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**The Journal of International Business and Economic Affairs**

**Volume 1**

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# Journal of International Business and Economic Affairs

Welcome to the third volume of the *Journal of International Business and Economic Affairs.*

In this volume we present three articles, by Ahmed Salama, Yongsheng Guo and Daniel May, dealing with the subjects of water resource sharing, corporate ownership and performance and economic cooperation.

Ahmed Salama discusses the theme of water distribution from the Nile to populations along the river. As a major water resource for the countries through which it flows, the Nile is vital to all of them. Economically, this leads to a requirement for decisions to be made on the optimal allocation of water to different countries. As in many cases where a vital but limited resource is involved, optimization of welfare is constrained by the need for minimum needs to be met for all sections of the population. In addition, while water is a limited resource, the amount of water available can still be influenced by water wastage or inefficiencies in the use of water in agriculture or industry. The amount of water available in the world as a whole, like the amount of other natural mineral resources available, is bounded by the total quantity available at any given moment. Water, however, is a more pressing necessity than other minerals and the quality of the water supplied to end users is of far greater sensitivity. The economics of the distribution, refining and use of water is therefore a major subject for future discussion and Dr Salama's contribution is very much to be welcomed. We hope to be able to publish further articles from Dr Salama and others in this area in future.

Investment and investor behaviour has long been a major source of economic puzzles and challenges and will continue to be so. Even the idea of devising ways of testing the efficiency of markets is daunting, given the difficulty in factoring in the conflicting objectives, differing resources and underlying assumptions of investors, which are all largely independent of the efficiency of the dissemination and processing of information relevant to investments. Furthermore, the sheer volume and variety of alternative investments available and the differing laws governing different investors, investees and investment instruments in different jurisdictions would make it a superhuman effort for researchers to model how an efficient market would really behave. It is equally difficult for the purely behavioural economist to model all the possible influences on investor behaviour in advance. This, alas, is reflected in the paucity of academic economists who have been able to retire in great luxury as a result of their superior insights into the financial markets.

Yongsheng Guo provides a Chinese perspective on financial markets, as well as on widely acknowledged issues in corporate governance and corporate control. The separation of ownership and control is an old-established phenomenon in enterprise and creates the same agency problems, in a different form, from those which exist in government and charity. Combined with widespread trading of shares, it also gives rise to further questions about what behaviour is likely, rational or even ethical on the part of owners. Do they respond to poor performance by intervening in their companies, do they try to sell their shares and walk away or do they content themselves with cursing their bad luck or bad judgment and leave both their




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investment and the company's management unchanged? If they intervene, how do they ensure that they do not make matters worse, especially if they are not familiar with the technical and market aspects of their companies' business? If they sell their shares, how do they avoid replacing a bad investment with a worse one? Dr Guo's research reveals that private ownership and especially private institutional ownership with high concentrations of ownership in the hands of a few large shareholders is positively correlated with management performance. Yet private institutional ownership is even more strongly correlated with the stock market performance of the company's shares. Share prices do not necessarily respond directly to commercial performance, suggesting inefficiencies in the markets. There is also, however, evidence of possible ineffiencies in corporate governance, with a reluctance to intervene in underperforming companies on the part of shareholders, including institutional shareholders from both the private and the public sector. This constitutes a highly valuable contribution to the subject of investment and investor behaviour in China.

Daniel May addresses issues of trust in forming alliances, specifically in cooperation between farmers. This article provides a model of the effect of trust on the formation of peer alliances and examines the practical issues in such alliances. Such cooperation can improve efficiency in an industry and is therefore valuable but there are barriers to the formation of alliances, with the lack of trust between farmers being a key issue. It is, however, possible, for public institutions, including EU institutions to take steps to increase trust, including the establishment of information offices and the provision of information channels. We are privileged to be able to print Dr May's contribution to this topic.

We would like to thank all our contributors and hope that their articles will be of interest and practical benefit to our readers.

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*Ahmed Salama*

# Nile Water Sharing: Ethiopia, (North & South) Sudan and Egypt

**Abstract**

Freshwater is one of highest priorities for the Nile Basin riparian countries. The Nile Basin by its size, political divisions and history constitutes a major freshwater-related environmental resource and focus of attention. The approach to integrated and sustainable management of freshwater resources needs to be stressed. The stochastic nature of water supply and dynamics of water demand imply the need for an allocation model with certain characteristics to maintain the sustainable development of the basin countries in order to maximize the overall welfare. Thus, the need for Pareto-optimal model is a prerequisite as the unidirectional of the river, is often considered as a source of tension and conflict between countries that is difficult to solve. The goal of this paper is to develop a model following the same methodology as Kilgour and Dinar (1999), which is based on utilizing the water of the river by transferring it between countries within the river basin, as it allows the downstream countries that are in need for water to get it from upstream country by compensating that country for less water available for usage, trying to balance the growing demand of water in the Nile region for the development, which would lead to raising the economic welfare for the basin countries.

**Keywords:** Water, Development, Welfare.

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## 1. Introduction

One of the greatest challenges facing humanity is the of use scarce resources in an equitable way. Water scarcity is the greatest threat to human health, the environment, peace and the global food supply. Besides the qualitative aspect of water, the available quantity of water has a direct impact on a region's potential to produce food. Worldwide, agriculture is the main consumer of water. Water availability therefore has a direct influence on national food security. According to the FAO, all Nile Basin countries suffer malnutrition except Egypt. All countries of the Nile Basin, except Uganda (during some years), are net importers of cereals. Resources such as land and water, as well as the general political and economic situation play crucial roles; competitive usage can accentuate the threat of running dry.

The Nile River is shared between eleven countries (Egypt, Sudan, South Sudan, Ethiopia, Eritrea, Tanzania, Uganda, Burundi, Rwanda, Democratic Republic of




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Congo and Kenya). The Nile Basin covers an area of 3.1 million $km^2$, of which 1% is urban, 2% are covered by forest, 3% by wetlands, 3% by open water, 4% by shrub, 5% by irrigated cropland, 10% by cropland, 30% by desert/semi-desert and 42% by grassland. Many countries in the Nile Basin are highly dependent on the Nile's water, as they are situated in arid or semi-arid regions. More than 95% of Egypt's water comes from the Nile, this means that it depends on rainfall outside of its territory. There are four main development needs concerning water use in the Nile Basin despite the fact that the national economic capacity to address these issues is limited:

1. Water for irrigation and hydroelectric power production.
2. Flood prevention.
3. Erosion and siltation of reservoirs minimization.
4. Water pollution minimization.

The Basin contains a rich and varied range of ecosystems. Since the Nile waters do not stop at administrative or political boundaries, the river basin has been of great importance as regards to human settlement, development of a rich diversity of cultures, civilizations for centuries. Nile River is a crucial resource for the economic development of the Nile basin States and a vital source of livelihood for 160 million inhabitants as well as 300 million people living in the ten riparian countries, growing by 2-3% per year. It is estimated that in the next 25 years, the population in the Nile basin will reach 600 million.

Consequently, the Nile basin States jointly recognized that the best way to utilize, protect and manage the Nile basin in an integrated sustainable way through close cooperation among all the countries within the natural, geographical and hydrological unit of the river whereby all interests of upstream and downstream countries are considered and served. Nevertheless, it is an important catalyst for greater regional integration, economic, political, knowledge integrations with benefits far exceeding those derived from the river itself.

Planning is central in water resources management, as it is needed to develop strategies to reduce water usage and use it more efficiently (demand management), to optimize the supply (supply management) and to maintain or improve water quality (pollution control). The present situation, with limited possibilities for extension of water supply and growing demands, provides new challenges for planning.

The problems of water management fragmentation within each Nile basin state, weak human and institutional capacity to manage the Nile waters in an integrated manner, uneven distribution of water professionals within the basin as well as the inadequate interaction among water professionals in the Nile basin countries.

The lack of socio-economic development and benefit sharing due to the complexity and variability of the river basin's hydrology, as well as the differences between Nile basin countries' economies, necessitate social economic development and benefit sharing through an integrated approach to water resources management, environmental conservation and regional sustainable development.

The inefficient use of water for agricultural projects, the unavailability and the inefficient use of water for agricultural production is one of the major problems facing the Nile Basin Initiative (NBI) countries. Therefore creating a framework that will




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enable stakeholders from the Nile countries to work together to promote basin-wide cooperation and awareness, enhance understanding and build capacity on the common irrigation and water-harvesting issues was a main objective of the NBI.

The benefits of the cooperative Nile waters management and fall into four categories:

- Environmental benefits derived from integrated river basin management.
- Direct economic benefits derived from more optimal basin-wide planning and sustainable development of water resources.
- Regional political benefits, in terms of increased stability and diminished tensions over river control issues.
- Indirect economic benefits, in apparently unrelated sectors, that are enabled by increased economic productivity and interaction, and decreased regional tensions.

Resources are particularly scarce; there is a growing concern among scholars that escalating tensions could lead to violent conflicts over water in the near future if steps towards cooperation are not implemented. This issue is of particular concern within Africa where agriculture is economically predominant, yet it is the only continent where the growth in food production is lagging behind population growth (UN, 2004).

Population growth, poverty, ecosystem degradation and water scarcity are serious threats to political stability in the Nile Basin nations. In the coming years, the combined effects of climate change and population growth will continue to strain the earth's finite freshwater resources, which was recognized as a basic human right. According to several studies by the Intergovernmental Panel on Climate Change, the flow of the Nile River is expected to decline 2040-2069.

Along with population growth, another important trend to watch within the region is the expanding economic growth. This can lead to the ability of a state to pursue new development projects which were previously not within the scope of its capabilities. However, the economic trends may disproportionately benefit local populations at the expense of neighbouring states. While academic works, have identified the beneficial effects of forming collaborative agreements in Nile basin region. The objective of this paper is to test the hypothesis that a fair water sharing agreement can be achieved where are the best interests of the riparian countries are served to maintain the sustainable agricultural development as a base of the economic development.

The paper is structured as follows. Section Two introduces an econometric application for water distribution, the results of the hypothesis of utilizing the water of the river by transferring it between countries within the river basin of the investigation. Finally, Section Three describes the policy recommendations and concludes the paper.

The emergence of South Sudan as new state invariably carries with it a vast array of challenges. Some of these challenges relate to resolving outstanding issues with the mother state, and the sharing and managing of common resources. This is certainly the case with the new state of South Sudan. Indeed, the challenges in South Sudan are compounded by the inability of northern Sudan and southern Sudan to resolve any of the large number of outstanding issues before secession. For reasons related to hydro-politics the Sudan People's Liberation Movement/Army (SPLM/A) gave up any responsibility for the Nile waters during the interim period to the central government.




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Although this might have facilitated acceptance by the Nile riparian's of the right to self-determination, it has resulted in major delays in the decisions on the sharing and management of the Nile waters between the two parts of the country, and eventually between the two states.

Sudan and the new state of South Sudan now have to address, *inter alia,* the issue of sharing and managing the Nile waters. They also have to address the grazing and related water rights of the border communities in areas across some of the tributaries of the White Nile. Indeed, some of the disputed border areas that the two parties still have to resolve, including the dispute over the Abyei area, fall across the White Nile or some of its tributaries, thus extending the border disputes to water rights. The Jonglei Canal Project, as well as the other projects for conserving some of the waters of the swamps of southern Sudan, could as well be on the agenda of the Sudan. The Sudan may bring up completion of the Jonglei Canal Project as a way of providing more water for sharing with the new state. Aside from hydro-politics, the security situation in South Sudan may be an important factor in determining the future of the Jonglei Canal Project, as well as the other swamp projects.

Moreover, South Sudan will also face the issue of its relationship with the other Nile riparians, and how to deal with the Nile Basin Cooperative Framework Agreement (CFA). As indicated earlier, the six countries that have thus far signed the CFA will do their best to woo, perhaps even pressure, southern Sudan to become a party to the CFA so as to provide the desperately needed sixth state for the CFA to enter into force and effect. On the other hand, Egypt and Sudan, who vehemently oppose the CFA, will do their best to court southern Sudan to their side, or at least keep it neutral on this issue. It remains to be seen how South Sudan will handle this matter.

The centrality of water resources in the issues that need to be addressed in post-conflict situations has been reconfirmed by the emergence of South Sudan as an independent nation. In this case, the issues go well beyond the Sudan and the new state of South Sudan, and extend to the other riparian states of the Nile Basin.

## 2. Methodology

This section adapts an analysis technique for the efficient allocation and management of the water within the Nile River basin using the process of water allocation through joint cooperation as per the NBI Initiative1999, optimization models and the market solution.

### 2.1. The Optimization Model

The optimization model or the Water Allocation System (WAS) is developed in order to allocate water for maximizing the net benefits to consumers who are subject to certain constraints. "Shadow value" is a system that is used when the maximization of benefits involves one or more constraints. Scarce resources have positive values even if their direct cost of production is zero; this positive value is called "scarcity rent."

- In any location, the shadow value of water used is equal to the direct marginal cost of production plus the scarcity rent.




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- At a given location, water will be produced only when the shadow value of water exceeds the marginal cost of production at that location.
- When water is transported from one location to another, the shadow value of water at the second location cannot exceed the first location shadow value by more than the cost of transportation.
- The activity that is profitable at the margin using shadow values should be increased, while the activity that loses money at the margin should be reduced.

Districts within a country, or between two or more countries are characterized by interdependent water demands, water supplies, water costs and related water infrastructure, could apply the WAS model .The geographical region that is under management is divided into a number of districts .Within each district, the annual renewable amount of water from each source, such as the pumping cost, is taken into consideration .The demand curves for water are used for household, agriculture and industrial use .Recycling of water waste and inter-district conveyance is allowed .The environmental issues are carried in many ways:

- Water extraction to be restricted to annual renewable amounts.
- A charge could be imposed on household and industry.
- Recycled water use in agriculture can be restricted.

The model allows infrastructure experimentation in future, such as building seawater desalination plants in the districts near seacoast .

The WAS model is a powerful tool for the analysis of costs and benefits of the various infrastructure projects, in addition, the model allocates the available water to maximize the net benefits and it also provide the shadow values .Beyond the efficient water allocation and management, the WAS model can be used for the purpose of assisting in the water negotiations and achieving cooperation through "win-win" criterion:

- The WAS model is used to reveal the water value at different locations so it enables the water disputes to be expressed in monetary terms, which might facilitate their solution.
- The WAS model is used by each negotiating party to evaluate the impact of different proposed water agreements for itself and for others, so this should aid negotiations.
- The WAS model shows that cooperation in managing shared water resources could be beneficial, if it is used on a regional scale .The cooperation involves the trading of water permits that is short-term to enable one party to use another party's water at specified locations .Such trading takes place at the shadow values provided by the WAS model's output and would lead to a joint benefits wherever the parties valued water in a different manner, further benefits could be achieved by the construction of joint infrastructure .The WAS approach shows that such disputes are merely matters of money, so the WAS solution could be used without waiting for the disputed parties as payments could be placed in an escrow fund while countries continue to negotiate.

## 2.2. Market Trading System for Water and Customary Law




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The idea of setting up free market for trading water has been introduced as a solution to the disputes over water between neighbouring nations but this market solution is a complex one because it is fraught with danger so it requires the intervention of the international law .The market solution aims to set up a trading system through which countries that are considered rich in water sell some to countries in need .A market always ensure peace and efficiency as the countries which pay for water will not waste a resource that they have paid for, on the other hand, the market solution helps in the settlement of water disputes as compensation can be sought in a court if a country infringes on the property of other .But, we must take into consideration the fact that water is unlike any other natural resource (except air) is ambient, which means that it moves and doesn't respect any political or administrative borders so there is no entity can control it . Ownership rights should be clear before the market work .The severe problem that always arise is that how to determine ownership of a resource. In order to govern the right of nations over shared water resources, the customary international law was developed, as there is no legal agreement between nations that share a common river .There are two types of international claims .First, the downstream nations claim absolute integrity of the river by blocking the upstream nations from affecting the quality and quantity of water flowing to them .Second, the upstream nation claims their absolute territorial water sovereignty regardless of the effect on downstream nations .The equitable utilization is said to be the solution for all these claims, it is a concept that oblige each nation to recognize the right of others for using water from a common source .Under this concept, countries decide on the quantity of water that is allocated to each nation by taking into consideration some standards as the amount of land that could be irrigated and the historic patters of usage in addition to the objective factors as the need for more water due to a growing population in certain nations.

The customary law has an advantage over the market solution as it recognizes the unique nature of the river water, as despite of determine ownership, It states a rule for water sharing within the river basin .On the other hand, the customary law has two disadvantages .First, it is too vague to determine the fair share of each nation .Second, there is no way or mechanism to enforce the law so in a case of violation; the only available way is the vendetta law.

## 2.3 Water as an Economic Good

Water is considered by many researchers to be an economic good due to the scarcity of resources. The economic value of water is related to the laws of supply and demand. Water is regarded as a never diminishing asset, the question of equitable utilization imply that there is an obligation not to harm to any country. Water resource allocation is subject to Efficiency and Equity.

The literature of international water disputes proposes several principles in order to solve disputes within an international water basin:

- *The theory of absolute territorial sovereignty* is known as "Harmon Doctrine," which gives the right to upstream countries to do whatever they like with the water flowing in their territory without taking into consideration the harm it causes to other downstream countries.




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- *The theory of absolute integrity of the river* maintains that upstream countries should not interfere in the natural flow of water, which passes through their territory in a manner that might have any impact on the flow of water downstream.
- *The theory of limited territorial integrity* states that each country could use the water of the river but this usage is subject to certain restriction in favor of other countries.
- *The theory of community of interests* ignores the national boundaries and regards the entire basin as a geographic and economic unit.

All these principles could not be considered a solution to the water scarcity, as there are no ways of enforcement. Thus, any country could violate these principles and seek its own benefit regardless of others. So we need a practical solution in order to maintain joint welfare for all countries sharing common water resource.

## 2.4 Data Description

In this paper we will try to arrive at the Pareto-optimal allocation model that maximizes the welfare of a downstream country (Egypt) and an upper stream country (Ethiopia) without causing any significant harm to any of them. There are several relevant factors that contribute the equitable utilization of water in both countries, which include:

A Renewable water supply

Renewable water supply originates from various sources and is delivered through many delivery systems. There are other sources of supply such as surface water, ground water, agriculture drainage water, reused treated waste water and desalination of sea water.

1. Surface water

To allocate the surface water efficiently. We have to balance between potential users due to the different competing claims of different competing users. Second, we have to consider the fact that the surface water flow variability, as the supplies of surface water are not constant over time.

2. Renewable ground water

Ground water is considered to cause less pollution than surface water. It is extracted from aquifers underground that widely differs in size as well as the recharge rates. Ground water is classified according to the depth of the source. Ground water is depletable or exhausted. The efficient allocation of groundwater requires declining demand over time. In addition, pumping of groundwater stops when either marginal cost of pumping exceeds marginal benefit of the ground water or exceeds other sources marginal cost.

3. Agricultural drainage water

A pump or a drainage stations can be used in the large-scale cultivations to deliver the water back to the main canal. Drainage has three kinds:

- The drains that carry freshwater that is used on the land or returned to the canal.




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- The drains that pick saline up from groundwater and use after mixing with the canal water.
- Drains polluted by wastes of the industrial and domestic usage. Drainage water should be used where it is produced rather than discharging it downstream facing difficulty of managing efficiently. Drainage re-use system increases the overall efficiency of the by 65%.

4. Reused treated wastewater

In agricultural land, the wastewater treatment levels for the application range from zero (discharge of raw sewage) to a highly treated water that is produced from newly constructed wastewater treatment plants. Trained operators monitor the wastewater stream for health risk levels. Wastewater reuse rules for agriculture follow the World Health Organization (WHO).

5. Desalination of seawater

Wealthy countries prefers this source of fresh water like gulf countries. Desalination is the process through which dissolved salt is separated from saline water and become available for usage. Desalination is a good option for countries that have huge amounts of saline water and could not find a way to use it.

B Water demand in Egypt

Uses of water include agricultural, industrial, household and municipal uses. The demand for water increases due to the large consumption of these sectors and to the growing population size.

Since water is being accepted as an economic good, it has a value assigned to it, which has three main economic effects:

- It reduces the overall water demand, as people tend to consume less water when they pay for it, they become more conservative in their consumption behavior.
- As a consequence, a decline in water use leads to an increase in the supply.
- The efficient use of water leads to a market-driven reallocation of water usage across various sectors, as a result of pricing policies that encourage responsible distribution.

A recent study on the vulnerability of Egypt's Mediterranean coast and the Nile Delta to sea level rise concluded that the impact of climate change on the Nile Basin could not be predicted but that there are indications that the impacts will be significant and severe.

1. Agriculture

The agriculture sector is considered the most dominant water user as about 70 percent of the world's freshwater is used in irrigation as farmers in developing countries consume double their counter parts in industrialized countries while getting crop yield three times less. Therefore, efficient water use could save 20 -30 percent of the world water, and increase food production to save millions from malnutrition and starvation.

2. Industry

The industrial sector is considered to be the second largest user of water accounts for 20 percent of the global freshwater usage. It is concentrated in the industrialized




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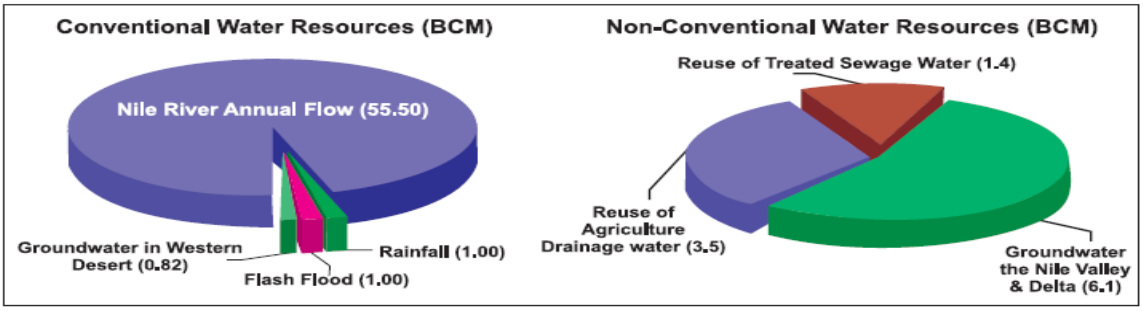
countries, while most of the developing and part of the industrialized countries consume less than 16 percent of their freshwater in the industrial sector. Dams and reservoirs are used to store the majority water to be utilized for irrigation and electrical power generation later. The industrial sector water used for industrial processes is about 35 percent, power generation consumes about 65 percent and the rest is used for thermal power generation. However, the industrial water storage in reservoirs can lead to excessive evaporation loss of water. Since the 1970s, it is noted that the water lost due to the reservoir evaporation is more than the amount that is consumed by the industrial and domestic sectors combined. Therefore, by the use of covered reservoirs and condensation systems, we could reduce the amount of water lost through improving the industrial water usage efficiency.

### 3. Domestic and Municipal

Domestic water use is considered to be a small percentage of global water use and it is defined as the amount of water available to the population residing in cities and towns. Most countries are consuming 0-30 percent of the freshwater regardless of their developmental status.

The requirement of water needed for municipal use was 4.5 $km^3$ in 2000, some of this water is consumed and the rest returns back to the sewerage system or to the groundwater by seepage. The domestic water use requirement is estimated to be around 6.6 $km^3$ in 2025.

**Figure 1: Water Resources of Egypt**




Source: International Commission on Irrigation and Drainage (ICID), New Delhi

### C Total water withdrawal per capita

The two main problems that face Egypt are the increasing population that results in decreasing per-capita water availability and increasing overall demand, and changing conditions particularly technology and climate that affect both water demand and supply. In reality, Egypt is unlikely to reach a satisfactory level of water use because of absolute constraints on availability. Thus, in the absence of inexpensive desalination, the only alternative is therefore a declining per-capita use of water. This can happen by declining benefits resulting from continued inefficient use of water in traditional ways or with constant or improving benefits resulting from improving water-use efficiency and changing water policies.

Implementing efficient methods of irrigation is very important as over 60 percent of the water used each year in the world is consumed for irrigating crops. Nowadays,

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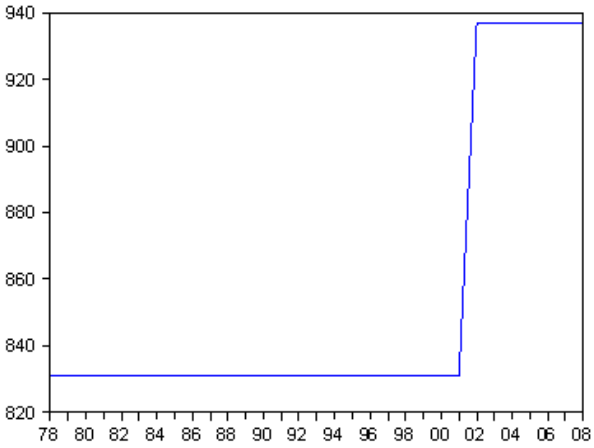
some farmers are using "surge-flow" technique in order to replace the traditional flooding and channelling irrigation. "Night time" irrigation is another technique used by many farmers, which reduces evaporation and increases efficiency. "Low-pressure sprinklers" improve efficiency by 60-70 percent compared with high-pressure sprinklers. "Low-energy precision application" could push the efficiency almost up to 100 percent, all these techniques to grow crops with less water but with greater yield. Figure 2 shows the total water withdrawal per capita in Egypt. Showing that since 2001, the amount of water withdrawal per capita has reached its peak due to the continuous inefficient use of water and the reliance on one source of water.

**Figure 2: Total Water Withdrawal per Capita**

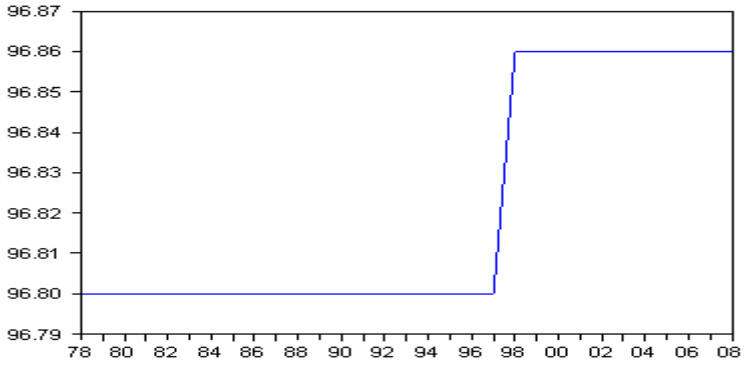



Source: Manually on E-views

D Dependency ratio

Egypt depends on the Nile as the main source of water supply. It is important to note that the agriculture sector consumes the larger amount of water in Egypt. Figure 3 shows the dependency ratio on water in Egypt.

**Figure 3: Dependency Ratio**




Source: Manually on E-views

Agriculture lost its position as the dominant economic sector during the 1970s, as agriculture exports contribution to GDP continued to decline (from 87 percent in1960, to 9.7 percent in 2010).

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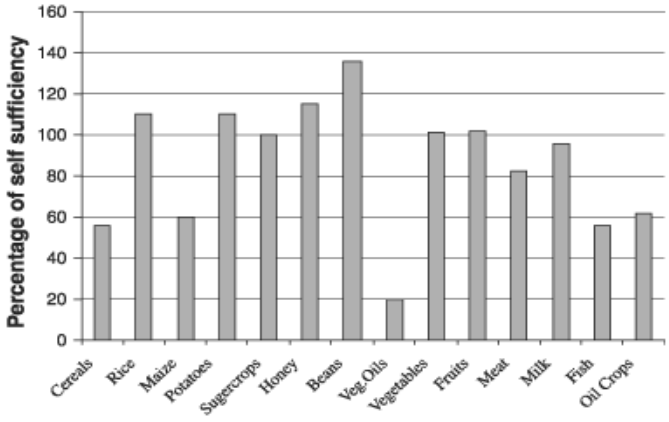
According to the national council for production and economic affairs, the Aswan high dam, which was completed in 1971, had proved its successful control of floodwaters and the continuous insurance of water supplies, but on the other hand, the consumption of water had been excessive and should be controlled. The drawbacks of the Aswan high dam is that some valuable land was lost below the dam due to the fact that the flow of the Nile silt was stopped and also the problem of increased salinity still exist.

**Figure 4: Self-Sufficiency of Crop Yield**

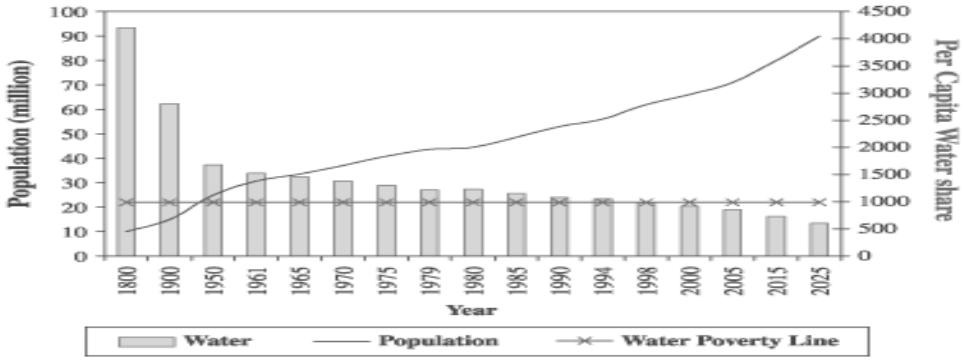



Source: ICID, New Delhi

E Population

The quantity and quality of water is imposing limits on Egypt's economic development, due to rapid population growth, deterioration of water quality, water scarcity and fragmentation of water management among various institutions, cost of water resource services recovery, in addition to the rapid degradation of surface and ground water quality less water is now available for various uses. Therefore, the deterioration of the quality of water has resulted in loss of biodiversity, human health hazard and the irreversible pollution of groundwater that is affecting the sustainability of agricultural production.

**Figure 5: Per Capita Water Share and Population Growth**




Source: ICID, New Delhi

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F Water Balance

The water balance is an accounting balance of the inputs and outputs of water. The water balance of a place, whether it is an agricultural field, watershed or continent is mainly determined by calculating the input, output, and storage changes of water at the Earth's surface. In our model, we are comparing the water supply with water demand in order to arrive at the equitable utilization of water in Egypt (see Table 1).

**Table 1: The Equitable Utilization of Water in Egypt**

| Supply | 1978-1997 | 1998–2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Surface Water | 55.5 | 55.5 | 55.5 | 55.5 | 55.5 | 55.5 | 55.5 | 55.5 | 55.5 | 55.5 |
| 2. Ground Water | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 |
| 3. Agricultural Drainage Water | 4.0 | 4.0 | 4.4 | 4.8 | 5.1 | 5.4 | 5.7 | 8.0 | 8.0 | 8.0 |
| 4. Reused Treated Waste Water | 0.2 | 2.971 | 2.971 | 2.971 | 2.971 | 2.971 | 2.971 | 2.971 | 2.971 | 2.971 |
| 5. Desalination of Sea Water | 0.025 | 0.1 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| Total | 61.025 | 63.871 | 64.231 | 64.631 | 64.931 | 65.231 | 65.531 | 67.831 | 67.831 | 67.831 |
| Demand | | | | | | | | | | |
| 1. Agriculture | 47.4 | 59 | 57.8 | 58.1 | 58.5 | 59.05 | 59.3 | 60 | 60 | 60 |
| 2. Industrial | 4.6 | 4 | 1.1 | 1.1 | 1.15 | 1.15 | 1.15 | 1.2 | 1.2 | 1.2 |
| 3. Municipal and Domestic | 3.1 | 5.3 | 5.3 | 5.4 | 5.6 | 5.8 | 6.1 | 6.5 | 6.6 | 6.7 |
| 4. Evaporation | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 |
| Total | 57.2 | 70.4 | 66.3 | 66.7 | 67.35 | 68.1 | 68.65 | 69.8 | 69.9 | 70 |

Source: AQUASTAT (2005)

## 3. Empirical analysis

The applied model in this paper is being based on the compensation concept, which is widely used in the field of economics. Before proceeding with such methodology, the applicant tries to assess the water scarcity problem in Egypt and test the necessity of the application of the compensation model as the only possible solution left to Egypt in order to solve its water problems with its upstream countries in the Nile Basin by using simple econometric concepts, the applicant will be able to arrive at the required results which will in turn facilitate the second stage, which is the application of the compensation model. As we noted earlier, the compensation model allows the downstream countries that are in need for water to get it from an upstream country by




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compensating that country for less water available for usage. In the first stage of the model, the applicant is going to construct a simple model in order to assess the water demand per year in Egypt and get an idea about the various factors that affect the demand and causes its rapid increase. The factors that are supposed to affect demand the most are namely; average supply per year, total water withdrawal per capita, dependency ratio, population and population density (the explanatory variables). Therefore, our null hypothesis is that the average demand per year in Egypt is not affected by those variables while the alternative hypothesis is that the average demand per year in Egypt affected by at least one of those variables. The model includes 31 observations as shown in Table 3.

The regression equation is:

Average demand per year (Y) = $-\beta_O + \beta_1$ Average Supply Per Year - $\beta_2$ Total Water Withdrawal Per Capita + $\beta_3$ Dependency Ratio + $\beta_4$ Population - $\beta_5$ Population Density + $e_i$

$H_o$: $\beta_0=\beta_1=\beta_2=\beta_3=\beta_4=\beta_5=0$

$H_1$: at least one of the $\beta$'s $\neq 0$

Average demand per year (Y) = - 20613.20 + 0.258025 Average Supply Per Year – 0.023843Total Water Withdrawal Per Capita + 213.5914Dependency Ratio + 0.164138Population - 0.177884Population Density+ $e_i$ (1)

**Table 2: Dependent variable: Average Demand per Year**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -20613.20 | 1120.712 | -18.39295 | 0.0000 |
| SUPPLY | 0.258025 | 0.198883 | 1.297371 | 0.2063 |
| WITHDRAWAL | -0.023843 | 0.004226 | -5.642042 | 0.0000 |
| DEPENDENCY | 213.5914 | 11.67286 | 18.29812 | 0.0000 |
| POPULATION | 0.164138 | 0.058641 | 2.799012 | 0.0097 |
| DENSITY | -0.177884 | 0.060152 | -2.957250 | 0.0067 |
| R-squared | | | | 0.991647 |
| Adjusted R-squared | | | | 0.989977 |
| S.E. of regression | | | | 0.586804 |
| Sum squared residuals | | | | 8.608459 |
| F-statistic | | | | 593.6114 |
| Probability(F-statistic) | | | | 0.000000 |
| Mean dependent variance | | | | 61.42581 |
| S.D. dependent variance | | | | 5.861241 |
| Durbin-Watson stat | | | | 2.213404 |

Source: Manually on E-views

## 4. Interpreting the Results

The regression $R^2$ is defined as the fraction of the sample variance of $Y_i$ that is explained by the explanatory variables. The goodness of fit is mathematically measured by this equation $R^2 = 1 - (ESS/TSS)$, but analyzing $R^2$ usually creates a problem as it makes the addition of any variable will increase $R^2$. So if a new variable is added, the corresponding $R^2$ cannot decrease but is more likely to increase. To avoid such problem, we can use another type of goodness of fit called adjusted $R^2$ or




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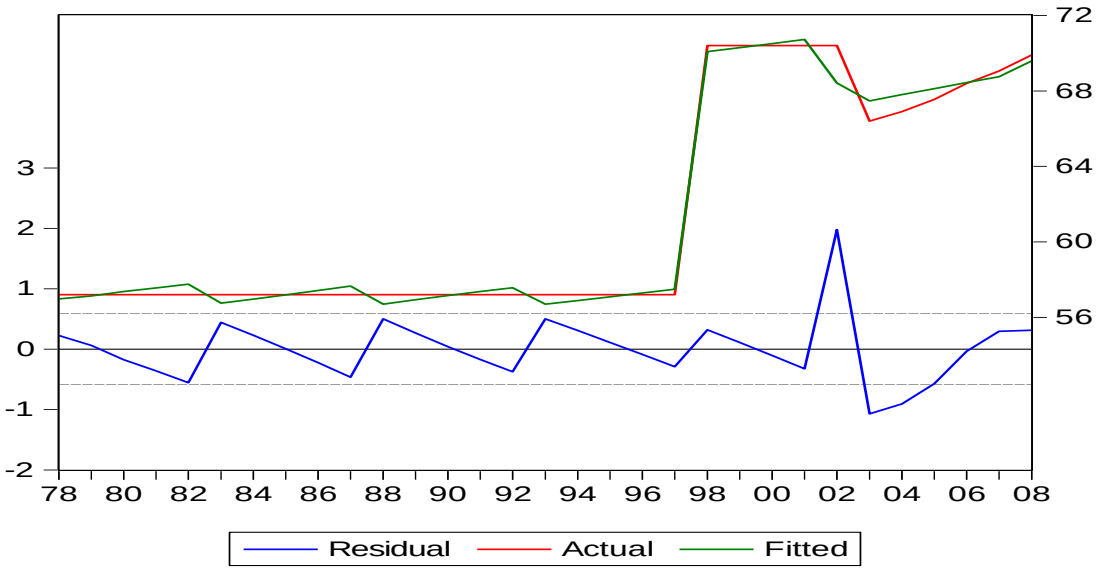
$R^2$ adjusted for degrees of freedom. It is considered a better measure of goodness of fit as it permits the trade off between increased $R^2$ and decreased degrees of freedom. Thus the adjusted $R^2$ is considered to be a modified version of $R^2$ that usually does not increase when new explanatory variables are added. In our model, this problem does not exist as both the $R^2$ and the adjusted $R^2$ are very high around 99 percent; which means that the explanatory variables namely; average supply per year, total water withdrawal, Dependency ratio, population and population density explain the variation in dependent variable namely; average demand per year by 99 percent.

**Figure 6: Residual Plotting of the Regression Equation**




Source: Manually on E-views

**Table 3: Correlation between the Variables**

| Description | Average demand / year | Average supply per year | Total water withdrawal per capita | Dependency ratio | Population | Population density |
|---|---|---|---|---|---|---|
| Average demand per year | 1.000000 | 0.914553 | 0.650557 | 0.988232 | 0.800733 | 0.805658 |
| Average supply per year | 0.914553 | 1.000000 | 0.814907 | 0.932152 | 0.838362 | 0.825728 |
| Total water withdrawal per capita | 0.650557 | 0.814907 | 1.000000 | 0.728219 | 0.729256 | 0.715605 |
| Dependency ratio | 0.988232 | 0.932152 | 0.728219 | 1.000000 | 0.825564 | 0.838105 |
| Population | 0.800733 | 0.838362 | 0.729256 | 0.825564 | 1.000000 | 0.985664 |
| Population density | 0.805658 | 0.825728 | 0.715605 | 0.838105 | 0.985664 | 1.000000 |

Source: Manually on E-views

## 4.1. Testing for Multicollinearity

Multi-co-linearity means the existence of linear relationship among the explanatory variables of the regression model to identify multi-co-linearity can take many forms.

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In our model, the problem of multi-co-linearity does not exist as the probability (F-statistic) is significant.

### 4.2. Testing for Autocorrelation

Autocorrelation usually occurs in regression analysis of time series data when the y value in one period is correlated with its next period value. Thus autocorrelation is the correlation of a series with its own lagged values. Autocorrelation problem does not exist in our model since the Durbin Watson test is equal to 2.213; which means that there are no autocorrelation between the variables.

### 4.3. Testing for Heteroskedasticity

Heteroskedasticity occurs mainly in models with cross-section data. It is usually caused by a relationship between the disturbance variable and one or more variables or their variances, and it can also be caused by the data. Thus, heteroskedasticity can be found in models with time series data. Therefore we applied the White test to check whether there is a problem of heteroskedasticity or not. Indeed, it is obvious that the model does not have the problem of heteroskedasticity and this is shown in the output and graph of the test, which yield significant variables.

**Table 4: Heteroskedasticity (White Test): Consistent Standard Errors and Covariance**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -20613.20 | 2088.824 | -9.868327 | 0.0000 |
| SUPPLY | 0.258025 | 0.389434 | 0.662564 | 0.5137 |
| WITHDRAWAL | -0.023843 | 0.007974 | -2.990254 | 0.0062 |
| DEPENDENCY | 213.5914 | 21.76580 | 9.813166 | 0.0000 |
| POPULATION | 0.164138 | 0.090743 | 1.808824 | 0.0825 |
| DENSITY | -0.177884 | 0.099971 | -1.779363 | 0.0873 |
| R-squared | | | | 0.991647 |
| Adjusted R-squared | | | | 0.989977 |
| S.E. of regression | | | | 0.586804 |
| Sum squared residuals | | | | 8.608459 |
| F-statistic | | | | 593.6114 |
| Probability(F-statistic) | | | | 0.000000 |
| Mean dependent variance | | | | 61.42581 |
| S.D. dependent variance | | | | 5.861241 |
| Durbin-Watson stat | | | | 2.213404 |

Source: Manually on E-views

### 4.4. Cointegration test

Cointegration is the phenomenon through which two or more series have the same stochastic trend in common; in this case, regression analysis can reveal long-run relationships among time series variables. Two or more time series with stochastic trends can move closely together over the long-run so that they appear to have similar trend component. Thus, two or more series that have a common stochastic trend are co-integrated. The co-integration relationship is used for forecasting. There are three methods in order to decide whether two variables can be modeled as co-integrated:




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1. Graph the series to see if they appear to have a common stochastic trend

2. Use expert knowledge and economic theory

3. Perform statistical tests for co-integration. Indeed, the three methods should be used in practice.

**Table 5: Unrestricted Cointegration Rank Test (Trace)**

| Hypothesized No. of Cointegrating Equations | Eigen value | Trace Statistic | 0.05 Critical Value | Probability |
|---|---|---|---|---|
| None | 1.000000 | 1045.266 | 3.841466 | 0.0000 |

Trace test indicates that there is one co-integrating variable at the 0.05 level.

### 4.5. Unit root test

The applicant now turns to the Unit Root Test. The reason behind using several unit root tests is the size and power of these tests. The test significance level which is the probability of committing type I error while power is the probability of rejecting the null hypothesis when it is false and it is calculated by subtracting the probability of type II error from 1 (type II error is the probability of accepting null hypothesis when it is false), the maximum power is 1. The null hypothesis of most unit root test is that the time series under consideration has a unit root; that it is non-stationary, while the alternative hypothesis is that the time series is stationary.

H0: time series is non-stationary

H1: time series is stationary.

In order to avoid the spurious regression problem that arises from regressing a non-stationary time series on one or more non-stationary time series, we need to transform non- stationary time series to stationary time series. The transformation process depends on whether the time series are difference stationary process (DSP) or trend stationary process (TSP). In a difference stationary process, if the time series has a unit root, the first differences of such time series are stationary, thus the solution is to take the first difference of the time series. A trend stationary process is stationary around the trend line, thus to make such time series stationary, we need to regress it on time and the residuals from this regression will then be stationary. It should be noted that if a time series is a difference stationary process but we treat it as trend stationary process, this is called under differencing while on the contrary, if a time series is a tend stationary process and we treat it as a difference stationary process, this is called over differencing. Indeed, the consequences of these specification errors can be serious depending on the way through which the serial correlation properties of the resulting error terms are handled. In fact, most macroeconomic time series are difference stationary process rather than trend stationary process.

The spurious regression is the reason behind the need for determining whether variables contain stochastic trends or not. Any variable could have no trend, only stochastic trend, only deterministic trend or both stochastic and deterministic trends.

*The Dickey-Fuller Test for a Unit Root*

Because p is skewed toward values less than 1 when $p = 1$, a traditional t-test with the null hypothesis that $p = 1$ against the alternative hypothesis $p < 1$, often result in




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rejecting the null hypothesis. The consequence of the failure to account for the true disturbance nature will lead you to think that $p < 1$, while it is equal to1. Therefore, the two statisticians David Dickey and Wayne Fuller used methods to salvage the t-test statistic, by computed correct critical values for the t-statistic instead of the misleading critical values that we get from the t-tables. Thus the convenience of this form is that the null hypothesis of a unit root ($p = 1$) becomes a test that the coefficient on $Z_{t-1, (p-1)}$, is zero. We could obtain the needed t-statistic directly from the standard regression output, as the t-statistic for this test that regression packages always report. As we rule out that $|p| > 1$ as implausible, the Dickey-Fuller test is considered to be a one-sided test in which the alternative hypothesis is $(p - 1) < 0$. Thus, if the t-statistic is negative, we reject the null hypothesis of a stochastic trend. By applying the augmented Dickey-Fuller unit root test to the average demand per year, average supply per year, total water withdrawal per capita and dependency ratio, the output is as follows.

The average demand per year, average supply per year, total water withdrawal and dependency ration has a unit root at the first difference, I(1). While, population has a unit root at the second difference, I(2), and population density has a unit root constant and linear trend. Thus, the applicant could not apply the regression model and thus ordinary least square (OLS) method is inapplicable too. The applicant applies the autoregressive distributed lag model.

**Table 6: Augmented Dickey-Fuller Test Statistics**

Average demand per year: Exogenous: none

| | | t-Statistic | Probability |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.282059 | 0.0000 |
| Test critical values: | 1% level | -2.647120 | |
| | 5% level | -1.952910 | |
| | 10% level | -1.610011 | |

Average supply per year : Exogenous: none

| | | t-Statistic | Probability |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.642585 | 0.0007 |
| Test critical values: | 1% level | -2.647120 | |
| | 5% level | -1.952910 | |
| | 10% level | -1.610011 | |

Total water withdrawal per capita: Exogenous: none

| | | t-Statistic | Probability |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.291503 | 0.0000 |
| Test critical values: | 1% level | -2.647120 | |
| | 5% level | -1.952910 | |
| | 10% level | -1.610011 | |

Dependency ratio: Exogenous: none

| | | t-Statistic | Probability |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.291503 | 0.0000 |
| Test critical values: | 1% level | -2.647120 | |
| | 5% level | -1.952910 | |
| | 10% level | -1.610011 | |

Population: Exogenous: second difference, none

| | | t-Statistic | Probability |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.595768 | 0.0009 |
| Test critical values: | 1% level | -2.660720 | |
| | 5% level | -1.955020 | |
| | 10% level | -1.609070 | |

Population density: level Exogenous: constant, linear trend

| | | t-Statistic | Probability |
|---|---|---|---|




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| | | | |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -7.899648 | 0.0000 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

Source: Manually on E-views

*Autoregressive Distributed lag model (ARDL)*

An Autoregressive Distributed lag model or ARDL model refers to a model with lags of both the dependent and explanatory variables. Thus our estimated ARDL equation is as follows:

D (average demand per year) = $\beta_0$ + $\beta_1$ D (average supply per year) + $\beta_2$ D (total withdrawal per capita) + $\beta_3$ D (population) + $\beta_4$ D (population density) – $\beta_5$ (average demand per year) (-1) + $\beta_6$ (average supply per year) (-1) + $\beta_7$ (total withdrawal per capita) (-1) + $\beta_8$ (population) (-1) + $\beta_9$ (population density) + $e_i$ (2)

The applicant asserted that the differenced variable is used to model the change in a variable from one time period to the next which is used with lagged variables to model the short run:

$$\Delta y_t = y_t - y_{t-1} \quad (3)$$

In econometrics usually the long and short run are modelled differently. The long-run equilibrium is defined as when the variables have attained some steady-state values and are no longer changing. In the long-run we can ignore the lags as:

$$y_t = y_{t-1} = y_{t-2} = y^* \quad (4)$$

Thus, to obtain the long-run steady-state solution from any given model we need to remove all time subscripts including lags, set the error term equal to its expected value of 0, remove the differenced terms and arrange the equation so that all X and Y terms are on the same side. For example given the following model, we can use the previous rules to form a long-run steady-state solution:

$$\Delta y_t = \alpha_0 + \alpha_1 \Delta x_t + \alpha_2 y_{t-1} + \alpha_3 x_{t-1} + u_t$$

$$0 = \alpha_0 + \alpha_2 y^* + \alpha_3 x^*$$

$$\alpha_2 y^* = - \alpha_0 - \alpha_3 x^*$$

$$y^* = -\frac{\alpha_0}{\alpha_2} - \frac{\alpha_3}{\alpha_2} x^* \quad (5)$$

Estimation equation: D (average demand per year) = - average supply per year (-1) - total water withdrawal per capita (-1) - population (-2) + population density + D (average supply per year) +D (total water withdrawal per capita) - D (population) - D (population density) (6)

**Table 7: Regression Analysis for Average Demand per Year**

| Variable | Coefficient | Probability |
|---|---|---|
| SUPPLY(-1) | 0.594730 | 0.0025 |
| WITHDRAWAL(-1) | -0.031102 | 0.0229 |
| POPULATION(-2) | -0.296623 | 0.1700 |
| DENSITY | 0.358145 | 0.0948 |
| DEMAND(-1) | -0.253317 | 0.0211 |
| D(SUPPLY) | 3.329994 | 0.0000 |




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| | | |
|---|---|---|
| D(WITHDRAWAL) | 0.009703 | 0.5718 |
| D(POPULATION) | -0.431236 | 0.8993 |
| D(DENSITY) | -0.172647 | 0.3100 |
| $R^2$ | | 0.768244 |
| Adjusted $R^2$ | | 0.675541 |
| Standard Error of Regression | | 1.472905 |
| Sum of Squared Residuals | | 43.38899 |
| Mean Dependent Variance | | 0.437931 |
| Standard Deviation of Dependent Variance | | 2.585801 |
| Durbin-Watson Stat | | 1.576170 |

Source: Manually on E-views

The general form of the autoregressive distributed lag (ARDL) form estimated from equation (1) is:

D (demand) = 0.594730 * supply (-1) -0.031102 * withdrawal (-1) - 0.296623 * population (-2) + 0.358145 density -0.253317demand (-1) + 3.329994 * D (supply) + 0.009703 * D (withdrawal) - 0.431236 * D (population) - 0.172647 * D (density) (7)

By omitting the difference variables from the equation,

0 = 0.594730 * supply (-1) -0.031102 * withdrawal (-1) - 0.296623 * population (-2) + 0.358145 * density -0.253317 * demand (-1) (8)

Hence,

0.253317 * demand (-1) = 0.594730 * supply (-1) -0.031102 * withdrawal (-1) - 0.296623 * population (-2) + 0.358145 * density (9)

Therefore,

Demand (-1) = [1/0.253317][0.594730 * supply (-1) -0.031102 * withdrawal (-1) - 0.296623 * population (-2) + 0.358145 density] (10)

This is the long-run steady state trend. There are three significant explanatory variables at the five per cent level or lower. Moreover, the diagnostic tests do not suggest any particular problems with the specification. Indeed, the restrictions of the short and long-run homogeneity imply that the short and long-run elasticity sum to zero.

### 4.6 Price of Water

The price of any good is determined by the fundamentals of delivery and distribution of this good among its users. In any market, buyers and sellers of a particular good interacts together and hence the price of the good is determined that will be affected by the supply and demand factors and thus shift either up or down according to the change of supply and demand. In order for the prices and quantities traded in the market to be efficient there should be suitable level of competition, few externalities and reasonable property rights. This is how an efficient market for a particular good should work.

In a narrow sense, the price of water is defined as the price that the users of water are willing to pay for a given volume of water delivered to them per unit of time. This definition of water applies to the users (customers) that get the water from third party,




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for example businesses or homeowners that are supplied through the public utility of water and farmers that pay for the water they received from centralized irrigation systems. On the other hand, there are other kinds of users, self-providers, that cover the majority of the worldwide freshwater withdrawal, such as rural homeowners and individual farmers that use the water wells, the industrial facilities that divert water from surface streams or use their own water wells or power plant that withdraw water from reservoirs of surface water and huge agricultural corporations. Neither of the two groups of users, customers and self-providers, pays the water real price, which should be theoretically equal to the real value of water.

The pricing of water gives us an important insight into the implication of the equity and efficiency of water usage and thus introduces the concept of investment in water supply systems which include:

- Investments required in the existing systems in order to increase the capacity of the system.
- Investments required for the expansion of the existing system.
- Investments required for the protection of existing water supplies.
- Investments required for shifting from one source of water supply to another source.

The cost of today's investments will have its benefits in terms of future consumption values.

## 4.7 Water Transfer

The Model that will be developed in the second stage of the model in this paper follows the same methodology as Kilgour and Dinar (1999). The model developed by Kilgour and Dinar (1999) is based on the idea of utilizing the water of the river by transferring it between countries within the river basin. To state it differently, it allows the downstream countries that are in need for water to obtain it from an upstream country by compensating that country for having less water available for usage. They introduce two important concepts in their paper to guarantee efficient optimal allocation that the applicant will be following: first, the Flexible Water Allocation Rule, which is a new approach that offers a better economic understanding of the allocation process of the total river water flows which makes the development of principles guaranteeing efficient Pareto-optimal allocation possible; and, second, the concept of the Efficient Schedules, which is a formula that produces efficient allocation for every possible level of flow volumes.

A Assumptions and Definitions

We characterize each country according to:

1. Water parentage contribution to the Nile River
2. Position on the Nile River basin (an upstream or downstream country)
3. The country's need for water, which is its demand for water

The water demand function for country j is denoted by: $p_j = f_j(q_j)$ (11)




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Where $p_j$ is country j water demand prices, while $q_j$ is country j water consumption amounts. Thus country j is consuming $q_j$ units per year and it would buy extra units of water up to $p_j(q_j)$. So, if consumption is already large, the amount of extra water needed will be very small but it will still be a positive value.

Qj units per year denote country j's water contribution to the Nile River basin. There are two scenarios for country j: either to consume $q_j = Q_j$ units per year, which means that there will be no transfer of water between countries as each country will consume all the water it contributes; or, on the other hand, there will be countries, which consume less water than the amounts they contribute to the Nile river basin, and others may be consuming more.

Country j's position relative to the Nile river basin countries is of great importance, as each country's contribution is equal to its own contribution plus the flow contribution not consumed by upstream countries.

To complete the model of water sharing scheme between countries, we should state all transfers between countries other than water. For now we assume that there are only money transfers. Thus, beside the three components of an individual country (water demand, flow contribution, geography), each upstream country receives an amount $x_j$ from its downstream country, which compensates upstream countries for less water usage.

One of the main goals of this model is to determine ways for sharing water that leads to maximizing welfare of countries involved. We assume that there are only two goods, water and money. So a country's total welfare is equal to its consumption surplus plus its net transfers (net money transfers, $x_j$). Thus the total welfare is denoted by the following equation:

Welfare = Consumption Surplus + Net Transfers (12)

We should differentiate between source, non-source and outlet countries. A source country is one from which the flow originates; a non-source country is a country where flow is received from one or more countries; while an outlet country is where the flow finally arrives without flowing anywhere else. A source country has the advantage of withdrawing water from the Nile River first.

B Application: Two Countries Problem (Egypt and Ethiopia)

We assume that there are two countries, Egypt (downstream country) and Ethiopia (upstream country). The sharing process takes place when Ethiopia (upstream country) decides not to consume all its flow volume of water but instead pass some of it to Egypt (downstream country) and Egypt decides to compensate Ethiopia with a money transfer.

Let Q, which represents a country's water contribution to the Nile river basin, also denote the total flow of water from Ethiopia to Egypt. Thus, the amount of water consumed by Ethiopia denoted by $q_u$ should satisfy $0 < q_u < Q$ and the amount of water consumed by Egypt, denoted by $q_d$, should satisfy $0 < q_d < Q - q_u$

Thus amounts available for consumption by Egypt (downstream country) are equal to $Q_d = Q - q_u$




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So the consumption of Ethiopia (upstream country) is less than its contribution only when Egypt (downstream country) compensates Ethiopia for this amount through money transfers denoted by x.

So the consumption of both countries and the net transfers maximize welfare somehow. So what is required is a function for (q(Q), x(Q)).

C Water Consumption and Compensation Schedules

A schedule is used as a method for identifying the amount of water consumed and the money received by each country, a schedule is denoted as S = (q, x). The main goal is to differentiate between schedules according to their favorability for each country and for the Nile basin countries as a group.

The welfare of any country is affected by its consumption of water (q) and its money transfers (x). For any schedule that offers a higher welfare level for a one country, it should offer a lower welfare level to the other. So the welfare of Ethiopia (upstream country) is given by $W_u (q_u, x) = f_u(q)\, dq + x$

And the welfare of Egypt (downstream country) is given by $W_d (q_d, x) = f_d(q)\, dq - x$

Thus $W_j(S)$ measures the well-being of country j, so country j prefers schedule S′ to schedule S″ if $W_j(S') > W_j(S'')$, and is indifferent between schedule S′ and schedule S″ if $W_j(S') = W_j(S'')$. A schedule is efficient when the water has the same price in every country so as not to transfer water from countries with low price to countries with high price, for certain payments.

In order to identify the optimal schedule (q, x) that is needed for the compensation process, we need to determine who owns the water. We assume that the source state (Ethiopia, upstream country) owns the water and thus consumes its flow volume Q. We assume as well that there are no money transfers from Egypt (downstream country) to Ethiopia (upstream country).

Thus (q, x) = (Q, 0) is the status quo schedule. The main goal is to identify the schedules that are preferred by both countries to the status quo schedule, so we need to identify all schedules (q, x) that satisfy $W_u (q, x) \geq W_u (Q, 0)$ and also the schedules where $W_d(q, x) \geq W_d(Q, 0)$. The schedules that satisfy these conditions are preferred by both countries.

**Figure 7: Status Quo**

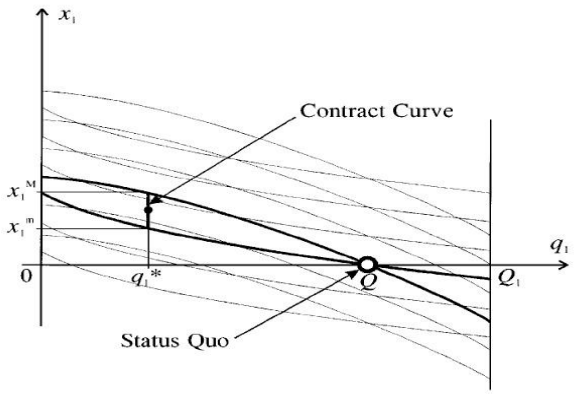


Figure 7 shows the indifference curves for both countries (upstream and downstream). Upstream country prefers the higher indifference curves while downstream countries




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prefers lower indifference curves, which implies that the schedule that is preferred by both countries to the status quo lies above upward country indifference curve and below downward country indifference curve. So the efficient consumption of water satisfy $q_1 = q_1^*$ , which is the maximum separation between the indifference curves, it is called Contract Curve. Therefore, we could argue that the efficient schedule is characterized by the maximum separation of the primary indifference curves.

## 5. Policy recommendations

- Governments should exercise a substantial degree of control over the use of water.
- Minimizing water losses by optimizing the use of the available water resources through carrying out improvement of the irrigation methods and the diversification of cropping patterns.
- Implement demand management measures such as improving extension policies, public awareness, pricing and regulate measures that improve efficiency and conserve water resources.
- Small-scale agriculture improvements could be a solution to the water stress, the use of pumps, drip irrigation for crops and other technological innovations.
- Improving water storage capacity and utilization.
- The need for framework cooperation between the Nile Basin Countries.
- The project of digging the Jonglei Canal, was considered an important integration project between, Egypt and Sudan, with the objective of ensuring the flow of 4.7 billion cubic meters of the Nile water which is annually to be distributed between Egypt and Sudan. It was regarded as the most important development of 104 modern irrigation and drainage facilities that could put an end to the agriculture being tied to the annual patterns of flooding and drought in Egypt and Sudan. The Jonglei canal project can be considered as the ultimate solution for the high demand of water in Egypt (Lewis, 2009).

## 6. Conclusion

The challenges that faces the people of the Nile and its sub-basins stems from the number of people and countries whose lives depend upon the Nile, coupled with their diversity in aspirations and aspects as well as some external influences. On the other hand, there are opportunities for integrated and sustainable development through cooperation that is motivated and bonded by the Nile. A new agreement introduced by the Nile basin countries calls for a fair utilization of the Nile waters for the benefit and welfare of all the riparian countries rather than on the basis of water allocations given to countries of Egypt and Sudan in the two historical agreements.

Nile Basin countries should cooperate for the welfare of their population. As a consequence economic interdependence, peace and confidence building will be established between the Nile Basin Countries.

On the other hand, the population growth and economic pressures are increasing faster than the Nile's capacity to sustain civilization and as a consequence the choice between conflict over an increasingly scarce resource or cooperation to manage that resource more equitably is of great concern to the Nile basin countries. In general, the




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water reduction methods would be far more effective if implemented in parallel with population reduction. There are many ways through which one could reduce the waste of water, managing its use, recycling it and making optimum use of it, but all these methods are subject to the law of diminishing returns.

Water is a potentially dangerous problem in many areas, but not yet a murderous one. But the question is will this continue in future as the demand on water resources increases and nations come to fear that their vital interests or their survival are at risk.

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# Ownership Structure, the Role of Institutional Investors and Corporate Performance in Chinese Markets

**Abstract**

This paper examines the relationship between ownership structure and firm performance and explores the role of institutional investors in corporate governance. By focusing upon 1,623 companies listed in Shenzhen and Shanghai Stock Exchanges from 1998 to 2008, this study found that state ownership negatively related to firms' financial, capital market and managerial performance. Financial and managerial performances were positive related to domestic and foreign institutional ownerships but rather insignificantly. State and institutional ownerships have a negative relationship with capital market performance. Eleven interviews with corporate managers and fund managers were conducted to identify the perceptions and behaviours of institutional investors. It was found private institutional investors were either less powerful or reluctant to influence the company, which implies that the role of institutional shareholders is weak in Chinese markets. It is proposed that an independent state-owned asset management company could have a positive role to enhance corporate governance and thus improve firm performance.

**Keywords:** Ownership Structure, Institutional Investor, Corporate Governance.

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## 1. Introduction

China's economic system has been gradually reformed from a central-planned economy to a more market-oriented economy since 1978. The Chinese government attempted to transform state-owned enterprises (SOEs) into corporations with diversified ownership (Allen et al., 2005). Many enterprises have raised additional capitals by issuing new shares to outside shareholders (Sun et al., 2003). Recently, the Chinese Securities Regulatory Commission (CSRC) implemented an experimental solution called split share structure reform1which is aimed at realizing the goal of making all shares tradable on the markets. On 19th June 2009, the State Council requires some public listed Chinese companies to transfer 10 percent of the total initial public offering state-owned shares to the National Social Security Fund.

Generally, a typical public listed company has a mixed ownership structure including state, institutional and individual ownerships. The objective of such action is to

[1] Source: China Security Regulatory Commission www.csrc.gov.cn




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introduce corporate governance mechanisms that facilitate the improvement in firm performance. It is believed that a sound corporate governance system is essential to improve firm performance. The relationship between ownership structure and firm performance has been one of the core issues in the corporate governance literature (e.g. Chen et al., 2006). It is suggested that ownership concentration helps to mitigate free-riding problem and institutional investors as block shareholders may have great interests in monitoring the companies. In addition, managerial shareholding may reduce agency problems and improve the alignment of interests between managers and shareholders.

However, most studies focus on developed economies, and agency problems in developing countries may be more severe due to the absence of strong legal protection and regulatory mechanisms. The data of many previous studies in emerging markets is either old or the sample size is simply small.

The Chinese economy is at the transition stage and corporate governance in Chinese companies is developing due to the ongoing ownership reform and in particular since 1998 institutional investors have been holding more and more shares and become a major force in Chinese capital markets (Yang and Wang, 2008). The Chinese markets maybe provide a good laboratory for studying the relationship between ownership structure and firm performance. This study employs a large data sample of 1623 listed companies in Shanghai and Shenzhen Stock Exchanges from 1998 to 2008, just before the financial crisis, and attempts to empirically examine the impact of different ownership types on firm performance and in particular institutional ownership.

Moreover, little research had been done to investigate how the institutional investors communicate with companies and make decisions. This study explores the reason behind the relationship between institution investors and firm performance if any. Eleven interviews were conducted with corporate and fund managers to identify the perceptions and behaviour of institutional investors in Chinese markets.

The remainder of this paper is organized as follows. Section 2 reviews the literature in corporate governance in particular ownership concentration, the role of institutional investors and the relationship with firm performance. Section 3 discusses the research methodology adopted and describes the data sets. Section 4 interprets the analysis and findings, and explores the reasons and activities. Finally, Section 6 summarizes the findings and concludes the study with theoretical implications and managerial suggestions.

## 2. Literature review

*Corporate Governance*

Solomon (2007) indicates that there is no single accepted definition of corporate governance and different countries have substantial differences in definition. The existing definitions of corporate governance can be seen as “narrow” view and “broad” view. In the “narrow” view, “corporate governance is restricted to the relationship between a company and its shareholders”. However in the “broad” view, corporate governance is not only about the relationship between a company and its




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shareholders, but also between a company and a broad range of other stakeholders, such as employees, suppliers, customers etc.

Shleifer and Vishny (1997) argue that corporate governance deals with the ways in which suppliers of finance to corporations assure themselves of getting a return on their investment. John and Senbet (1998) propose a more comprehensive definition that corporate governance deals with mechanisms by which stakeholders of a corporation exercise control over corporate insiders and management such that their interests are protected'.

There are two dominating theories of corporate governance, Agency Theory and Stakeholder Theory. In Agency Theory, the agency relationship is defined as a contract under which one party (the principal, shareholders) engages with another party (the agent, managers) to perform some service on their behalf that involves delegating some decision-making authority to the agent (Jensen and Meckling, 1976). There could be a possibility of conflict of interest between managers and shareholders as managers have their own personal goals, which may not be the same as the company's one.

Wearing (2005) claims that stakeholders, any party that has a "stake" in the company, are affected either directly or indirectly by a firm's operations. The corporate policies that generate the most wealth for shareholders may not be the policies that generate the greatest total social wealth for stakeholders (Blair, 1995).

In this study, although many parties are affected by the corporate failure, such as employees losing jobs and pension fund, creditors losing the loan, supplier losing goods, and so on, mainly the problem between shareholders and management are discussed. So, basically Agency Theory is adopted and agency problems are studied.

Filatotchev et al. (2007) identified the key drivers of good corporate governance and the following sections focus on some corporate governance mechanisms in particular ownership structure and the role of institutional investor.

*Ownership Structure*

Berle and Means (1932) argue that managers pursue their private benefits and interests rather than those of shareholders. Consequently, it is difficult for shareholders to control professional managers when ownership becomes more diffused. They conclude that there is a negative correlation between ownership diffusion and firm performance. Jensen and Meckling (1976) argue that the real interest of managers is to allocate the firm's resources in such a way that works toward their own interests rather than that of outside investors, and thus a conflict arises between managers and shareholders. These agency problems are more severe in developing countries, which lack comprehensive and effective legal protection mechanisms and lack the impartial judiciary and strong governance necessary to provide such protection (La Porta et al., 1999).

Kuznetsov et al. (2001) argues that concentrated ownership is expected to mitigate agency problems that arise between shareholders and managers because large owners have stronger incentives and greater opportunities for monitoring managers than small shareholders and this leads to improved firm performance.




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However, Hart (1995) argues that large shareholding may not always be beneficial to a company for two main reasons. First, there is a trade-off effect between large portions of shares and portfolio diversification advantages. Second, large shareholdings cannot eliminate agency problems. La Porta et al. (2000) and Claessens et al. (2002) affirm that if the ownership concentration exceeds a certain threshold, the large shareholders are inclined to pursue private interests disregarding the interests of minority shareholders. Johnson et al. (2000) uses the term "tunnelling" to explain that controlling owners transfer firm's resources to serve their own interests.

Because of the controversy in the literature this study examines whether ownership concentration influences firm performance in Chinese markets.

*State Ownership*

The government or the government appointed independent organizations can be treated as a form of institutional investor and fulfil the monitoring functions. For example, in late 2008 and early 2009 some UK and US companies and financial institutional were nationalized and new regulations and professionals were assigned to monitor the company. However in many transitional countries such as China, the state owned companies were less profitable and efficient. Governments were criticized as the role in management and corporate governance and therefore the Chinese government reforms the ownership structure of Chinese SOEs.

Nevertheless, governments play an important role in corporate governance since they hold a large fraction ownership of enterprises. The main priority of the government may not be on firm performance, which easily results in the inefficiency of state owned firms (Shleifer and Vishny, 1994). Xia and Fang (2005) and investigate the impact of state-ownership on enterprise performance and generally find a negative effect. However, these studies either use small data sample or old information. Recently, the Chinese Government has reformed the ownership structure and developed regulations for the capital markets and corporations (Chen et al., 2008). This study examines the relationship between state ownership and firm performance by using public listed companies' data from 1998 to 2008.

*Top One Shareholder's Ownership*

If the top one shareholder holds a large proportion of shares of the company they may have great incentive to monitor and control the company and therefore reduce the free riding problems (Short and Keasey, 2005) and improve the corporate governance in the company.

However, there may be conflicts between controlling shareholders and minority stockholders, that controlling shareholders can sacrifice minority shareholders' interest in pursuing their own interests (McConnell and Servaes, 1990). La Porta et al. (1999) argue that minority shareholders' interests are difficult to guarantee. There could be a serious "tunnelling effect" that transfers of assets and profits out of firms for the benefit of their controlling shareholders. For example Li et al. (2006) indicate that embezzlement by controlling shareholders, one type of tunneling behaviour, has become a serious corporate governance problem in China. Because of the contradictory argument in the literature, this study examines the relationship between top-one shareholder ownership and firm performance.




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*Foreign Ownership*

It is widely argued that foreign investment is a mechanism for improving corporate governance that positively influences firm performance in emerging markets (Kimura and Kiyota, 2004; Klapper and Love, 2004). Foreign investors may have the ability and incentive to monitor the companies in the interest of shareholders (Shleifer and Vishny, 1997). Moreover, foreign corporate practices may be superior to those prevailing in the host economy like China, and therefore the companies may adopt superior practices in areas such as information disclosure, internal checks and balances, and accounting standards (OECD, 2002).

Nevertheless, foreign investors may acquire a controlling stake in a domestic firm and have the same incentive as other insiders to exploit minority shareholders. In emerging market foreign shareholders may not have an incentive to improve corporate governance that undermine other shareholder since foreign investors often acquire management control, because they can enjoy with relative ease if corporate governance is weak (Bebchuk, 1999). Because of the contradictory arguments in the literature, this study tests if foreign ownership has a positive relationship with firm performance.

*Executive Ownership*

Jensen and Meckling (1976) believe that managers as agents may have different interests with shareholders as principles. Managers may realize their own interests by controlling the firm's resources and making decisions in favour of their own interests. Managerial ownership can reduce agency problems by making the insider managers' interest and outside shareholders' interest consistent. Shleifer and Vishny (1986) also argue that the more shares managers hold, the less the shareholders have to make managers serve their interests. Share options as a part of executive remuneration is one more mechanism that can be refined to improve corporate governance (Jensen, 1993). Cai and Cheng (2005) allege that managerial ownership, as an incentive mechanism, can have an active effect on firm governance and re-investment behaviour (Cull and Xu, 2005) and firm performance.

However, Fama and Jensen (1988) argue managerial ownership can lead to managerial entrenchment. Weisbach (1988) and Bethel et al. (1998) find that managerial ownership has a negative relationship with corporate performance. The results from theoretical and empirical studies are inconclusive and this study examines the relationship between managerial ownership with firm performance.

In general, quite mixed and even contradictory arguments and empirical results have been widely observed and therefore there is no conclusive correlation between ownership structure and firm performance. Likely reasons for this include the differences in measurements and data sample used, and the technique applied, for example Bai et al. (2004), Wei et al. (2005) and Fan et al. (2007) mainly focused on capital market performance. This study makes contribution to the arguments from an empirical research in Chinese markets.




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*The Role of Institutional Investors*

Davis and Steil (2001) defined institutional shareholder as "a specialized financial institution that manage savings collectively on behalf of small investors toward a specific objective in terms of acceptable risk, return maximization, and maturity of claims". The most common institutional investors are pension funds, life insurance companies and mutual funds etc.

*Universal Owner*

In the literature, a number of studies suggest that institutional investors play a positive role in corporate governance. For example, "shareowner role" is to actively participate and engage in the corporate governance instead of sitting on the board as an outsider Mallin (2008). The active participation in investee companies includes regular communication with directors and high-level managers (Holland, 2002), voting in the annual general meeting on issues such as executive remuneration and election of directors. Hawley and Williams (2007) proposed a role of "universal owners", not only supervision of financial performance but also more attention to the social, environmental and ethical performance of a company as a whole.

*Free-Rider*

Short and Keasey (2005) indicated a free-rider problem because of the potential for an individual institution to benefit from the actions of others. Normally, free-riders tended to enjoy the benefits of any collective action without bearing any voice costs of that. In this case, the enormous risk and cost took by the active institutional shareholder may only add value to free-riders. And therefore some institutional investors may select only financially healthy firms in which to invest and play a passive role in corporate governance (Faccio and Lasfer, 2000).

*Legal role*

The role of institutional investors was highlighted in corporate governance policies, for example, the UK Cadbury Report in 1992 expressed that the institutions should make sure the companies in their portfolios follow their corporate governance best practice recommendations. However, the over-stressed role of institutional investors from Cadbury to Hampel report in ensuring the companies adherence to best practice was attacked by the Myners Review in 2001. The under-qualification of pension fund management, the uncertainty of time frame of the fund managers' performance assessment and the possible lack of performance-based rewarding system were targets of the Myners' bullets (Keasey, Short and Wright, 2005).

*Short-Term or Long-Term*

Institutional investors are notorious for their greedy and insatiable appetite of short-term interest. Moreover, the short-terminst behaviour is accused of leading to continuous takeover activity in the UK, the reducing dividends payments and underperformance of industry and economy (Marsh, 1990). Charkham (1994) indicated that many fund managers are not equipped to act as long-term investors




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because their main knowledge is about short-term markets instead of the whole industry.

Malling (2008) pointed out that the system is actively short-term and there is a lack of incentives to look long-term. If the return on the investment falls below that of the chosen comparators, fund managers tend to be replaced, for example, two out of four quarterly under performance will place extreme stress on fund managers to exit. Rappaport (2005) shared a similar perspective that fund managers were blamed for the corporate executives' obsession with short-term earnings.

However, there is alternative explanation of short-termism. The complexity and conflict of the institutional interest presented, for example institutional shareholders may have current or potential business relationships with the firm, and therefore they may be less willing to actively curb management decisions. Furthermore, Hoskisson et al. (2002) argues that the different objectives and compensation arrangements of pension fund lead to different investment strategy.

*Exit or Voice*

Hirschman (1970) summarised the behaviour of institutional investors as exit and voice model. Voice indicates venting dissatisfaction directly to management while exit suggests selling the shareholding. But the exit is not always feasible for the institutional investors due to the mandated balances of stock holdings. Moreover, in order to direct institutions to voice, the government may search to force them behave in the desired way through regulation. However, the final decision of intervention is made independently and automatically. In one word, voice is strongly suggested but exit is not banned by regulations.

*Public or Private Communication*

Institutional shareholders may not take public initiative to voice their dissatisfaction when the cost of doing so has far outweighed the benefit, for example disgrace to the reputation, loss of share value and many other hidden costs and concerns. As a result, the big boss of the institution may prefer to discuss privately, also called behind the scene attempts (Short and Keasey, 2005).

Moreover, according to the popularity of behind-the-scenes networks and the long-term mutual reciprocal relationships, institutions may cultivate a climate in which cooperation can breed and free riding is reduced (Short and Keasey, 2005). For instance in the UK, large scale institutional shareholders insurance companies and pension funds were subordinate to association of British insurers and the national association of pension funds for consultancy and advices in the UK. But the secret of collective action of institutional investors is the size of the group of institutions, the bigger the group, the weaker the cooperation (Short and Keasey, 2005).

In summary, the arguments in the literature are inconclusive and empirical studies find controversial results (Yang and Wang, 2008). It is unknown that institutional investors play a passive role or active role in corporate governance and if any how institutional investors participate in corporate governance in Chinese markets. And therefore this study investigates the role of institutional investors and the perceptions and behaviour of institutional investors in Chinese markets.




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## 3. Research methodology

*Quantitative Research and Data*

Both qualitative and quantitative methods were employed in this study. Firstly, this study adopts a positivistic approach to seek the facts or causes of social phenomena, with little regard to the subjective state of the individual (Hussey and Hussey, 1997). Following the tracks of the classic empirical social science research, and on the premises of the theory-testing, hypothetical-deductive approach, this study begins with theory, to deduce and further test hypotheses about relationships between dependent and independent variables.

This study examines the relationship between firm performance and ownership structure in the form of regression analysis. The literature proposes that ownership concentration has positive effect on firm performance. State ownership should have positive effects on firm performance if the government is seen as a special institutional investor. There should be a positive relationship between institutional shares and firm performance. A positive relationship is proposed between managerial ownership and performance. Therefore, the null hypotheses of this study are presented as follow:

H01: There is no relationship between ownership concentration and firm performance.

H02: There is no relationship between institutional ownership and firm performance.

H03: There is no relationship between state ownership and firm performance.

H04: There is no relationship between managerial ownership and firm performance.

*Dependent Variables*

This study employs three broad types of performance including financial, managerial and capital market based performance. According to Demsetz and Villalonga (2001), accounting profit rates are "backward-looking" performance and market-based valuation measurement is "forward-looking" to reflect the investors' expectation about firms' future. Managerial performance reflects firms' risk management and future development.

With regarding to accounting performance variables, return on equity (ROE) is adopted as an indicator calculated as the net earnings over the net assets. In terms of market based valuation, Tobin's Q is widely used as an indicator in accounting and finance literature. It is measured as a ratio of the market value of a company debt and equity to the current replacement cost of its assets (Hovey et al., 2003). This study uses the version of Tobin's Q (La Porta et al., 2002) as the annual average share price over the net asset per share (Hovey, et al., 2003). Managerial performance is measured as the increase rates of total assets.

*Independent and Control Variables*

Ownership concentration can be measured by the proportion of total shares held by the largest five individuals and the largest five institutional investors (Demetz and Lehn, 1985). However the Chinese listed companies do not have large individual




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shareholders and therefore the proportion of total institutional shareholding is used as an indicator. In addition to concentration, the total percentage of state ownership and domestic and foreign institutional ownership are further used as explanatory factors. State, institution, top-one ownership, foreign and managerial ownerships are measured by the percentage of shareholding over the total shares of the company.

Other factors, including firm size, industry sectors, debt equity ratio and age of firms are also identified by literature since they may affect firm performance. Two of them including firm size and debt/equity ratio are chosen as control variables as they may be correlated to ROE, increase of total assets and market value in this study (Rajan and Zingales, 1995).

The estimated regression model as follow shows the relationship between performance measures and total institutional ownership, state ownership, domestic institutional ownership, top-one ownership, foreign ownership, managerial ownership, debt equity ratio and total assets.

$$P= \alpha + \beta 1OC + \beta 2SO + \beta 3DIO + \beta 4TOo + \beta 5FIO + \beta 6EO + \beta 7LEV + \beta 8SIZE + \varepsilon$$

P = performance calculated as return on equity (ROE), net profit over net assets, Tobin's q, annual average share price over net assets per share, average growth rate (AGR) or increase rate of total assets

OC = ownership concentration

SO = the percentage of shares held by the state

DIO = the percentage of equity owned by domestic institutional investors

TOP = the percentage of equity owned by top one investor

FIO = the percentage of equity owned by foreign investors

EO = the percentage of equity owned by executives

LEV = debt to equity ratio

SIZE = the size of the firm calculated as log10 of total assets

ε = error factors

The data are collected from Qinghua University Finance Data (Qinghua University, 2009), including 1,623 firms listed on both the Shanghai and Shenzhen stock exchanges from 1998 to 2008. The database covers companies' information about ownership structure, profitability and share prices. The annual average share prices and new asset per share at the end of the year are collected. Based on the data, the percentage of state and institutional ownership and performance measurements such as Tobin's Q, are calculated by using Microsoft Excel software. SPSS is utilized to analyze data and a linear regression, correlation analysis and F and T test techniques are adopted to test the hypotheses.

*Qualitative Study*

Moreover, in order to explain the findings from quantitative study and further explore the role of institutional investor, a qualitative study is conducted and an inductive logic is followed to derive a theory from qualitative data (Creswell, 1998). A




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grounded theory approach (Strauss and Corbin, 1998) is adopted, which is a unique form of theory construction that data is systematically collected and processed (Miller and Fredericks, 1999).

This study employs semi-structured interview as a main method to collect qualitative data and secondary data is collected to complement the primary data. Interview is a good way to go to the place and talk with the actors to collect case data, which allows the researcher to get as close as possible to the people involved in the phenomenon (Parker and Roffey, 1997). The concept of theoretical sampling is pursued to extend the general applicability or analytic generalizability of the theory (Locke, 2001). The number of cases is based on theoretical saturation that the appropriate number of cases is achieved when no additional data can be found in developing the properties of the conceptual categories (Strauss and Corbin, 1998). The 11 interviews were conducted with 8 fund managers, 2 corporate managers, and 1 market analyst. The following broad questions were asked and the interviewees were free to talk about their perceptions and actions.

"Do you monitor or control the companies? And why?"

"How do you communicate with the companies?"

"How do you make an investment decision?"

"What is your role in corporate governance and in the capital markets?"

The systematic data analysis was utilized, which involved generating concepts through the process of coding. Strauss and Corbin (1998) identified three different types of coding to develop a grounded theory: open coding, axial coding and selective coding. To be able to identify the concepts the researcher has to open up the text and expose the thoughts, ideas, and meanings contained therein. The process of grouping concepts at a higher, more abstract, level is termed categorizing. Axial coding is defined, as the process of relating categories to their subcategories, termed "axial" because coding occurs around the axis of a category, linking categories at the level of properties and dimensions. The research findings should be presented as a set of interrelated concepts, not just a listing of themes. In this study, selective coding involved the integration of the categories that have been developed to form the initial theoretical framework.

The written work must demonstrate the groundedness of the theoretical elements and good practice of the analytic operations performed. Moreover, the written work needs to achieve authenticity and a solid data theory coupling (Locke, 2001). The presentation of grounded theory in this study similarly follows a format that involves the telling of theoretical elements and the showing of data fragments that instance them. The findings were presented by identifying key concepts and categories and using interview quotes to instance the themes.

## 4. The relationship between ownership structure and firm performance

*Ownership Concentration (OC) and Firm Performance*




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The initial data sets were 17,853 but some firms did not disclose some information at specific time and therefore the uncompleted data sets were excluded from the sample. Some outliers were identified, for example if ROE more than one hundred percent and less then negative one hundred the data set was excluded and a case study may be necessary to investigate the company. Finally 10,534 sets of data were used to investigate the relationship between ownership concentration and firm performance.

**Table 1: Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| ROE | 10534 | -99.98 | 96.63 | 3.2837 | 10.00494 |
| Tobin's Q | 10534 | -1.406295918367E3 | 5.631800000000E2 | 4.91927421666908 | 18.40883015885616 |
| Total asst increase rate | 10534 | -78.6250 | 2107.5524 | 17.936292 | 48.1080184 |
| OC | 10534 | .000480097907 | 0.99006761339 | .54753501084770 | .274231147088647 |
| Lev | 10534 | 1.0082 | 693.6981 | 2.805794 | 8.3355996 |
| Total Asset | 10534 | 3.968571E7 | 9.757654E12 | 9.54915683E9 | 1.811878753E11 |
| Valid N | 10534 | | | | |

The above Table 1 describes the statistics of dependent, independent and control variables. The average ownership concentration represented by the percentages of total institutional shares over total shares of the company is 55 percent. The average ROE is 3.28 percent but some large negative numbers may have decreased the value. The average Tobin's q, represented by average annual market share price divided by the average net asset at the end of financial year, is 4.9 with a few negative net assets. Calculated by total debts over equity, financial leverage shows an average value of 2.8, with a few strange high values in some companies. The annual increase rate of total assets shows an average of 48 percent, which suggests a quick development in the Chinese markets.

**Table 2: Coefficients for Dependent Variable ROE**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | -13.215 | 1.894 | | -6.978 | .000 |
| | OC | 2.958 | .352 | .081 | 8.402 | .000 |
| | Lev | -.109 | .012 | -.091 | -9.388 | .000 |
| | LogTA | 1.648 | .204 | .078 | 8.073 | .000 |

**Table 3: Model Summary**




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| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .142 | .020 | .020 | 9.90568 |

Predictors: (Constant), LogTA, OC, Lev

**Table 4: ANOVA**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 21112.002 | 3 | 7037.334 | 71.720 | .000[a] |
| | Residual | 1033229.573 | 10530 | 98.122 | | |
| | Total | 1054341.575 | 10533 | | | |

Predictors: (Constant), LogTA, OC, Lev

Dependent Variable: ROE

Tables 2 to 4 show the relationship between ROE and ownership concentration, financial leverage and firm size from the regression. The model indicates that the dependent variable ROE has a positive relationship with ownership concentration, negative relationship with financial leverage and positive relationship with firm size, with a weak explanation power of 2 percent.

Tables 5 to 7 show the relationship between Tobin's q and ownership concentration, financial leverage and firm size from the regression. There is a negative relationship between Tobin's q and ownership concentration, positive relationship with financial leverage and negative relationship with firm size. R square 0.164 indicate a better explanation power of the factors and the relationships are stronger than with ROE.




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**Table 5: Coefficients for Dependent Variable Tobin's q**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. |
| 1 | (Constant) | 47.349 | 3.218 | | 14.713 | .000 |
| | OC | -.491 | .598 | -.007 | -.820 | .412 |
| | Lev | .870 | .020 | .394 | 44.090 | .000 |
| | LogTA | -4.842 | .347 | -.125 | -13.954 | .000 |

**Table 6: Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .405[a] | .164 | .164 | 1.683276270836218E1 |

Predictors: (Constant), LogTA, OC, Lev

**Table 7: ANOVA**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 585885.787 | 3 | 195295.262 | 689.257 | .000[a] |
| | Residual | 2983590.211 | 10530 | 283.342 | | |
| | Total | 3569475.998 | 10533 | | | |

Predictors: (Constant), LogTA, OC, Lev

Dependent Variable: Tobin's q

The regression model shows there is a weak positive relationship between annual total asset increase rate and ownership concentration and negative relationship with financial leverage and positive relationship with firm size.

This reveals that ownership concentration has a positive impact on firms' financial performance but the market sees this as a negative factor. Moreover ownership concentration has a weak positive influence on firm's annual growth rate.

The same regression analyses were conducted for other independent variables and the table summarises the regression results. The numbers of β show the relationship between dependent variables (DV) and independent variables (IDV) and the adjusted R square indicates how well the resulting line matches the original data points.




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**Table 8: Coefficients for Dependent Variable Total Asset Increase Rate**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | -80.288 | 9.143 | | -8.781 | .000 |
| | OC | 8.114 | 1.700 | .046 | 4.774 | .000 |
| | Lev | -.076 | .056 | -.013 | -1.363 | .173 |
| | LogTA | 10.204 | .986 | .100 | 10.351 | .000 |

**Table 9: Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .110[a] | .012 | .012 | 47.8221924 |

Predictors: (Constant), LogTA, OC, Lev

**Table 10: ANOVA**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 295668.844 | 3 | 98556.281 | 43.095 | .000[a] |
| | Residual | 2.408E7 | 10530 | 2286.962 | | |
| | Total | 2.438E7 | 10533 | | | |

a. Predictors: (Constant), LogTA, OC, Lev

b. Dependent Variable: Total Asset Increase Rate

The regression model shows there is a weak positive relationship between annual total asset increase rate and ownership concentration and negative relationship with financial leverage and positive relationship with firm size.

This reveals that ownership concentration has a positive impact on firms' financial performance but the market sees this as a negative factor. Moreover ownership concentration has a weak positive influence on firm's annual growth rate.

The same regression analyses were conducted for other independent variables and the table summarises the regression results. The numbers of β show the relationship between dependent variables (DV) and independent variables (IDV) and the adjusted R square indicates how well the resulting line matches the original data points.




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**Table 11: Regression Results**

| Independent Variable | OC | SO | TOP | DIO | FIO | EO | LEV | LogTA |
|---|---|---|---|---|---|---|---|---|
| Dependent Variable | | | | | | | | |
| ROE | 2.958 | -0.670 | 5.85 | 2.163 | 6.715 | 12.289 | -0.11 | 1.637 |
| | (0.021) | (0.050) | (0.100) | (0.014) | (0.028) | (0.024) | (0.013) | (0.013) |
| Tobin's q | -0.491 | -1.242 | -0.458 | -0.864 | 1.421 | 2.959 | 0.87 | -4.838 |
| | (0.164) | (0.002) | (0.607) | (0.145) | (0.163) | (0.624) | (0.164) | (0.164) |
| AGR | 8.114 | -9.429 | 0.78 | 19.266 | 3.346 | 111.25 | -0.08 | 10.145 |
| | (0.012) | (0.006) | (0.01) | (0.012) | (0.006) | (0.081) | (0.010) | (0.010) |

There is a negative relationship between state ownership and ROE, a weak negative relationship with Tobin's q and a weak negative relationship with annual growth rate. This indicates that state ownership has negative influence on firm's financial and market performance and future development. There is a positive relationship between top ownership and ROE, which means the biggest owner, has more power and interest and may monitor and control the company. A strong negative relationship between top ownership and Tobin's q illustrates that market prices are low if a major investor controls the company. There is a positive relationship between top-one ownership and firm growth rate.

The regression analysis reveals a weak positive relationship between ROE andperformance and firm growth indicate that managerial ownership has a positive impact on firm performance. However, only a few public listed Chinese companies have executive ownerships and the percentages of executive ownership are very low compared to companies in developed countries.

The regression analysis discovers that firms' performance is different at different level of financial leverage and firm size. Financial leverage, an indicator for financial risk, has a negative relationship with financial performance and a positive relationship with market performance and a negative with firm growth. It is contradictory to the traditional accounting theory, the trade-off between profit and risk and the market does not discount firm's financial risks.

Moreover, firm size as a major factor influences performance. There is a strong negative relationship between firm size and market performance. Big companies' share prices are lower than those of relative small companies. It implies that investors intend to buy more small companies' shares instead of those of big companies.

Table 12 shows the correlations between these variables. ROE, an indicator ofperformance. This means that market share prices do not reflect firms' profitability. The increase rates of total assets, which represent firms' growth rates, are negatively correlated with market share prices. This suggests that the market share prices do not reflect firms' development potentials. There is a negative correlation between firm size and Tobin's q, which means that big companies' share prices are lower than those




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of small companies. This implies that investors intend to buy more small companies' shares. The correlation analysis results are consistent with that of regression analysis.

In general, the quantitative study finds that domestic and foreign institutional investors and executive investors may positively influence firm financial performance through monitoring and controlling the company. The government as an investor does not effectively influence the companies' profitability. The state and domestic institutional ownerships have negative impacts on firms' market performance. Executive and foreign institutional ownerships have positive impacts on firm's market performance but only a small number of Chinese companies have executive or foreign ownerships. Institutional investors have positive influence on firm development but rather insignificantly. The Chinese capital markets are not very confident with state and institutional ownerships, and firm size. Moreover, in these two Chinese markets share prices do not reflect firms' profitability and do not discount financial risks. And therefore an investigation of institutional investors' perception and behaviour may be helpful for understanding this phenomenon.

## 5. The role of institutional investors in corporate governance

In order to gain a better understanding of Chinese markets and the role of institutional investors, eleven interviews have been conducted with top managers of Chinese companies and fund managers.

*Agency Problem in Chinese Companies*

The interviewees perceived that theoretically managers should be responsible to shareholders and make every effort to improve share prices. However, share prices depend on many factors and are out of mangers' control. Financial performance is just one of the factors that influence the market share price. In addition, some mangers might treat share issuing as a way of financing projects or collecting funds. For example a corporate manager says that:

"We will be happy if our share prices go up but we have no idea with share prices. We are doing well but now the share price is going down because of the financial crisis.

"Issuing shares is a good way to collect money. We applied for fiscal budget twenty years ago and then borrow from banks ten years ago and now we issue shares. We do not need to return the fund forever. Whatever the share price changes, the fund we can use will never change."




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**Table 12: Correlations**

| | | ROE | TobinQ | Total Asst Increase rate | OC | Lev | LogTA |
|---|---|---|---|---|---|---|---|
| ROE | Pearson Correlation | 1.000 | -.012 | .200** | .081** | -.087** | .071** |
| | Sig. (2-tailed) | | .230 | .000 | .000 | .000 | .000 |
| | N | 10534 | 10534 | 10534 | 10534 | 10534 | 10534 |
| TobinQ | Pearson Correlation | -.012 | 1.000 | -.011 | -.012 | .386** | -.098** |
| | Sig. (2-tailed) | .230 | | .270 | .225 | .000 | .000 |
| | N | 10534 | 10534 | 10534 | 10534 | 10534 | 10534 |
| Total Asst Increase rate | Pearson Correlation | .200** | -.011 | 1.000 | .045** | -.007 | .099** |
| | Sig. (2-tailed) | .000 | .270 | | .000 | .456 | .000 |
| | N | 10534 | 10534 | 10534 | 10534 | 10534 | 10534 |
| OC | Pearson Correlation | .081** | -.012 | .045** | 1.000 | -.016 | -.014 |
| | Sig. (2-tailed) | .000 | .225 | .000 | | .106 | .165 |
| | N | 10534 | 10534 | 10534 | 10534 | 10534 | 10534 |
| Lev | Pearson Correlation | -.087** | .386** | -.007 | -.016 | 1.000 | .067** |
| | Sig. (2-tailed) | .000 | .000 | .456 | .106 | | .000 |
| | N | 10534 | 10534 | 10534 | 10534 | 10534.000 | 10534 |
| LogTA | Pearson Correlation | .071** | -.098** | .099** | -.014 | .067** | 1.000 |
| | Sig. (2-tailed) | .000 | .000 | .000 | .165 | .000 | |
| | N | 10534 | 10534 | 10534 | 10534 | 10534 | 10534 |

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

The above quote shows that agency problems do exist in Chinese companies. Corporate governance mechanisms may be employed to monitor, supervise and audit the management and therefore reduce agency problem and improve firm performance.

*Corporate Governance in Chinese Companies*

The interviewees perceived that moral hazard and conflict of interest were fundamental problems. Mangers may consider their own interests first for example ambitious expansion to build a corporate empire or establishing personal relationships with politicians using company's resources. The interviewees believed that corporate governance was helpful in corporate management. For example, a fund manager argued that:

"You cannot expect that a manager scarifies his own benefits and makes full contribution to shareholders that he does not know and will never see. You can see many managers make great fortune and take every benefit, a luxury car, a free holiday."

"Some managers were prosecuted and put into prison but probably less than one percent guys with bad luck. It is very hard to identify an illegal transaction and provide enough evidence. Many things are not legal issues and the law has no idea




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with them for example managers like doing something that you can see, we call face project."

"Corporate governance is a good system, like people see a monitor on the wall and will never steal a small stuff. You should not rely on themselves but mechanisms. However, I do not see corporate governance works very well in many companies"

The above quotes demonstrate that the interviewees believed that corporate governance is useful but there are some problems in many Chinese companies.

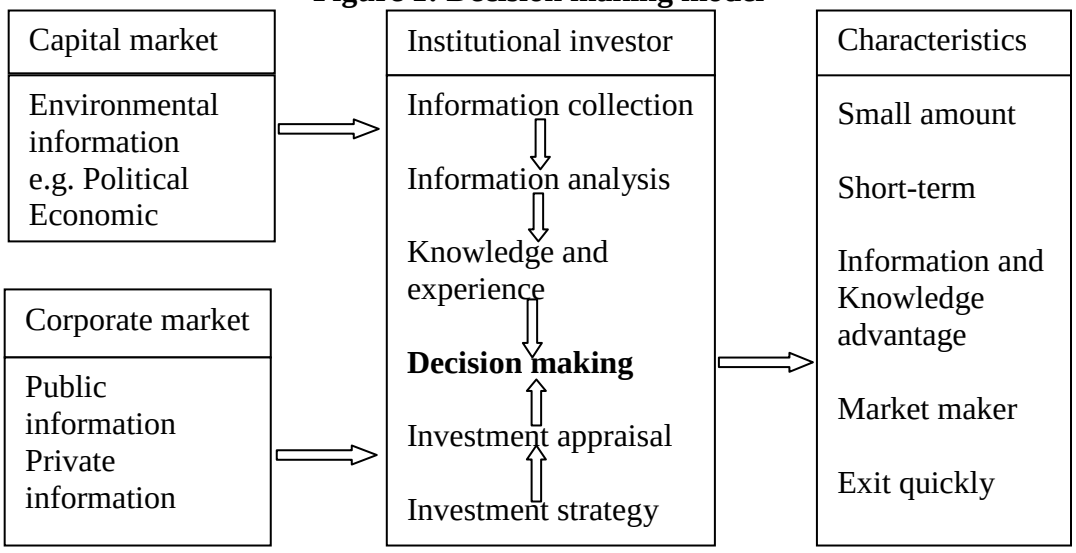
*The Role of Institutional Investors*

The interviewees argued that institutional investors should participate in corporate governance. For example a fund manager explained that:

"Institutional investors have a huge amount of fund that can be invested in the company for a long term. We very care about the company's operations and want to know the company's history, current situation and future development. Moreover, we can even communicate with company's managers and collect more information that is not available at the market. Because we are shareholders, the owner of the company, we need to make sure that the company we invested is healthy and have a bright future. Because we want to keep our wealth and make return on investment. It is possible as we are specialised and experienced in collecting, analysing information and making decisions. The investment decision also depends on our investment strategy and appraisal."

The following figure shows the decision making process of institutional investors.

**Figure 1: Decision making model**




*Small Amount and Short-Term Investment*

The interviewees believed that the Chinese institutional investors are comparatively small and mainly make short term investment in practice. For example, a market analyst in Shenzhen Stock Exchange says that:

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"Currently, seventy percent of institutional investors are small and medium organisations with total transactions less than one million Chinese RMBs, but in Hong Kong market one third and in London ten percent. They are the major fund providers in the Chinese markets and they have more short term investment."

"Chinese institutional investors diversified their portfolio with small amounts of fund and short term investments. They buy and sell shares frequently to explore the prices and make abnormal return. The capital markets are not stabilised by these institutional investors but very volatile." A fund manager described.

*Information and Knowledge Advantage*

The fund managers are specialists who have more knowledge and experience and they have more information than other individual investors. They take advantage of information and knowledge and make quick decisions. For example a fund manager argued that.

"In the Chinese markets there are many institutional investors. We have to analyse other investors' thought and behaviour and take different actions. In this game only a few players can win and make profit."

"Fund managers are clever and they buy shares at low prices and sell at high prices and make profit. Individual shareholders will follow and they will buy shares when the price is going up and many have been locked in at the high prices." A fund manager explained.

*Market Maker*

"A few institutions are market maker and they can manipulate the share price. The recent 'Sheng Li,' 'Tian Ge' and even 'Huang' cases are some examples." A fund manager commented.

"Some financial crocodiles always attach those small companies because they have enough funds. The big companies are not easy to attach as they are too big. Many big companies are in the main industry and the government does not allow them to be attacked." A market analyst remarked.

*Exit Quickly*

The institutional investors would exit as soon as they find there is a possibility that the company's share price will go down. For instance, a fund manager conveyed.

"It is impossible and unfair to require the institutional investors to buy and hold and participate in corporate governance. We need to make return on our investment in order to keep our jobs and be rewarded. I think the state-owned assets supervision and administration commission should take the responsibility not us as a commercial company."

"Investors are reluctant and seldom to participate in corporate governance. Even if there is some participation, they are reactive and superficial. We have many market analysts, stock analysts but very few corporate analysts to investigate the fundamental value of the companies."




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The above quotes demonstrate the institutional investors are small and undeveloped and the fund managers are game players who making decisions according to market information and other investors' actions and therefore they have a weak role in corporate governance.

*The Role of the Government and the State-Owned Asset Supervision and Administration Commission*

Most Chinese big companies were fully owned by the government before 1978 and it was widely believed that government direct interference was not efficient in managing the companies. The government might focus on social welfares instead of profit and have a production orientation instead of market orientation.

Market mechanisms were introduced into Chinese companies and ownership reform was conducted to reduce state ownership and the corporate managers should be responsible to shareholders and make decisions independently. Furthermore the government appointed the supervision and administration commission to manage the state-owned asset.

The interviewees perceived that these institutional investors were not true owners of the company and not be able to fulfil their shareholder rights. For example, a corporate manager conveyed that:

"The state was the owner, which means all of us were owners of the company and now the State-owned Asset Commission is the owner. Are there any different?"

"Direct intervention is inefficient but non-intervention is not helpful either. At current time, the state-owned asset commission is still a governmental department and I don't think they work very well."

*An Independent State-Owned Asset Management Company*

The interviewees believed that an independent company could effectively manage the state-owned asset. For example, a fund manager argued that.

"Some independent organisations may be better than a government department in monitoring and controlling the company. They are more knowledgeable and specialised in accounting and auditing but would not directly participate in the management of the company."

"As they are managing the state-owned assets, which are huge they are able to buy and hold and moreover they can participate in corporate governance. For example, they can send supervisors to the company and appoint non-executive directors and select auditing firms."

*The Nature of Chinese Capital Markets*

The Chinese capital markets make great contribution to the economic development by providing funds in primary markets and corporate governance mechanisms in secondary markets for the public listed companies, as Figure 2 shows. However, corporate governance mechanisms are still weak in the Chinese markets. The role of institutional investors is weak because the institutions are small and the fund managers are not active in monitoring and controlling the companies. State ownership




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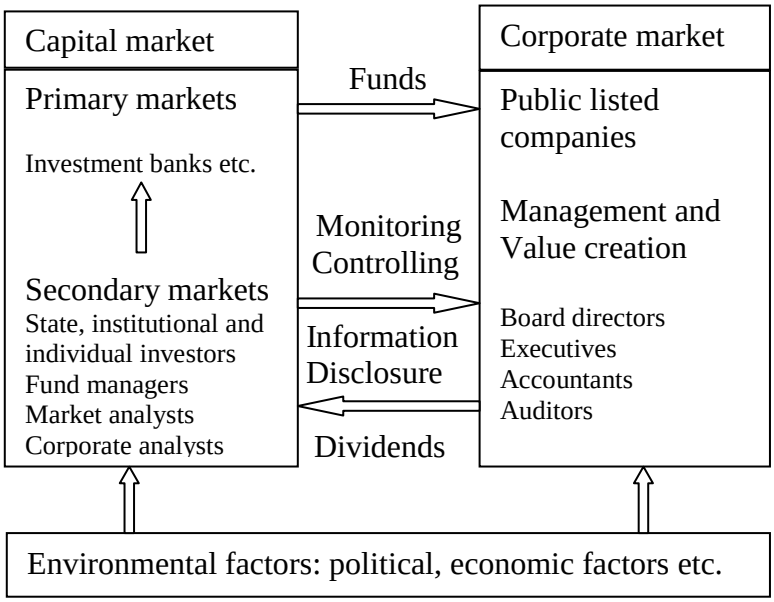
is not very efficient as the traditional confusion of ownership still exists and shareholders right are not fully expressed.

**Figure 2: The Value Creation and Allocation Process Model in the Chinese Markets**




## 6. Conclusion

By investigating the relationship between ownership structure and firm performance, this study found that there was a weak positive relationship between ownership concentration and firms' financial and managerial performance but a strong relationship between ownership concentration and capital market performance. State ownership had a negative relationship with firms' financial, market and managerial performance. Domestic institutional ownership had a weak positive relationship with firms' financial and managerial performance but a negative relationship with capital market performance. Foreign institutional and executive ownerships had positive relationships with firm performance but they were not popular in Chinese markets. It was found that market share prices have a negative correlation with firms' financial performance, growth potential and financial risk.

The qualitative study found that institutional investors were either less powerful or reluctant to influence the company but more focused on exploring the share prices. The institutional investors play a weak role in corporate governance although the communication between fund managers and corporate managers enhance the information disclosure by the companies. The state-owned asset supervision and administration commission represents the state investors but could not express shareholders right well. The interviewees suggested that an independent state-owned asset management company might be helpful to participate in corporate governance.

The findings confirmed that agency problem (Jensen and Meckling, 1976) did exist in Chinese companies and corporate governance mechanisms (Solomon, 2007) were necessary to reduce the problem and therefore improve firm performance. The

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findings were consistent with Shleifer and Vishny's (1994) argument that state ownership is not efficient. This study found that institutional investors have different behaviour from those in Holland's (2002) model. Moreover, this study does not support the Efficient Market Hypothesis (EMH) (Fama, 1965) in Chinese markets as share prices had a weak negative correlation with firms' profitability and financial risk. Behavioural Finance (Forbes, 2009) theories could be employed to explain the institutional investors' perception and behaviour. It is found that Game Theory (Neumann and Morgenstern, 1944) was widely used by Chinese fund managers.

This study suggests that the Chinese capital markets need to be further improved. Apart from the development of regulations institutional investors should be further developed. In particular, an independent investment company could be established to manage the state-owned assets and actively participate in corporate governance. Instead of mainly exploring the share prices the investors could adjust their investment strategy, for example makes more long-term investment and develop long-term based incentive systems. They could analyse the fundamental value of the companies by analysing companies' historical and current performance, the dynamic of companies' value creation and future development potential. The fund managers and analysts could communicate with corporate managers acquiring updated information.

Furthermore, institutional investors could actively participate in companies' corporate governance, supervise companies' operation and influence their decisions. For example firstly, they can nominate independent directors, ask for more information about corporate strategy, and provide advice on financial management. Secondly, the institutional investors may construct a shadow council to monitor company's operation and conduct independent investigation and provide alternative solutions. Thirdly, they could regularly publish a list of their potential target companies and invested companies and disclose acquired information to the public. These actions will give the managers much pressure and express shareholders' right to participate in corporate governance. Institutional investors could play an important role in monitoring and controlling the companies and therefore improve firm performance. Moreover they could make great contribution to the development of Chinese capital markets and the whole economy.

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*Daniel May*

# How Distrust Affects the Formation of Collaborative Alliances in Agriculture?

**Abstract**

Collaborative alliances have been identified as useful business strategies to help individuals to adjust in turbulent business environments. Surprisingly, the article found that this strategy was not adopted by the ex-sugar beet farmers of the West Midland of the UK in response to the reform of the Sugar Regimen introduced by the European Union in 2006. According to these farmers, this is the result of lack of trust among potential partners. The article uses the network model developed by May (2011) with the purpose of determining whether this outcome corresponds to an equilibrium caused by the existence of distrust. Policy implications are then discussed.

**Keywords:** Collaborative Alliances, Networks of Collaboration, Distrust.

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## 1. Introduction

A significant number of academic works have investigated how the formation of collaborative alliances has helped firms to adjust in turbulent business environments. The results obtained by these works revealed a number of beneficial effects that can indeed help organisations to adjust in these dynamic environments. Because one of the factors that cause instability in business environments is the introduction of policy reforms, this suggests that firms have an incentive to form alliances when these reforms are implemented. Consequently, it is reasonable to expect that the number of collaborative alliances increases after a policy change is adopted. Surprisingly, however, no work has been made to determine whether policy reforms have positively affected the formation of these alliances. The objective of this article is to fill this gap in order to test the hypothesis that policy reforms positively affect the formation of collaborative alliances in rural areas. The scope of the research is to test this hypothesis by considering the particular case of the sugar beet farmers of the West Midlands region of the UK because their business was negatively affected by the reform of the Sugar Regime of the European Union in 2006. As a consequence of this reform, the sugar beet factory located at Allscott in Shropshire was closed and farmers in this area were obligated to adjust to in response to this important policy shock.




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The paper is structured as follows. Section Two presents a literature review on the topic of collaborative alliances in the context of dynamic business environments. Section Three describes the methodology used in the research. Section Four describes the results of the investigation. Finally, Section Five concludes the paper and discusses some policy implications of the results.

## 2. Literature Review

A relatively new theoretical development has been introduced in the last decades with the objective of understanding how organisations adjust in turbulent and dynamic business environments. This development is referred to as dynamic capabilities and is defined by Eisenhardt and Martin (2000, p.1,107) as "the firm's processes that use resources –specifically the processes to integrate, reconfigure, gain and release resources – to match and even create market change. Dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve and die." Wang and Ahmed (2007), based on empirical academic works, argued that dynamic capabilities are characterised by three components or factors that are common across firms: (i) adaptive capability (i.e. a firm's ability to identify and capitalize on emerging market opportunities); (ii) absorptive capability (i.e. ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends in order to innovate); and (iii) innovative capability (i.e. a firm's ability to develop new products and/or markets, through aligning strategic innovative orientation with innovative behaviours and processes).

Collaborative alliances have been identified as important business strategies because they can help firms to adjust in dynamic environments. This is because they contribute in the development of dynamic capabilities as they positively affect the development of both absorptive capacity and innovative capability. For example, Chen (2004) explains that inter-firm alliances and collaboration across firms can help firms to acquire the outside knowledge that is needed to adjust in turbulent conditions. Hagedoorn and Duysters (2002), on the other hand, point out that the formation of strategic alliances can help firms to obtain the information that is needed to innovate in new processes and products. Finally, collaborative alliances also help farmers to adjust in turbulent business environment because they allow them to charge lower prices for agricultural goods. This is because unitary costs can be reduced by means of collaboration. That is, collaboration can reduce information asymmetries, minimise transaction costs, reduce both transport and communication costs, and purchase in volume and share inputs including seeds, fertilizer and farm equipment (Gerichhausen et al., 2009, Gall and Schroder, 2006, Lapar et al., 2006).

As explained in the introduction, the beneficial effects of collaboration suggest that firms have an incentive to form collaborative alliances in response to a policy reform because they can help them to adjust in the turbulent condition caused by this policy change. This is the hypothesis investigated in this article. The methodology adopted to test this hypothesis is presented in the next section.

## 3. Methodology




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The aim of this article is to test the hypothesis that policy reforms positively affect the formation of collaborative alliances in rural areas. For this purpose, the research was conducted in two stages. In the first stage, a sample of ex-sugar beet farmers of the West Midlands of the UK was considered with the purpose of determining whether these individuals formed collaborative alliances in response to the reform of the Sugar Regime introduced by the European Union in 2006. The second stage, on the other hand, was designed to determine the nature and implications of lack of collaboration identified in the first stage. In order to develop the second stage, the social network model developed by May (2011) was adopted. The idea was to use this model to determine whether lack of collaboration constituted a stable equilibrium. In this context, it was analysed how to break this theoretical equilibrium with the objective of favouring a more integrated collaborative network across farmers.

### 3.1 Methodology Used in the First Stage of the Research

The first stage of the research was designed to complete with two objectives. The first one was to determine whether the ex-sugar beet farmers of the West Midlands region of the UK (ESBF) increased the number of collaborative alliances in response to the implementation of the Sugar Regime reform (SRR). For this purpose, some ESBF were asked to report the number of alliances that they had before and after the introduction of the reform. A simple student *t* test was adopted to determine whether the average of the number of collaborative alliances that farmers had before the reform ($n_B$) was statistically smaller than the average of the number of collaborative after the reform ($n_A$). The null and alternative hypothesis established for this test is shown as follows:

$H_0$ $n_A = n_B$

$H_1$ $n_A > n_B$

The second objective, on the other hand, was to determine whether farmers' attitudes toward the formation of collaborative alliances increased in response to the SRR. To complete with this objective, some ESBF were asked to indicate their attitudes toward the formation of collaborative alliances in response to the SRR. In particular these individuals were asked to use a 5-Likert point scale (i.e. irrelevant, not very important, important, very important, and essential) to respond the following statement before and after the implementation of the SRR: "collaborative alliances formed with the objective of reducing productive costs are suitable to make your farm a successful business enterprise". A simple student t test was adopted to determine whether the means of the Likert scores reported by the farmers in the sample for the case "before the reform ($\mu_B$)" was statistically smaller than the sample mean for the case "after the reform ($\mu_A$)". The null and alternative hypothesis established for this test is shown as follows:

$H_0$ $\mu_A = \mu_B$

$H_1$ $\mu_A > \mu_B$

The information obtained in this stage was useful to identify the existence of potential barriers preventing farmers from collaborating in response to the reform, even when




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being willing to collaborate. For the purpose of the present research, it is argued that a barrier exists when the following conditions are both satisfied: (i) $n_A = n_B$; and (ii) $\mu_A > \mu_B$.

The sample consisted of 48 farmers which correspond to 8.1 per cent of the total sugar beet growers that operated in the West Midlands before the reform. This sample was collected in a period of six months. The data collection method was based on a combination of cluster, stratified and snowball sampling techniques. The reason for using them was that there was not a list of ESBF available in the public domain. Before adopting these techniques, different unsuccessful attempts to obtain a random sample were made.

The sample cluster was selected considering the most relevant counties of the West Midlands region in terms of the number of ESBF. They corresponded to the counties of Shropshire, Worcestershire, Herefordshire, Staffordshire and surrounding areas accounting for 48%, 15%, 14%, 12% and 11% of the total sugar beet farm holdings in 2005, respectively. The sample considered relatively similar proportions for these counties in terms of the number of farmers that participated in the investigation accounting for 46%, 15%, 13%, 15% and 13%, respectively. A similar approach was adopted by Rural Business Unit of the University of Cambridge and Royal Agricultural College (2004) but in terms of regions rather than counties.

The sample stratification was made considering the size of the farm in terms of the number of hectares. It was not possible to find official statistics on this variable. Nonetheless, a criterion was established based on the opinions of the 10 farmers that formed the pilot sample. The precaution was taken to include a balanced number of farmers to the classes defined by this measure.

The snowball technique was developed separately in each relevant county. As a result, it was possible to find a number of ESBF that is consistent with the sample cluster strategy defined above.

### 3.2 Methodology Used in the Second Stage of the Research

The second stage was designed with the purpose of determining whether some important facts identified in the first stage could theoretically been explained by the existence of distrust among potential partners. This is because distrust has been identified as a factor that negatively affects the formation of collaborative alliances (for a discussion, see Gerichhausen *et al*., 2009; and Banaszak, 2008). In order to develop this analysis, the network model developed by May (2011) was adopted. This model is formally described as follows.

A collaborative alliance between farmers $i$ and $j$ is described by a link, given by a binary variable $g_{ij} \in \{0,1\}$ with $g_{ij} = 1$ if an alliance exists between farmers i and j and $g_{ij} = 0$ otherwise. A network $g = \{(g_{ij})_{ij \in N}\}$ is a description of the collaborative alliances that exist among a set $N = \{1,\ldots, N^*\}$ of farmers, where N* is the total number of farmers. Networks $g^c$ and $g^e$ are the complete network (i.e. $g_{ij} = 1$ for all i, $j \in N$) and the empty network (i.e. $g_{ij} = 0$ for all i, $j \in N$). Let G denote the set of all possible networks, $g + g_{ij}$ denote the network obtained by replacing $g_{ij} = 0$ in network g by $g_{ij} = 1$ and $g - g_{ij}$ denote the network obtained by replacing $g_{ij} = 1$ in network g




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by $g_{ij} = 0$. Let $N_i(g) = \{j \in N: g_{ij} = 1\}$ be the set of farmers with whom farmer i has farmer has a collaborative alliance in network g. Assume that $i \notin N_i(g)$ so that $g_{ii} = 0$. The cardinality of $N_i(g)$ is denoted $\eta_i(g)$. That is, $\eta_i(g)$ is the number of collaborative alliances that farmer i has in network g. Given this definition, it always holds that $\eta_i(g + g_{ij}) = \eta_i(g) + 1$.

In order to determine the objective function of farmers, on the other hand, the following assumptions have been adopted:

i. Farmers are price takers: It is assumed that the demand for this good is perfectly elastic. Formally, assume for simplicity and without losing generality that all the farmers in set N produce the same crop. Let p(g) be the price of this crop in network g. Because farmers are price takers, it is assumed that $p(g) = p$ for all $g \in G$.

ii. Farmers have a fixed area of land: Farmers in the short-medium run cannot respond to exogenous changes of marginal cost by increasing production because they face a land constraint given by the existence of clear property rights (i.e. they have a fixed area of land). This restriction is introduced as follows. Let $c_i$ be the marginal cost faced by farmer $i \in N$. If $p = c_i$, then farmer i maximises profits by using all its land endowment. If $p < c_i$, then the farmer maximises profits by choosing an output smaller than that obtained when using all its land endowment. Finally, if $p > c_i$, then farmer i produces the same output than that produced when $p = c_i$ as a consequence of the land restriction. Formally, if $p \geq c_i$, then $Q_i(g) = Q_i$ for all $g \in G$, where $Q_i$ represents the output of the crop produced by farmer i. In contrast, if $p < c_i$, then $Q_i(g) < Q_i$.

iii. Farmers distrust their potential partners: Assume that the marginal cost faced by farmer i in network g is given by $c_i = \lambda_i - \theta_i\eta_i(g) + \varphi_i\eta_i^2(g)$, where $\lambda_i$ is the marginal cost faced by farmer i when this individual does not have collaborative alliances. The term $\theta_i\eta_i(g)$ represents the beneficial effect of collaborative alliances on marginal cost, where $\theta_i > 0$ reflects how strong this beneficial effect is. Finally the term $\varphi_i\eta_i^2(g)$ represents the distrust cost of collaboration. This cost is assumed to be a quadratic function of $\eta_i(g)$. That is, the distrust cost increases more than proportionally when the number of links increases. A justification for this assumption is the fact that monitoring the activities developed by partners becomes more difficult when the number of collaborators increases. The coefficient $\varphi_i$ reflects how strong the negative effect of this cost is.

Using these assumptions, the objective function of farmer i in networks g and $g + g_{ij}$ is defined as follows:

$$\pi_i(g) = p(g)Q_i(g) - [\lambda_i - \theta_i\eta_i(g) + \varphi_i\eta_i^2(g)]Q_i(g) \quad (1)$$

$$\pi_i(g + g_{ij}) = p(g + g_{ij})Q_i(g + g_{ij}) - [\lambda_i - \theta_i\eta_i(g + g_{ij}) + \varphi_i\eta_i^2(g + g_{ij})]Q_i(g + g_{ij}) \quad (2)$$

For simplicity it is assumed that $p = \lambda_i$ for all $i \in N$. This implies that farmers will have an incentive to form a collaborative alliance as long as $p > \lambda_i - \theta_i\eta_i(g) + \varphi_i\eta_i^2(g)$. Farmers have an incentive to form a collaborative alliance when this condition is satisfied because it allows them to make super-profits. On the other hand, since $p(g) = p$ for all $g \in G$ and $Q_i(g) = Q_i$ for all $g \in G$ when $p > c_i$, farmer i will have an




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incentive to form a collaborative alliance with farmer j when the following expression is positive:

$$\pi_i(g + g_{ij}) - \pi_i(g) = \{\theta_i - \varphi_i[\eta_i(g + g_{ij}) + \eta_i(g)]\}Q \quad (3)$$

In order to determine the stability of the network of collaboration, the pairwise stability concept proposed by Jackson and Wolinsky (1996) has been adopted. Formally, network g is pairwise stable if for all i, $j \in N$: (i) if $\pi_i(g + g_{ij}) - \pi_i(g) > 0$, then $\pi_j(g + g_{ij}) - \pi_j(g) < 0$; and (ii) $\pi_i(g) > \pi_i(g - g_{ij})$. Condition (i) specifies that if two farmers, i and j, do not have a collaborative alliance, then at least one of them has no an incentive to form one; and condition (*ii*) means that no farmer has an incentive to break an existing alliance.




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## 4. Results

### 4.1 Results of the first stage of the research

The results obtained in this stage revealed that before the implementation of the SRR 16 farmers in the sample had two collaborative alliances, 25 had only one collaborative alliance, and the rest did not have any sort of collaboration. In contrast, after the implementation of this reform, 17 farmers had two alliances, 28 had only one alliance, and the rest were not involved in collaboration. The Student t value obtained from this information was 0.81. In contrast, the Student t value for one-sided test, 94 degrees of freedom and 5% of significance level is equal to 1.661. Because the t calculated was smaller than the t table, the null hypothesis was not rejected. As a result, it was concluded that the number of collaborative alliances did not increase after the implementation of the reform (i.e. $n_A = n_B$).

On the other hand, farmers assigned in average a value equal to 3.21 (variance = 0.87) to the statement "collaborative alliances formed with the objective of reducing productive costs are suitable to make your farm a successful business enterprise" for the case "before the reform". In contrast, they assigned a value equal to 3.87 (variance = 0.85) to this statement for the case "after the reform". The Student t calculated with this information was 3.48. Because in this case the t calculated was larger than the t table, the null hypothesis was rejected. It was concluded, therefore, that the farmers in the sample increased their positive attitudes towards the formation of collaborative alliances in response to the SRR (i.e. $\mu_A > \mu_B$).

Because the farmers in the sample did not increase collaboration after the reform even when increasing their positive attitudes towards collaborative alliances, it was inferred the existence of a barrier preventing them from forming these alliances. The survey revealed that farmers did not increase collaboration because they did not trust their potential partners. This problem has also been identified by researchers in other studies. For example, Ortmann and King (2007) argued that the free-rider problem arises when property rights among members of the alliance are not sufficiently well defined. In this case, some individuals have the incentive to avoid bearing the full cost of their actions. Likewise, Gerichhausen et al. (2009) and Banaszak (2008) argued that lack of trust can negatively influence the formation of collaborative alliances.

### 4.2 Results of the second stage of the research

The objective of this stage was to determine whether the barrier identified in the first stage (i.e. existence of distrust) can generate a theoretical network in equilibrium that is consistent with that characterising the case of the ex-sugar beet farmers (ESBF). This is shown in the following Proposition.

**Proposition 1:** If $3 < \theta_i/\varphi_i < 5$ for all $i \in N$, then farmers have an incentive to form cooperative alliances with at most two partners.

**Proof:** Assume $\eta_i(g) = 2$. According to equation 3, a farmer will have an incentive to form a collaborative alliance with at most two farmers when the following conditions are both satisfied: (i) $\pi_i(g + g_{ij}) - \pi_i(g) < 0$, which implies $\theta_i - 5\varphi_i < 0$; and (ii) $\pi_i(g) -$




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$\pi_i(g - g_{ik}) > 0$, which implies $\theta_i - 3\varphi_i > 0$. But this implies $3 < \theta_i/\varphi_i < 5$, which is feasible. QED.

This result reveals an important fact. That is, it is the relative importance of distrust cost with respect to the beneficial effect of collaboration (i.e. $\theta_i/\varphi_i$) that really determines the incentives of farmers to participate in collaborative alliances. Since $3 < \theta_i/\varphi_i < 5$ is a feasible solution of the model, the argument given by the ESBF to explain the lack of collaboration in response to the SRR is supported by the theoretical network model.

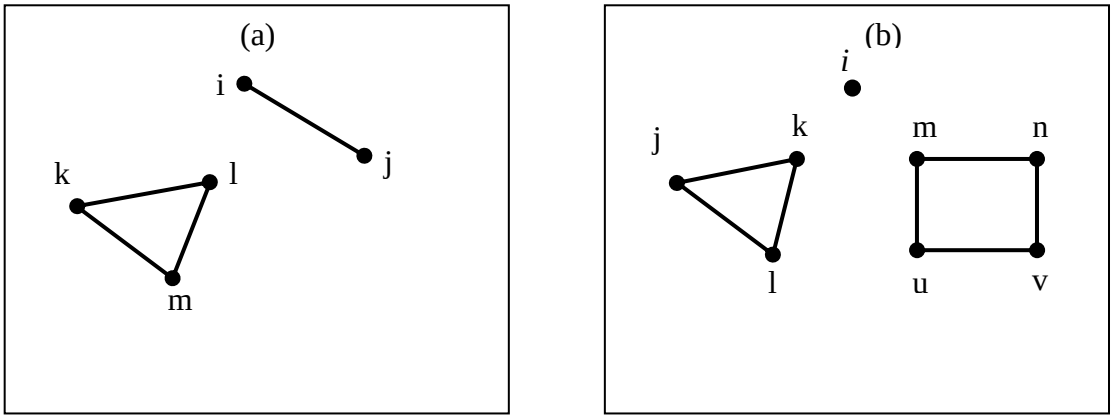
A natural question arising from this result is what networks are stable when farmers are willing to form collaborative alliances with at most two partners. In order to provide an answer, let us consider the following Proposition.

**Proposition 2:** If $\pi_i(g + g_{ij}) - \pi_i(g) > 0$, then $\pi_i(g) - \pi_i(g - g_{ik}) > 0$.

**Proof:** Note that $\eta_i(g + g_{ij}) + \eta_i(g) > \eta_i(g) + \eta_i(g - g_{ik})$. This implies that $\theta_i - \varphi_i[\eta_i(g) + \eta_i(g - g_{ik})] > \theta_i - \varphi_i[\eta_i(g + g_{ij}) + \eta_i(g)]$. But this implies that $\pi_i(g) - \pi_i(g - g_{ik}) > \pi_i(g + g_{ij}) - \pi_i(g)$. Therefore, if $\pi_i(g + g_{ij}) - \pi_i(g) > 0$, then it must be concluded that $\pi_i(g) - \pi_i(g - g_{ik}) > 0$. QED.

This is an important result to determine the stability of the network. According to this proposition, if $3 < \theta_i/\varphi_i < 5$ for all $i \in N$ and if a farmer has an incentive to form an alliance with another farmer, then the former does not have an incentive to break an existing one. In terms of the stability concept presented in Section 2.2, this means that condition (ii) is always satisfied when farmers have at most two alliances. Since condition (i) is also satisfied when farmers have two alliances, it is inferred that several different networks can all be stable. They include networks composed of complete components (i.e. sets of farmers having collaborative alliances with one another) formed by 2 or 3 farmers; incomplete components (i.e. sets in which one or more farmers do not have an alliance with at least on farmer that belongs to these sets) formed by 4 or more farmers; and at most one singleton (i.e. a farmer who does not have any alliance). Some examples are presented in Figure 1:

**Figure 1: Stable networks of collaboration when $3 < \theta_i/\varphi_i < 5$ for all $i \in N$**







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The network presented in Figure 1 (a) is composed of two complete components. One of them is formed by two farmers: i and j. The other one is formed by three farmers: k, l and m. Since farmers i and k have only one collaborative alliance, they have an incentive to form an additional alliance with any of the other farmers. However, because farmers k, l and m have all two collaborative alliances, they are not willing to form an additional alliance with either farmer i or farmer j. As a result, this network is stable. Figure 1 (b), on the other hand, is composed of one complete component (farmers j, k and l); an incomplete component (farmers m, n, u and v), and a singleton (farmer i). Farmer i has an incentive to form an alliance with any of the other farmers because he/she does not have any alliance. However, since all the other farmers have already two alliances, they do not have an incentive to form an additional one. As a consequence, this network is also stable.

## 5. Conclusions and Policy Implications

The objective of this article was to determine whether the number of collaborative alliances existing among the ex-sugar beet growers of the UK increased after the implementation of the Sugar Regime reform. It was found that only farmers' positive attitudes toward the formation of collaborative alliances increased in response to this reform, but not the effective number of alliances existing among them. This discrepancy suggests the existence of a barrier preventing these individuals from increasing collaboration. The ex-sugar beet growers argued that this barrier corresponded to distrust among potential partners. In order to determine the effect of distrust on the architecture of the network of collaboration, this article adopted the social network model of collaboration developed by May (2011). The results revealed that when distrust costs increase at an increasing rate as the number of alliances increases, only networks formed by farmers having none, one, or two alliances can be stable. These networks are consistent with the patterns of collaborative alliances that characterise the agricultural sector of the West Midlands region of the UK.

The results obtained in this article have important policy implications when considering the trend of the current policy orientation of the European Union. That is, the European Union has developed important reforms of the Common Agricultural Policy by replacing distorting domestic policies by lump sum transfers called decoupled payments. It has been argued that the formation of collaborative alliances can help farmers to adjust in response to these policy changes because cooperation allows them to reduce unitary costs (Bowler, 1985). However, the results obtained in this article revealed that farmers cannot be fully benefited from cooperation when they face distrust costs. If farmers were able to reduce distrust, then they would also be able to increase collaboration because the only stable network when distrust is not present is the complete network (a formal proof can be found in Proposition 3 of May, 2011). Larger collaborative alliances, in turn, would help farmers to adapt to policy reforms more efficiently because these alliances are associated with lower production costs.

Policy makers could consider the establishment of programmes to stimulate the formation of private offices designed to assume the administrative tasks of collaboration. That is, to find partners, to find potential markets for join production, to




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establish clear property rights on the resources that are shared by members of alliances, and to provide relevant information about inputs and market trends. These offices not only could be opened with the purpose of helping farmers to reduce distrust costs, but also could become alternative profitable enterprises in rural areas. Actually, the farmers that participated in the survey provided a positive feedback about this idea.

Finally, it is important to clarify that the article was focussed on the particular case of the ex-sugar beet farmers of the West Midlands region of the UK. It would be interesting to extend this research in order to analyse the formation of collaborative networks by other types of farmers. In addition, the development of this investigation in other countries or regions would provide valuable information that could be used to identify cross-cultural factors affecting the formation of collaborative in rural areas. All these possible extensions are left for future research.

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