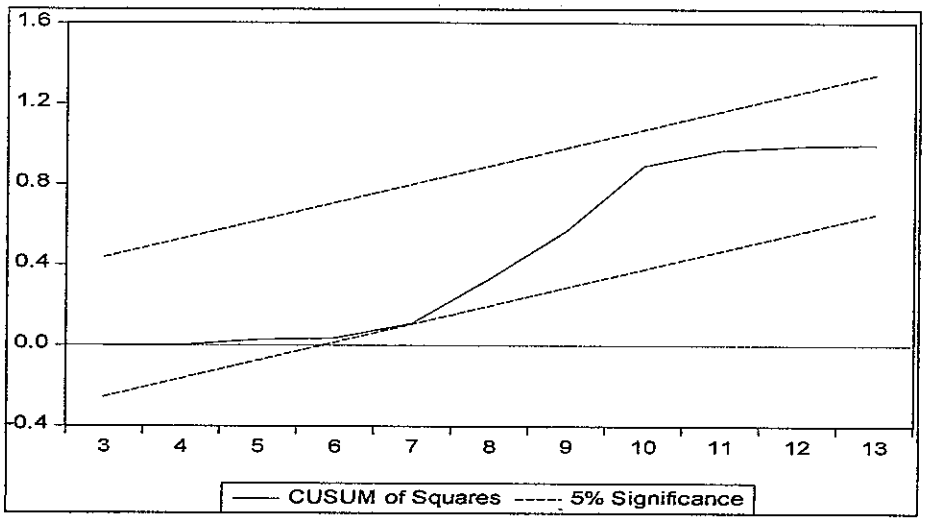

Figure 4.34. Result of CUSUM of Squares Test for the Structural Break in Company Y (1)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.102. Result of Chow Test for the Structural Break in Company Y (1)

Chow Breakpoint Test: 2006			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	6.224143	Prob. F(2,9)	**0.0201**
Log likelihood ratio	11.28946	Prob. Chi-Square(2)	0.0035
Wald Statistic	12.44829	Prob. Chi-Square(2)	0.0020

Even there was no structural break seen in the result of CUSUM of squares test, the result of the Chow test indicates the opposite. H0 is rejected because p=0,0201 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in multinationality and business performance for Company Y.

Company T:

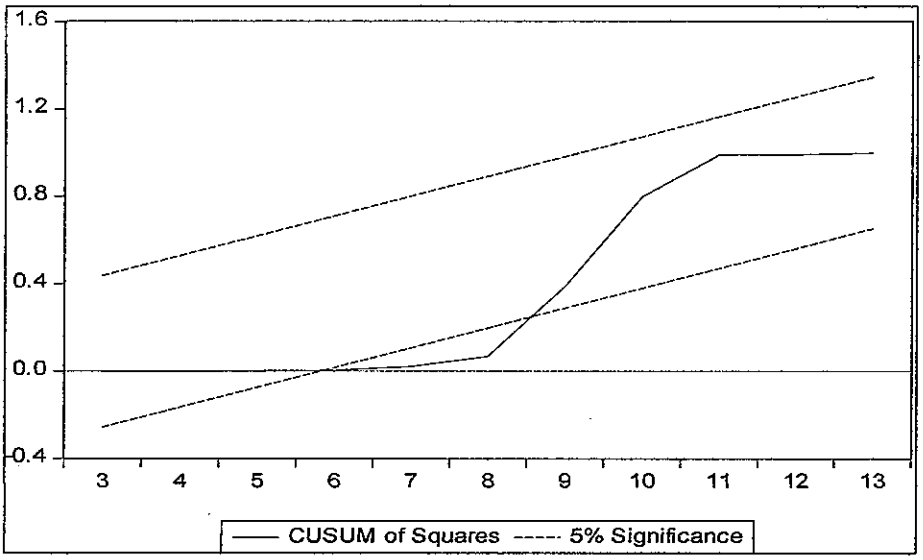

Figure 4.35. Result of CUSUM of Squares Test for the Structural Break in Company T (2)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.103. Result of Chow Test for the Structural Break in Company T (2)

Chow Breakpoint Test: 2011			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	0.821406	Prob. F(2,9)	**0.4703**
Log likelihood ratio	2.179583	Prob. Chi-Square(2)	0.3363
Wald Statistic	1.642813	Prob. Chi-Square(2)	0.4398

H0 cannot be rejected because p=0,4703 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in multinationality and business performance for Company T.

In total, 6 different companies, for which changes in multinationality happened, were investigated severally using structural break analysis. The results showed that structural breaks were determined in 3 companies and there were no structural breaks seen in 3

companies. According to these outcomes, it is not possible to make a generalization for the group and reason concretely whether there is a significant relationship between the change in multinationality and business performance or not, on the contrary it can be indicated that it is possible to observe both a significant relationship and no significant relationship as changing per company.

Table 4.104. Companies and Statuses of Structural Breaks in Multinationality

Companies	Statuses of structural breaks
Company I	Yes
Company G	No
Company A	Yes
Company Q	No
Company Y	Yes
Company T	No

H13. There is a significant relationship between the change in ownership structure and business performance.

H0: No structural break happened in a specific year according to the change in ownership structure

H1: A structural break happened in a specific year according to the change in ownership structure

Table 4.105. Companies and Years of Changes in Ownership Structure

Companies	Year of change
Company A	2006
Company L	2007
Company G	2012
Company Q	2007
Company Y	2006
Company I	2003
Company T	2011
Company X	2011
Company K	2012
Company V	2011

CUSUM of squares and Chow tests were carried out severally to detect the structural breaks in each of these companies. Obtained results are given as follows:

Company A:

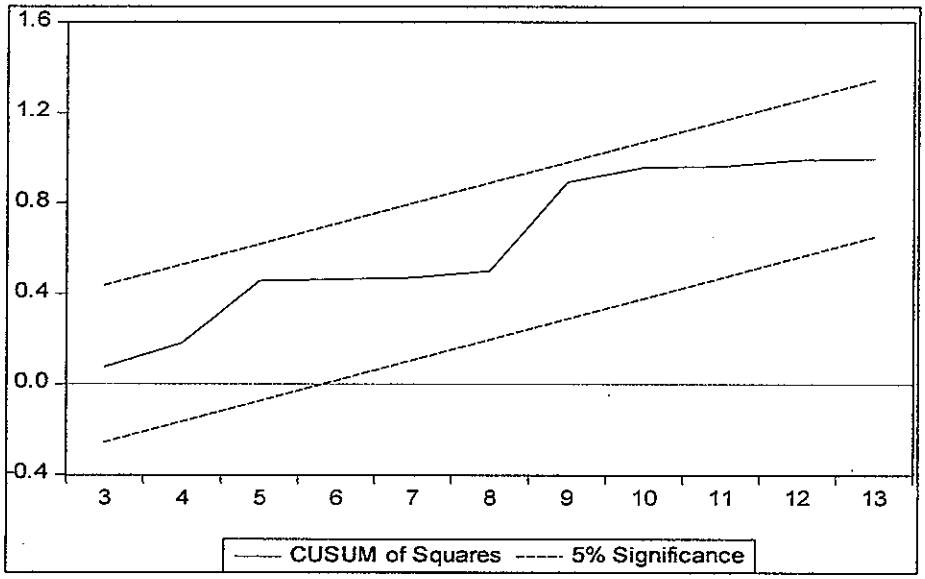

Figure 4.36. Result of CUSUM of Squares Test for the Structural Break in Company A (6)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.106. Result of Chow Test for the Structural Break in Company A (6)

Chow Breakpoint Test: 2006			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	1.932428	Prob. F(2,9)	**0.2003**
Log likelihood ratio	4.644571	Prob. Chi-Square(2)	0.0980
Wald Statistic	3.864856	Prob. Chi-Square(2)	0.1448

H0 cannot be rejected because p=0,2003 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in ownership structure and business performance for Company A.

Company L:

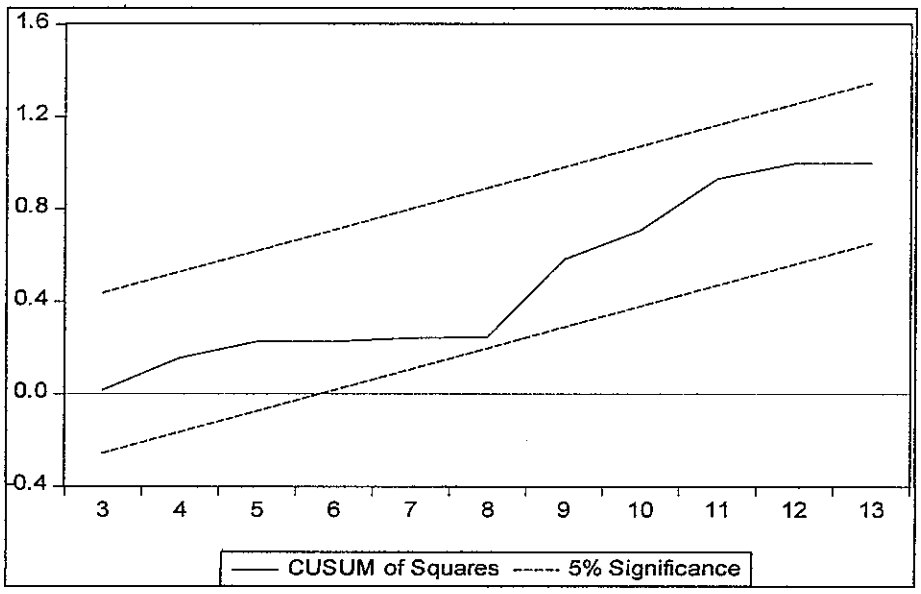

Figure 4.37. Result of CUSUM of Squares Test for the Structural Break in Company L (2)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.107. Result of Chow Test for the Structural Break in Company L (2)

Chow Breakpoint Test: 2007			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	5.572554	Prob. F(2,9)	**0.0266**
Log likelihood ratio	10.47458	Prob. Chi-Square(2)	0.0053
Wald Statistic	11.14511	Prob. Chi-Square(2)	0.0038

Even there was no structural break seen in the result of CUSUM of squares test, the result of the Chow test indicates the opposite. H0 is rejected because p=0,0266 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that

there is a significant relationship between the change in ownership structure and business performance for Company L.

Company G:

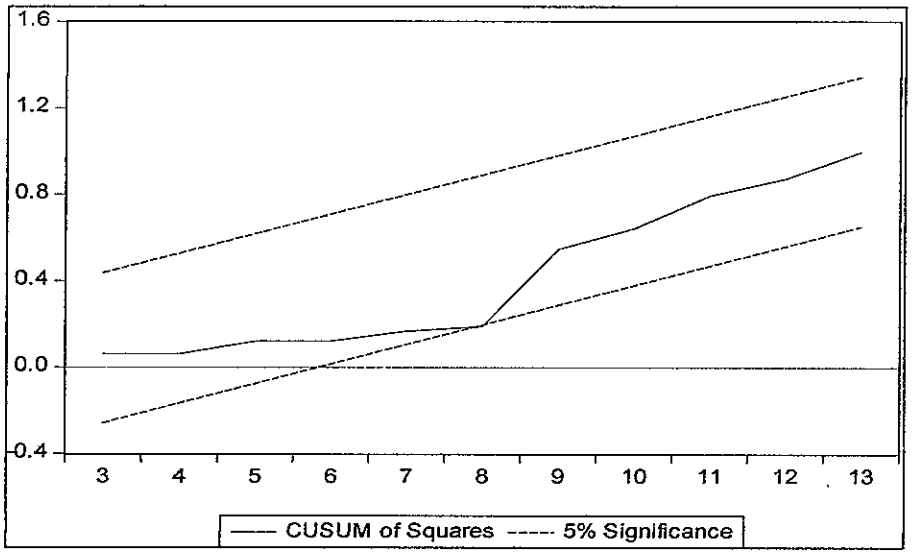

Figure 4.38. Result of CUSUM of Squares Test for the Structural Break in Company G (3)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.108. Result of Chow Test for the Structural Break in Company G (3)

Chow Breakpoint Test: 2012			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	1.144379	Prob. F(2,9)	**0.3607**
Log likelihood ratio	2.945575	Prob. Chi-Square(2)	0.2293
Wald Statistic	2.288757	Prob. Chi-Square(2)	0.3184

H0 cannot be rejected because p=0,3607 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in ownership structure and business performance for Company G.

Company Q:

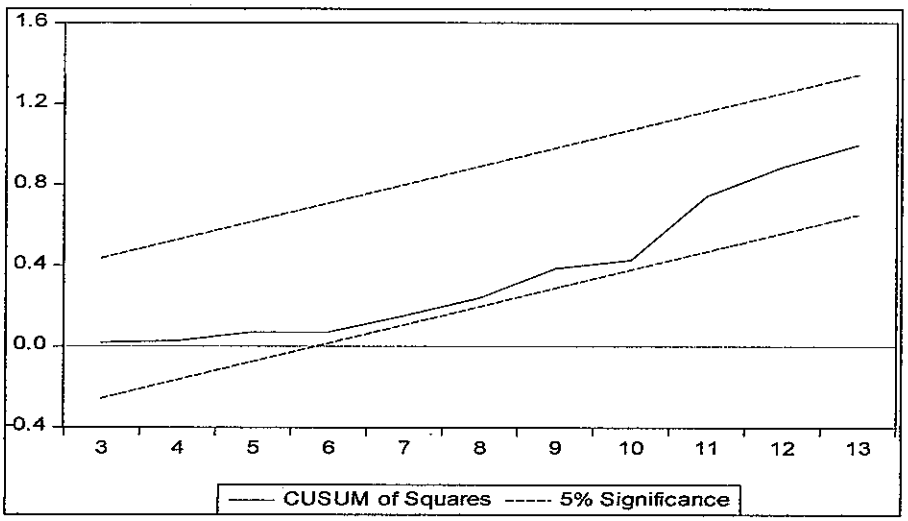

Figure 4.39. Result of CUSUM of Squares Test for the Structural Break in Company Q (3)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.109. Result of Chow Test for the Structural Break in Company Q (3)

Chow Breakpoint Test: 2007			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	36.02686	Prob. F(2,9)	**0.0001**
Log likelihood ratio	28.57254	Prob. Chi-Square(2)	0.0000
Wald Statistic	72.05373	Prob. Chi-Square(2)	0.0000

Even there was no structural break seen in the result of CUSUM of squares test, the result of the Chow test indicates the opposite. H0 is rejected because p=0,0001 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in ownership structure and business performance for Company Q.

Company Y:

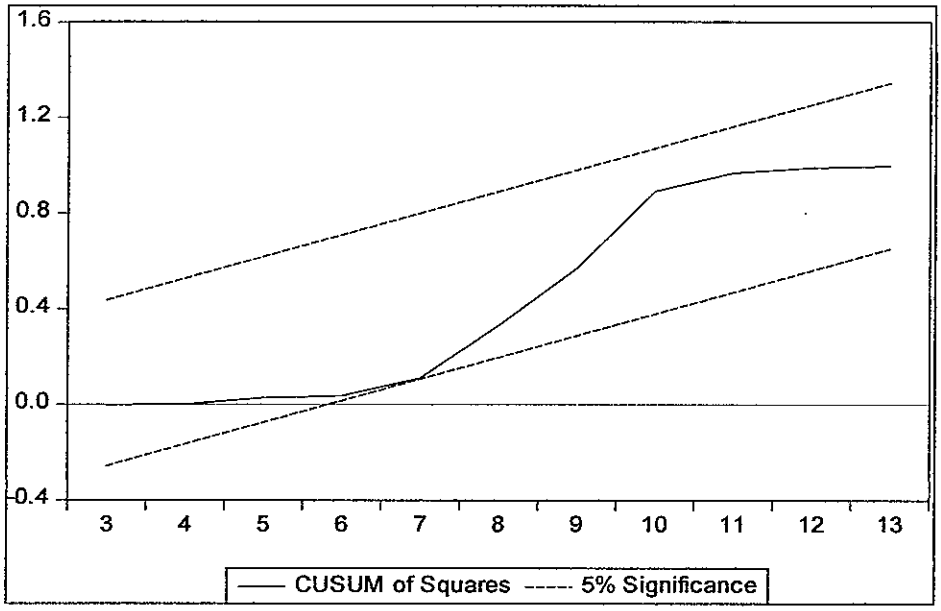

Figure 4.40. Result of CUSUM of Squares Test for the Structural Break in Company Y (2)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.110. Result of Chow Test for the Structural Break in Company Y (2)

Chow Breakpoint Test: 2006			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	6.224143	Prob. F(2,9)	**0.0201**
Log likelihood ratio	11.28946	Prob. Chi-Square(2)	0.0035
Wald Statistic	12.44829	Prob. Chi-Square(2)	0.0020

Even there was no structural break seen in the result of CUSUM of squares test, the result of the Chow test indicates the opposite. H0 is rejected because p=0,0201 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in ownership structure and business performance for Company Y.

Company I:

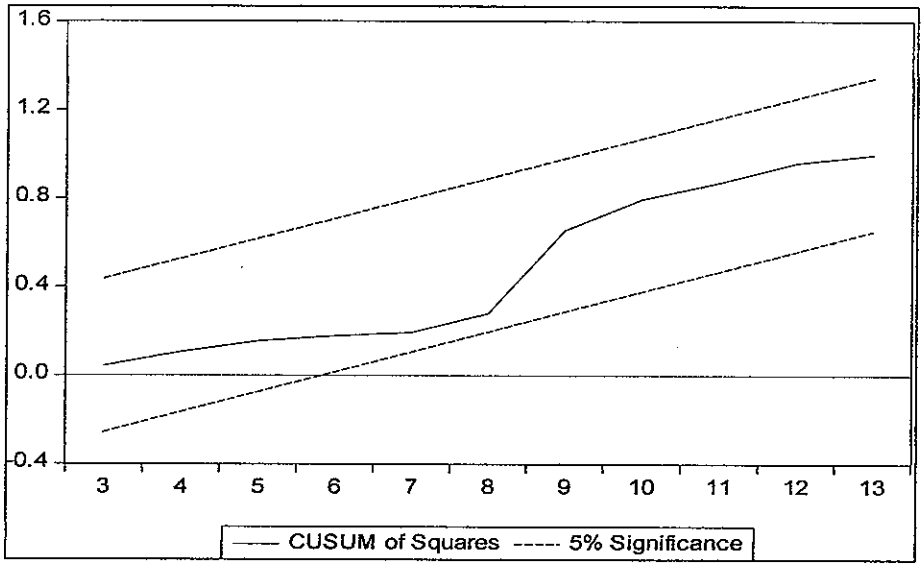

Figure 4.41. Result of CUSUM of Squares Test for the Structural Break in Company I (4)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.111. Result of Chow Test for the Structural Break in Company I (4)

Chow Breakpoint Test: 2003			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	8.867905	Prob. F(2,9)	**0.0075**
Log likelihood ratio	14.15413	Prob. Chi-Square(2)	0.0008
Wald Statistic	17.73581	Prob. Chi-Square(2)	0.0001

Even there was no structural break seen in the result of CUSUM of squares test, the result of the Chow test indicates the opposite. H0 is rejected because p=0,0075 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in ownership structure and business performance for Company I.

Company T:

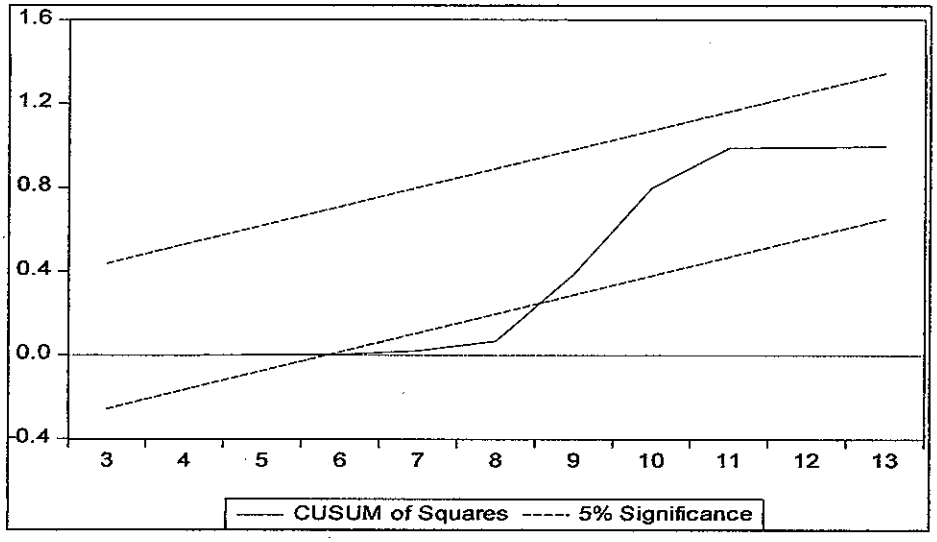

Figure 4.42. Result of CUSUM of Squares Test for the Structural Break in Company T (3)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.112. Result of Chow Test for the Structural Break in Company T (3)

Chow Breakpoint Test: 2011			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	0.821406	Prob. F(2,9)	**0.4703**
Log likelihood ratio	2.179583	Prob. Chi-Square(2)	0.3363
Wald Statistic	1.642813	Prob. Chi-Square(2)	0.4398

Even there was a structural break seen in the result of CUSUM of squares test, the result of the Chow test indicates the opposite. H0 cannot be rejected because p=0,4703 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in ownership structure and business performance for Company T.

Company X:

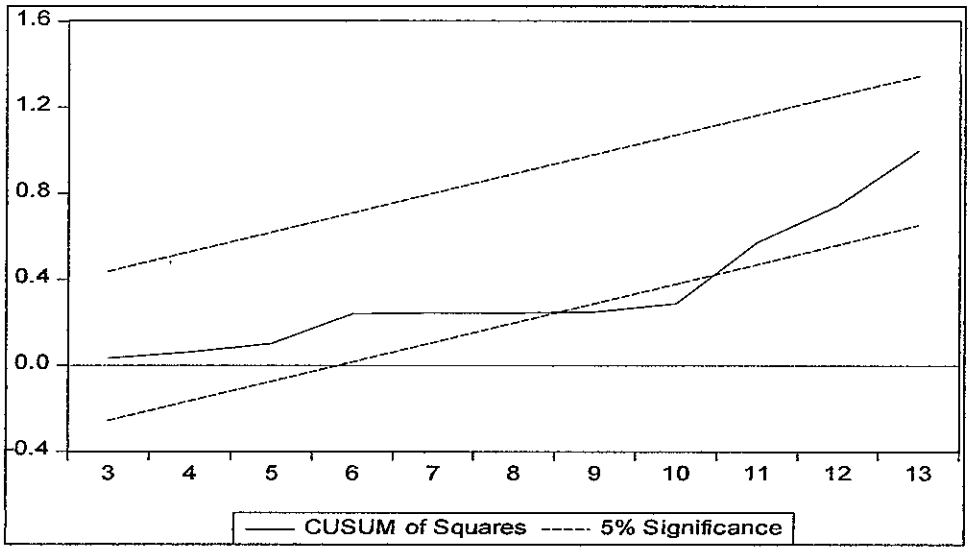

Figure 4.43. Result of CUSUM of Squares Test for the Structural Break in Company X (1)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.113. Result of Chow Test for the Structural Break in Company X (1)

Chow Breakpoint Test: 2011			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	10.64538	Prob. F(2,9)	**0.0042**
Log likelihood ratio	15.77703	Prob. Chi-Square(2)	0.0004
Wald Statistic	21.29075	Prob. Chi-Square(2)	0.0000

H0 is rejected because p=0,0042 is less than α=0,05. It is possible to indicate that within the significance level of 5 %, a structural break happened in the specified year. Accordingly it can be indicated that there is a significant relationship between the change in ownership structure and business performance for Company X.

Company K:

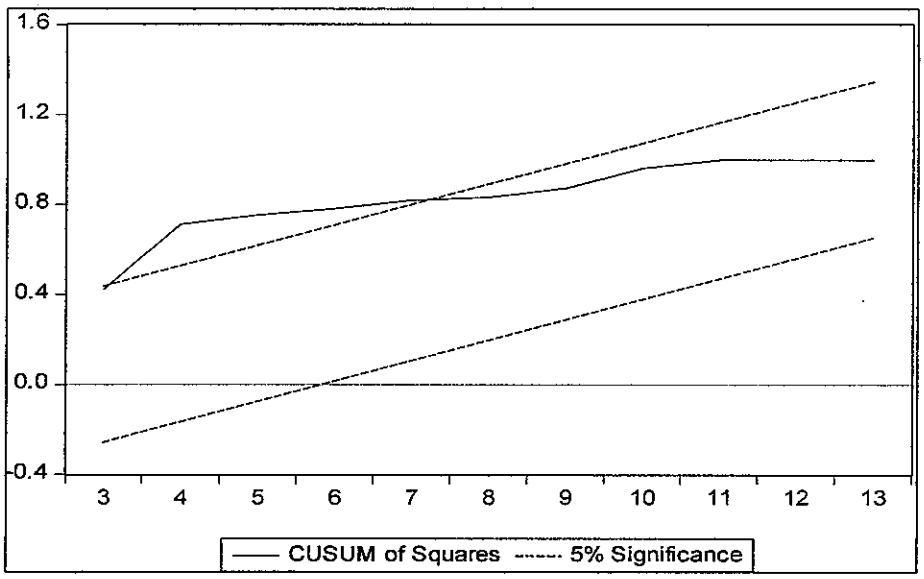

Figure 4.44. Result of CUSUM of Squares Test for the Structural Break in Company K (2)

A structural break is seen in the graph of CUSUM of squares test.

Table 4.114. Result of Chow Test for the Structural Break in Company K (2)

Chow Breakpoint Test: 2012			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	0.000736	Prob. F(2,9)	**0.9993**
Log likelihood ratio	0.002127	Prob. Chi-Square(2)	0.9989
Wald Statistic	0.001473	Prob. Chi-Square(2)	0.9993

Even there was a structural break seen in the result of CUSUM of squares test, the result of the Chow test indicates the opposite. H0 cannot be rejected because p=0,9993 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in ownership structure and business performance for Company K.

Company V:

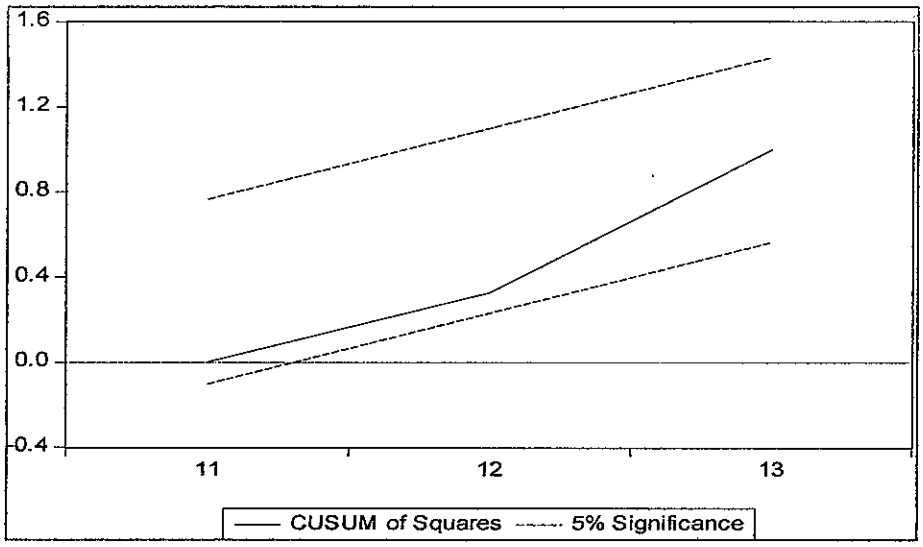

Figure 4.45. Result of CUSUM of Squares Test for the Structural Break in Company V (1)

No structural break is seen in the graph of CUSUM of squares test.

Table 4.115. Result of Chow Test for the Structural Break in Company V (1)

Chow Breakpoint Test: 2011			
Null Hypothesis: No breaks at specified breakpoints			
Varying regressors: All equation variables			
Equation Sample: 1 13			
F-statistic	2.452657	Prob. F(2,9)	**0.1412**
Log likelihood ratio	5.655604	Prob. Chi-Square(2)	0.0591
Wald Statistic	4.905313	Prob. Chi-Square(2)	0.0861

H0 cannot be rejected because p=0,1412 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, no structural break happened in the specified year. Accordingly it can be indicated that there is no significant relationship between the change in ownership structure and business performance for Company V.

In total, 10 different companies, for which changes in ownership structure happened, were investigated severally using structural break analysis. The results showed that structural breaks were determined in 5 companies and there were no structural breaks

seen in 5 companies. According to these outcomes, it is not possible to make a generalization for the group and reason concretely whether there is a significant relationship between the change in ownership structure and business performance or not, on the contrary it can be indicated that it is possible to observe both a significant relationship and no significant relationship as changing per company.

Table 4.116. *Companies and Statuses of Structural Breaks in Ownership Structure*

Companies	**Statuses of structural breaks**
Company A	No
Company L	Yes
Company G	No
Company Q	Yes
Company Y	Yes
Company I	Yes
Company T	No
Company X	Yes
Company K	No
Company V	No

4.3.6. Findings on Hypotheses About Percentage (%) Contribution of Domestic Manufactured Products to Sales

H14. There is a significant relationship between the percentage (%) contribution of domestic primary (API) manufactured products to sales volume and business performance.

Descriptive statistics are given in below table:

Table 4.117. Descriptive Statistics for % Contribution of Domestic Primary (API) Manufactured Products to Sales Volume

	Category	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 - 25 %	5	10,4	83,3	83,3
	26 – 50 %	1	2,1	16,7	100,0
	Total	6	12,5	100,0	
Missing	System	42	87,5		
Total		48	100,0		

Because there is only one company in the category of 26 – 50 %, statistical group parameters like variance, median and mean cannot be estimated. Therefore it is not possible to make any statistical comparison between groups and accordingly this hypothesis cannot be tested.

H15. There is a significant relationship between the percentage (%) contribution of domestic primary (API) manufactured products to sales turnover and business performance.

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$

Descriptive statistics are given in the following table:

Table 4.118. Descriptive Statistics for % Contribution of Domestic Primary (API) Manufactured Products to Sales Turnover

	% contribution	N	Mean	Std. Deviation	Std. Error Mean
Sales Volume	% 0-25	4	41136252,9038462	28119364,73938390	14059682,36969195
	% 26 - 50	2	28217167,5000000	10006129,73960587	7075402,19230769
Sales Turnover	% 0-25	4	2,3589620E8	1,63418101E8	81709050,25087060
	% 26 - 50	2	1,0247162E8	75322403,43619162	53260982,24500000
Sales Growth	% 0-25	4	2010659,4166667	1144381,83286557	572190,91643279
	% 26 - 50	2	2705777,5416667	676934,24020549	478664,79166667

Independent sample t test was carried out to measure the hypothesis and the result of this analysis is given in the following table:

Table 4.119. Results of Independent Samples t test for H15

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									5% Significance Level of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Sales Volume	Equal variances assumed	2,291	**0,205**	0,6	4	**0,581**	12919085	21530002	-4,7E+07	72695955
	Equal variances not assumed			0,821	3,952	0,458	12919085	15739631	-3,1E+07	56831232
Sales Turnover	Equal variances assumed	0,767	**0,43**	1,052	4	**0,352**	1,33E+08	1,27E+08	-2,19E+08	4,86E+08
	Equal variances not assumed			1,368	3,951	0,244	1,33E+08	97535128	-1,39E+08	4,06E+08
Sales Growth	Equal variances assumed	0,516	**0,512**	-0,766	4	**0,486**	-695118	906959,5	-3213241	1823005
	Equal variances not assumed			-0,932	3,51	0,411	-695118	746004,3	-2885395	1495159

Levene's test was used to check the equality of variances.

$H_0: \sigma^2_1 = \sigma^2_2$

$H_1: \sigma^2_1 \neq \sigma^2_2$

The results of the Levene's test are given below:

For sales volume: $p = 0,205 > \alpha=0,05$

For sales turnover: $p = 0,43 > \alpha=0,05$

For sales growth: $p = 0,512 > \alpha=0,05$

Accordingly, H0 for the Levene's test cannot be rejected, which means that the variances between the categories are equal for all of these three dependent variables.

Because the variances are equal, results of t test obtained according to the condition of "equal variances assumed" should be compared with the significance level $\alpha=0,05$. The comparisons are given below:

For sales volume: $p = 0,581 > \alpha=0,05$

For sales turnover: $p = 0,352 > \alpha=0,05$

For sales growth: $p = 0,486 > \alpha=0,05$

Therefore H0 cannot be rejected, there is no difference between the means. It is possible to indicate that within the significance level of 5 %, there is no significant relationship between the percentage (%) contribution of domestic primary (API) manufactured products to sales turnover and business performance.

H16. There is a significant relationship between the percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales volume and business performance.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out with ownership structure as grouping variable considering the number of data. Descriptive statistics are given as follows:

Table 4.120. Descriptive Statistics for % Contribution of Domestic Secondary (Finished Goods) Manufactured Products to Sales Volume

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	% 0-50(*)	2	2,1	4,8	4,8
	% 51 - 75	6	12,5	28,6	38,1
	% 76 - 100	13	27,1	61,9	100
	Total	21	43,8	100	
Missing	System	27	56,3		
Total		48	100		

(*) %0-25 and %26-50 categories are combined as %0-50 because there is only one company in each of them.

Because the number of companies in one of the categories is less than the number of dependent variables, the hypothesis was tested severally for sales volume, sales turnover and sales growth and then interpreted for business performance.

Table 4.121. Statistics of Kruskal-Wallis Test for Sales Volume in H16

	Sales volume
Chi-Square	1,310
df	2
Asymp. Sig.	,520

H0 cannot be rejected because p=0,520 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales volume in terms of sales volume.

Table 4.122. Statistics of Kruskal-Wallis Test for Sales Turnover in H16

	Sales turnover
Chi-Square	0,153
df	2
Asymp. Sig.	,926

H0 cannot be rejected because p=0,926 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales volume in terms of sales turnover.

Table 4.123. Statistics of Kruskal-Wallis Test for Sales Growth in H16

	Sales growth
Chi-Square	4,517
df	2
Asymp. Sig.	,105

H0 cannot be rejected because p=0,105 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales volume in terms of sales growth.

These results of hypothesis tests made severally on three dependent variables indicate that there is no significant relationship between the percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales volume and business performance.

H17. There is a significant relationship between the percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales turnover and business performance.

H_0 : All categories have the same distribution

H_1 : At least one category has a different distribution

Kruskal-Wallis test was carried out with ownership structure as grouping variable considering the number of data. Descriptive statistics are given as follows:

Table 4.124. Descriptive Statistics for % Contribution of Domestic Secondary (Finished Goods) Manufactured Products to Sales Turnover

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	% 0-25	2	4,2	9,5	9,5
	% 26 - 50	4	8,3	19	28,6
	% 51 - 75	2	4,2	9,5	38,1
	% 76 - 100	13	27,1	61,9	100
	Total	21	43,8	100	
Missing	System	27	56,3		
Total		48	100		

Because the number of companies in one of the categories is less than the number of dependent variables, the hypotheses was tested severally for sales volume, sales turnover and sales growth and then interpreted for business performance.

Table 4.125. Statistics of Kruskal-Wallis Test for Sales Volume in H17

	Sales volume
Chi-Square	3,260
df	3
Asymp. Sig.	,353

H0 cannot be rejected because p=0,353 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference

between the distributions of percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales turnover in terms of sales volume.

Table 4.126. Statistics of Kruskal-Wallis Test for Sales Turnover in H17

	Sales turnover
Chi-Square	2,824
df	3
Asymp. Sig.	,420

H0 cannot be rejected because p=0,420 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales turnover in terms of sales turnover.

Table 4.127. Statistics of Kruskal-Wallis Test for Sales Growth in H17

	Sales growth
Chi-Square	4,259
df	3
Asymp. Sig.	,235

H0 cannot be rejected because p=0,235 is greater than α=0,05. It is possible to indicate that within the significance level of 5 %, there is no significant difference between the distributions of percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales turnover in terms of sales growth.

These results of hypothesis tests made severally on three dependent variables indicate that there is no significant relationship between the percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales turnover and business performance.

H18. There is a significant relationship between the percentage (%) contribution of domestic toll manufactured products to sales volume and business performance.

$H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4$

$H_1 : \mu_i \neq \mu_j$ (At least two means are not equal)

$$H_o : \begin{pmatrix} \mu_{11} \\ \mu_{12} \end{pmatrix} = \begin{pmatrix} \mu_{21} \\ \mu_{22} \end{pmatrix} = \begin{pmatrix} \mu_{31} \\ \mu_{32} \end{pmatrix} = \begin{pmatrix} \mu_{41} \\ \mu_{42} \end{pmatrix}$$

μ_{11}, μ_{12} = Mean of companies' business performances with 0-25 % local toll manufacturing (sales volume, sales turnover)

μ_{21}, μ_{22} = Mean of companies' business performances with 26-50 % local toll manufacturing (sales volume, sales turnover)

μ_{31}, μ_{32} = Mean of companies' business performances with 51-75 % local toll manufacturing (sales volume, sales turnover)

μ_{41}, μ_{42} = Mean of companies' business performances with 76-100 % local toll manufacturing (sales volume, sales turnover)

Percentage (%) contribution of domestic toll manufactured products to sales volume is the independent variable, which is categorized as 0-25 %, 26-50 %, 51-75 % and 76-100 %. Dependent variables are sales turnover and sales volume. The variable market share was excluded from the analysis because of the expected multicollinearity between it and sales volume which is typical considering that market share figures are obtained directly from sales volume figures. In addition, the variable sales growth was excluded from the analysis too, because there are only two companies in 51-75 % category and therefore it was necessary to reduce the number of dependent variables considering that the number of elements in each category should be at least equal to the number of dependent variables. The correlation table for the dependent variables is given as follows.

Table 4.128. Correlation Table for H18

		Sales Volume	Market Share	Sales Turnover	Sales Growth
Sales Volume	Pearson Correlation	1	,999**	,831**	,862**
	Sig. (2-tailed)		,000	,000	,000
	N	36	36	36	36
Market Share	Pearson Correlation	,999**	1	,835**	,837**
	Sig. (2-tailed)	,000		,000	,000
	N	36	36	36	36
Sales Turnover	Pearson Correlation	,831**	,835**	1	,677**
	Sig. (2-tailed)	,000	,000		,000
	N	36	36	36	36
Sales Growth	Pearson Correlation	,862**	,837**	,677**	1
	Sig. (2-tailed)	,000	,000	,000	
	N	36	36	36	36

**. Correlation is significant at the 0.01 level (2-tailed).

First, outlier detection was made using Mahalanobis distance method and no outlier was found. Equality of covariance matrices was checked using Box's test. p value is obtained as 0,019 which is greater than the required level of significance as 0,05. This indicates that the covariance matrices are not equal. In conjunction with this, linearity was observed between both dependent variables. MANOVA was carried out to measure the hypothesis and the result of this analysis is given in the following table:

Table 4.129. MANOVA Result of H18

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	,362	8,793[b]	2,000	31,000	,001	,362
	Wilks' Lambda	,638	8,793[b]	2,000	31,000	,001	,362
	Hotelling's Trace	,567	8,793[b]	2,000	31,000	,001	,362
	Roy's Largest Root	,567	8,793[b]	2,000	31,000	,001	,362
TOLL_volum	Pillai's Trace	,212	1,262	6,000	64,000	,288	,106
	Wilks' Lambda	,791	1,284[b]	6,000	62,000	,278	,111
	Hotelling's Trace	,260	1,302	6,000	60,000	,270	,115
	Roy's Largest Root	,246	2,627[c]	3,000	32,000	,067	,198

In the MANOVA result, Pillai's trace value for the independent variable of percentage (%) contribution of domestic toll manufactured products to sales volume was obtained with p value 0,288 which is greater than the required level of significance as α=0,05. Accordingly, H0 cannot be rejected. This result shows that means of business performances are equal to each other according to all four categories of percentage (%) contribution of domestic toll manufactured products to sales volume. With regard to this result, it is possible to indicate that within the significance level of 5 %, there is no significant relationship between the percentage (%) contribution of domestic toll manufactured products to sales volume and business performance.

H19. There is a significant relationship between the percentage (%) contribution of domestic toll manufactured products to sales turnover and business performance.

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$

Descriptive statistics are given below:

Table 4.130. Descriptive Statistics for % Contribution of Domestic Toll Manufactured Products to Sales Turnover

	% contribution	N	Mean	Std. Deviation	Std. Error Mean
Sales Volume	% 0 - 25	29	3,2021995E7	2,93273991E7	5,44596129E6
	% 51 - 75	7	1,8281868E7	1,68410794E7	6,36532972E6
Sales Turnover	% 0 - 25	29	2,3129083E8	1,98436920E8	3,68488109E7
	% 51 - 75	7	1,5210583E8	1,57175967E8	5,94069317E7
Sales Growth	% 0 - 25	29	2,0121087E6	2,08154174E6	3,86532597E5
	% 51 - 75	7	1,0713569E6	1,40795337E6	5,32156355E5

Independent sample t test was carried out to measure the hypothesis and the result of this analysis is given in the following table:

Table 4.131. Results of Independent Samples t test for H19

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									5% Significance Level of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Sales Volume	Equal variances assumed	3,144	**0,085**	1,185	34	**0,244**	1,37E+07	1,16E+07	-9,83E+06	3,73E+07
	Equal variances not assumed			1,64	16,145	0,12	1,37E+07	8,38E+06	-4,01E+06	3,15E+07
Sales Turnover	Equal variances assumed	1,421	**0,241**	0,98	34	**0,334**	7,92E+07	8,08E+07	-8,50E+07	2,43E+08
	Equal variances not assumed			1,133	11,151	0,281	7,92E+07	6,99E+07	-7,44E+07	2,33E+08
Sales Growth	Equal variances assumed	2,778	**0,105**	1,129	34	**0,267**	9,41E+05	8,34E+05	-7,53E+05	2,63E+06
	Equal variances not assumed			1,43	13,213	0,176	9,41E+05	6,58E+05	-4,78E+05	2,36E+06

Levene's test was used to check the equality of variances.

$H_0: \sigma^2_1 = \sigma^2_2$

$H_1: \sigma^2_1 \neq \sigma^2_2$

The results of the Levene's test are given below:

For sales volume: $p = 0,085 > \alpha=0,05$

For sales turnover: $p = 0,241 > \alpha=0,05$

For sales growth: $p = 0,105 > \alpha=0,05$

Accordingly, H0 for the Levene's test cannot be rejected, which means that the variances between the categories are equal for all of these three dependent variables.

Because the variances are equal, results of t test obtained according to the condition of "equal variances assumed" should be compared with the significance level $\alpha=0,05$. The comparisons are given as follows:

For sales volume: $p = 0,244 > \alpha=0,05$

For sales turnover: $p = 0,334 > \alpha=0,05$

For sales growth: $p = 0,267 > \alpha=0,05$

Therefore H0 cannot be rejected, there is no difference between the means. It is possible to indicate that within the significance level of 5 %, there is no significant relationship between the percentage (%) contribution of domestic toll manufactured products to sales turnover and business performance.

4.3.7. Summary of Findings

A summary of findings on the tested hypotheses is given in Table 4.132 below.

Table 4.132. Summary of Findings

Hypotheses	**Results**
H1. Supply chain structures of pharmaceutical companies in Turkey have a significant impact on their business performances.	Significant
H1a. Supply chain structures of pharmaceutical companies in Turkey have a significant impact on their sales turnovers.	Non-significant
H1b. Supply chain structures of pharmaceutical companies in Turkey have a significant impact on their sales volumes.	Significant
H1c. Supply chain structures of pharmaceutical companies in Turkey have a significant impact on their sales growths.	Non-significant
H1d. Supply chain structures of pharmaceutical companies in Turkey have a significant impact on their market shares.	Significant
H1e. Pharmaceutical companies having primary manufacturing sites in their supply chain structures have significantly different business performances than pharmaceutical companies having no primary manufacturing site in their supply chain structures.	Non-significant
H1f. Pharmaceutical companies having secondary manufacturing sites in their supply chain structures have significantly different business performances than pharmaceutical companies having no secondary manufacturing site in their supply chain structures.	Significant

Table 4.132. Summary of Findings, continued

H1g. Pharmaceutical companies having own manufacturing sites in their supply chain structures have significantly different business performances than pharmaceutical companies having not own manufacturing site in their supply chain structures.	Significant
H1h. Pharmaceutical companies having toll manufacturing sites in their supply chain structures have significantly different business performances than pharmaceutical companies having no toll manufacturing site in their supply chain structures.	Significant
H1i. Pharmaceutical companies getting the warehousing and distribution services rendered by a 3PL company have significantly different business performances than pharmaceutical companies having and operating their own warehousing and distribution centers.	Non-significant
H2. There is a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of multinationality.	Significant
H3. There is a significant difference between business performances of pharmaceutical companies in terms of multinationality.	Non-significant
H3a. There is a significant difference between sales turnovers of pharmaceutical companies in terms of multinationality.	Non-significant
H3b. There is a significant difference between sales volumes of pharmaceutical companies in terms of multinationality.	Non-significant
H3c. There is a significant difference between sales growths of pharmaceutical companies in terms of multinationality.	Non-significant
H3d. There is a significant difference between market shares of pharmaceutical companies in terms of multinationality.	Non-significant
H4. There is a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of product originality.	Significant
H5. There is a significant difference between business performances of pharmaceutical companies in Turkey in terms of product originality.	Significant
H5a. There is a significant difference between sales turnovers performances of pharmaceutical companies in Turkey in terms of product originality.	Non-significant
H5b. There is a significant difference between sales volumes performances of pharmaceutical companies in Turkey in terms of product originality.	Significant

Table 4.132. Summary of Findings, continued

H5c. There is a significant difference between sales growths performances of pharmaceutical companies in Turkey in terms of product originality.	Non-significant
H5d. There is a significant difference between market shares performances of pharmaceutical companies in Turkey in terms of product originality.	Significant
H6. There is a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of ownership structure.	Significant
H7. There is a significant difference between business performances of pharmaceutical companies in terms of ownership structure.	Non-significant
H7a. There is a significant difference between sales turnovers of pharmaceutical companies in terms of ownership structure.	Non-significant
H7b. There is a significant difference between sales volumes of pharmaceutical companies in terms of ownership structure.	Non-significant
H7c. There is a significant difference between sales growths of pharmaceutical companies in terms of ownership structure.	Non-significant
H7d. There is a significant difference between market shares of pharmaceutical companies in terms of ownership structure.	Non-significant
H8. There is a significant relationship between the change in the primary (API) manufacturing node of supply chain structure and business performance.	*
H9. There is a significant relationship between the change in the secondary (finished goods) manufacturing node of supply chain structure and business performance.	*
H10. There is a significant relationship between the change in the toll manufacturing node of supply chain structure and business performance.	*
H11. There is a significant relationship between the change in warehousing and distribution node of supply chain structure, and business performance.	*
H12. There is a significant relationship between the change in multinationality and business performance.	*
H13. There is a significant relationship between the change in ownership structure and business performance.	*

Table 4.132. Summary of Findings, continued

H14. There is a significant relationship between the percentage (%) contribution of domestic primary (API) manufactured products to sales volume and business performance.	**
H15. There is a significant relationship between the percentage (%) contribution of domestic primary (API) manufactured products to sales turnover and business performance.	Non-significant
H16. There is a significant relationship between the percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales volume and business performance.	Non-significant
H17. There is a significant relationship between the percentage (%) contribution of domestic secondary (finished goods) manufactured products to sales turnover and business performance.	Non-significant
H18. There is a significant relationship between the percentage (%) contribution of domestic toll manufactured products to sales volume and business performance.	Non-significant
H19. There is a significant relationship between the percentage (%) contribution of domestic toll manufactured products to sales turnover and business performance.	Non-significant

*: According to the results obtained by the structural break analysis made on company basis severally, both results are seen for these hypotheses. Based on this fact, it is not possible to generalize the result as whether the relationship exists or not.

**: Because it was only one data obtained according to questionnaire outcomes in one category, it was not possible to test this hypothesis.

CHAPTER 5. CONCLUSION

In this chapter, the findings of the study are reviewed and summarized. First, conclusions to the study are presented based on the tested hypotheses. Following this, theoretical and practical contributions are given sequentially and in the end limitations of this study and recommendations for future research are stated.

5.1. CONCLUSIONS TO THE STUDY

The main objective of this study was to investigate the impact between the supply chain structures and business performances of pharmaceutical companies in Turkey and find an empirical support for this impact. Obtained results showed that business performances of pharmaceutical companies differ from each other according to their supply chain structure categories, which clearly indicates that supply chain structures of pharmaceutical companies in Turkey have a significant impact on their business performances. In addition, this impact was in deep examined item by item on the dependent variables of sales turnover, sales volume, sales growth and market share separately. It was found that supply chain structures have a significant impact on both sales volumes and market shares, which is a consistent outcome with the expectation and general result, but opposite to this, the results showed that there is no significant impact of supply chain structures on sales turnovers and sales growths. This result may be associated with the companies' product portfolios in terms of pricing especially.

In addition to this major impact, it was also intended to examine whether there are significant differences between business performances of pharmaceutical companies in Turkey according to the existence of primary manufacturing sites, secondary manufacturing sites, toll manufacturing sites in their supply chain structures together with the comparison of differences in the warehousing and distribution node.

Last but not least, it was investigated whether it makes any difference in terms of business performances of pharmaceutical companies in Turkey, having their own manufacturing sites in their supply chain structures or not. Findings imply that there are significant differences between business performances of pharmaceutical companies having secondary manufacturing sites in their supply chain structures and the ones having not, and in addition to this there are also significant differences between business performances of pharmaceutical companies having toll manufacturing sites in their supply chain structures and the ones having not. In particular, the outcomes point out that there are significant differences between the business performances of pharmaceutical companies having their own manufacturing sites in their supply chain structures and the ones having not. This is a result which was aimed to be proven with this study especially.

With regard to the relationships between multinationality, supply chain structure and business performance, noteworthy results were obtained. First, it was shown that there is a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of multinationality, which is consistent with the findings in the literature (Buckley and Ghauri, 2004; Casson and Wadeson, 2012). Even this is an expected outcome, findings on the hypotheses testing the significant differences between business performances and directly aligned to this, sales turnovers, sales volumes, sales growths and market shares, in terms of multinationality indicate that there are no significant differences between business performances, sales turnovers, sales volumes, sales growths and market shares of pharmaceutical companies in Turkey in terms of multinationality. This result is consistent with the findings in the literature (Hennart, 2007).

Product originality has been another construct of this research, which was considered in three different categories. Two important results were obtained from hypothesis testing namely, that there are significant differences both between supply chain structures and business performances of pharmaceutical companies in Turkey in terms of product originality. Even a significant difference was indicated between the business performances of pharmaceutical companies, different results were obtained for the dependent variables sales turnover, sales volume, sales growth and market share. It was

found that there is a significant difference between sales volumes of pharmaceutical companies in Turkey in terms of product originality, but in contrast with this result, no significant differences were found between sales turnovers, sales growths and market shares of pharmaceutical companies in Turkey in terms of product originality.

Investigation of the relationships between ownership structure, supply chain structure and business performance has been another purpose of this research. Findings indicate that there is a significant difference between supply chain structures of pharmaceutical companies in Turkey in terms of ownership structure, but opposite to this result, there was no significant difference found between neither business performances as general measures, nor sales turnovers, sales volumes, sales growths and market shares of pharmaceutical companies in Turkey in terms of ownership structure.

Changes in the primary manufacturing node, secondary manufacturing node, toll manufacturing node, and warehousing and distribution node of supply chain structure, multinationality and ownership structure were investigated in terms of their relationships with business performance using structural break analysis carried out on company basis severally. Obtained results indicate that by testing each of the six hypotheses listed under above stated changes, structural breaks were determined and not determined on company basis in each of them. According to these outcomes, it can be indicated that it is possible to observe both a significant relationship and no significant relationship as varying per company between the changes in the primary manufacturing node, secondary manufacturing node, toll manufacturing node, and warehousing and distribution node of supply chain structure, multinationality and ownership structure and business performances of pharmaceutical companies in Turkey.

Final part of this study consists of the results of hypotheses tested about the percentage (%) contribution of domestic manufactured products to sales. It was tested severally whether there is a significant relationship between the percentage (%) contribution of domestic primary manufactured products to sales volume and sales turnover, the percentage (%) contribution of domestic secondary manufactured products to sales volume and sales turnover, the percentage (%) contribution of domestic toll manufactured products to sales volume and sales turnover, and business performance. It was not possible to test the hypotheses about the percentage (%) contribution of domestic primary manufactured products to sales volume, because it was only one data

obtained according to questionnaire outcomes in one category. Findings indicate that there was no significant relationship found between the percentage (%) contribution of domestic primary manufactured products to sales turnover, the percentage (%) contribution of domestic secondary manufactured products to sales volume and sales turnover, the percentage (%) contribution of domestic toll manufactured products to sales volume and sales turnover, and business performance.

5.2. CONTRIBUTIONS OF THE STUDY

Contributions of this study are evaluated in two separate sections as contributions to theory and contributions to practice.

5.2.1. Contributions to Theory

With the results obtained for all constructs included in the research model, this study contributes to fill the gaps in the literature about the impact of supply chain structure on business performance, relationship between product originality and supply chain structure, relationship between product originality and business performance, relationship between multinationality and supply chain structure, and relationship between ownership structure and supply chain structure.

This research contributes to theory with the indications that supply chain structure has an impact on business performance, there are significant relationships between supply chain structure and multinationality, supply chain structure and product originality, supply chain structure and ownership structure, and product originality and business performance. The importance of this study lies on the investigation of the concept of supply chain structure with its impact on business performance from supply chain management perspective, and on the combination of the relationships between multinationality, product originality and ownership structure as several constructs from management perspective. The research model illustrates the associations between all of them. Due to the nature of its content, this study has the role to be a bridge between supply chain management and strategic management.

5.2.2. Contributions to Practice

In fact, this study has the attribute to be a debut in terms of investigation and determination of supply chain structures and their impact on business performance in Turkish pharmaceutical industry. It aims to give considerable implications to the practitioners in Turkish pharmaceutical industry with its results. An objective of this study has been to constitute a framework for managers in Turkish pharmaceutical sector in order to give them a better understanding and insight about how to conceptualize and evaluate the impact of supply chain structure on business performance, and the relationships between these both and multinationality, product originality and ownership structure. Accordingly, the results of this study will guide the practitioners to work on how to increase their companies' business performances. Apart from this, the results of this study may play a supporting role for the new investment decisions in the Turkish pharmaceutical sector, especially in terms of investment to manufacturing.

From a practitioner perspective, it can be recommended to the managers to try to be more informed about the supply chain structures and supply chain processes of their companies and to pay special attention to the strategic dimension of the supply chain in terms of creating competitive advantage. It should be taken into account that in order to increase the business performances of their companies, managers should try to be more involved in supply chain oriented relationships in both dimensions of structure and processes.

5.3. LIMITATIONS OF THE STUDY

The findings of this study are subject to certain limitations which should be considered during interpretation of these findings. First limitation is that the study focused on only one sector. Second limitation is related to sampling method. Convenience sampling method was employed in conjunction with Pareto approach due to the difficulty of contacting the whole target population and gather data from them. Third and the last limitation is the national context of the study, which means that the study encompasses Turkey only.

5.4. RECOMMENDATIONS FOR FURTHER RESEARCHS

Even this study provides a detailed evaluation of supply chain structures of pharmaceutical companies in Turkey and their impact on business performance together with the relationships to multinationality, product originality and ownership structure, a further study can be carried out about examination of interactions between multinationality, product originality and ownership structure and categorization of supply chain structures accordingly. The findings of this study may be used as a guide for investigation of supply chain structures and their impact on business performance in other sectors as well. The research model can be adapted by including or changing variables, even sector specific ones in case of studies covering other sectors.

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ANNEXES

ANNEX 1. INITIAL VERSION OF THE QUESTIONNAIRE (IN TURKISH)

Değerli Katılımcı,

Aşağıda, Okan Üniversitesi Sosyal Bilimler Enstitüsü İngilizce İşletme Anabilim dalı doktora programı öğrencisi Emre Göllü tarafından gerçekleştirilmekte olan **"Tedarik Zinciri Yapısının Firma Performansı Üzerindeki Etkisi: İlaç Sektörü Üzerine Özel Bir Çalışma"** başlıklı doktora tez çalışması için hazırlanmış anket formu yer almaktadır. Çalışmada, Türk ilaç sektöründe faaliyet gösteren firmaların tedarik zinciri yapıları ve bunların, firmaların performansları üzerindeki etkileri incelenecektir.

Araştırma sırasında verilen cevaplar ve gerek firmanızın gerekse sizin isminiz gizli tutulacak olup bunların sadece akademik çalışma için kullanılacağı taahhüt edilmektedir. Çalışma tamamlandıktan sonra elde edilecek sonuçların talep edilmesi durumunda sizinle paylaşılması mümkün olacaktır.

Ankette yer alan her bir ifadeye belirtilen kriterler doğrultusunda içtenlikle yanıt vermenizi rica edeceğim. Değerli vaktinizi ayırarak doktora tez çalışmam için gerçekleştirdiğim bu araştırmaya gönüllü katkıda bulunduğunuz için şimdiden teşekkür ederim.

Saygılarımla,

Araştırmayı Yürüten

Emre Göllü

Anket soruları

1. Firmaların tedarik zinciri yapılarının belirlenmesine yönelik sorular

Aşağıdaki 10 soru araştırma modelinin kapsamında tedarik zinciri yapısının incelenmesine karşılık gelmektedir:

1. Firmanızın Türkiye'de kendine ait **ilaç aktif maddesi (API) üretim fabrikası** var mıdır?

   a) Evet b) Hayır

2. Firmanızın Türkiye'de kendine ait **tam mamul ilaç üretim fabrikası** var mıdır?

   a) Evet b) Hayır

3. Firmanız, Türkiye'de **fason olarak tam mamul ilaç üretimi** yaptırmakta mıdır?

   a) Evet b) Hayır

4. Firmanız, depolama sürecinde, **mülkiyeti ve işletmesi kendine ait olan depo** kullanmakta mıdır?

   a) Evet b) Hayır

5. Firmanız, depolama hizmetini **dış kaynak kullanımı (outsourcing)** yoluyla üçüncü taraf lojistik (3PL) hizmet sağlayıcı bir firmadan mı almaktadır?

   a) Evet b) Hayır

6. Firmanız, dağıtım hizmetini **dış kaynak kullanımı (outsourcing)** yoluyla üçüncü taraf lojistik (3PL) hizmet sağlayıcı bir firmadan mı almaktadır?

   a) Evet b) Hayır

7. 2001 – 2012 döneminde depolama sürecinizde, dış kaynak kullanımına (outsourcing) geçiş veya kendi deponuzun faaliyete geçişi şeklinde bir değişiklik gerçekleşti mi?

   a) Evet b) Hayır

   Yanıtınız evet ise yılı:

8. 2001 – 2012 döneminde dağıtım sürecinizde, dış kaynak kullanımına (outsourcing) geçiş veya kendi araç filonuzun oluşturulması ve kullanılması şeklinde bir değişiklik gerçekleşti mi?

   a) Evet b) Hayır

   Yanıtınız evet ise yılı:

9. 2001 – 2012 döneminde firmanızın **Türkiye'de fabrika kurmak şeklinde**, üretime yönelik bir yatırımı gerçekleşti mi?

   a) Evet b) Hayır

   Yanıtınız evet ise yılı:

10. 2001 – 2012 döneminde firmanızın **Türkiye'de mevcut bir fabrikayı satın almak** şeklinde, üretime yönelik bir yatırımı gerçekleşti mi?

    a) Evet b) Hayır

    Yanıtınız evet ise yılı:

2. Firmaların satışlarında yerel olarak üretilen ürünlerin payının değerlendirilmesine yönelik sorular

Aşağıdaki 3 soru araştırma modelinin kapsamında firmaların satışlarında yerel olarak üretilen ürünlerin payının değerlendirilmesine yöneliktir:

1. Firmanızın Türkiye'de kendine ait ilaç aktif maddesi (API) üretim fabrikası varsa, yıllık toplam satışınızın % kaçı, aktif maddesi (API) Türkiye'de üretilen ürünlerden kaynaklanmaktadır ?

	%0-25	%26-50	%51-75	%76-100
Kutu adedi bazında (%)				
Ciro bazında (%)				

2. Firmanızın Türkiye'de kendine ait tam mamul ilaç üretim fabrikası varsa, yıllık toplam satışınızın % kaçı, Türkiye'de üretilen ürünlerden kaynaklanmaktadır ?

	%0-25	%26-50	%51-75	%76-100
Kutu adedi bazında (%)				
Ciro bazında (%)				

3. Firmanız Türkiye'de fason olarak tam mamul ilaç üretimi yaptırmaktaysa, yıllık toplam satışınızın % kaçı, Türkiye'de fason olarak üretilen ürünlerden kaynaklanmaktadır ?

	%0-25	%26-50	%51-75	%76-100
Kutu adedi bazında (%)				
Ciro bazında (%)				

3. Firmaların sahiplik yapılarının ve çokulusluluk düzeylerinin belirlenmesine yönelik sorular

Aşağıdaki 3 soru araştırma modelinin kapsamında firmaların sahiplik yapılarının ve çokulusluluk düzeylerinin belirlenmesine yöneliktir:

1. Firmanızın sahiplik yapısı aşağıdaki seçeneklerden hangisine uymaktadır?

   a) **Aile veya Şahıs firması:** Firmanın sahibi, bir aile veya bir kişidir.

   b) **Kurumsal yatırımcı:** Firmanın sahibi, bir yatırım firması, yatırım bankası veya fonu vb. tüzel kişidir.

   c) **Hissedarlar:** Firmanın sahipleri, birden fazla sayıdaki hissedarlardır.

   d) **Çokuluslu yabancı şirketin yerel firması:** Firmanın sahibi, çokuluslu bir yabancı şirket grubudur.

2. 2001 – 2011 döneminde firmanızın sahiplik yapısında bir değişiklik gerçekleşti mi? (Örn. başka bir şirketle birleşme veya yabancı sermaye katılımı vb.)

   a) Evet b) Hayır

   Yanıtınız evet ise yılı:

3. Firmanızın faaliyetleri, çokuluslu luk bakımından değerlendirildiğinde aşağıdakilerden hangisine uymaktadır?

   a) **Yerel:** Firmanın faaliyetleri sadece Türkiye'de iç piyasayı kapsamaktadır.

   b) **Bölgesel:** Firmanın faaliyetleri, Türkiye'yi ve Türkiye'ye yakın coğrafi bölgelerdeki (Ortadoğu, Balkanlar, Kafkasya gibi) diğer ülkeleri kapsamaktadır.

   c) **Bölgelerarası:** Firmanın faaliyetleri, Türkiye'yi ve Türkiye ile birlikte dünya üzerinde farklı coğrafi bölgelerdeki ülkeleri kapsamaktadır.

   d) **Küresel (Global):** Firma, Türkiye'nin yanı sıra tüm dünyada faaliyet göstermektedir.

4. Firmalar arasındaki farklılıkların belirlenmesine yönelik sorular

Aşağıdaki 5 soru, firmalar arasındaki farklılıkların belirlenmesi amacına yöneliktir.

1. Firmanızın personel sayısı aşağıdaki aralıklardan hangisinde yeralmaktadır?

   a) 0-250 b) 251-500 c) 501-750 d) 750'den fazla

2. Firmanızın Türkiye'de ilaç sektöründeki faaliyet süresi aşağıdaki aralıklardan hangisinde yeralmaktadır?

   a) 0-10 yıl b) 11-20 yıl c) 21-30 yıl d) 31 yıl ve üzeri

3. Firmanızın ürünleri, orijinallik bakımından aşağıdaki kategorilerden hangisine uymaktadır?

   a) Orijinal b) Jenerik

4. Firmanız Türkiye'den ihracat gerçekleştirmekte midir?

   a) Evet b) Hayır

5. Firmanızın Türkiye'de AR-GE Bölümü mevcut mudur?

   a) Evet b) Hayır

Anketimiz tamamlanmıştır. Soruları yanıtlayarak verdiğiniz destek için teşekkür ederim.

ANNEX 1A. INITIAL VERSION OF THE QUESTIONNAIRE (TRANSLATED TO ENGLISH)

Dear Survey-participant,

Below, you can find the survey as part of the PhD thesis study, "Impact of supply chain structure on business performance: A study on pharmaceutical industry", held by Emre Göllü, PhD student at Okan University, Institute of Social Sciences, Department of Management.

With this study, supply chain structures of the companies in Turkish pharmaceutical industry and the effect of these structures on their performance will be examined.

Responses to the survey, your name and the name of the company you represent will be kept strictly confidential. Once the study is completed, if requested, the results can be shared with the survey-participants.

I kindly ask for your sincere answers, following the criteria given.

Thank you in advance for your contribution.

Best regards,

Emre Göllü
Researcher

Survey questions

1. **Questions for the determination of supply chain structures of the companies**

Following 10 questions refer to the supply chain structure study within the research model:

1. Does your company have a site for active pharmaceutical ingredient (API) production in Turkey?

b) Yes b) No

2. Does your company have a production site for finished goods in Turkey?

a) Yes b) No

3. Does your company have toll manufacturing in Turkey for finished goods' production?

a) Yes b) No

4. Does your company use a self-owned and –managed warehouse for storage?

a) Yes b) No

5. Does your company outsource the service of finished goods' storage via a 3PL service provider company?

a) Yes b) No

6. Does your company outsource the service of finished goods' distribution via a 3PL service provider company?

a) Yes b) No

7. During the period of 2001-2012, did your company decide to outsource finished goods' storage service or start to operate its self-managed warehouse?

a) Yes b) No

If yes, when? .....

8. During the period of 2001-2012, did your company decide to outsource finished goods' distribution service or start to establish and use its own distribution fleet?

a) Yes b) No

If yes, when? .....

9. During the period of 2001-2012, did your company invest on building up its own production site in Turkey?

a) Yes b) No

If yes, when? .....

10. During the period 2001-2012, did the company made a production investment via buying an already-built site in Turkey?

a) Yes b) No

If yes, when? .....

2. Questions on evaluation of the locally manufactured products' share in the sales of the company

Within the research model, following 3 questions are prepared to evaluate locally produced products' share in company's sales:

1. If your company has its own API production site in Turkey, what is the share of the sold products, which contain APIs produced in Turkey, in company's annual total sales?

	%0-25	%26-50	%51-75	%76-100
Per volume (box) (%)				
Per sales turnover (%)				

2. If your company has its own finished goods production site in Turkey, what is the share of these finished goods sold, in company's annual total sales?

	%0-25	%26-50	%51-75	%76-100
Per volume (box) (%)				
Per sales turnover (%)				

3. If your company has toll manufacturing in Turkey for finished goods production, what is the share of these toll manufactured finished goods sold, in company's annual total sales?

	%0-25	%26-50	%51-75	%76-100
Per volume (box) (%)				
Per sales turnover (%)				

3. Questions to determine the ownership and multinationality structures of companies

Following 3 questions are prepared to determine the ownership and multinationality structures of companies:

1. What kind of ownership structure does your company have in Turkey?

   a) **Family- or personal-owned:** The owner is a family or an individual.

   b) **Institutional:** The owner is a legal entity such as investor company, investor bank or investment fund.

   c) **Shareholders:** The owners are a group of shareholders.

   d) **Local subsidiary of a foreign multinational company**: The owner is a multinational companies group.

2. During the period 2001 – 2012 did any change occur in the company's ownership structure (Examples: Sold to another company, merged with another company, addition of foreign capital into the structure, etc.)?

   b) Yes b) No

   If yes, when? .....

3. Regarding multinationality, which of the following categories does your company's business fit in?

   a) **Local:** Company business only covers Turkish domestic market.

   b) **Regional:** Company business covers Turkey and regions near to Turkey (Middle East, the Balkans, and Caucasus).

   c) **Trans**-regional: Company business covers Turkey and different geographical regions in the world.

   d) **Global:** Company operates globally.

4. Questions to determine the differences between companies:

Following 5 questions are prepared to determine differences between companies:

1. What is the total headcount in your company?

   a) 0-250 b) 251-500 c) 501-750 d) More than 750

2. For how many years has your company been present in Turkish pharmaceutical industry?

   a) 0-10 b) 11-20 c) 21-30 d) 31 or more

3. Regarding originality, which category do your company's products belong to?

   a) Original b) Generic

6. Does your company export from Turkey?

   a) Yes b) No

7. Does your company have an R&D department in Turkey?

   a) Yes b) No

You have completed the survey. Thank you for your contribution.

ANNEX 2. ITEM-LEVEL CONTENT VALIDITY INDEX (I-CVI) TABLE

Item-level Content Validity Index (I-CVI)																			
		Number of experts																	
Item no. 1.section	I-CVI	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4	0,78	+	+	+	+	+	+	+	+	+	-	+	+	+	+	-	-	-	+
5	0,83	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	-	-	+
6	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
7	0,94	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+
7 - Y	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
8	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
8 - Y	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
9	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
9 - Y	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
10	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
10 - Y	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2.section																			
1 - V	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
1- T	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2 - V	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2 - T	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3 - V	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3 - T	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3.section																			
1	0,83	+	+	+	+	+	+	-	+	+	+	-	-	+	+	+	+	+	+
2	0,83	+	+	+	+	+	+	+	+	+	+	+	+	-	-	+	-	+	+
2 - Y	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3	0,89	+	+	+	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+
4.section																			
1	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
5	1,00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

ANNEX 3. UPDATED VERSION OF THE QUESTIONNAIRE (IN TURKISH)

Değerli Katılımcı,

Aşağıda, Okan Üniversitesi Sosyal Bilimler Enstitüsü İngilizce İşletme Anabilim dalı doktora programı öğrencisi Emre Göllü tarafından gerçekleştirilmekte olan **"Tedarik Zinciri Yapısının Firma Performansı Üzerindeki Etkisi: İlaç Sektörü Üzerine Özel Bir Çalışma"** başlıklı doktora tez çalışması için hazırlanmış anket formu yer almaktadır. Çalışmada, Türk ilaç sektöründe faaliyet gösteren firmaların tedarik zinciri yapıları ve bunların, firmaların performansları üzerindeki etkileri incelenecektir.

Araştırma sırasında verilen cevaplar ve gerek firmanızın gerekse sizin isminiz gizli tutulacak olup bunların sadece akademik çalışma için kullanılacağı taahhüt edilmektedir. Çalışma tamamlandıktan sonra elde edilecek sonuçların talep edilmesi durumunda sizinle paylaşılması mümkün olacaktır.

Ankette yer alan her bir ifadeye belirtilen kriterler doğrultusunda içtenlikle yanıt vermenizi rica edeceğim. Değerli vaktinizi ayırarak doktora tez çalışmam için gerçekleştirdiğim bu araştırmaya gönüllü katkıda bulunduğunuz için şimdiden teşekkür ederim.

Saygılarımla,
Araştırmayı Yürüten
Emre Göllü

Anket soruları

1. Firmaların tedarik zinciri yapılarının belirlenmesine yönelik sorular

Aşağıdaki 15 soru araştırma modelinin kapsamında tedarik zinciri yapısının incelenmesine karşılık gelmektedir:

1. Firmanızın Türkiye'de kendine ait **ilaç aktif maddesi (API) üretim fabrikası** var mıdır?

   a) Evet b) Hayır

2. 2001 – 2012 döneminde firmanızın Türkiye'de **ilaç aktif maddesi (API) üretim fabrikası** sahiplik durumunda bir değişiklik oldu mu?

   a) Evet b) Hayır

   Yanıtınız evet ise yılı:

3. Firmanızın Türkiye'de kendine ait **tam mamûl ilaç üretim fabrikası** var mıdır?

a) Evet b) Hayır

4. 2001 – 2012 döneminde firmanızın Türkiye'de **tam mamûl ilaç üretim fabrikası** sahiplik durumunda bir değişiklik oldu mu?

a) Evet b) Hayır

Yanıtınız evet ise yılı:

5. Firmanız, Türkiye'de **fason olarak tam mamul ilaç üretimi** yaptırmakta mıdır?

a) Evet b) Hayır

6. 2001 – 2012 döneminde firmanızın Türkiye'de **fason olarak tam mamûl ilaç üretimi yaptırma** durumunda bir değişiklik oldu mu?

a) Evet b) Hayır

Yanıtınız evet ise yılı:

7. Firmanız, tam mamûl ilaç depolama sürecinde**, mülkiyeti ve işletmesi kendine ait olan depo** kullanmakta mıdır?

b) Evet b) Hayır

8. Firmanız, tam mamûl ilaç depolama hizmetini **dış kaynak kullanımı (outsourcing)** yoluyla üçüncü taraf lojistik (3PL) hizmet sağlayıcı bir firmadan mı almaktadır?

b) Evet b) Hayır

9. 2001 – 2012 döneminde tam mamûl ilaç depolama sürecinizde, dış kaynak kullanımına (outsourcing) geçiş veya kendi deponuzun faaliyete geçişi şeklinde bir değişiklik gerçekleşti mi?

b) Evet b) Hayır

Yanıtınız evet ise yılı:

10. Firmanız, tam mamûl ilaç dağıtımı hizmetini **dış kaynak kullanımı (outsourcing)** yoluyla üçüncü taraf lojistik (3PL) hizmet sağlayıcı bir firmadan mı almaktadır?

b) Evet b) Hayır

11. 2001 – 2012 döneminde tam mamûl ilaç dağıtımı sürecinizde, dış kaynak kullanımına (outsourcing) geçiş veya kendi araç filonuzun oluşturulması ve kullanılması şeklinde bir değişiklik gerçekleşti mi?

a) Evet b) Hayır

Yanıtınız evet ise yılı:

12. 2001 – 2012 döneminde firmanızın **Türkiye'de ilaç aktif maddesi (API) üretim fabrikası** faaliyete geçirildi mi? (Mevcut bir fabrikayı satın almak veya sıfırdan fabrika kurmak şeklinde)

a) Evet b) Hayır

Yanıtınız evet ise yılı:

12. soruya yanıtınız evet ise lütfen 13. soruyu yanıtlayınız, değilse 14. soruya geçiniz.

13. 2001 – 2012 döneminde firmanızın **Türkiye'de ilaç aktif maddesi (API) üretim fabrikasını** faaliyete geçirmesinin amacı aşağıdakilerden hangisidir?

a) İlaç aktif maddesi (API) üretiminde mevcut kapasiteyi artırmak

b) İlaç aktif maddesi (API) üretimine başlamak

14. 2001 – 2012 döneminde firmanızın **Türkiye'de tam mamûl ilaç üretim fabrikası** faaliyete geçirildi mi? (Mevcut bir fabrikayı satın almak veya sıfırdan fabrika kurmak şeklinde)

a) Evet b) Hayır

Yanıtınız evet ise yılı:

14. soruya yanıtınız evet ise lütfen 15. soruyu yanıtlayınız, değilse 2. bölüme geçiniz.

15. 2001 – 2012 döneminde firmanızın **Türkiye'de tam mamûl ilaç üretim fabrikasını** faaliyete geçirmesinin amacı aşağıdakilerden hangisidir?

a) Tam mamûl ilaç üretiminde mevcut kapasiteyi artırmak

b) Tam mamûl ilaç üretimine başlamak

2. Firmaların satışlarında yerel olarak üretilen ürünlerin payının değerlendirilmesine yönelik sorular

Aşağıdaki 3 soru araştırma modelinin kapsamında firmaların satışlarında yerel olarak üretilen ürünlerin payının değerlendirilmesine yöneliktir:

1. Firmanızın Türkiye'de kendine ait ilaç aktif maddesi (API) üretim fabrikası varsa, yıllık toplam satışınızın % kaçı, aktif maddesi (API) Türkiye'de üretilen ürünlerden kaynaklanmaktadır ?

	%0-25	%26-50	%51-75	%76-100
Kutu adedi bazında (%)				
Ciro bazında (%)				

2. Firmanızın Türkiye'de kendine ait tam mamul ilaç üretim fabrikası varsa, yıllık toplam satışınızın % kaçı, Türkiye'de üretilen ürünlerden kaynaklanmaktadır ?

	%0-25	%26-50	%51-75	%76-100
Kutu adedi bazında (%)				
Ciro bazında (%)				

3. Firmanız Türkiye'de fason olarak tam mamul ilaç üretimi yaptırmaktaysa, yıllık toplam satışınızın % kaçı, Türkiye'de fason olarak üretilen ürünlerden kaynaklanmaktadır ?

	%0-25	%26-50	%51-75	%76-100
Kutu adedi bazında (%)				
Ciro bazında (%)				

3. Firmaların sahiplik yapılarının ve çokulusluluk düzeylerinin belirlenmesine yönelik sorular

Aşağıdaki 3 soru araştırma modelinin kapsamında firmaların sahiplik yapılarının ve çokulusluluk düzeylerinin belirlenmesine yöneliktir:

1. Firmanızın Türkiye'deki sahiplik yapısı aşağıdaki seçeneklerden hangisine uymaktadır?

   a) **Aile veya Şahıs firması:** Firmanın sahibi, bir aile veya bir kişidir.

   b) **Kurumsal yatırımcı:** Firmanın sahibi, bir yatırım firması, yatırım bankası veya fonu vb. tüzel kişidir.

   c) **Hissedarlar:** Firmanın sahipleri, birden fazla sayıdaki hissedarlardır.

   d) **Çokuluslu yabancı şirketin yerel firması**: Firmanın sahibi, çokuluslu bir yabancı şirket grubudur.

2. 2001 – 2012 döneminde firmanızın Türkiye'deki sahiplik yapısında bir değişiklik gerçekleşti mi? (Örn. Başka bir şirket tarafından satın alınma, başka bir şirketle birleşme veya yapıya yabancı sermaye katılımı vb.)

   a) Evet b) Hayır

   Yanıtınız evet ise yılı:

3. Firmanızın dünya genelindeki faaliyetleri, çokulusluluk bakımından değerlendirildiğinde aşağıdakilerden hangisine uymaktadır?

   a) **Yerel:** Firmanın faaliyetleri sadece Türkiye'de iç piyasayı kapsamaktadır.

   b) **Bölgesel:** Firmanın faaliyetleri, Türkiye'yi ve Türkiye'ye yakın coğrafi bölgelerdeki (Ortadoğu, Balkanlar, Kafkasya gibi) diğer ülkeleri kapsamaktadır.

   c) **Bölgelerarası:** Firmanın faaliyetleri, Türkiye'yi ve Türkiye ile birlikte dünya üzerinde farklı coğrafi bölgelerdeki ülkeleri kapsamaktadır.

d) **Küresel (Global):** Firma, Türkiye'nin yanı sıra tüm dünyada faaliyet göstermektedir.

4. Firmalar arasındaki farklılıkların belirlenmesine yönelik sorular

Aşağıdaki 5 soru, firmalar arasındaki farklılıkların belirlenmesi amacına yöneliktir.

1. Firmanızın personel sayısı aşağıdaki aralıklardan hangisinde yeralmaktadır?

   a) 0-250 b) 251-500 c) 501-750 d) 750'den fazla

2. Firmanızın Türkiye'de ilaç sektöründeki faaliyet süresi aşağıdaki aralıklardan hangisinde yeralmaktadır?

   a) 0-10 yıl b) 11-20 yıl c) 21-30 yıl d) 31 yıl ve üzeri

3. Firmanızın ürünleri, orijinallik bakımından aşağıdaki kategorilerden hangisine uymaktadır?

   a) Orijinal b) Jenerik

4. Firmanız Türkiye'den ihracat gerçekleştirmekte midir?

   a) Evet b) Hayır

5. Firmanızın Türkiye'de AR-GE Bölümü mevcut mudur?

   a) Evet b) Hayır

Anketimiz tamamlanmıştır. Soruları yanıtlayarak verdiğiniz destek için teşekkür ederim.

ANNEX 3A. UPDATED VERSION OF THE QUESTIONNAIRE (TRANSLATED TO ENGLISH)

Dear Survey-participant,

Below, you can find the survey as part of the PhD thesis study, "Impact of supply chain structure on business performance: A study on pharmaceutical industry", held by Emre Göllü, PhD student at Okan University, Institute of Social Sciences, Department of Management.

With this study, supply chain structures of the companies in Turkish pharmaceutical industry and the effect of these structures on their performance will be examined.

Responses to the survey, your name and the name of the company you represent will be kept strictly confidential. Once the study is completed, if requested, the results can be shared with the survey-participants.

I kindly ask for your sincere answers, following the criteria given.

Thank you in advance for your contribution.

Best regards,

Emre Göllü
Researcher

Survey

1. Questions on the definition of supply chain structures of the companies

Following 15 questions refer to the supply chain structure study within the research model:

1. Does your company have a site for active pharmaceutical ingredient (API) production in Turkey?

   a) Yes b) No

2. During the period of 2001-2012, did any change occur in your company's active pharmaceutical ingredient (API) production site ownership in Turkey?

   a) Yes b) No

   If yes, when? .....

3. Does your company have a production site for finished goods in Turkey?

a) Yes b) No

4. During the period 2001-2012, did any change occur in your company's finished goods production site ownership in Turkey?

a) Yes b) No

If yes, when? .....

5. Does your company have toll manufacturing in Turkey for finished goods' production?

a) Yes b) No

6. During the period 2001-2012, did any change occur in your company's toll manufacturing activities for finished goods-production in Turkey?

a) Yes b) No

If yes, when? .....

7. Does your company use a self-owned and –managed warehouse for the storage of finished goods?

a) Yes b) No

8. Does your company outsource the service of finished goods storage via a 3PL service provider company?

a) Yes b) No

9. During the period 2001-2012, did your company decide to outsource finished goods' storage service or start to operate its self-managed warehouse?

a) Yes b) No

If yes, when? .....

10. Does your company outsource the service of finished goods distribution via a 3PL service provider company?

a) Yes b) No

11. During the period 2001-2012, did your company decide to outsource finished goods' distribution service or start to establish and use its own distribution fleet?

a) Yes b) No

If yes, when? .....

12. During the period 2001-2012, did your company start with API production at its own site in Turkey (via buying already-built site or constructing of a new one)?

a) Yes b) No

If yes, when? .....

If your answer to question 12 is yes, please continue with question 13; if not, please go to question 14.

13. What was the reason behind your company's decision of API production site start-up in period 2001-2012?

a) To increase its capacity for API production
b) To start API production

14. During the period 2001-2012, did your company start with finished goods production at its own site in Turkey (via buying an already-built site or constructing of a new one)?

a) Yes b) No

If yes, when? .....

If your answer to question 14 is yes, please continue with question 15; if not, please proceed to part 2.

15. What was the reason behind the company's decision of finished goods' production site start-up in Turkey?

a) To increase its capacity for finished goods
b) To start finished goods production

2. Questions on evaluation of the locally produced products' share in company sales

Within the research model, following 3 questions are prepared to evaluate locally produced products' share in company's sales:

1. If your company has its own API production site in Turkey, what is the share of the sold products, which contain APIs produced in Turkey, in company's annual total sales?

	%0-25	%26-50	%51-75	%76-100
Per volume (box) (%)				
Per sales turnover (%)				

2. If your company has its own finished good-production site in Turkey, what is the share of these finished goods sold, in company's annual net sales?

	%0-25	%26-50	%51-75	%76-100
Per volume (box) (%)				
Per sales turnover (%)				

3. If your company has toll manufacturing in Turkey for finished goods production, what is the share of these toll manufactured finished goods sold, in company's annual net sales?

	%0-25	%26-50	%51-75	%76-100
Per volume (box) (%)				
Per sales turnover (%)				

3. Questions to determine the ownership and multi-nationality structures of companies

Following 3 questions are prepared to determine the ownership and multinationality structures of companies:

1. What kind of ownership structure does the company have in Turkey?

   a) **Family- or individual-owned:** The owner is a family or an individual.

   b) **Institutional:** The owner is a legal entity such as investor company, investor bank or investment fund.

   c) **Shareholders:** The owners are a group of shareholders.

   d) **Local subsidiary of a foreign multinational company**: The owner is a multinational companies group.

2. During the period 2001 – 2012 did any change occur in the company's ownership structure (Examples: Sold to another company, merged with another company, addition of foreign capital into the structure, etc.)?

   a) Yes b) No

   If yes, when? .....

3. Regarding multinationality, which of the following categories does the worldwide company business fit in?

   a) **Local:** Company business only covers Turkish domestic market.

   b) **Regional:** Company business covers Turkey and regions near to Turkey (Middle East, the Balkans, and Caucasus).

   c) **Trans**-regional: Company business covers Turkey and different geographical regions in the world.

   d) **Global:** Company operates globally.

4. Questions to determine the differences between companies:

Following 5 questions are prepared to determine differences between companies:

1. What is the total headcount in your company?

   a) 0-250 b) 251-500 c) 501-750 d) More than 750

2. For how many years has the company been present in Turkish pharmaceutical industry?

   a) 0-10 b) 11-20 c) 21-30 d) 31 or more

3. Regarding originality, which category do the company's products belong to?

   a) Original b) Generic

4. Does the company export from Turkey?

   a) Yes b) No

5. Does the company have an R&D department in Turkey?

   a) Yes b) No

You have completed the survey. Thank you for your contribution.

ANNEX 4. RELIABILITY ANALYSIS TABLE

Construct / Dimension	**Number of items**	**Cronbach's alpha**	**Cronbach's alpha based on standardized items**	**Result**
Supply chain structure				
Primary manufacturing	1	-	-	Accept
Secondary manufacturing	1	-	-	Accept
Warehousing and distribution	1	-	-	Accept
Multinationality	1	-	-	Accept
Product originality	1	-	-	Accept
Ownership structure	1	-	-	Accept
Share of primary production in the sales	2	-	-	-
Share of secondary production made in own factory in the sales	2	0,838	0,891	Accept
Share of secondary production made as toll manufacturing in the sales	2	0,765	0,839	Accept

CURRICULUM VITAE

Emre Göllü was born in İstanbul, on May 16, 1975. After graduating İstanbul Erkek Lisesi (Istanbul High School) in 1993, he studied his BSc in Chemical Engineering in Istanbul Technical University, where he graduated in 1997. He received his MSc degree in Chemical Engineering from Istanbul Technical University in 1999. During his MSc study, he worked as research and teaching assistant in the Chemical Engineering Department of Istanbul Technical University.

After fulfilling his military service between August 1999 and March 2000, he decided to continue his career in the private sector and started to work at Roche Müstahzarları San. A.Ş. in the field of quality management. He received his MBA degree from Istanbul Technical University in 2002. In the same year he changed his career to the field of supply chain management at Roche Müstahzarları San. A.Ş. In August 2005 he moved to Johnson & Johnson Sıhhi Malzeme Tic. Ltd. Şti. as Logistics Manager and then in January 2007 he joined UCB Pharma A.Ş. as Logistics Manager. He started his PhD study in the Business Administration Program of Okan University in April 2010. Since March 2012 he has been working as the Supply Chain Manager of Turkey, Middle East and Africa Region at UCB Pharma A.Ş. His areas of research interest are supply chain management, logistics management, operations management, strategic management, management and organizations, sports management and sports economics. He speaks fluent German and English, and French at intermediate level. Furthermore, he is writing articles in an Internet news portal and sectorial journals.