INVESTIGATING THE RELATIONSHIP BETWEEN THE RECENT INVESTMENTS ON CONSTRUCTION SECTOR AND SOME ECONOMIC INDICATORS OF TURKEY

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ABSTRACT

INVESTIGATING THE RELATIONSHIP BETWEEN THE RECENT INVESTMENTS ON CONSTRUCTION SECTOR AND SOME ECONOMIC INDICATORS OF TURKEY

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Construction industry is believed to constitute a significant part of the economic development and there are quite noteworthy studies that analyze the relationship between construction industry investments and economic development. This study attempts to find out this causal relationship by using Toda and Yamamoto Augmented VAR model for Granger Non-causality. In addition, two separate models are used in order to detect the effects of specific construction activities such as residential, commercial and industrial by both public and private actors. The quarterly data are taken from Turkstat covering the period of 2000Q1-2013Q4 for model 1 and 2002Q1-2013Q4 for model 2. The results of the Wald tests of the first model shows that the total construction activities and GDP have bidirectional causal relationship both for public and private sectors. Also, a significant bidirectional causality has been found between public and private construction activities indicating the mutual interaction among different actors in the industry. However, the second model shows that these bidirectional causalities are not valid for specific construction types. According to the results of the Wald tests, all of the unidirectional relationships are proceeded from GDP to residential and commercial construction types of public sector, and residential and industrial construction activities by private actors. Nonetheless, an important bidirectional causality is detected between public residential construction activities and total employment.

Keywords: Construction Industry, GDP, Toda and Yamamoto Augmented VAR model

Öz

TÜRKİYE'DE YAKIN DÖNEMDEKİ İNŞAAT SEKTÖRÜ YATIRIMLARI İLE BAZI EKONOMİK GÖSTERGELER ARASINDAKİ İLİŞKİNİN İNCELENMESİ

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İnşaat sektörünün ekonomi içinde önemli bir rolü olduğuna inanılmaktadır ve ekonomik gelişme ile inşaat sektörü arasındaki ilişkiyi inceleyen pek çok araştırma bulunmaktadır. Bu tez çalışmasında da bu iki değişkenin arasındaki nedensellik ilişkisi Toda ve Yamamoto Augmented Var modeli kullanılarak açıklanmaya çalışılmış ve bunu yaparken hem özel hem de kamu sektörü tarafından gerçekleştirilen toplam inşaat faaliyetleri ile sanayi, ticari ve konut tarzı gibi daha alt ölçekli inşaat faaliyetlerinin ekonomik göstergelerle olabilecek farklı nedenselliklerini gözlemleyebilmek için 2 ayrı model üzerinde çalışılmıştır. TÜİK'ten elde edilen çeyrek dönemlik veriler ile ilk model için 2000Ç1-2013Ç4 dönemi ve ikinci model için ise 2002Ç1-2013Ç4 zaman dilimi ele alınmıştır. İlk model için yapılan Wald testi sonucunda kamu ve özel sektör toplam inşaat faaliyetleri ile Gayri Safi Yurtiçi Hasıla arasında iki yönlü bir nedensellik olduğu görülmekle beraber kamu ve özel sektör toplam inşaat faaliyetleri arasında da karşılıklı bir nedensellik ilişkinin olduğu tespit edilmiştir. Fakat ikinci modele bakıldığında bu iki yönlü etkileşimin inşaat faaliyetlerinin alt kolları için geçerliliğini koruyamadığını görmekteyiz. Yapılan Wald testinin sonuçları Gayri Safi Yurtiçi Hasıla'dan kamu sektörü tarafından yapılan konut ve ticari inşaatlara, ayrıca özel sektör tarafından gerçekleştirilen konut ve sanayi tarzı inşaat faaliyetlerine doğru yönelen pek çok tek taraflı nedensellik ortaya çıkarmıştır. Bunun dışında ikinci modelde gözlemlenen kamusal konut inşaatları ve toplam istihdam arasındaki iki yönlü nedensellik de dikkat çekmektedir.

Anahtar kelimeler: İnşaat sektörü, GSYİH, Toda ve Yamamoto VAR modeli

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AIC	Advanced Industrial Country
BT	Balance of Trade
CCI	Construction Cost Indices
CEGDPPRS	Construction Expenditure in the Gross Domestic Product (Private Sector)
CEGDPPS	Construction Expenditure in the Gross Domestic Product (Public Sector)
CEGDPTOT	Construction Expenditure in the Gross Domestic Product (Total)
CF	Construction Flows
CGDFCF	Gross Domestic Fixed Capital Formation
CPI	Inflation
CVA	Construction Value Added
GDP	Gross Domestic Product
GDPD	Gross Domestic Product Deflator
GFCF	Gross Fixed Capital Formation
GNI	Gross National Income
GNP	Gross National Product
GVAC	Gross Value Added in Construction
GVC	Gross Value of Construction Works
GVCW	Gross Value of Construction Works
IMF	International Monetary Fund
IMKB100	Istanbul Stock Exchange National 100 Index
INTES	The Turkish Employers' Association of Construction Industries
LCNS	Construction Sector
LDC	Less Developed Country
LGDP	Aggregate Economy

NATO	North Atlantic Treaty Organization
NCONGDP	Nominal Time Series Data on Value Added to GDP by Construction Industry
NIC	Newly Industrialized Country
rcnst	Real Investment in Construction Activity
rcp	Real Private Consumption Expenditures
reg	Real Government Expenditures
TOBB	Türkiye Odalar ve Borsalar Birliği
TOKI	Toplu Konut İdaresi Başkanlığı
TURKSTAT	Turkish Statistical Institute
UE	Unemployment Rate
XTAST	Istanbul Stock Exchange Non-Metal Minerals Index

CHAPTER 1

INTRODUCTION

Throughout the world, construction industry is regarded as one of the most significant tool for economy and it is stated that the construction activities generate 11% of global total GDP. (Rider Levett Bucknall, 2009). Since the construction industry can provide vast employment opportunities and stimulate large number of sub-sectors, the investments on construction industry are considered as the way out of economic stagnation especially for developing countries. Also, the construction activities were gained importance and accelerated to recover the destruction of World War 2 by many countries.

Owing to these features of the industry, many researchers have analyzed the relationship between construction industry and economic development. Their results have showed that this linkage differs from each other with regard to developing and developed countries. For example, Rameezdeen and Ramachandra (2006) find out that there is a unidirectional relationship from construction industry to economy and not vice versa, on the contrary, Tse and Ganesan (1997) and Yiu et al (2004) come up with a conclusion of opposite causality for Hong Kong.

For the case of Turkey, the construction industry plays an important role in economy and considered as the main source of numerous

related sub-sectors and employment as well. In the last decade, especially several large scale residential projects have been carried out by both public and private actors. As for public sector, TOKI can be observed as the main actor by constructing 692,999 housing units by the time of December 2015 (TOKI). Also, a wide range of urban regeneration projects have been conducted by public sector covering almost all cities in Turkey. Similarly, private sector has been implementing several large scale industrial, commercial and residential projects.

In addition, the international construction activities have positive contributions on economy by providing foreign currency input and transfer of technology (Uzunkaya, 2013).

From the first appearance of Turkish contractors in Libya in 1972, Turkish construction activities has spread to many other countries and around 318 billion dollar worth of projects were completed by Turkish companies in total (T.C. Ekonomi Bakanlıgı). Furthermore, 42 Turkish construction companies were selected for the top 250 companies in the world by Engineering News Record Magazine in 2014.

Turkish construction industry also offers wide range of employment opportunities. Although the seasonality affects the employment volume for different periods, the employment rate of the construction industry rarely decreases in terms of yearly records. According to the latest data of TURKSTAT, around 2 million employees are recorded within the construction industry which corresponds 7.5% of total employment in September 2015.

In order to have a better understanding about the role of construction industry on economy, it is vital to look into origins of

the sectoral development. "Urbanization and growth go together: no country has ever reached middle-income status without a significant population shift into cities". (Spence, Annez, & Buckley, 2009). In the light of this informative and instructive explanation, the study will express the historical development of Turkish construction industry within the frame of urbanization process in Turkey and then the relationship between construction industry and economy will be studied.

Since the declaration of the Republic in 1923, the Turkish construction industry has witnessed several important periods. This study includes these significant time spans which are categorized in terms of the urbanization experience of Turkey handled by the study of Sengul (2012).

Sengul divides the urbanization period of Turkey into three parts as the period of 1923-1950, 1950-1980 and after 1980. These periods include quite significant milestones for construction industry in Turkey. For instance, after the declaration of the new capital, Ankara has experienced an excessive need of housing because of the high migration from rural areas which give a chance to local construction companies and contractors to take part in construction activities and improve their operations.

With noticing all these essential points mentioned above, this study will analyze the relationship between construction industry and economy by using Toda and Yamamoto Granger non-causality test.

The relationship will be first analyzed for 2000Q1 – 2013Q4 period including GDP, employment, public and private construction proportions in GDP variables in order to find out the importance of public and private construction activities for Turkish economy.

Afterward, this relationship will be analyzed in more detail for the period of 2002Q1 – 2013Q4 using the data of residential, commercial and industrial construction activities for both public and private sector.

CHAPTER 2

THE OVERVIEW OF CONSTRUCTION INDUSTRY

2.1. Introduction

"The construction industry is responsible for the planning, design, construction, maintenance and eventual demolition of the buildings and works which enable economic and social activities to be performed. It is, essentially, a service industry, obtaining its inputs from various sectors of the economy, with which it is interrelated and interlinked in a complex manner." (Ofori, 1980). Ofori has summarized almost all significant aspects of the construction industry as stated above. In addition to these features, the great potential of employment opportunities of the construction industry should not be ignored. For instance, the planning phase includes the macro and micro level construction practices such as national development and project level plans which require large workforce of architectures, planners and engineers.

However, most of the researchers that investigating the importance of the industry in economy based their study on the linkage of the construction industry with other industries and sub-sectors. Giang, Pheng (2011) states this feature of construction industry as "the ability of the construction industry to stimulate economic growth also comes from the strong linkages between construction and other

sectors in the economy". (p.121). This relationship is also confirmed by many other researchers who have studied on both developing and developed countries such as Ozkan, Ozkan and Gunduz (2012), Alhowaish (2015), and Lean (2001), and after some considerable analysis the linkages of the construction sector are categorized as backward and forward linkages. Bolkol (2015) explaines these linkages as "the inputs that are used in construction sector are also related to many other sectors and this is called backward linkage. Moreover, an increase in construction volume may also cause an increase in the volume of aggregate economy what is called forward linkage" (p.42).

In the light of this brief introduction, it can be said that the construction industry has a crucial role in economy both for triggering other sectors and providing vast job opportunities for people. With respect to this information, the following part will summarize the global construction activities by stating the standings of countries and illustrating the investments on construction by different regions. However, because of the differences in economic structures of countries the latter part will be divided into two parts as developing and developed countries. Therefore, the structure of construction industry, its relationship with economy and current & future trends will be overviewed separately for both segments.

2.2. Global Overview of the Construction Industry

The global construction 2020 report published by Oxford Economics explains that the 11% of global GDP is comprised of global construction sector activities. Moreover, it is forecasted that this percentage will be exceeded and reached to 13.2% in the next

decade with the development of Asian and American markets by stating "We expect global construction to grow by 67% from $7.2 trillion today to $12 trillion in 2020. Growth in China, India and the US will generate 54% of the $4.8 trillion increase in global construction output" (Rider Levett Bucknall, 2009, p.8). Whereas this expectation is supported by the industry report of AECOM, they emphasize that the share of developed country markets on global construction investment will be shifted to developing countries. (Figure 1).

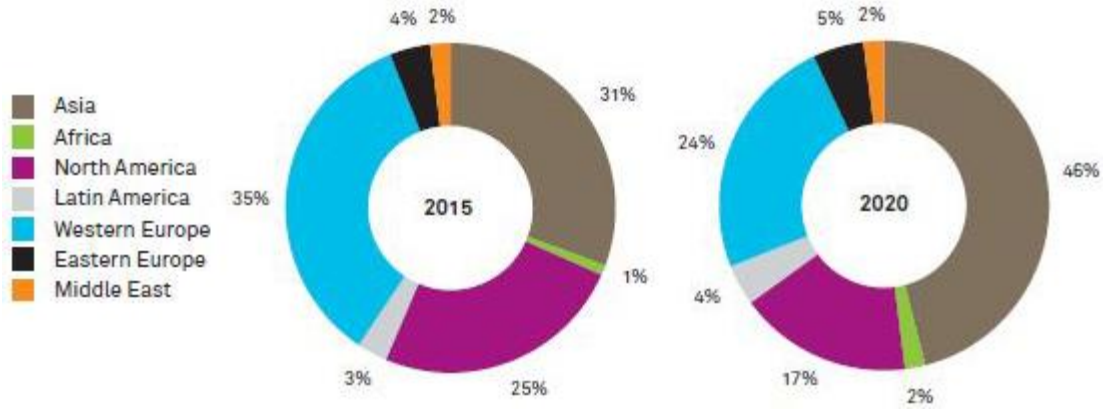

Figure 1: Share of construction spending by region 2015-2020

(Source: IHS Global Insight, 2011)

The reasons behind this increase in the Asian market are stated as the rise in population, rapid urbanization and strong economic growth whereas the developed countries will face limited economic and population growth. Therefore, the largest share of the sector will shift from US to China as it can be observed from Table 1.

Table 1: Top 10 largest construction markets in 2009 and 2020

	$Billion	Share of world market 2009 (%)	Predicted top 10 by 2020
US	1,132	17.4	China
China	1,034	13.7	US
Japan	592	7.9	India
Germany	303	4.0	Japan
Spain	292	3.9	South Korea
France	270	3.6	Germany
Italy	262	3.5	Spain
South Korea	248	3.3	Russia
India	247	3.3	UK
UK	243	3.2	Canada

(Source: Rider Levett Bucknall, 2009)

The rise of the construction market developing countries is projected to be 110% and if this growth rate is achieved, the contribution of developing countries to global construction output will substantially be shifted from 35% to 55%. Apart from that, despite the better growth rate of India, the leading country of this progress is expected to be China with its $2.5 trillion output.

Unlike developing countries, the limited sector improvement is forecasted for most of the developed countries. For instance, the infrastructure projects are expected to increase 20% in developed countries whereas the improvement of developing countries is expected to be 130%. The reasons that cause limited growth are explained as "The after-effects of the financial crisis, high levels of

public debt, lack of demographic dynamism and austerity programmes will severely limit recovery for construction in Western European countries" (Rider Levett Bucknall, 2009, p.11).

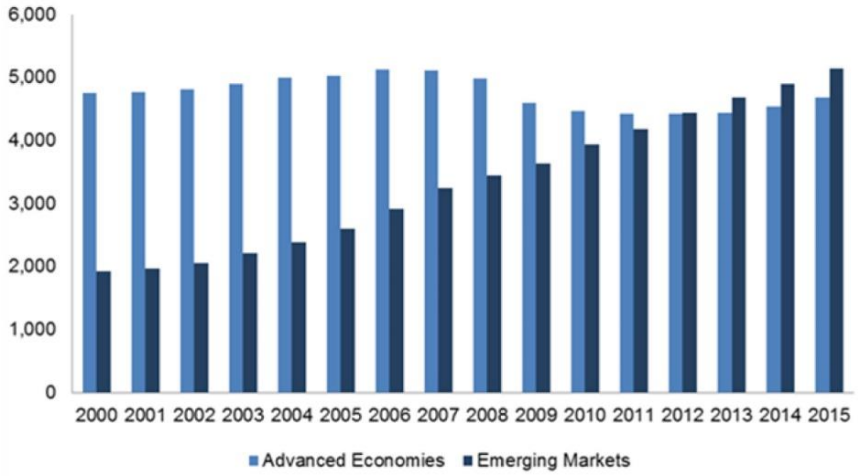

Figure 2: Construction Gross Output (real USD)

(Source: Euler Hermes Economic Research, 2015)

The figure 2 represents the changes of the global construction market in terms of construction gross output of developing and developed countries. It can easily be seen that the global financial crisis in 2008 made advanced economies to follow a decreasing trend unlike the steady increase of emerging markets.

After summarizing the global outlook and highlighting the rise of the developing countries in terms of total construction outputs, the industry will be analyzed in detail for both developing and developed countries respectively.

2.3. Construction Industry in Developing Countries

The World Bank defines developing country as "the one in which the majority lives on far less money - with far fewer basic public services - than the population in highly industrialized countries". It is also stated that most of the developing countries face low-performing economy, problems in education, low-paying jobs and other social issues. Since the construction industry can decrease the unemployment rate and has positive effect on the economy by triggering related sub-sectors, it is mostly seen as the locomotive of the economy (Celik, 2007) especially for the developing countries.

In the light of this information, following parts will explain the general structure of the industry in developing countries by giving specific statistics from the Asian market and referring significant relationship between construction industry and economic development.

2.3.1. General Structure of the Industry

"The construction industry is a vital sector of an economy not only because of the housing and infrastructure it produces to supply shelter and other economic needs but also because of its 'pull' and 'push' multiplier effects on other economic sectors" (Chiang, Tao & Wong, 2015). These characteristics of the construction industry are the main reasons for most of the developing countries to invest heavily on construction, however, the multiplier effect for other sectors in economy is accepted as the most significant one.

With regard to this effect of the construction industry, the explanation of United Nations should be taken into consideration

very seriously. "Building activities that use local materials, local technologies and local small-scale enterprises have much greater potential to generate employment. If local and small-scale manufacturers of building materials are encouraged, they are likely to have larger multiplier effects than large-scale, capital-intensive technologies, because they are generally more likely to use manufactured tools and machinery and are typically marketed and transported by small-scale enterprises" (United Nations, 2013, p.142). It can easily be understood that if the local activities in construction industry is encouraged in developing countries, their economic return will be much better.

The supportive statement for the explanation of United Nations is emphasized by International Labour Organization as: "In countries where wages are low and there is mass unemployment, the replacement of labour by machines does not make sense, from either an economic or a social perspective. In these countries all employment opportunities are welcome and the construction has no difficulty attracting labour. It could potentially create even more employment" (International Labour Organization, 2001). Though this expression clearly puts forward the role of providing vast job opportunities of construction industry, the effects of the industrialization and urbanization leading that potential cannot be overlooked. In this respect the corresponding report pointed out that "In the process of industrialization and urbanization, construction work provides a traditional point of entry into the labour market for migrant workers from the countryside. Construction is often the only significant alternative to farm labour for those who do not have any particular skill, and it has special importance for the landless" (p.11).

There are considerable number of developing countries that experienced the internal migration in this manner. According to data of United Nations, the proportion of rural population in Malaysia decreased from 66.5% to 58% and to 50.2% for the following years of 1970, 1980 and 1990 respectively. During this 10 year periods the number of employment in construction industry rose from 91,000 to 270,200 and to 423,900 which indicating the role of construction industry as a source of employment for new comers to cities.

Matos and Baeninger (2001) also mentioned the process in Brazil as "Brazil experienced expressive changes between 1950 and 1960, based on the increasing urbanization and on expressive rural-urban migratory movements, maintaining high expansion rhythms during the 1960's and 1970's, during the so-called 'economic miracle'". (p.23). International Labour Organization supported this expression by stating the employment increase in construction sector from 781,000 to 4,743,000 between 1960 and 1999 which leads "doubling its share of the workforce from 3.4 per cent to 6.6 per cent" (International Labour Organization, 2001).

Since Asia region is a home for more than half of the world's population with high urbanization rate and population density (Raftery et al, 1998, p.730), the movement of people to countryside needs particular attention which is shown along with the changes of urban population in some Asian countries in Table 2.

Table 2: Urban population in Asia from 1975 to 2014 (% of total)

Country Name	1975	1985	1995	2005	2014
Bangladesh	9.84	17.50	21.69	26.81	33.52

Table 2 (continued)

China	17.40	22.87	30.96	42.52	54.41
India	21.33	24.35	26.61	29.23	32.37
Indonesia	19.32	26.09	36.08	45.94	53.00
Japan	75.72	76.71	78.02	85.98	93.02
Korea, Rep.	48.03	64.88	78.24	81.34	82.36
Malaysia	37.65	45.89	55.69	66.59	74.01
Pakistan	26.34	29.34	31.84	34.73	38.30
Thailand	23.76	28.09	30.28	37.52	49.17

(Source: Worldbank)

The high level of urbanization brought about the need of expenditures on new buildings, housing, better transportation and infrastructure systems including water, electricity, etc. (Spring, 2015, p.2).

Although the improvement of construction industry became a necessity for solving population density, pollution and infrastructure problems because of the needs stated above, there are some barriers against the advancements for the case of developing countries.

Firstly, the inadequacy in capacity in terms of resources and skills is regarded as one of the major problems (The International Council for Research and Innovation in Building and Construction, United Nations Environment Programme & International Environment Technology Centre, 2002). According to report of CIB, UNEP & IETC, this scarce capacity hardly manage the regular construction activities and most of the time outsourcing is needed since small scale construction companies are dominant in developing countries. Therefore, the presence of international companies becomes

unavoidable. This existence and foreign investments enables major projects to be carried out which helps the infrastructure improvement, offers job opportunities to local companies and decreases the expenditures of the construction projects by creating a competitive environment for foreign companies (Ofori, 2000).

Secondly, an unclear economic environment causes public sector investments on construction to change frequently which creates difficulties within the industry since the major part of the market formally comprises of governmental investment. (The International Council for Research and Innovation in Building and Construction, United Nations Environment Programme & International Environmental Technology Centre, 2002, p.35). However, the largest housing production in developing countries are informal and the most common example can be seen as shacks. Agenda 21 explains this informal type of housing as "insecure tenure, poor-quality environments, small units, high density, inadequate physical and social services, and the unavailability of finance and credit" (p.28).

Thirdly, the developing countries are unable to match the high urbanization rate with urban investment which creates more poverty.

Fourthly, the lack of accurate data and the technological inertia are concerned as the other barriers along with the lack of integrated research that construction industry confronts in developing countries (The International Council for Research and Innovation in Building and Construction, United Nations Environment Programme & International Environmental Technology Centre, 2002).

Finally, the lack of leadership in construction projects is marked as a crucial factor according to Ofori and Toor (2012) because of many significant indicators such as low working quality, inadequacy in managing multi-cultural environment and "the clients, end purchasers, users and other stakeholders of construction in these countries are unaware of aspects of construction" (p.7).

In addition to the barriers stated above, corruption in construction industry causes vast capital leakages; as a result, the progression of the projects are affected badly, the poverty is maintained and the risk of collapse for deficient buildings are increased which can cause many casualties (Goldie-Scot, p.212).

Although those challenges compel most of the developing countries to improve their quality and productivity in construction projects, China is leading the way in increasing its share in global construction market. The information retrieved from National Bureau of Statistics of China revealed that the share of construction in GDP shifted from 5.3% in 2002 to 7.0% in 2014. Also, the total output value had an outstanding increase from 91,043.80 million dollar in 1995 to 2,776,874.40 million dollar in 2014. However, this excessive improvement caused housing boom (bubble) in China by high increase in housing prices. According to Chen and Wen (2015), the "ghost" buildings are generated as a result of this increase and the rate of idle housing reached its peak with 22.4% in 2013 (p.1).

Apart from housing bubble, the construction market is affected negatively from the global financial crisis in 2008-2009. However, the first improvement is achieved by the high performance of Asian construction market which left other regional markets far behind. According to AECOM, the investments on construction industry in

2013 were 4% more than in 2012 regarding Asia which corresponds 44% of global investments on construction (p.10). The significant part of this contribution was provided by the infrastructure enhancements. The raise in the infrastructure expenditure of Asia from 2009 to 2013 caused the region to possess more than half of the global investment itself (PWC, 2014, p.3).

2.3.2. Construction Industry and Economy

The role of construction industry in economic development has been studied by many researchers and their findings regarding to developing countries are included in this part.

For developing countries, construction activities are regarded as the key for getting rid of the economic stagnation because of its ability to accelerate several sub-sectors. According to Giang and Pheng (2011), "Since large quantities of building materials and components are purchased from a large number of supply industries, an expansion of the construction industry can stimulate the expansion of these industries through backward linkage" (p.121). As they mentioned, many researchers such as Rameezdeen and Ramachandra (2008), Dlamini (2012), Choy et al (2014) and Lopes, Nunes and Balsa (2011) acknowledged and emphasized the trigger feature of construction industry for other sectors in their studies.

With regard to the relationship between construction industry and economy, some researchers found unidirectional causal linkages while some of them revealed bi-directional relationships. For instance, Khan (2008) illustrated the unidirectional linkage from construction industry to economic development by using Granger causality method with 55 years data of Pakistan, however, the study

of Lopes, Nunes and Balsa (2011) contradicted with Khan's study as it showed exactly opposite unidirectional relationship between these variables by using the same method with 38 years data of Cape Verde.

Apart from unidirectional linkages, Siqi and Honyu (2004), Lean (2001), Hosein and Lewis (2005), Alkowaish (2015) and some other researchers pointed out that bi-directional relationship between construction industry and economic development exists.

Likewise, this relation is explained as "a close association between construction, the manufacturing sector and the commerce sector that supplies the materials and equipment required by the construction sector" (Lean, 2001, p.355). Although this definition is supported by many studies like the one conducted by Kaya, Yalcınkaya and Huseyni (2013) stating the locomotive feature of the construction industry with its more than 200 sub-sectors, Dakhil (2013) observed that except trade sector there is no causality between construction sector and other sectors for the case of Libya (p.103). According to Dakhil (2013), although this outcome is not easy to clarify, because trade sector plays an important role for external investors to enter the Libyan market, this result can be assumed as reasonable (p.104).

To conclude, the positive correlation between economy and construction industry is observable for most cases. In addition, together with the vast employment opportunities and the coordination with numerous other sectors, construction industry has an important part in the economies of developing countries.

2.3.3. Trends in Construction Industry

The development of construction industry in developing countries has some important features which are more visible for specific countries. Since India and China plays a crucial role in global construction market, these features can mostly be seen in the region of Asia.

The reputation of Asia in global economy with its low labour cost, vast natural resources and extensive purchaser image caused the region to be momentous growth power of the world (PWC, 2014, p.6). This power of production and improvement regarding construction industry has some major trends in Asia.

First of all, the incremental economic situation in Asia maintains the growth in urbanization. According to report of Spring, this population shift gets more effective with rising wealth and middle class in order to push construction industry to improve (p.3).

Secondly, the growing share of private sector against public sector regarding infrastructure works created tremendous development in projects such as transportation, water, energy, etc. Raftery, Pasadilla, Chiang, Hui and Tang mentioned this change as "This is a far cry from the situation in the 1970s when private sector involvement was focused on building construction while the public sector considered it its preserve to construct infrastructure projects" (p.732).

To sum up, the high involvement of foreign contractors in Asia supports attracting global investors. Therefore, the significant level

of spending is expected from them in the context of real estate purchase (Spring, 2015, p.3).

2.4. Construction Industry in Developed Countries

The developed countries are defined as the countries with high income economy by World Bank. These countries are more industrialized and their life standards are higher than developing countries.

In this part, the activities of construction industry in developed countries will be overviewed including its importance in economy.

2.4.1. General Structure of the Industry

Although the construction sector in Asia is rapidly growing because of its immense market and increasing urban population, the markets of developed countries including Australia, Canada, Japan, United States and Western Europe correspond quite large part in the total global construction activities. Nevertheless, the market growth in developed countries is not faster than the market of developing countries. (Garcia, 2011, p.22).

Since it includes many actors within, the European construction market will be analyzed in detail after stating some brief information about the markets of Australia and United States.

Following the industries of mining and finance, construction is the third broadest industry with its 8% share of GDP and more than one million employed people that generate 9% of the total labour in Australia (Ai GROUP, 2015, p.1). Also, the relationship between labour and GDP of Australia is indicated as "a one percentage point higher labour productivity growth in the construction industry will

increase real GDP by $1.252 billion" (PWC, 2013, p.9). Therefore, it can be said that the role of construction industry in economy is quite high for the case of Australia.

As for the American construction market, it is affected by the recession in 2008 and the spending on construction industry is dramatically lowered as it can be seen in figure 3. Nonetheless, the recovery is achieved in 2015 and with the leadership of residential construction, the industry is estimated to grow by 3-4% between 2015 and 2020, while the growth rate of GDP is forecasted to be 3% (Garcia, 2011, p.23).

Figure 3: Total construction spending in US (millions of dollars)

(Source: Fred Economic Research)

As it is mentioned before, the construction sector has global influence and importance on employment. For instance, 10% of total workforce in UK is working in the construction sector (HM

Government, 2013, p.26), similarly 9% of total labor in Australia corresponds construction industry (Ai GROUP, 2015, p.1). Moreover, 20% of employment in relevant industries is generated by construction industry (Methodological Centre for Vocational Education and Training, 2008, p.12). However, despite these high shares of the industry, the 2008 crises affected the employment shares negatively (Figure 4). According to International Labour Organization, more than 5 million employed people are laid off in construction sector in 2008 (International Labour Organization, 2009, p.16).

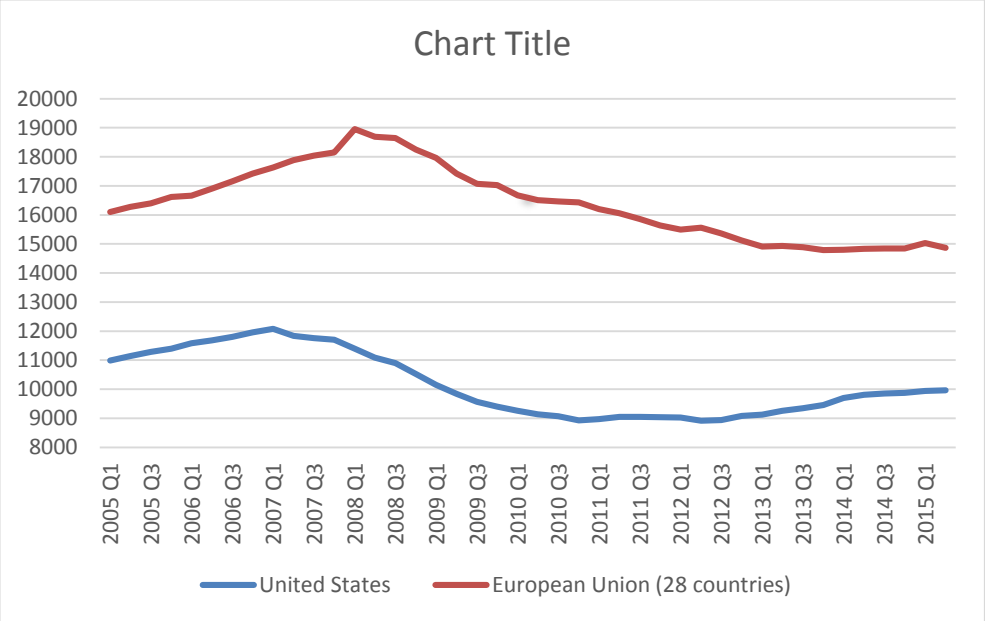

Figure 4: Employment (thousands of people)

(Source: OECD Stat)

Even though the residential projects are recovering the bad image of the industry, the problems about migrant workers can still be observed. Especially Western European countries employs high number of migrant personnel due to their market's deficiency, and this situation causes illegal work power to exist and decreases the salaries which affects the industry to improve (Methodological Centre for Vocational Education and Training, 2008, p.21).

Whereas the strengths of the European construction sector are described as the vast employment opportunities, high involvement of R&D improvements by big firms and possibility to specialize in subsectors for many companies, the weaknesses are comprised of flat trend in productivity, fragile industry appearance, low motivation of environmental preservation, accidents in construction sites and inadequate training for workers in small scale companies (Methodological Centre for Vocational Education and Training, 2008, p.9).

2.4.2. Construction Industry and Economy

As it is stated before, the construction industry can support economy by decreasing the unemployment rate and activating other sub-sectors. However, it can also be affected negatively by the occasions in economy which can be seen for developed countries recently.

The latest financial crises was experienced throughout the world beginning from 2007 to 2009 and caused by "a combination of asset price bubbles, mainly in the real estate sector, and of a credit bubble" (Brauers et al, 2013, p.59). According to Keeley and Love, one of the most important reason for this recession was the cheap mortgages that created a bubble in real estate and caused an

increase in loans for housing by people who were unable to fulfill the payment requirements (p.21)

The effects of the mortgage crises are observed first in United States as decrease in house prices and failure of the mortgages given by American Banks, then experienced in Europe by money transfer from European Banks to American Banks (Brauers et al, 2013).

The investments on the construction projects are decreased intensely. Therefore, the economic activities are slowed down and the unemployment rates started to increase. According to Pissarides, the highest unemployment is witnessed in Spain (p.17). The data of OECD specifies the fall in employment as 25% during the crises for Spain (2010, p.52).

As for European market, the strengths were unable to prevent the euro crisis to affect the industry. When the construction industry were going to hit the bottom in 2009 the predictions were stating that the positive movement may happen after 2011 (Hanlon, 2009, p.1), but between 2009 and 2012, the spending on construction are decreased by 9.9%, 3.2%, 0.2% and 2.8%, and recovery expectations are delayed after 2014 (Deloitte, 2013, p.9).

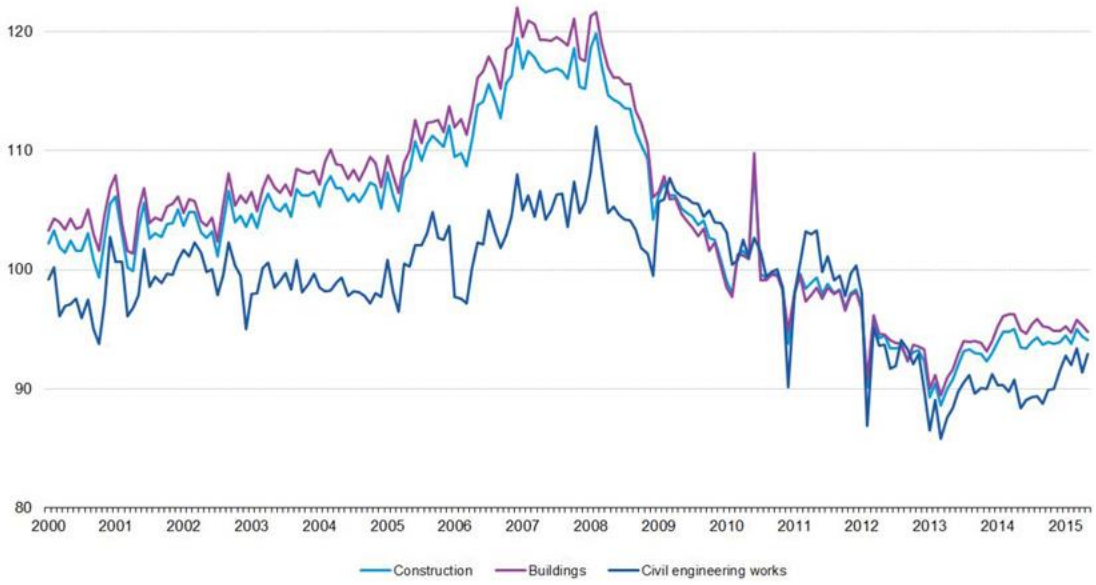

Figure 5: Production index of total construction, building and civil engineering in Europe

(Source: Eurostat)

After these declines during the crisis, the industry finally was able to begin growing again in 2014 (Figure 5) and the activities are expected to be around 1,400 billion euro by 2017, although this value is still not better from the situation before the crisis (CECE, 2015, p.4).

According to CECE report, the highest rate of recovery belongs to UK with 3.9% residential growth with the help of 10% increase in private sector. On the other hand, Italy seems to be affected very badly and the expected numbers of 2017 is still below than 2007 by 27%. (p.4).

2.4.3. Trends in Construction Industry

The important topics regard to developments in construction industry can be gathered under the title of efficiency and innovation especially for developed countries.

With the continuous development in technology, the systems used in construction projects are updated frequently. To illustrate, the usage of the geo-fencing mobile apps are increasing year by year which helps managers to manage the payments without spending much time to figure out several payments to workers, contractors or other actors. Similarly the 3D printing technology is expected to be used widely.

In addition to technological advancements, green building concept is favored because of its cost-effectiveness and eco-consciousness. Companies are also decreasing the paper used in their processes by shifting all of the contents of projects, contracts, etc. to digital versions.

CHAPTER 3

CONSTRUCTION INDUSTRY IN TURKEY

3.1. Introduction

In this part the historical development of Turkish construction industry is analyzed with regard to three separate time periods. These time ranges are selected according to the urbanization experience of Turkey and the following results in construction industry and economy explained in the article of Sengul (2012).

In the first period the first attempts after the declaration of the republic, the housing problems in the new capital Ankara and the significant construction activities will be explained between the years of 1923 and 1950.

Second period deals with the critical events after World War 2, the formation of slums at the edge of the cities and following construction improvements are expressed for the period of 1950-1980.

The final period covers the era after 1980 and deals with the new identity of public sector in construction activities, the effects of global financial crisis and advancements in Turkish construction industry.

After this part, international construction activities of Turkish contractors/companies and the industry's relationship with the economy are analyzed according to important economic indicators.

Finally, the structural analysis of the industry is stated referring to the Five Forces framework of Michael Porter.

3.2. The History of the Industry

3.2.1. The Development Period of 1923-1950

After the declaration of the Republic in 1923, Turkish construction industry has started to experience significant improvements. This part covers those improvements with the term of nation-state urbanization between 1923 and 1950 as Sengul (2012) classified.

Before explaining the developments in Turkish construction industry and the urbanization process, the understanding of spatial development in the period of Ottoman Empire will be summarized shortly in order to give better perspective to latter advancements practiced by Turkish Republic.

According to Sengul (2012), the Ottoman Empire had central-environment model in terms of governmental and spatial organization. However, because of unstable borders of the country, it was getting hard to control the land especially for remote distance from the center which shows that there were not strong local administrative organizations because of centralism.

In his study other significant factors are pointed out as the unequal city developments leading Istanbul to be dominant and organic spatial structure of the Ottoman cities causing problems because of inadequate transportation systems to distant parts of the cities.

Apart from those characteristics, the Ottoman Empire left millions of external debt, 4,000 kilometers of railroads, 18,335 kilometers of roads and 94 bridges to Turkish Republic (Batmaz et al., 2006).

The initial attempts to overcome these difficulties were the railroad projects which allowed us to observe the first contractors of Turkey later on (Unsal, 2006). According to Unsal (2006), the first railroad project implemented by Turkish contractor started in 1914 covering the line of Ankara-Yahşiyan and the line was ready to be used in 1925.

In time, Turkish companies and contractors gained experience and knowledge by working with foreign colleagues. However, it can be said that until 1935 the projects were operated mostly by foreign companies or contractors. Nevertheless, Turkish contractors were quite successful in the whole construction operations and they were able to construct 1,697 kilometers of roads in 1930 (Unsal, 2006). As a result of this, Turkish contractors and companies operated all railroad projects after 1935.

However, there were only 3 institutions that can fulfill the need of engineers and technical personnel in the industry. Therefore, this need was tried to be provided by hiring foreign personnel (Unsal, 2006). This mobility also helped the education to be better, especially when German academicians are hired by educational institutions after World War 2 (Batmaz et al., 2006).

Another important attempt was the position of Ankara against Istanbul after the declaration of the Republic. In 13 October 1923, Ankara is declared to be the capital city of Turkey. According to Şengül (2012), this change was one of the strategy to create a nation-state model for Turkey together with the investments on Anatolian part in terms of infrastructure and economy. As a result of this, the obvious differences between İstanbul and the Anatolian part of the country were tried to be reduced.

After the declaration of the new capital, Ankara has witnessed residential problems because of the high rate of population increase. In order to solve this problem, the land below the railroad had been zoned for housing constructions in the city and 1-2 storey houses with large gardens have been built, however, those houses were criticized because of its inconvenient structure to support neighborhood relationships (Yavuz, 2000). After that, the features of the residential areas are shifted to multi-storey buildings, but Yavuz (2000) states that those multi-storey buildings were unsuccessful because they did not have any common area where people can socialize and because of that they caused alienation among people and created unhealthy, boring and unhappy residential areas (p.239). Those high multi-storey buildings were the base point of today's apartment blocks.

Apart from multi-storey buildings, cooperative type of residential developments can also be observed in this era. One of the first attempts was the "Bahcelievler kooperatifi" which provided housing to many government officials and other people who needs accommodation. Moreover, it created the basis of today's Bahcelievler district by constructing more than 150 residential building in a short time (Keles, 2000).

When Ankara is selected as a capital city, the international urban planning competition was launched to determine the urban plan of city and the project of the German planner Hermann Jansen was selected as the leading project. According to Nalbantoglu (2000), the project was carried out successfully for the period of 1928-1938. However, the following periods had problems trying to meet the housing need because of high rate of population increase. Apart from population problem, high prices and struggles in providing materials

for constructions were some major difficulties together with low support from government. In addition to that, during the implementation process of the project, the specified house types (at most 3 storey buildings) in the plan are ignored and much higher houses were constructed even if Jansen was opposed to those type of buildings (Nalbantoglu, 2000).

Although the aims couldn't be met after some time in terms of city planning, Ankara was regarded as a big opportunity for local construction companies. After the declaration of the Republic, the number of construction companies was 7 in Ankara, while there were 28 companies based in Istanbul (Batmaz et al., 2006).

According to Batmaz, Emiroglu and Unsal (2006), the first construction company established in Ankara was recorded as "Türk İnşaat Evi". The company played an important role during the high development stage in Ankara by building houses for management staff, but the lifespan of the company was quite short (p.64). However, this stage in Ankara brought about new companies and entrepreneurs who invested in construction sector such as Vehbi Koc. Although he took part in significant construction projects for 15 years, he abandoned construction industry because of its high risk of bankruptcy (Batmaz et al., 2006).

Even though there were high risks in the industry, the big projects were still carried out. One of the most important project was the railroad project that supported the agricultural production by increasing the wheat amount that is transported. According to Batmaz, Emiroglu and Unsal (2006), 149.000 tons of wheats were transported by railways in 1929-1930 while only 48.000 tons of wheats were carried by railways in 1924. (p.81). Apart from its

contribution in agriculture and capital accumulation, the railroad projects inspired local contractors and entrepreneurs to involve in construction activities as stated before.

The other significant project was "Büyük Su Projesi". In order to fight against malaria and create new lands for agricultural activities by drying out swamplands, this project had great priority. Moreover, it was regarded as the starting point of dam constructions for Turkish construction industry (Unsal, 2006). As a result of the efforts of this project, the dam of Cubuk was started to be constructed in 1930 which is known as the first dam that the Republic ever built (Batmaz et al., 2006).

In 1944, one of the international significant step took place in United States by having "Bretton Woods" congress with 44 allied countries around the world before the end of World War 2. In this congress, the currencies of those countries were determined to be valued in terms of dollars according to new international monetary system. Also, the establishment of International Monetary Fund (IMF) and World Bank were the following implementations after this agreement.

Following these events, International Bank for Reconstruction and Development was established in 1945. In order to benefit from this program, the Turkish government prepared a project including 10,000 kilometers of roads, 1,600 kilometers of railroads, and the projects of the ports of İstanbul, Samsun, Trabzon and Eregli. (Unsal, 2006). According to Unsal, the 49% of the estimated investment cost of the projects for the period covering 1948-1952 were planned to spend in foreign currency. Therefore, the government applied to the Organization for European Economic Co-

operation (OEEC) to request those amounts, but the request was not accepted by the government of United States. However, this process provided a way to adopt a concept of using foreign currency in later construction projects.

Apart from those projects, Sengül (2012) mentioned that one of the most important step which helped the new modern cities to be built was the establishment of the municipalities. They were based on the law introduced in 1930 which stated that all settlements with a population over 2,000 need to have municipalities. The duties of municipalities were supporting the local development activities and implementing the policies for their territories.

Whereas there were great efforts to create new modern cities with big projects, this period witnessed many failures and disabilities to reach the targets. For example, while the shift of the capital city from İstanbul to Ankara provided some balance in terms of the capital investments to Anatolian part of the country and İstanbul, the targets for the new capital city couldn't be reached because of the financial problems, high rate of population increase in Ankara during the implementation of the new city plan designed by Jansen, and high risk of bankruptcy in construction industry for Turkish contractors. In addition to that, financial deficiencies prevented municipalities to complete their projects together with insufficient employees. Also, another problem of this era was the belief of urban and residential difficulties were just belonged to Ankara (Keles, 2000).

3.2.2 The Development Period between 1950 and 1980

Since the modernist vision of the nation-state policy couldn't address the traditional part of the Turkey that representing the majority, the attempts got negative response from them and along with the end of World War 2 the failure of this derangement became obvious because the poor part of the population living in rural areas moved to cities by combining with the traditional majority and created slums around the city together with the contrast type of living conditions of middle class which ended the period of nation state urbanization and created new period that can be called as urbanization of labor power (Sengul, 2012).

As Sengül explained, the characteristic of this period was the movement of the crowd of people from rural areas to cities and the results of this shift. However, in order to have better understanding about this period, the important events leading that flow will be summarized and then the activities in construction industry according to this progress will be defined.

When the World War 2 ended, the European economies were having hard times because of the destruction of the War. Following the events of Bretton Woods agreement and the establishments of IMF & World Bank, the Marshall plan which was an economic aid to European countries to rebuild their economies was implemented by United States covering 1948-1951 period. During this period, Turkey also received 137 million dollars of economic help and adopted modernization policy with export base agricultural development, however, the high rate of population increase in rural areas was observed as the crucial result of this strategy (Sengul, 2012). Although construction industry of Turkey benefited from Marshall Plan and other economic aids between 1950-1970 by establishing new companies and finding a chance to improve existing ones

(Ozorhon, 2012)., this situation created vast unemployed rural citizens and forced them to migrate to cities.

Following this situation, people who migrate to cities created slums at the edge of urban areas and brought their lifestyles contradicting with middle class in cities. Those slums were constructed quite in a short time without infrastructure and any order. As a result of this, the government and middle class people had some struggles until some laws were introduced in order to handle this problem. As Sengul mentioned 3 periods can be observed during the change of the concept of slums viewed by government.

At the first stage covering 1950-1960, people live in slums were in cooperation only with their relatives and neighbors, and their relations with existing urban areas was tense.

In 1960-1970, the attempts of government to unite the slums and urban areas can be observed. Those attempts were including providing infrastructure for slums, employment opportunities for immigrants and the official right of ownership for their slums. However, those efforts were objected after 1970s.

From the first appearance of the slums, many of them were destroyed, but those destructions were followed by many other new slums with high population increase (Table 3).

Table 3: Slums and Urban population statistics 1955-1990

Years	Number of Slums	Population of Slums	Percentage in Urban Population (%)
1955	50,000	250,000	4.7

Table 3 (continued)

1960	240,000	1,200,000	16.4
1965	430,000	2,150,000	22.9
1970	600,000	3,000,000	23.6
1980	1,150,000	5,750,000	26.1
1990	1,750,000	8,750,000	33.9

(Source: Keles, 2000)

According to current law, there are 3 types of actions related with slums as rehabilitation, removal and avoidance. As Keles explained, government, local authority and the owner of the slum together rehabilitate the slum if it is recoverable. However, in the case of not recoverability, they are destroyed in terms of removal. As for the case of avoidance, government can either finds ways to prevent the constructions of slums in long term or it can help immigrants by constructing cluster housing in short term together with an option of demolishing them (p.398).

For the case of Turkish construction industry, it can be said that economic aids of Marshall Plan supported the industry in technical point of view by giving the opportunity of working with acquired construction machines (Unsal, 2006). Like Marshall Plan, some important institutions have also contributed Turkish construction industry to develop such as NATO, General Directorate of Highways and the State Water Supply Administration. As Unsal mentioned, after 2 years from joining to NATO, the law related to construction works in Turkey was introduced and as a result of this Turkish construction industry got several benefits. For example, the construction companies were able to use new machines with low

costs, and lots of airports, gas stations, ports and official buildings were constructed owing to that law.

The developments mentioned above were followed by the increase in the budget for highway constructions from 6,448,128 Turkish liras in 1949 to 506,679,106 Turkish liras in 1975 (Unsal, 2006). Similar to highways, the budget for ports was stated as 160,650,000 Turkish liras in 1960 when the budget for railroads recorded as 90,865,000 Turkish liras (Unsal, 2006).

During that time the private construction sector was also gaining speed thanks to the need of housing because of the high population increase in cities, and after the enacting of property law, the cooperative type of housing were encouraged and just in Ankara 200 cooperatives were constructed between 1950 and 1960 (Batmaz et al., 2006). However, especially between 1945 and 1960, the housing sector was not perceived as service sector since there were no inspections in construction activities which was necessary to fulfill the need of housing (INTES, 2003). On the contrary, it was perceived as the source of profit (Keles, 2000), therefore the poor quality buildings and disordered housing areas have started to grow.

After 1960s, profit based constructions and slum areas were increased, therefore the disordered housing areas maintained and expanded (INTES, 2003). In addition to this, during that time the economy has witnessed high inflation, reduction in natural resources, increase in import, decrease in export and accumulation of debt to foreign countries. As a result of this, Turkish construction industry had serious crisis (Ozorhon, 2012). However, despite these difficulties, the first international construction project took place in

Libya in 1972 and Turkish companies started to be involved in international market.

3.2.3. The Development Period After 1980

This era represents the developments in construction industry during the new neo-liberal extrovert developmental economic strategy of Turkey that stating a decrease in labour cost and domestic demand while increasing export activities (Balaban, 2011). Throughout this period some significant improvements, high increase rates, some fluctuations and attempts to solve new and existing problems from previous periods can be observed.

To begin with, after the military coup in 1980, the military government took some precautions and changed some policies which resulted in positive outcomes for construction industry and brought about an increase in construction industry activities (Ozorhon, 2012). Similarly, the support from the government in developments in terms of construction industry during that period was acknowledged by several researchers. As Balaban mentioned, one of the most important factor causing a rapid growth in construction industry was the public infrastructure investments made by government. These investments provide a better understanding about the change in governmental strategies because while those resources were used in industrialization with respect to import substitution until 1980s, after 1980s they were started to be invested in environmental construction (Balaban, 2011). Apart from these investments in infrastructure, some legal changes about the residential regulations and the establishments of governmental institutions, such as TOKI, played a significant role in this rapid growth period.

The critical change in terms of the residential regulations can be seen with regard to slums in 1984 when the new construction laws were accepted. After the implementation of the new laws, new multi-storey buildings were constructed instead of slums. As a result of this, the construction activities increased rapidly and as it can be observed from graph 6, the number of construction permits followed the increasing trend from 189,486 to 497,674 for the years of 1984 and 1987. Besides, similar construction activities also took place in already constructed areas in cities and the shares of cooperatives in all type of constructions were increased owing to financial credits provided by TOKI (INTES, 2003).

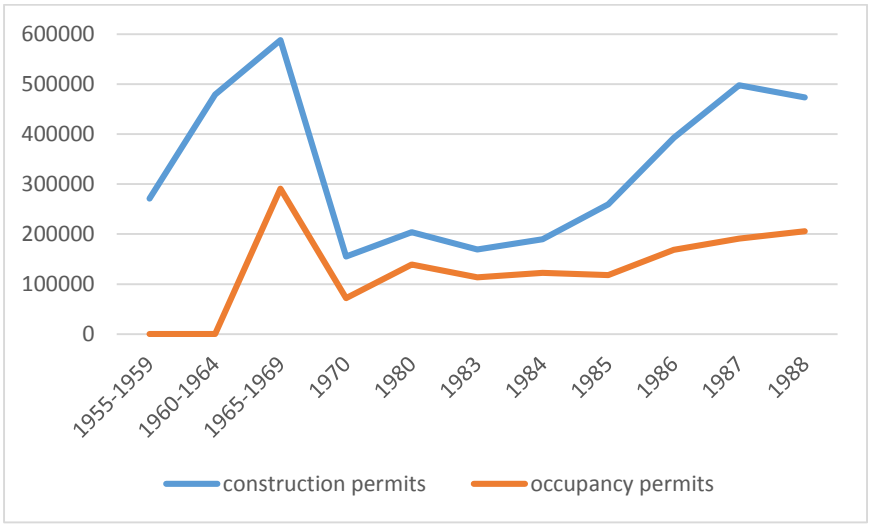

Figure 6: Construction and Occupancy permits

(Source: Turkstat)

TOKI has played an important role during the growth of the sector between 1982 and 1988. The activities of TOKI were mainly divided into two areas as giving affordable financial credits to residential

cooperatives and building contractors, and providing housing units for low income families. Also, the operations of TOKI as being a public unit became more substantial after the terrifying Marmara earthquake in 1999 and until the new growth period of construction industry in 2002, TOKI constructed 43,145 houses while giving credit to 950,000 housing units approximately (TOKI, 2015).

Before the growth period of 1982-1988, the construction permits showed some fluctuations by increasing rapidly and then decreasing until 1983 (Figure 6). However, from the beginning of 1983, they started to show and increasing trend until 1988. This trend was followed by the number of occupancy permits which nearly doubled from 113,453 to 205,485 between 1983 and 1988.

Similarly, the contribution of construction industry to total GDP increased from 3,365,000 TL to 5,452,000 TL between the years of 1983 and 1987 (Figure 7).

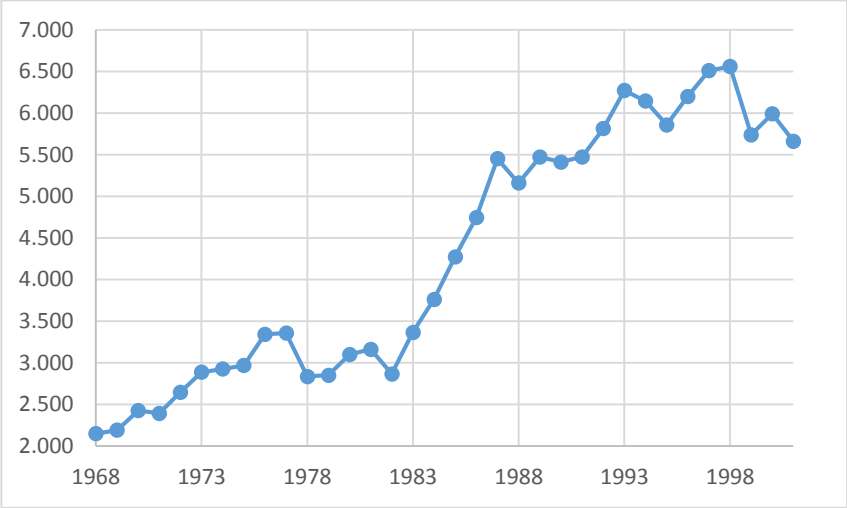

Figure 7: Contribution of Construction Industry to GDP (1000 TL)

(Source: Turkstat)

Moreover, this increase corresponds to the growth in the share of construction industry in GDP. While the share of the industry in GDP was 5.86% in 1983, this amount managed to reach 7.29% after 4 years (Table 4).

Table 4: Increase of the construction industry proportion in GDP (According to fixed prices of 1987)

1983		**1987**	
Construction Industry	GDP	Construction Industry	GDP
3,365 (thousands TL)	57,333 (thousands TL)	5,452 (thousands TL)	74,722 (thousands TL)
5.86%		**7.29%**	

(Source: Turkstat)

It can also be seen that starting from 1983, the growth rate of the construction sector remained positive and quite high until 1988 compared to previous and latter periods (Table 5).

Table 5: Construction sector growth rate between 1976 and 1991

Years	**The Growth Rate**
1976	12.7
1977	0.4
1978	-15.5
1979	0.6
1980	8.7
1981	2.1
1982	-9.3
1983	**17.4**

Table 5 (continued)

1984	**11.8**
1985	**13.6**
1986	**11.0**
1987	**14.9**
1988	-5.4
1989	6.1
1990	-1.1
1991	1.1

(Source: Turkstat)

In 1990s, the activities of construction industry were negatively affected because of the political imbalance dominating Middle East and this situation caused the industry to search new international markets (Ozorhon, 2012) which will be analyzed in detail in the heading of Turkish construction industry in international market.

The second important growth period of the construction industry after 1988 started in 2002. Following the recovery from the economic crisis in 2001, construction industry began to operate effectively until the next global economic crisis in 2008.

As it can be derived from the figure 8, the number of construction permits have started to decrease from 497,674 after 1987 until 2002 when it was showing quite low amount of 161,920. However, with the growth of the industry, this value has reached 600,387 in 4 years. Likewise, the number of occupancy permits have started to show an increasing trend after 2004.

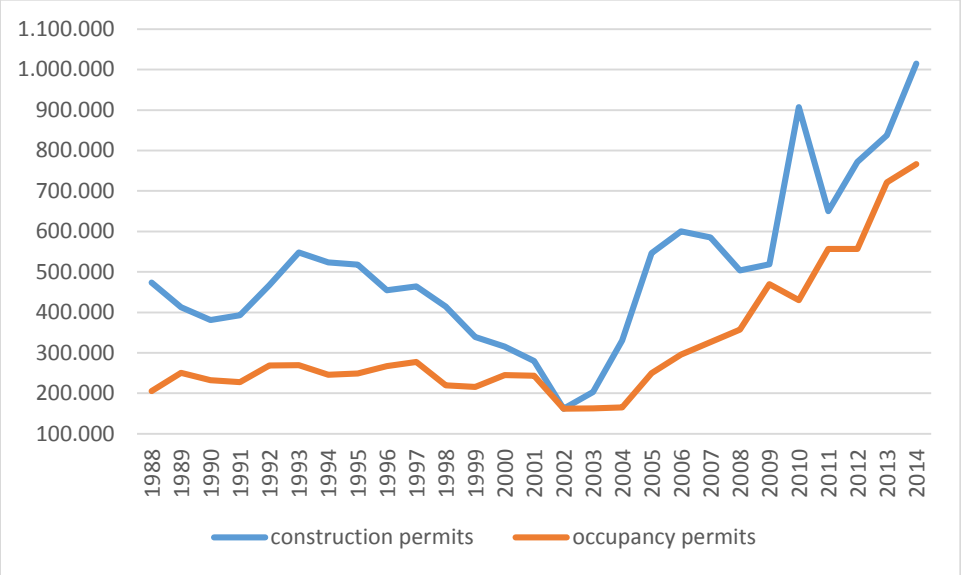

Figure 8: Construction and Occupancy Permits

(Source: Turkstat)

Also, this period has witnessed some significant contributions of construction industry in GDP with an increasing trend until it reached its peak point of 6,573,647 TL in 2007 (Figure 9).

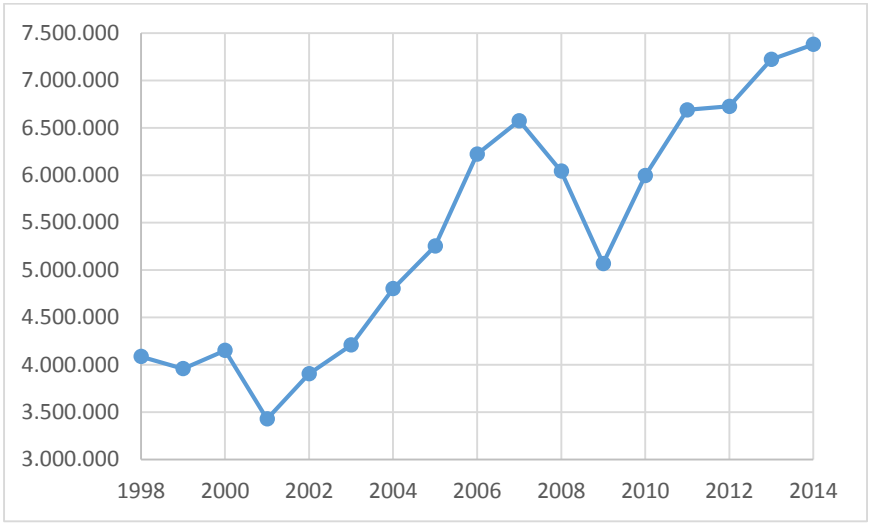

Figure 9: Contribution of Construction Industry to GDP (1000 TL)

(Source: Turkstat)

In order to understand the impact of this increase, the difference in the shares of construction industry in overall GDP is indicated in table 6.

Table 6: Increase of the construction industry proportion in GDP (According to fixed prices of 1998)

2001		**2007**	
Construction Industry	GDP	Construction Industry	GDP
3,426,908 (thousands TL)	68,309,352 (thousands TL)	6,573,647 (thousans TL)	101,254,625 (thousands TL)
5.01%		**6.49%**	

(Source: Turkstat)

During this period, the contribution of the government in construction activities cannot be ignored like the previous growth stage. In other words, one of the fundamental reason of the growth in construction industry between 2002 and 2008 was the support of government (Balaban, 2011).

After some new legal regulations at that time, TOKI has started to become the major actor for government side with its widened authority and vast resources (Balaban, 2011). According to housing construction report of TOKI, the number of housing provided by TOKI has reached to 692,999 up to December 2015 and 41% of these residential units were provided for middle income families. Also, the projects of transformation of slums constitute 15% of the total housing production. During the whole operations of TOKI, the construction industry has been accelerated with several other sub-sectors because of the large scale construction projects.

In a conclusion, several employment opportunities were provided by the industry as a support for the economy and the estimated number of total employment stated as 900,000 in housing construction report of TOKI.

The construction industry has maintained its positive growth rate until the global financial crisis has showed itself and affected the Turkish construction industry as well as the other global industries (Table 7).

Table 7: Construction sector growth rate between 1999 and 2014

Years	The Growth Rate
1999	-3.1
2000	4.9
2001	-17.4
2002	**13.9**
2003	**7.8**
2004	**14.1**
2005	**9.3**
2006	**18.5**
2007	**5.7**
2008	-8.1
2009	-16.1
2010	18.3
2011	11.5
2012	0.6
2013	7.4
2014	2.2

(Source: Turkstat)

In order to understand the impacts of global financial crisis, figure 10 shows the inflation and unemployment rates in Turkey after the global financial crisis. As it can be deducted from the graph, unemployment rate has increased rapidly and peaked at 16.1% in February 2009. In other words, the increase in unemployment rate can be calculated as 75% in 9 months between May 2008 and February 2009. With respect to this change, the growth of the construction industry started to follow negative trend and it decreased until -16.1% in 2009 (Table 7).

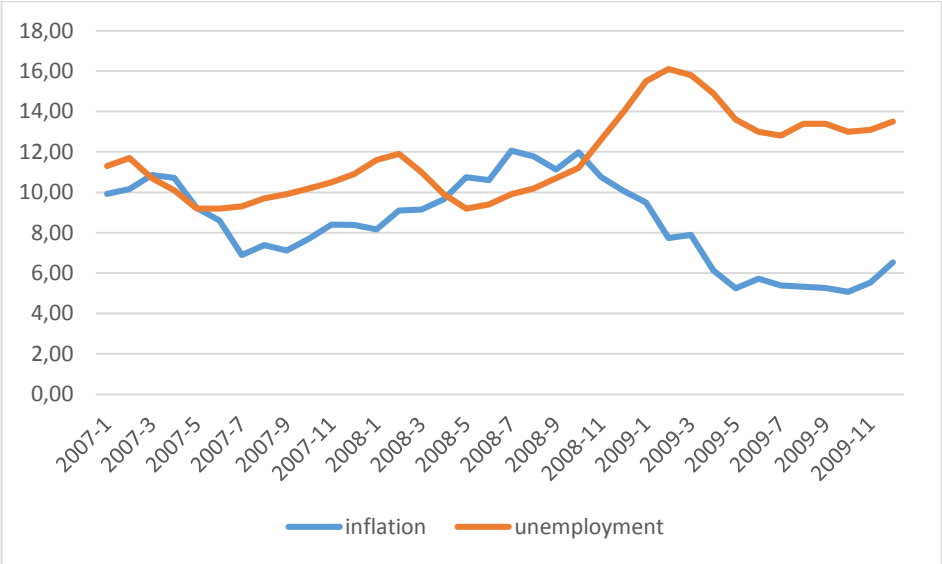

Figure 10: Inflation and Unemployment rates

(Source: Turkstat and the Central bank of Turkey)

However, the negative effects of the global financial crisis has started to disappear after 2009Q3, and until 2010Q3 it has reached 23.7% growth rate from -18.2% (Figure 11). According to Gunay and

Kesimli (2011), the reasons behind this improvement were the decrease in inflation after the recession following the crisis and the fall in interest rates of residential loans as a result of interest rates reduction issued by central bank (p.91).

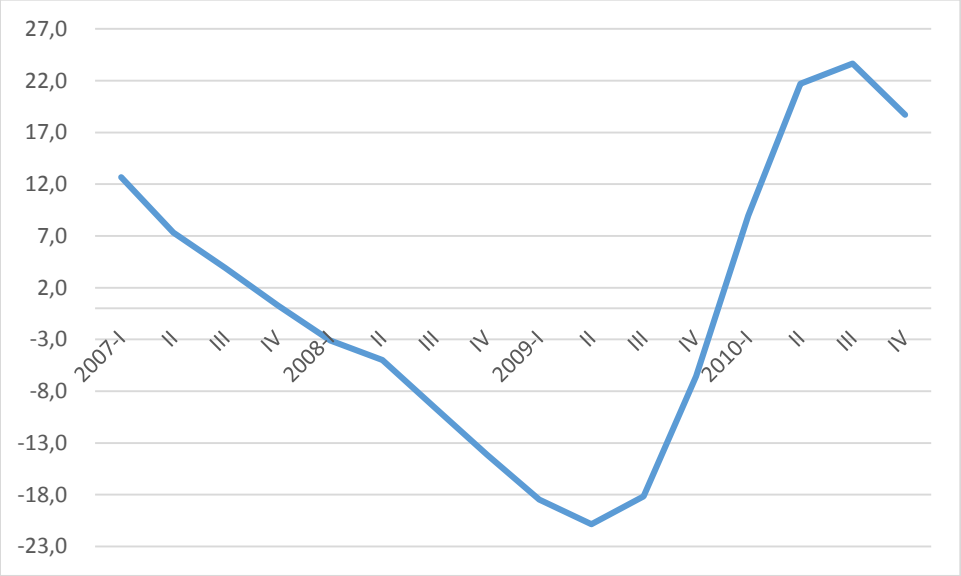

Figure 11: Construction industry growth rate

(Source: the Ministry of Development of Turkey)

One of the other important point in construction industry after 1980 is the concept of urban regeneration. With several regulations, the demolition of hazardous and old buildings were legalized and this demolition was followed by constructing the new, durable buildings. Although urban regeneration is important for preventing the possible vital destructions caused by a probable earthquake, these activities were observed to be contradicted with its aim and the projects were carried out in terms of financial gains according to some researchers.

Sengül (2012) and Balaban (2011) mentioned that after the projects were completed in terms of urban regeneration, the previous owners of the housing units cannot afford the new accommodation conditions and the upper class start to dwell in that places such as in Dikmen Valley project in Ankara.

Apart from urban regeneration, the latest developments in construction projects were mostly focusing on Istanbul which creates the imbalance in terms of the investment spending's in Turkey. Those projects mainly include shopping malls, business quarters and housing estates for high income families. Figure 12 shows the size of the European shopping center market in terms of square meters and the second place of Turkey after the latest large quantity of investments in shopping mall constructions.

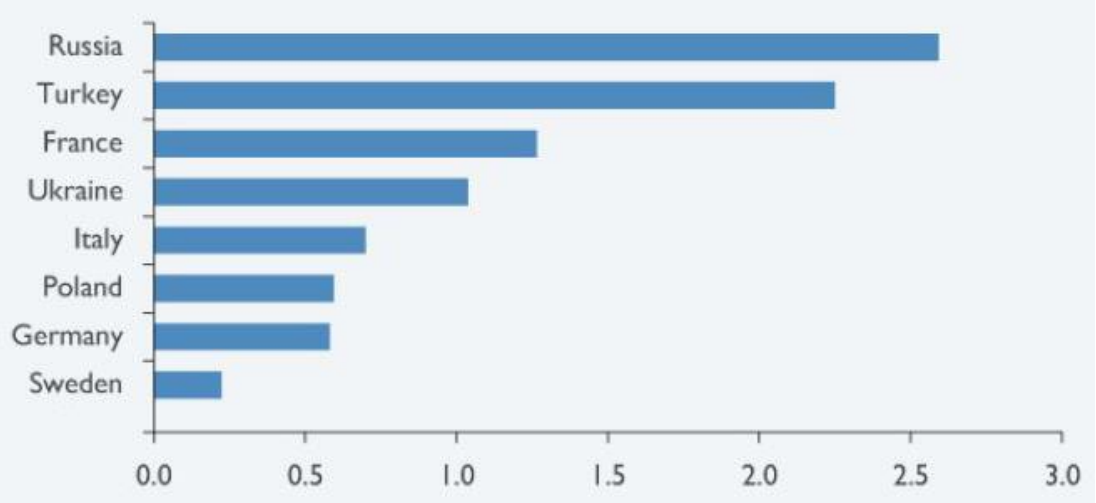

Figure 12: Size of European shopping centers (square meters)

(Source: Cushman & Wakefield Retail research)

3.3. Turkish Construction Industry in International Market

In 1970s, Turkish construction industry has been searching for the ways of involving in international projects by exporting its labor power and experience. The starting point for the industry was Libya in 1972 and 72% of the total international construction activities took place in that country until 1980. However, in course of time the share of Libya has slowly decreased with respect to some new market openings and some political conditions. After the civil war in 2011, its share hit the bottom of 3.8% for the period of 2010-2014, but in total it still has 9.2% shares of international construction activities (Table 8).

Table 8: The Distribution of Countries that Turkish construction industry operates (1972-2015*till the end of August)

Countries	**Total Project Worth ($)**	**Shares (%)**
Russia	61,734,482,583	19.4
Turkmenistan	47,764,386,993	15.0
Libya	29,166,540,000	9.2
Iraq	23,150,955,153	7.3
Kazakhstan	20,707,220,727	6.5
Saudi Arabia	16,821,039,067	5.3
Algeria	12,212,883,095	3.8
Qatar	11,547,329,605	3.6
Azerbaijan	11,016,353,070	3.5
The UAE	8,994,218,940	2.8
Other Countries	75,315,749,326	23.7
Total	318,431,158,560	

(Source: The Ministry of Economy in Turkey)

The table 8 also shows that throughout the whole international construction experience of 43 years, Russia has the biggest part with almost 62 billion dollars' worth of projects. After the dissolution of the Soviet Union in 1991, Turkish contractors has started to increase their presence in Russia in terms of construction projects and between 1990 and 1999, the share of Russia in construction activities has reached 34.5% and got the first place from Libya.

Although the part of Russia seems to be almost 20% of total international construction works of Turkish contractors, since 2010 the presence in Turkmenistan started to increase and the period of 2010-2014 witnessed that the first place taken by Turkmenistan from Russia with 24.2% share of total international construction activities, however the first 8 months of 2015 revealed that the projects in Kuwait will take the biggest part (Table 9).

Table 9: The Distribution of Countries that Turkish construction industry operates for the year of 2015* (Until the end of August)

Countries	**Total Project Worth ($)**	**Shares (%)**
Kuwait	4,340,000,000	29.2
Turkmenistan	2,915,172,409	19.6
Russia	2,284,638,224	15.4
Algeria	2,081,368,742	14.0
Saudi Arabia	1,016,246,828	6.8
Others	2,213,516,980	14.9
Total	14,850,943,183	

(Source: The Ministry of Economy in Turkey)

In total, Turkish contractors undertook 318.4 billion dollars' worth of 8,620 projects in 104 countries since 1972. In addition, Turkish contractors have accomplished to be involved in the global top 225 contractors list of Engineering News Record Magazine with 8 companies in 2003. Moreover, when the list has been altered as top 250 global contractors, the number of the construction companies have reached to 42 in 2014 and it continues to grow in 2015 (The Ministry of Economy).

3.4. The Economic Indicators of Construction Industry

It is thought that construction sector has considerable contribution to the overall economy since it creates employment opportunities and activates several other subsectors during its operations. In this part, this relationship will be analyzed in terms of many variables such as employment, public & private sector expenditures and GDP.

As it can be inferred from the figure 13, the entire flow of GDP and construction growth rate has followed the similar path. For example, when GDP has decreased to -5.7% in 2001 because of the economic crisis, construction industry has also affected from this recession and showed the same reaction as GDP with -17.4% growth rate. Starting from 2002, the construction industry has entered the growth period which is analyzed in detail above and reached the peak point of 18.5 while the GDP was also increasing until 2004.

Figure 13: Construction and GDP growth rates

(Source: Turkstat)

After 2007, the global financial crisis has affected both the Turkish economy and construction activities negatively and both variables showed a crucial decrease until 2009. And then, they both have fluctuated accordantly.

The construction industry also has an important share in the overall GDP. Even though this share has underwent some decreases due to economic crisis, the industry was able to recover itself and together with the sub-sectors which construction industry triggers, the total share of the construction activities is accepted to be almost 30% of total GDP.

Table 10: Construction Industry and GDP (According to current prices)

Years	**Construction Industry (thousands TL)**	**GDP (thousands TL)**	**The share of Construction in GDP (%)**
1998	4,085,861	70,203,147	5.8
1999	5,687,701	104,595,916	5.4
2000	8,405,526	166,658,021	5.0
2001	10,702,029	240,224,083	4.5
2002	14,707,329	350,476,089	4.2
2003	18,405,464	454,780,659	4.0
2004	24,661,000	559,033,026	4.4
2005	28,694,134	648,931,712	4.4
2006	35,849,263	758,390,785	4.7
2007	41,013,267	843,178,421	4.9
2008	44,657,644	950,534,251	4.7
2009	36,577,637	952,558,579	3.8
2010	45,669,500	1,098,799,348	4.2
2011	57,751,314	1,297,713,210	4.5
2012	62,156,828	1,416,798,490	4.4
2013	69,557,490	1,567,289,238	4.4
2014	79,743,528	1,749,782,267	4.6

(Source: Turkstat)

For instance, the decline of the shares can be observed after the global financial crisis and the bottom line can be seen as 3.8%, however with the 18.3% growth rate in 2010, the share in GDP started to increase again (Table 10).

Similarly, the amounts of both public and private sector expenditures on construction industry have increased when the economy got through the negative effects of global financial crisis (Figure 14).

Another significant point can be deducted from the graph is the considerable change of public expenditures which also corresponds the period of the important role of TOKİ.

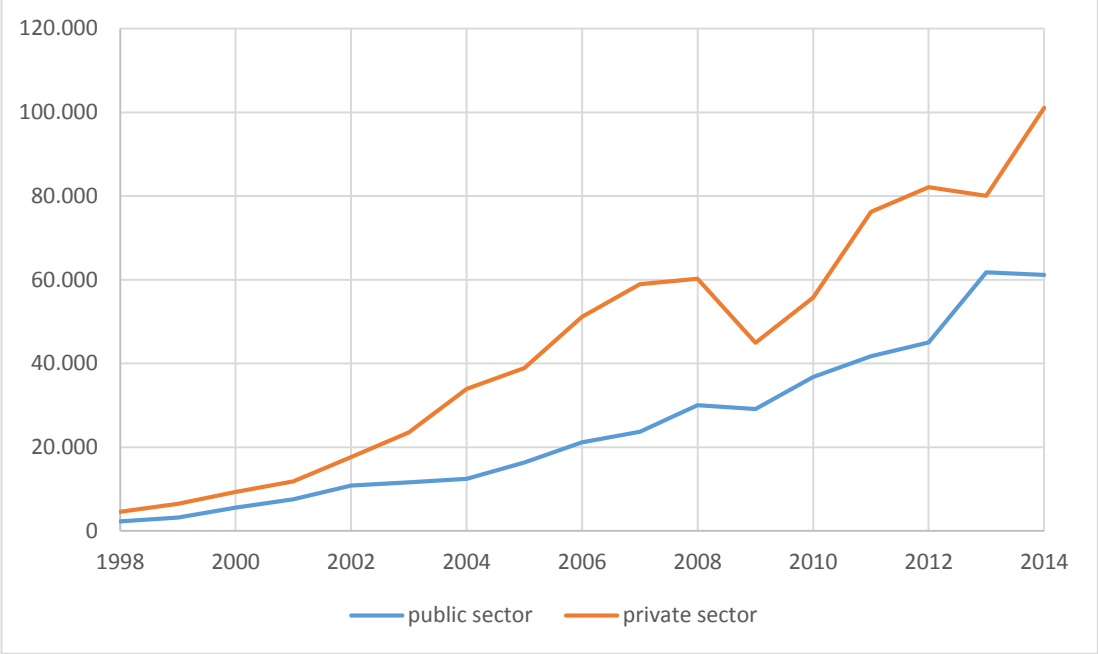

Figure 14: The Public and Private construction sector expenditures

(Source: Turkstat)

Apart from those parameters, unemployment has been crucial issue for Turkish economy for a long time. According to latest data of Turkstat, the number of unemployed citizens was stated as 3,103,000 and the unemployment rate was reported as 10.3%. Since the industry has substantial relationship with several sub-sectors, the contribution of the construction industry to employment is quite essential for economy. The table 11 shows the numbers of

people employed by construction industry and total employment for those over 15 years old.

Table 11: Total and Construction Industry Employment

Years	**Total employment (thousands)**	**Construction industry employment (thousands)**
2005	19,633	1,097
2006	19,933	1,192
2007	20,209	1,231
2008	20,604	1,238
2009	20,615	1,305
2010	21,858	1,434
2011	23,266	1,680
2012	23,937	1,717
2013	24,601	1,768
2014	25,933	1,912
2015* September	27,156	2,040

(Source: Turkstat)

Also, the other remarkable situation can be observed between unemployment rate and the employment rate in construction industry. By looking at the figure 15, it can be deducted that even though the unemployment rate increases rapidly sometimes, the employment provided by construction industry rarely decreases and its constant growth helps unemployment rate to become smaller. Especially when unemployment rate reached the peak point in 2009 due to global financial crisis, the steady employment increase in construction industry was crucial to get rid of the negative effects of the crisis following years.

Figure 15: Total unemployment and construction industry employment rate

(Source: Turkstat)

With respect to increase in public and private sector expenditures on construction industry, the number of house sales has showed an increasing trend (Figure 16). Since TOKI has completed several projects after 2012, the great increase of sales can be observed in 2013. Also, the low interest rates of long term credits provided by banks lead the way of mortgage sales increase, however this increase should be payed attention because the initial reason of the global financial crisis was mortgage trouble in USA.

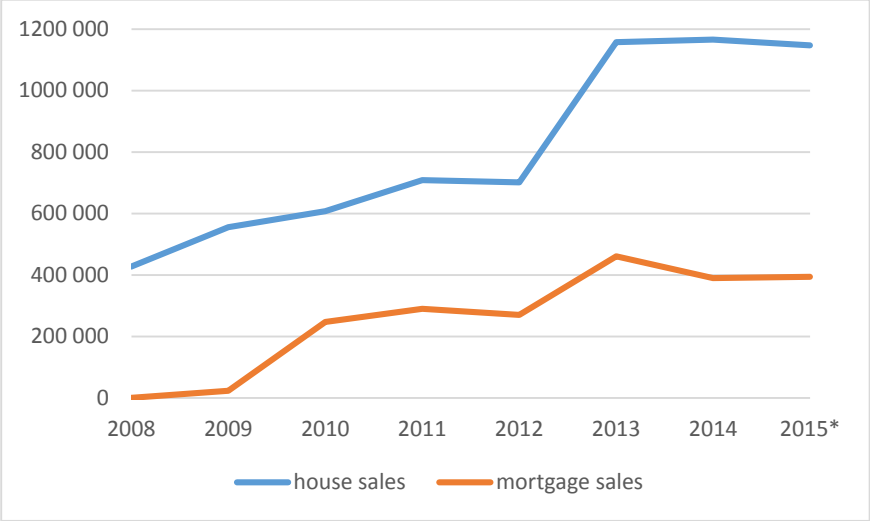

Figure 16: The number of housing and mortgage sales (2015 data covering the months until December)

(Source: Turkstat)

3.5. Structural Analysis of the Industry

In this part, the structural analysis of Turkish construction industry will be handled in terms of its profitability and the competition within the industry. To investigate the features of the industry within these boundaries, the study will follow the Five Forces framework designed by Michael Porter in 1979.

For a company, it is crucial to understand all the conditions of the industry fully before starting to operate. Since Porter's Five Forces model is able to satisfy this need of companies, the analysis became one of the necessities for managers in time.

According to Porter, there are five key forces that identify the attractiveness of the industry. They include three horizontal sources as threat of new entrants, rivalry among existing firms and threat of substitutes. As for the remaining vertical sources, they consist of bargaining power of suppliers and buyers (Figure 17). In order to

analyze Turkish construction industry within this framework, the five forces will be explained and then evaluated for the case of Turkish construction industry respectively.

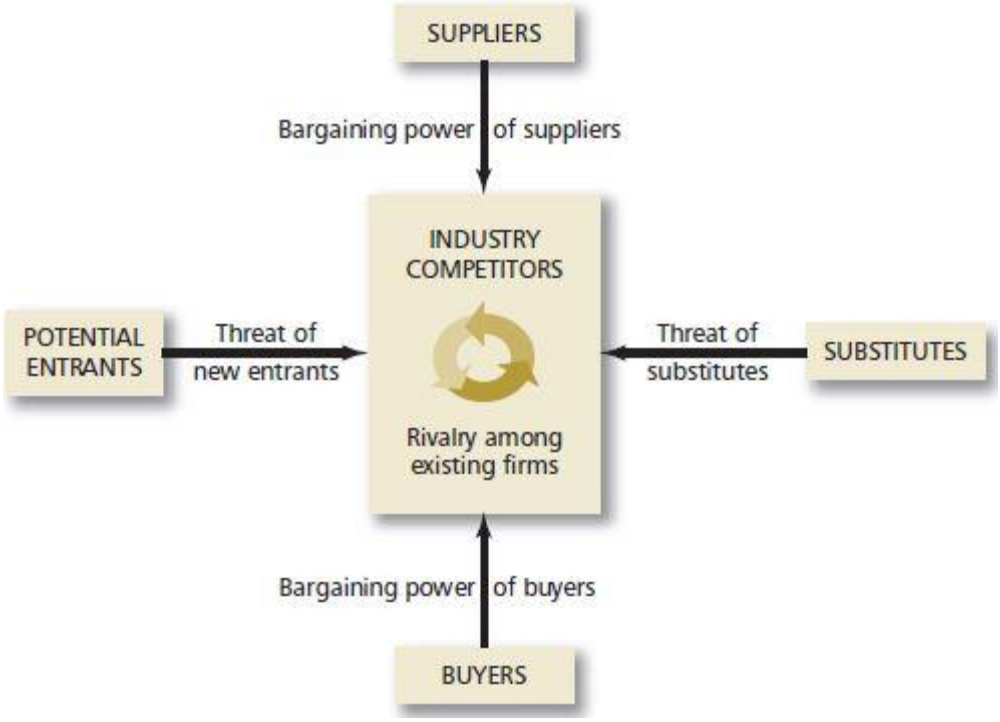

Figure 17: Porter's Five Forces Framework

(Source: Grant, 2010)

First of all, the existence of the new entrants in the industry may have some negative consequences for existing companies or the industry itself, however these effects can be lowered in the context of the entry barriers of the industry. The barriers gain more importance when the industry is attractive because of its profitability. The level of complexity of the barriers for the new entrants can be examined according to several aspects such as capital requirements, economies of scale, product differentiation and governmental & legal barriers.

Capital requirements refers to the initial setup costs which are required in entry phase of the industry. The amount of this cost can be determinant for many companies. For example, creating smart phone applications does not require large amounts so that everyone can enter this market. However, production of airplane engines are extremely costly, therefore it is really hard for new entrant to enter and survive in this industry. According to Birgonul and Dikmen, the amount of entry cost depends on the scale of the projects in the construction industry. Whereas the initial amount of investment is quite high for nuclear plant projects, this amount can be really low for standard and small scale projects. Nonetheless, the fact that establishing a sole proprietorship for 50,000 TL and limited company for 5,000 TL makes it easy to start with small scale projects and then grow in time for newcomers.

Economies of scale stands for the advantage of low unit cost through high amount of production. Grant (2010) states that "The problem for new entrants is that they are faced with the choice of either entering on a small scale and accepting high unit costs, or entering on a large scale and bearing the costs of underutilized capacity" (p.72). With regard to this definition, existing firms in construction industry have an advantage since they have much more projects than new entrants so that they can lower their costs. Therefore, this factor can be recognized as one of the middle level barriers. Also, there is high effect of learning curve in construction industry. According to Karaoz (2003), construction industry has 70-90% learning rate that provides efficiency for existing firms and absolute cost advantage over potential entrants.

Product differentiation includes brand recognition and customer loyalty advantage of existing firms over potential newcomers.

Although this feature requires lots of investments on advertising for newcomers in order to survive in specific segments of construction industry such as residential buildings, Birgonul and Dikmen (2001) mentioned that for some construction types this feature does not create a barrier, on the contrary, it can be an advantage for new entrants over existing firms for the projects of which the cost is the matter rather than the quality.

Governmental & legal barriers can be identified as the necessary documents or permissions asked by government in order to operate in an industry. Government determines these procedures and allows companies to take part in an industry. For construction industry, construction permits and contractor licenses can be considered among these necessities which constitutes the middle level barriers of entry.

All in all, it can be said that it is easy for new entrants to entry to construction industry and this situation narrows the level of activity for all companies. On the other hand, the legal requirements, learning curve of workers and the economies of scale creates some slight barriers.

Secondly, the competition within an industry is expected to be high when there are numerous actors. These actors try to seek ways to differentiate their products in order to gain a competitive advantage over the rivals. However, product differentiation is hardly viable for construction industry. For most of the time, the projects are given to companies which bid the lowest predicted cost for construction in auctions. According to Uzunkaya (2013), this situation creates price based competition rather than the aspects of quality and technology (p.47).

In addition, due to the easiness of entry for new entrants, the number of companies in construction industry grows substantially. As it can be derived from figure 18, the average number of new firms in the industry accounts for 746 per month and the highest amount is examined for April 2015 as 1,154 new companies. This situation results in the increase in the level of competition for construction industry. Moreover, Birgonul and Dikmen stated that the big companies in construction industry may enter the small scale markets to decrease their excess capacity cost; hence both the increase in competition and the threat for existing companies in small scale markets are supported.

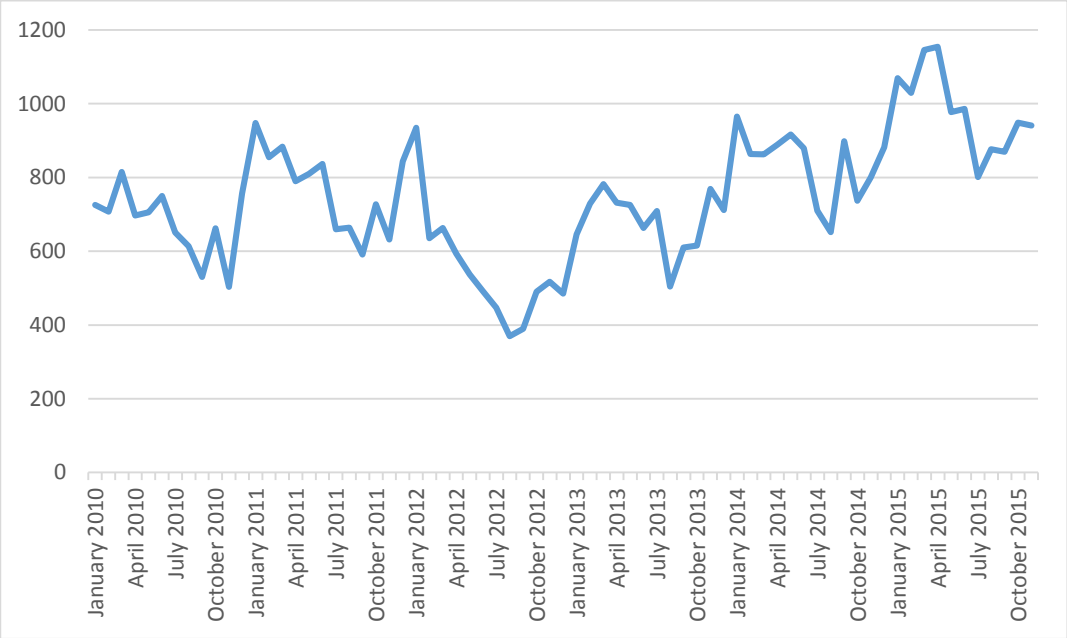

Figure 18: Number of new companies in construction industry

(Source: TOBB)

Thirdly, the existence of substitute products in an industry can change the choices of customers and their willingness to pay on some product is sensitive in this conditions. For example, when the prices of tea gets too high, the demand for tea may decrease and the raise can be observed for the demand of coffee. However, it is hard to talk about substitute products for construction industry in Turkey. As Uzunkaya (2013) mentioned, the low innovation capacity, inadequacy of R&D, few number of patents per capita, insufficient scientific research institutes and inadequate collaboration between university and industry can be observed for Turkish construction industry (p.24). As a result of this, the inventions of new, innovative and productive methods in construction activities cannot be seen which could have been a substitute for traditional methods and processes.

Fourthly, Porter (1980) states that "suppliers can exert bargaining power over participants in an industry by threatening to raise prices or reduce the quality of purchased goods and services" (p.27). As Porter explained, if there are few suppliers in the industry, they have power over companies in the industry. However, construction industry has numerous suppliers and the switch cost for companies is quite low. Therefore, it is not realistic to say that the bargaining power of suppliers is high. Moreover, the companies can lower the bargaining power of suppliers by backward integration and they can manufacture their own materials which is the most preferred way for many large companies lately in Turkish construction industry.

Lastly, Porter (1980) explained that the fifth factor of bargaining power of buyers depends on some specific situations. Among these circumstances some of them are suitable for the case of construction industry. According to Porter (1980), "If a large portion of sales is

purchased by a given buyer this raises the importance of the buyer's business in results" (p.24). For construction industry, government can be classified as this type of buyer because of the large scale projects that they manage, as a result of this high bargaining power of government can be observed.

Also, if it is easy to find different suppliers with similar products, the low switching cost creates high bargaining power for buyers. Since it is hard to differentiate products in construction industry and there are several suppliers, buyers have high bargaining power.

To sum up, the total attractiveness of the construction industry can be reported as low because of easiness to entry for new entrants, high number of companies resulting decrease in gains, high competition, low bargaining power of suppliers and high bargaining power of buyers.

CHAPTER 4

LITERATURE REVIEW

4.1. Introduction

There are several studies regarding the relationship between the investments on construction industry and economic parameters especially GDP.

Primarily, the focus of the researchers was finding the correlation between these variables and then, some of them examined this correlation by using data from large number of countries in order to reach a general perspective. Since construction industry expenses are thought as one of the most important input for economic development, most of the studies are related to developing countries.

When the correlation is found, the importance shifted to the direction of the relationship and at this point the studies revealed some differences. For example, the unidirectional relationship from economic growth to construction industry was observed by Tse and Ganesan (1997), whereas the opposite way of causality is valid for the study conducted by Chang and Nieh (2004).

Some latter studies analyzed the sector more in detailed by dividing construction into several sub-sectors and separating the public and

private implementations. This categorization also helped researchers to specify the differences of building type or non-building type of construction activities made by public and private hand in economy.

It is also remarkable that outcomes differ in terms of the time span, therefore some of the authors separated their findings as long-run and short-run.

To sum up, since some researchers mentioned the difference between developed and developing countries in this context, the literature review is divided into four pieces as the studies about the relationship between construction sector investments and GDP, the previous studies for developing countries, the previous studies for developed countries and the previous studies for Turkey.

4.2. The Studies about the Relationship between Construction Sector Investments and GDP

One of the initial study concerning the role of construction sector in economy belongs to Strassmann (1970). His analysis included the countries which have more than a million population during the time period of 1955–1964 and showed a strong relationship between the investments on construction sector and economic growth. He also referred to the study of Kuznets in 1960 which stated the construction industry is a variable dependent on national income and investment.

Three years later, Duccio Turin (1973) studied the relationship between the construction sector and economic development and explained his aim with this study as "to provide guidance to the policy-making bodies responsible for the development of the construction industry by drawing their attention to the nature of the

construction process… To the steps that could be taken to remove some of the existing and future constraints in the vital areas of materials, manpower, financial resources, organization and management, institutional set-up and statutory requirements" (Ofori, 2012). His study contained wide range of economic topics including both the operations and the individuals who have important roles. He included 85 countries into the study for the time period of 1955-1965 and listed the countries in terms of their average per capita product in descending order.

This study had several outcomes. To begin with, the percentage of construction value added (CVA) of GDP, and the capital formation in construction of GDP were observed differently for developing and developed countries. While the percentage of CVA was 3 to 5 for developing countries, it was 5 to 8 for developed countries. Also, the value of capital formation was 6 to 9 percent of GDP for developing countries, but this rate was 10 to 15 percent for developed countries. Apart from that, the study showed a strong linear relationship between construction sector investments and economic growth.

The supporting studies to Turin's work have been established by Drewer (1980), Ball (1981), Edmonds and Miles (1984), and Wells (1986). Ball drew an attention mostly to the employment opportunities created by construction investments at different levels whereas the study of Wells emphasized that the construction sector has to speed up more than the economy while the economy is growing because of the great proportion of construction industry in Gross Fixed Capital Formation in developing countries otherwise insufficient sector increase would be an obstacle for economic growth programs.

Later studies showed that rather than linear relationship there are some curvilinear and inverted U-shape relationship between construction industry investments and economic growth. The inverted U-shape relation was mentioned in the study of Maddison (1987). He stated that if developing economy completely understands its financial potential during the economic growth, it turns out to be less reliant on any single division such as construction industry to empower monetary development and improvement. The study accepts the first initial increase of the proportion of construction in total output, however it shows a decrease of the proportion in a long run.

In 1990, Ofori found out the unidirectional effect of construction sector investments to economic growth. These investments affect the national income because it provides income and value added. In his study, Ofori expressed this value added as "the sum of salaries and wages of employees, interest on borrowed capital, net rent, profit and allowance for depreciation" (Ofori, 1990, as cited in Giang & Pheng, 2011, p.119).

Bon (1992) criticized the study of Turin (1973) because it was mostly covering the developing countries. Therefore he included a wide range of countries from each continent in his study and he mentioned that there are different roles of the construction sector in the context of economic shift from less developed country (LDC) to newly industrialized country (NIC) and to advanced industrial country (AIC) in terms of GNP per capita (Graph 18). According to Bon, the construction volume follows an increasing trend until a country became one of the newly industrialized countries, and then it shows a decreasing trend when it reaches to the point of advanced industrial country. His claim was same for the response of the share

of the construction as well. Therefore the proposition of "volume follows share" was established by him which has been discussed and criticized by several researchers later on such as Ruddock and Lopes (2006), and Choy (2011).

Bon also pointed out the importance of urbanization and industrialization for construction industry. According to him, at the beginning the proportion of urban population in total has an increasing rate as GNP per capita grows, but in long run this proportion increases with a declining trend. This process is alike with the proportion of the construction industry investments in economy for long term.

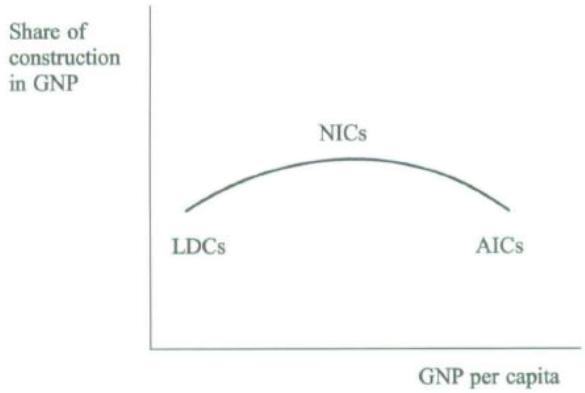

Figure 19: The Bon Curve

(Source: Bon, 1992)

Since almost all of the previous studies regarding to this topic used Granger Causality Test, their findings and features are summarized to have wide range of information in table 12.

Table 12: Summary of previous studies

Country	Author & Year	Variables	Time Period	Data Source	Results
China	Siqi and Hongyu, 2004	GDP, Construction investment and other investments	1981 – 2001, yearly data	China Statistical Yearbook	Bidirectional relationship between construction and GDP
Sri Lanka	Rameezdeen and Ramachandra, 2006	GDP and CGDFCF	1980 – 2004, yearly data	Central Bank of Sri Lanka	Unidirectional effect from construction to economy
Sri Lanka	Ramachandra, Rameezdeen and Rotimi, 2013	CVA, CGDFCF, CCI, GDP, GDPD, UE, BT	1990-2009, yearly data	Central Bank of Sri Lanka	Unidirectional effect from construction to economy
Ghana	Anaman and Osei-Amponsah, 2007	GDP and NCONGDP	1968 – 2004, yearly data	United Nations, IMF and Ghana Statistical Service	Unidirectional effect from construction to economy (3 year-lag)
Pakistan	Khan, 2008	LCNS and LGDP	1950 – 2005, yearly data	Handbook of Statistics of Pakistan Economy	Unidirectional effect from construction to economy
Cape Verde	Lopes, Nunes and Balsa, 2011	GDP, GNI and GVAC	1970 – 2008, yearly data	United Nations and World Bank	Unidirectional effect from GDP to construction (6 year-lag)
Malaysia	Choy, 2012	GDP and CVA	2000Q1 – 2009Q4 & 1970 – 2009, yearly and quarterly data	Economic Planning Unit of the Prime Minister's Departmen of Malaysia	Bidirectional relationship with quarterly data (3 year-lag), Unidirectional effect from construction to gdp with yearly data

Table 12 (continued)

Libya	Dakhil, 2013	GDP, construction expenditure, GDP of each economic sector	1986 – 2009, yearly data	Central Bank of Libya and ministry of Planning of Libya	Unidirectional effect from gdp to construction in short-run, Unidirectional effect from construction to gdp in long-run
United States	Green, 1997	GDP, Private domestic non-residential investment, domestic residential investment	1959 – 1992, yearly data	Citibase	Unidirectional effect from residential investment to gdp, and from gdp to non-residential investment
Hong Kong	Tse and Ganesan, 1997	GDP and Construction investment	1983 – 1995, yearly data	Hong Kong monthly digest of Statistics	Unidirectional effect from gdp to construction
Hong Kong	Yiu, Lu, Leung and Jin, 2004	GVC and GDP	1984 – 2002, yearly data	Hong Kong monthly digest of Statistics	Unidirectional effect from gdp to construction output
Hong Kong	Wong, Chiang and Ng, 2008	GVCW and GDP	1983Q1 – 2006Q4, quarterly data	Census and Statistics Department of the government of Hong Kong SAR	Unidirectional effect from infrastructure to gdp
Hong Kong	Chiang, Tao and Wong, 2015	GVCW and GDP	1983Q1 – 2013Q4, quarterly data	Census and Statistics Department of the government of Hong Kong SAR	Bidirectional relationship between gdp and construction

Table 12 (continued)

Singapore	Lean, 2001	GDP, Manufacturing, Utility, Construction, Commerce, Transport and Communications	1986Q1 – 1992Q2, quarterly data	Ministry of Trade and Industry of Singapore	Bidirectional relationship between gdp and construction
Taiwan	Chang and Nieh, 2004	GDP, rcnst, reg, rcp	1979Q1 – 1999Q4, quarterly data	Taiwan Ministry of Education	Unidirectional effect from construction to gdp
14 Western Europe Countries	Wilhemsson and Wigren, 2011	GDP, residential construction	1980 – 2004, yearly data	OECD and Euroconstruct	Bidirectional relationship between construction and gdp, Unidirectional effect from residential investment to gdp
Saudi Arabia	Alkowaish, 2015	CF, GDP and Oil Revenues	1970 – 2011, yearly data	Saudi Arabian Monetary Agency Database	Bidirectional relationship between construction and gdp
Turkey	Ozkan, Ozkan and Gunduz, 2012	Infrastructure investment, building and residential investments both public and private, GDP	1987 – 2008, monthly data	Central Bank of Turkey	Bidirectional relationship between construction and gdp
Turkey	Kaya, Yalcınkaya and Huseyni, 2013	GDP, construction investment both private and public	1987 – 2010, yearly data	DPT	Unidirectional effect from public construction to gdp, from public construction and gdp to private construction

Table 12 (continued)

Turkey	Kargı, 2013	GDP, GFCF, CPI, CEGDPPS, CEGDPPRS, IMKB100, XTAST, CEGDPTOT	2000Q1 – 2012Q3, quarterly data	Central Bank of Turkey	Bidirectional relationship between public construction and gdp
Turkey	Bolkol, 2015	GDP, Building production, non-building production	2005 – 2013, yearly data	TURKSTAT	Unidirectional effect from gdp to building production and to non-building production

4.2.1. Previous Studies for Developing Countries

Lopes (1997) examined the relationship between construction sector and GDP of 15 developing countries of Africa. The analysis was based on the data from 1980 to 1992 and the countries were divided into two groups as the ones with descending GDP and the ones with ascending GDP for 12 year time period. With this categorization he was able to identify differences in terms of correlations regarding GDP and construction value added. He concluded that "… in countries in which GDP per capita decreased in the period referred to, construction value added decreased not only relatively but also absolutely. In countries which experienced an increasing growth in the same period, CVA increased absolutely but not relatively" (p.201). In the light of these information, the correlation was valid only for an economy of decreasing GDP.

After 5 years, in order to verify this relationship, Lopes, Ruddock and Riberio conducted a similar model with 15 countries from Africa and this time the model was covering 22 years including same GDP categorization. Their outcome was consistent with Lopes (1997) stating that the decrease in CVA causes a decrease in GDP, but not visa-versa.

The study of Siqi and Hongyu (2004) exhibited the significant linkages between construction investments and GDP both for short-run and long-run containing the data from 1981 to 2001 of China. For both time spans, the bidirectional relationships are detected according to Granger model and after dividing this sector into residential and non-residential type of investments, Siqi and Hongyu came up with a conclusion that while residential construction investments has an effect on GDP, the non-residential construction investments does not affect GDP. Therefore the consistency between this study and the work of Green (1997) is pointed out. Their study also showed that the construction sector has the most triggering effect on national economy comparing to other sectors for the case of China.

Rameezdeen and Ramachandra (2006) questioned the interrelation between construction sector investment and economic growth for Sri Lanka by using Granger Causality Test for the years covering 1980-2004. They used GDP as economic growth parameter and Construction in Gross Domestic Fixed Capital Formation (CGDFCF) as the data. The outcome of the study was existence of the unidirectional effect of construction sector over economy. While this result was supporting the previous study of Ofori (1990), it was diverging from the study of Tse and Ganesan's (1997) because their outcome was showing that the construction growth is affected by

GDP. Rameezdeen and Ramachandra (2008) also examined the proportion of construction in Gross National Product (GNP) and National Income (NI). They found that the proportion for developed countries was higher than the one for Sri Lanka because construction sector has poor feature of dragging other sectors into economy in Sri Lanka. Five years later, Rameezdeen, Ramachandra and Rotimi (2013) searched for the further information about the causality by using the data covering 1990-2009 using Granger Causality test. The consequence was the existence of unidirectional linkage to the national economy of construction sector in Sri Lanka. This result was supporting the previous studies and stating one of the crucial reasons for this consequence as "national economic activities precede construction activities for all indicators except construction investment" (Rameezdeen, Ramachandra and Rotimi, 2013, p.49).

The Granger Causality Test is also used in the study conducted by Anaman and Osei-Amponsah (2007) for Ghana in order to find the relationship between the growth in construction sector and the growth in the economy by using the data from 1968 to 2004 and it had two outcomes. According to observations, "the growth of the macro-economy as measured by the growth of GDP preceded the decline in the output of the construction industry with a two-year lag" and "the growth in the construction industry Granger-caused growth in GDP, with a three year lag" (Anaman, Osei-Amponsah, 2007, p.958). They emphasized the importance of the investments on construction sector and stated that with the increase of the spending for construction sector by government, the economy of the Ghana can be improved, new employment opportunities can be created and the poverty can be reduced.

The case of Pakistan has distinctive feature since the construction sector has only a 2.3 percent share in GDP (Khan, 2008). Nevertheless, its contribution to the labor force cannot be underestimated and it is stated that the economy of Pakistan is given direction by construction sector according to unidirectional causal relationship from construction sector to the economy found by Khan (2008) using the long range data from 1950 to 2005 with Granger Causality Test.

The opposite results from Pakistan have been found by Lopes, Nunes and Balsa (2011) for Cape Verde case. Using the time series data of GDP and Construction sector for 1970-2008 by Granger causality test, the correlation can be identified for the time series, however, the causality was only found from GDP growth to construction sector growth with a 6 years lag. On the other hand, the results do not show any effect of the construction growth on the GDP growth, at least in the short and medium-run (Lopes, Nunes and Balsa, 2011, p.57).

The difference between the long-term and the short-term relationships between construction sector and GDP can be easily seen in the case study of Malaysia. In order to reveal this difference, Choy (2012) worked on both quarterly time series data from 2000Q1 to 2009Q4 and yearly time series data from 1970 to 2009 by using Granger Causality Test. The results of the study analyzing short-term were specified by Choy as "The Granger causality test results reveal bidirectional relationship flow between the construction sector and the aggregate economy of the quarterly data" (2012, p.30). However, this relationship differentiate according to direction. Whereas the lag is one quarter from construction growth to aggregate economy, three quarters lag is observed from aggregate

economy to construction growth. As for long term "it was the construction growth driving the growth of the aggregate economy of Malaysia. This is unveiled by the yearly data which shown unidirectional causality running from construction sector to the aggregate economy" (Choy, 2012, p.30). The later study of Malaysia divided the time periods into three parts which are 1970-1985, 1985-1998 and 1998-2009. Choy, Skitmore, Runeson and Bridge (2014) observed the correlation relationships of construction sector productivity and GDP by using partial correlation method without establishing the causality of the two parameters. Contrary to 1970-1985 time period which states no correlation with GDP and construction productivity, 1985-1998 and 1998-2009 the periods showed significant correlation. According to Choy, Skitmore, Runeson and Bridge, since the construction sector was neglected and there were some other policies aiming societal goals, the activity for construction industry stayed at the low level for the period of 1970-1985.

Dlamini (2012) also reported the difference of the interrelationships between construction sector to economic growth in terms of short-run and long-run. According to the study based on the time series data of South Africa, there is not an observable relationship between this sector and economic growth in the long-run although the positive effect of construction sector investments on economic growth is observed in the short-run.

One of the most comprehensive work studied by Dakhil (2013) for Libya. He not only investigated the relationship between the construction industry and economic growth, but also included the other economic sectors into the analysis. He used Granger Causality Test after applying the Augmented Dickey Fuller (ADF) and the Philip

Perron (PP) unit root tests for the period of 1986-2009. He summarized his findings as; "There is a causality relationship from GDP to the construction industry in the short run and from the construction sector to GDP in the long run" (Dakhil, 2013, p.108-109).

4.2.2. Previous Studies for Developed Countries

Some of the later studies were searching for the causality between the sub-sectors of construction industry and the economy. Green (1997) analyzed the data of United States and stated the outcome of his work as "under a wide variety of time-series specifications, residential investment causes, but is not caused by GDP, while non-residential investment does not cause, but is caused by GDP" (Green, 1997, p.253).

In 1997, Tse and Ganesan observed the unidirectional causal relationship from GDP to construction sector investment by using the data of Hong Kong for the periods 1983-1995. Their findings was different from the most of the studies since they found no causality from construction investments to GDP, but one of the importance of their study was the method they used. They stated that "Granger causality methodology is commonly applied to investigations on the relationships among money supply, stock prices and inflation, but no-one has tested the linkages between the construction sector and the aggregate economy using this method" (Tse & Ganesan, 1997, p.371). Following this study, Yiu, Lu, Leung and Jin (2004) conducted a longitudinal research for the relationship between the real growth rate of construction output and the real growth rate of GDP regarding Hong Kong with the data from 1984 to 2002. They reached the results of causal relationship from the real growth rate

of GDP to the real growth rate of construction output and no linear linkage between the construction growth and economic growth. Several years later, Wong, Chiang and Ng (2008) emphasized the effect of the infrastructure sector on the economic development. Their study also included the transformation of the role of the construction sector for the changing economies from NIC to AIC. They explained this transformation as "The trend of construction share in Hong Kong reveals that as economic development moves to its advanced mature stage, the share in GDP diminishes and therefore the importance of its role in economic development also declines" (Wong, Chiang, Ng, 2008, p.823).

In contrast to the studies with unidirectional results, Chiang, Tao and Wong (2015) came up with a bidirectional conclusion including longest time series data for Hong Kong ranges from 1983Q1 to 2013Q4. Moreover, they state that "Bon's proposition of an inverted U-curve is supported in this study to certain extent. The share of construction in the Hong Kong economy follows Bon's proposition as Hong Kong develops from a newly industrialized economy to an advanced industrialized one" (Chiang, Tao and Wong, 2015, p.8).

Unlike unidirectional relationships, Lean (2001) found out the bidirectional causal relationship between construction investments and economic growth for the case of Singapore using data from 1986Q1 to 1999Q2. Lean interpreted this causal relationship as "The causal trends can be reversed by a change in the economic condition in Singapore or technology innovations in certain sectors via the bi-directional linkages. This also shows that the intersectoral linkages are complex, and the construction output change has a multiplied effect on the economy over the short to medium term" (p.362)

Similar result to Lean was reached by Lopes (2003) despite of poor data of Portugal. National output and construction output information are taken into account for the period of 1980-2002 in the study. It is also inferred that the growth of the share of construction value added in GDP has a great contribution in terms of the growth of employment.

One of the unidirectional relationships was also found by Chang and Nieh (2004), however, unlike Tse and Ganesan (1997) the direction was observed from the construction sector to economic growth. Their analysis included the data range from 1979Q1 to 1999Q4 regarding Taiwan and they stated that this unidirectional relation was valid for both short-term and long-term.

Since the economy of Trinidad and Tobago mostly depend on the petroleum industry, the analysis of Hosein and Lewis (2005) included oil and gas revenues into the search of relationship between construction value added and GDP as well. The positive relationships between almost all the parameters have been identified at the end of the study and the bidirectional causality flow is detected between GDP and construction value added. Apart from this outcome, authors called attention to the importance of the contribution provided by using local labor and equipment in construction industry.

A comparative research covering most competitive economies of Denmark, Finland, Singapore and Sweden has been done to justify the understanding that "the share of construction in total output of the economy would change as it progressed through the entire path of development, i.e., the share increases during the early phases of economic development and decreases when it reaches the industrially advanced phase" (Hua, 2009, p.264). According to this

proposition, the decrease in construction recognized relatively at the beginning and then absolute decrease took place (volume follows share). Hua (2009) conducted this longitudinal study with time series statistics range from 16 to 18 years. After examining the construction sector output performances and the proportions in economy, three outcomes have been reported. First of all, the output of the construction sector for AICs can be moderately high whereas the proportion of the sector in economy is moderately low. Secondly, it is crucial to maintain the importance of this sector even for the AICs due to its feature of being a financial controller for the corresponding authorities of counties. Finally, the national economies of AICs are continuously increasing thanks to the activities of construction sector mainly building and improving the infrastructure.

The broader case was researched by Wilhelmsson and Wigren (2011) including 14 countries into the model to shed light on the causality relationship between GDP and construction for Western Europe. In terms of bidirectional effects, the results was compatible with the work of Lean (2001). Regarding sub-sector outcome, residential construction investments seemed to be more effective than nonresidential construction investments on GDP which is quite similar to the findings of Green (1997).

The oil revenue was added to the model for Saudi Arabia as well. Alkowaish (2015) worked on the data belong to 1970-2011 and his deductions were categorized in terms of long-run and short-run. Although he detected significant bidirectional causality between construction industry and economic growth for both time spans, the short-run effect of oil revenue was stronger than the construction industry on economic growth.

4.2.3. Previous Studies for Turkey

For the period of 1970-2004, Celik (2007) observed that construction sector, especially residential construction, has a great effect on the economy of Turkey by using the method of Vector Auto Regression Model. He mentioned that the construction sector has triggering effect on more than 200 sub-sectors which provides wide range of employment opportunities. Therefore he identified the construction sector as the locomotive of the economy in Turkey and included that with the increase of the construction investments, the sub-sectors can be improved, the percentage of the capacity usages can be optimized and the inflation can be decreased.

The leading role of the construction sector has been confirmed by several studies, but according to Gundes (2011) the sector is losing this leading role in the economy because of its declining share in GNP after 1990s. The linkages of the sector with the entire Turkish economy are also questioned in the study and the strong backward linkages in the economy is observed while the weak forward linkages are admitted.

Ozkan, Ozkan and Gunduz (2012) also pointed out the triggering effect of construction sector on 200 sub-sectors and mentioned that "in times of demand shortages in economy, governments yield GDP by increasing construction investments and vitalizing the sector" (Ozkan, Ozkan, and Gunduz, 2012). Their investigation on causality between construction sector investments and GDP growth in Turkey was in detailed because they divided construction sector into three parts as infrastructure, residential and building for both public and private sector. They used Granger Causality Test and the outcomes

showed bidirectional relationship between these partial sector investments and GDP growth.

In order to identify the importance of the construction sector in the economy, Kaya, Yalcınkaya and Huseyni (2013) investigated the relationship between Public and Private sector investments and GDP by using the yearly data for 1987-2010 with the method of Granger Causality test. The result was similar to other developing countries showing the strong relationship between total construction investments and economic growth. They highlighted two important relations in their study which are unidirectional causality from public sector investments to GDP, and from public sector investments and GDP to private sector investments. This analysis showed that the private sector is dependent to the general economic performance whereas the public sector is not affected by the economic performance.

The work of Kargi (2013) contained new parameters as inflation, Istanbul stock exchange national 100 index and Istanbul stock exchange non-metal minerals index in order to investigate the new linkages along with the interrelation between construction industry and economic growth. The data were based on the quarterly records from 2000Q1-2012Q3 of Turkey and they showed no correlation with inflation and IMKB100 for construction industry whereas a powerful correlation between construction industry and GDP was detected.

One of the latest research about this topic belongs to Bolkol (2015). He stated that "because it is found that, there is no cointegration which means there is no long-run relationship between variables, VAR Granger Causality method is used to test the causality in short-run. The findings reveal that, the causality runs from GDP to Building

Production and Building Production to Non-Building Production" (Bolkol, 2015, p.42). After mentioning no connection in long-run and bidirectional relationship between GDP and Construction industry, Bolkol suggested that relying mostly on construction activities may not be the best way to improve the national economy of Turkey.

CHAPTER 5

DATA, METHODOLOGY AND FINDINGS

In this part, the data used in the models, applied methodology for the study and the results will be explained in order to investigate the relationship between economic development and construction industry activities.

5.1. Data

To begin with, the study will contain two models. The reason behind this separation can be stated as the availability of data and the specific aims of each model. Since there were some changes in recording techniques of some data such as the number of housing sales, they could not be used in the model because of the possible invalid results. Therefore, the most appropriate data for the model are detected for the time period of 2000-2013 and 2002-2013 as quarterly data.

The selected data for the first model include GDP, public construction in GDP, private construction in GDP and the number of total employment. Since GDP corresponds to national economic condition of a nation and employment is quite significant indicator that contributes economic development, they are used in the model as economic variables. As for construction variables, the public and private activities are added into model separately in order to observe

the different effects of each sector to economy and vice versa. According to graph 19, the contributions of each sector to GDP have different characteristics in terms of their response to economic crises, hence, it is important to analyze their causality individually.

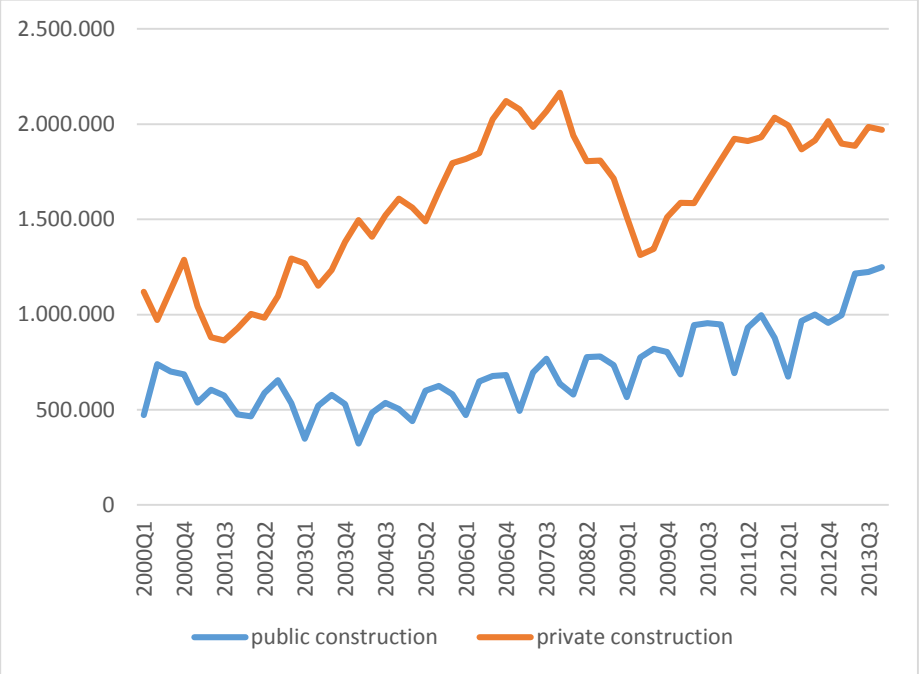

Figure 20: Public and Private construction in GDP (1000 TL)

(Source: Turkstat)

The data are gathered from TURKSTAT database and they are represented at constant 1998 prices. In the model, the data are used as quarterly periods covering 2000Q1-2013Q4 and including 52 number of observations.

The second model is studied to find more specific relationships between construction industry and economy. In order to reach that aim, the construction industry is analyzed in terms of residential, commercial and industrial constructions both by public and private actors together with GDP and the number of total employment variables.

The quarterly data are retrieved from TURKSTAT for the periods of 2002Q1-2013Q4 according to constant prices of 1998.

As a consequence, the models will be applied by using the software of Eviews 7 for the data shown below (Table 13) and the following parts will explain the used method in detail for each step. At the end, the findings will be underlined for both models and they will be compared with the findings of other studies regarding the case of Turkey.

Table 13: The features of the data

Model 1	**Model 2**
2000Q1 – 2013Q4	**2002Q1 – 2013Q4**
GDP	GDP
Employment	Employment
Public Construction	Residential Construction (public & private)
Private Construction	Commercial Construction (public & private)
	Industrial Construction (public & private)

5.2. Methodology

There are several studies about the linkage between construction industry and national economy. Almost all of these studies have used Granger Causality test to find the direction of the causality between variables. According to Granger (1969) " if some other series Y(t) contains information in past terms that helps in the prediction of X(t) and if this information is contained in no other series used in the predictor, then Y(t) is said to cause X(t)" (p.430). In addition to this explanation, the outcomes of this model are stated as the bidirectional causality, unidirectional causality from one variable to another and non-causality among variables.

In order to benefit from this model, the time series data should be used as their stationary forms. Stationarity refers to the time series data which has constant mean, variance and covariance over time. To illustrate, the GDP data used in model 1 and 2 is represented in the figure 20 in terms of its natural logarithmic values since it is better to investigate the growth rate by this way. As it can easily be seen that the data has an increasing trend as a non-stationary time series despite of some fluctuations.

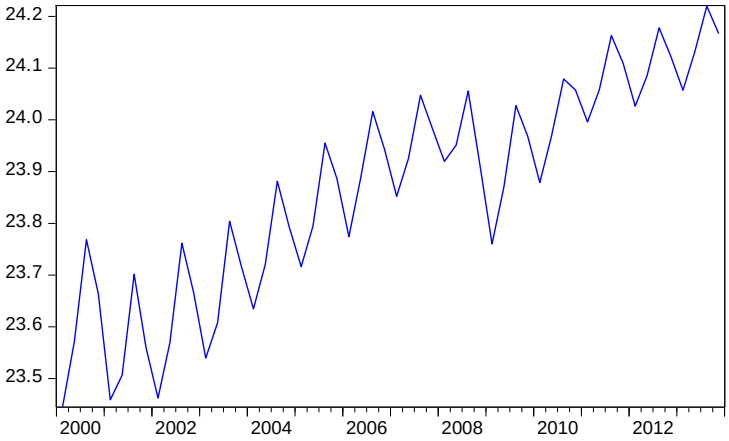

Figure 21: Non-stationary LGDP data

However, the studies regarding time series assume data as stationary because of the possibility of spurious regression caused by non-stationary time series. According to Choy (2012), when regression is implemented among nonstationary time series data, quite high value of R^2 can be observed in spite of irrelevant data used. Therefore, the time series should be used in their stationary forms by conducting unit root testing like the example of GDP in figure 21.

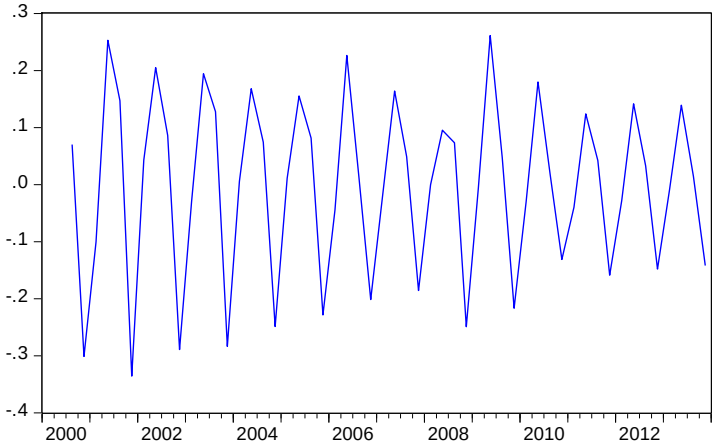

Figure 22: Stationary data of LGDP

In this study, in order to reach the stationary forms of the data, the most common unit root testing of Augmented Dickey Fuller (ADF) test is used for both models. The null hypothesis of ADF test states that the variable is not stationary or the variable has got a unit root. In order to reject the null hypothesis and accept the alternative hypothesis which features stationarity, we need to analyze the t-statistics and p-value of the outcome. If t-statistic is smaller that the critical values in the outcome table or the absolute value of the t-

statistic is bigger than the critical values, when can reject the null hypothesis and state that the data is stationary. Also, the p-value should be below 0.05(5%) to conclude that the data is stationary.

In this study, the results of all ADF test for each data are demonstrated in appendix part and they showed that the data for each model are not stationary at the same differences of the data.

For model 1, the time series data of employment, gdp and private construction are found that they are all stationary at the second differences, however, the public construction data observed as stationary at the its first difference.

Similarly, employment and gdp data are stationary at their second differences, where the other data of commercial, industrial and residential construction for both public and private sector are found stationary at their first differences.

As a result of this information given above, Toda and Yamamoto Augmented VAR model for Granger non-causality is chosen to have more accurate solution for the study.

Toda and Yamamoto proposed a new way using time series data at level in VAR process because of problems caused by unit roots. They also stated that "one can test linear or nonlinear restrictions on the coefficients by estimating a levels VAR and applying the Wald criterion, paying little attention to the integration and cointegration properties of the time series data in hand" (p.227). As they declared, this model does not require cointegration testing in the analysis. The procedure starts with conducting unit root tests for all the variables to find their orders of integration, and then choosing the maximum order of integration (d) in order to be able to construct a VAR model

with the variables at level. The lag length of this VAR model is calculated by summing up the maximum order of integration and the optimum lag length of VAR selected before according to some criterion such as Shwarz and Akaike information criterion.

After checking the stability of VAR by testing its autocorrelation, heteroscedasticity, roots and its structural breaks, Wald test is applied to find out the long run causal relations among the variables by trying to reject the null hypothesis of non-causality according to F statistics.

At last, the detailed information about these causal relations can be deducted from the impulse response options of the augmented VAR.

5.3. Findings

The first step of the model requires to find orders of integration of each data by conducting unit root testing and specify the maximum order of integration. Since both models in the study have stationary time series data at their second difference at most, the maximum order of integration (d) is chosen as 2 both for first and second model. Following outcomes will be explained below starting from the case for model 1 and then model 2.

After finding the maximum order of integration of model 1, the VAR model is estimated for the variables of gdp, employment, private and public construction, and the optimum lag length is selected as 4 according to Schwarz information criterion. Therefore, the VAR model is estimated again with 6 (4+2) lag intervals for endogenous variables.

Since there is no root has positioned outside the unit circle, the estimated VAR model can be regarded as stable. Also the

autocorrelation, normality and heteroscedasticity tests prove that the VAR is stable, thus, we can state that the model is well behaved.

After being sure that the model is stable, the least squares equation estimation is implemented with quadratic spectral kernel and Andrews automatic bandwidth method for all variables and the Wald test is applied to detect the causalities.

As it can be understood from the table 14, whereas there is unidirectional causality from private construction to employment, bidirectional causal relationship between public construction & GDP, private construction & GDP, employment & GDP and private & public construction, no causal relationship is detected between employment and public construction variables.

Table 14: Results of the Wald Test for model 1

Variables	**Results**
Public c. ⟷ GDP	Bidirectional relationship
Private c. ⟷ GDP	Bidirectional relationship
Employment ⟷ GDP	Bidirectional relationship
Private c. ⟷ Public c.	Bidirectional relationship
Private c. ⟶ Employment	Unidirectional relationship
Employment **x** Public c.	No relationship

After investigating long term causality among variables, the short term relationship can also be analyzed by using impulse-response option in VAR model. Figure 22 displays the responses of GDP and

private construction variables to a positive employment shock. For both of the cases the causality can be seen with 3 quarters lag.

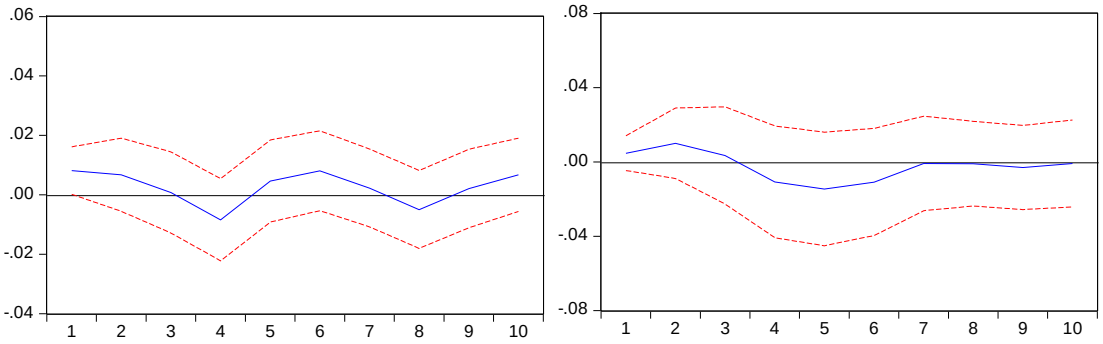

Figure 23: Responses of GDP and Private construction to employment

Also the response of public construction to one standard deviation shock of private construction can be seen as 4 quarters in the figure below.

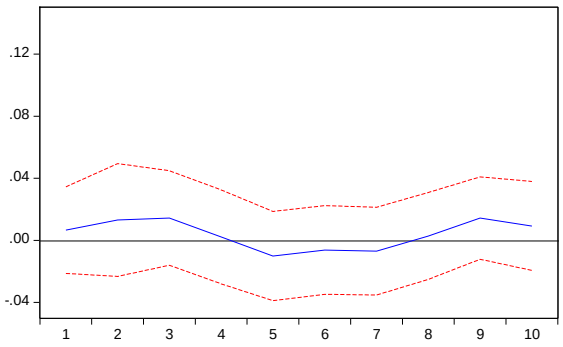

Figure 24: Response of Public construction to Private construction

The steps mentioned above were also implemented for the second model and the optimum lag length for VAR model is found as 1

according to Schwarz information criterion. Therefore, the VAR model is estimated with 3 lag intervals for endogenous variables.

At the appendix part it can be seen that the VAR satisfies the stability condition since there is no root is detected outside the unit circle. Also, the model includes no serious errors in terms of autocorrelation, normality and heteroscedasticity.

The table 15 specifies the results of the Wald test which is conducted to the model with same features as the first model. The outcomes indicate that there are bidirectional causal relationship between GDP & Employment, and Employment & Public residential construction. Apart from that, the analysis revealed that there are 5 unidirectional causal relationships which can be observed from the table below.

Table 15: Results of the Wald Test for model 2

Variables	**Results**
GDP ⟷ Employment	Bidirectional relationship
Employment ⟷ Public r. c.	Bidirectional relationship
GDP ⟶ Public r. c.	Unidirectional relationship
GDP ⟶ Public c. c.	Unidirectional relationship
GDP ⟶ Private r. c.	Unidirectional relationship
GDP ⟶ Private i. c.	Unidirectional relationship
Employment ⟶ Private i. c.	Unidirectional relationship

CHAPTER 6

CONCLUSION

Turkish construction industry has witnessed several important stages after the declaration of the Republic of Turkey. This evolution has been analyzed together with the urbanization process and these stages are determined according to study of Sengul (2012).

At the first stage, the first attempts of the industry can be seen as rail road projects after the fall of the Ottoman Empire. Until 1935, Turkish construction companies and contractors were able to gain experience in construction projects carried out by foreign contractors and construction companies. After that time Turkish companies and contractors were able to manage the whole processes of the construction projects. However, there was a shortage of skilled local staff because of insufficient educational institutions. This situation was also tried to be solved by hiring foreign personnel until some new institutions were established.

Another important event in the first stage of the urbanization process and development period of construction industry was the declaration of the new capital as Ankara in 1923. This decision was quite significant to find a balance between Istanbul and the Anatolian part of Turkey. However, the rapid population increase in Ankara has caused several problems such as high demand of housing. Although these problems were tried to be solved according to the urban plan

of Hermann Jansen, in time the requirements of the plan were disregarded and several multi-storey buildings were started to be built and the first examples of today's apartment blocks were constructed.

The second stage has covered the significant movement of the crowd of people from rural areas to cities together with the reasons behind this migration and the results for cities.

After the World War 2, the economic aid of Marshall Plan has been offered by United States to European countries including Turkey in order to get over the destruction of the war during 1948-1951 period, but this economic aid has caused the rapid increase of population in rural areas and in time, the unemployment rate of these territories has increased and people were forced to move to cities. Following this migration, numerous slums has been built at the edge of the cities in a short time, as a result of this, several political and social problems has started to emerge.

Although urban areas have witnessed some spatial problems as well after the population shift mentioned above, the construction industry has benefited from the Marshall Plan in terms of technical equipment.

In this stage, private construction sector activities and cooperative type of housing have also been accelerated. Between 1950 and 1960, 200 cooperatives were constructed just in Ankara (Batmaz et al., 2006). However, after 1945, housing sector has started to be perceived as the source of profit rather than service sector. (Keles, 2000). As a result of this, the quality of buildings has started to decrease and irregular urban places have appeared.

After 1980, the role of the government in construction industry has started to change. Balaban mentioned that one of the substantial reason behind the rapid growth in construction industry after 1980 was the investments in infrastructure development made by government. According to him, government has changed its strategy in construction because while these investments had been made for import substitution until 1980s, it has started to be invested for the use of environmental construction.

Apart from infrastructural investments, the third stage of the period after 1980 has also witnessed the significant residential construction investments, and both public and private sector has quite significant part in this growth. As a result of these activities, the number of construction and occupancy permits has started to increase and the industry had a distinct growth period between 1982 and 1988. During that time the portion of construction industry in GDP has also increased from 3,365,000 TL to 5,452,000 TL. Also the average growth rate of the industry during that period has been calculated as 13.74%.

After that period, because of the economic crisis in 2001 and the political imbalance in Middle East, Turkish construction industry was negatively affected until the new growth period of 2002-2007.

In 2007, the industry has reached its peak point in terms of portion in GDP as 6,573,647 TL and the average of the growth rate of construction industry for this period was observed as 11.55%, however, the global financial crisis has stopped this growth in 2008 and the unemployment rate has reached and peaked at 16.1%.

Although construction industry has been affected negatively by the global crisis, the recovery was observable after the third quarter of 2009 for the industry following the decrease of inflation.

As it can be understood that the industry is sensitive to external factors both locally and globally. This sensitiveness is also observable for the activities of Turkish construction industry within the international construction market. For example, the first international construction activities have taken place in Libya for Turkish construction industry in 1972 and the following 8 years Libya was the major actor in international market by forming 72% of all international construction activities for Turkish contractors and companies, but over time its share has decreased because of political troubles and the civil war in 2011 and it has lost its position as being the major actor.

As for the indicators of construction industry in economy, it can be seen that the GDP and construction growth rates are following the similar path and reacting to economic crisis accordingly. In addition to that, the average share of construction in GDP is 4.58% between 1998 and 2014, while the value increases year by year according to data retrieved from Turkstat. Apart from that, the public and private sector expenditures on construction has an increasing trend after 1998 excluding the times of economic crisis.

It is also important to highlight that when the total unemployment rate has increased and reached its peak point in 2009 because of the global financial crisis, the employment rate in construction industry maintained its steady increase.

Because of these features of the industry stated above, the relationship between construction industry and economy has been

investigated by many researchers. Their findings showed that the relationship can change according to characteristics and the time span of the data.

In this study, this relationship is analyzed by 2 models using Toda and Yamamoto Augmented VAR model for Granger non-causality method.

The first model including the quarterly data for the years of 2000-2013 showed that both public and private construction amounts in GDP has long-term bidirectional causal relationship with GDP. Therefore, it can be said that there is a positive linkage among these variables and they trigger each other.

Another bidirectional causal relationship is found between public and private construction variables for long-term. This result states that their positive activities are encouraging each other to increase. Also, the short-term causality from private to public construction is apparent among these variables by impulse response option in VAR model with 3 quarters lag.

The second model seeks deeper linkage between construction industry and economy by covering residential, industrial and commercial construction data for both public and private sector.

The results indicate an important bidirectional causality between employment and public residential construction data which stands for the increase in employment can be caused by an increase in public residential construction activities and vice versa.

Apart from bidirectional linkages, several unidirectional causalities are detected from GDP to public residential, public commercial, private residential and private industrial construction data for long-

term stating that GDP triggers specific types of construction activities both public and private sector.

Lastly, another significant unidirectional causality is found from employment to private industrial construction data. It is showing that the increase of the total employment can prompt industrial construction activities.

In the light of these results of two models, we can state that the bidirectional causal relationship between construction industry and economy is getting weaker and turning into uni-directional causality from GDP to construction when we search for the specific construction activities. Therefore, it is observable that the policy of construction based development in economy is getting weaker and according to recent data, the developments in construction industry are not triggering the economic development.

Since there are limited amount of data available for this study and the focus was checking whether the causalities between total construction industry values and GDP are maintained for specific type of construction activities or not, some relationships could not be included in this study and they are left for future possible studies. For instance, a panel analysis can be conducted regarding this relationship or some other industries such as energy can be included to the model. Also, by gathering data from several developing countries this causality can be searched to observe validity of Bon curve.

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APPENDICES

Appendix A. DETAILS OF MODEL 1

Data used in model

Quarter	GDP (thousands TL)	LGDP	Employment (thousands person)	LEmployment
2000Q1	15,217,908	23.446	19,856	16.804
2000Q2	17,269,135	23.572	22,347	16.922
2000Q3	21,019,481	23.769	22,796	16.942
2000Q4	18,929,875	23.664	21,153	16.867
2001Q1	15,419,915	23.459	20,149	16.819
2001Q2	16,173,158	23.507	22,231	16.917
2001Q3	19,650,704	23.701	23,038	16.953
2001Q4	17,065,575	23.560	20,704	16.846
2002Q1	15,469,977	23.462	19,387	16.780
2002Q2	17,214,452	23.569	21,975	16.905
2002Q3	20,876,687	23.762	22,833	16.944
2002Q4	18,958,715	23.665	21,658	16.891
2003Q1	16,716,746	23.540	20,244	16.823
2003Q2	17,898,517	23.608	21,696	16.893
2003Q3	21,774,718	23.804	22,411	16.925
2003Q4	19,948,211	23.716	20,811	16.851
2004Q1	18,380,247	23.634	19,902	16.806
2004Q2	20,035,372	23.721	22,188	16.915
2004Q3	23,528,095	23.881	22,874	16.945
2004Q4	21,541,877	23.793	21,870	16.901
2005Q1	19,947,283	23.716	18,988	16.759
2005Q2	21,577,563	23.795	20,597	16.841
2005Q3	25,323,570	23.955	20,740	16.848
2005Q4	23,651,314	23.887	20,057	16.814
2006Q1	21,133,291	23.774	18,944	16.757
2006Q2	23,678,188	23.888	20,873	16.854
2006Q3	26,916,390	24.016	21,222	16.870
2006Q4	25,010,451	23.943	20,695	16.845
2007Q1	22,844,200	23.852	19,688	16.795
2007Q2	24,581,028	23.925	21,321	16.875

2007Q3	27,772,167	24.047	21,525	16.885
2007Q4	26,057,230	23.984	20,466	16.834
2008Q1	24,445,513	23.920	19,864	16.804
2008Q2	25,226,375	23.951	21,842	16.899
2008Q3	28,009,692	24.056	22,068	16.910
2008Q4	24,240,150	23.911	20,999	16.860
2009Q1	20,842,792	23.760	19,779	16.800
2009Q2	23,267,231	23.870	21,455	16.881
2009Q3	27,233,060	24.028	22,108	16.911
2009Q4	25,660,031	23.968	21,741	16.895
2010Q1	23,467,330	23.879	21,267	16.873
2010Q2	25,692,251	23.969	23,055	16.953
2010Q3	28,669,613	24.079	23,195	16.959
2010Q4	28,056,450	24.057	22,854	16.945
2011Q1	26,382,817	23.996	22,802	16.942
2011Q2	28,082,510	24.058	24,445	17.012
2011Q3	31,176,687	24.163	24,884	17.030
2011Q4	29,532,710	24.109	24,267	17.005
2012Q1	27,196,829	24.026	23,338	16.966
2012Q2	28,854,662	24.085	25,282	17.046
2012Q3	31,643,556	24.178	25,367	17.049
2012Q4	29,929,973	24.122	25,291	17.046
2013Q1	28,047,894	24.057	24,546	17.016
2013Q2	30,204,750	24.131	26,130	17.079
2013Q3	33,005,549	24.220	25,960	17.072
2013Q4	31,298,268	24.167	25,443	17.052

Quarter	Private Construction (thousands TL)	LPrivate Construction	Public Construction (thousands TL)	LPublic Construction
2000Q1	1,119,354	20.836	471,931	19.972
2000Q2	971,370	20.694	739,299	20.421
2000Q3	1,129,347	20.845	701,225	20.368
2000Q4	1,288,225	20.976	685,497	20.346
2001Q1	1,041,870	20.764	537,249	20.102
2001Q2	880,209	20.596	604,418	20.220
2001Q3	864,126	20.577	575,650	20.171
2001Q4	928,041	20.649	476,263	19.981
2002Q1	1,002,967	20.726	465,876	19.959
2002Q2	983,944	20.707	588,269	20.192
2002Q3	1,096,200	20.815	655,936	20.301

2002Q4	1,294,941	20.982	535,144	20.098
2003Q1	1,269,295	20.962	347,346	19.666
2003Q2	1,151,325	20.864	520,500	20.070
2003Q3	1,233,150	20.933	577,878	20.175
2003Q4	1,381,429	21.046	530,206	20.089
2004Q1	1,495,435	21.126	322,124	19.590
2004Q2	1,409,199	21.066	484,595	19.999
2004Q3	1,521,071	21.143	535,526	20.099
2004Q4	1,608,555	21.199	504,875	20.040
2005Q1	1,561,240	21.169	440,191	19.903
2005Q2	1,489,184	21.121	600,774	20.214
2005Q3	1,646,761	21.222	625,029	20.253
2005Q4	1,795,332	21.308	582,040	20.182
2006Q1	1,816,706	21.320	472,596	19.974
2006Q2	1,847,073	21.337	648,716	20.290
2006Q3	2,026,019	21.429	677,326	20.334
2006Q4	2,122,248	21.476	682,869	20.342
2007Q1	2,077,976	21.455	493,720	20.017
2007Q2	1,985,988	21.409	696,458	20.361
2007Q3	2,068,478	21.450	767,718	20.459
2007Q4	2,164,432	21.495	636,322	20.271
2008Q1	1,940,024	21.386	579,743	20.178
2008Q2	1,805,631	21.314	776,469	20.470
2008Q3	1,809,183	21.316	779,220	20.474
2008Q4	1,714,979	21.263	733,892	20.414
2009Q1	1,512,364	21.137	567,221	20.156
2009Q2	1,313,260	20.996	774,474	20.468
2009Q3	1,344,245	21.019	820,103	20.525
2009Q4	1,510,538	21.136	804,048	20.505
2010Q1	1,587,104	21.185	685,999	20.346
2010Q2	1,585,650	21.184	944,400	20.666
2010Q3	1,699,816	21.254	954,319	20.676
2010Q4	1,812,504	21.318	948,091	20.670
2011Q1	1,923,577	21.377	693,353	20.357
2011Q2	1,910,870	21.371	931,594	20.652
2011Q3	1,931,126	21.381	996,783	20.720
2011Q4	2,034,149	21.433	877,333	20.592
2012Q1	1,994,180	21.413	673,708	20.328
2012Q2	1,868,118	21.348	966,421	20.689
2012Q3	1,914,030	21.372	1,000,665	20.724
2012Q4	2,015,594	21.424	956,009	20.678
2013Q1	1,898,647	21.364	996,698	20.720

2013Q2	1,885,618	21.357	1,215,275	20.918
2013Q3	1,985,225	21.409	1,223,618	20.925
2013Q4	1,969,700	21.401	1,248,598	20.945

Augmented Dickey Fuller Unit Root Test Results

Differences of Variables	T-Stat Value	5% Value	10% Value	P Value	Test Type
LEmployment	-1.492	-3.508	-3.184	0.818	Trend and Intercept
	0.902	-1.948	-1.612	0.899	None
DLEmployment	-2.338	-3.510	-3.185	0.406	Trend and Intercept
	-1.075	-1.947	-1.612	0.251	None
D2LEmployment	-8.063	-3.508	-3.184	0.000	Trend and Intercept
	-8.202	-1.947	-1.612	0.000	None
LGDP	-3.262	-3.500	-3.180	0.084	Trend and Intercept
	2.479	-1.947	-1.613	0.996	None
DLGDP	-3.457	-3.502	-3.181	0.055	Trend and Intercept
	-2.012	-1.947	-1.613	0.043	None
D2LGDP	-21.331	-3.500	-3.180	0.000	Trend and Intercept
	-21.781	-1.947	-1.613	0.000	None
LPrivate	-2.212	-3.499	-3.179	0.473	Trend and Intercept
	0.613	-1.947	-1.613	0.846	None
DLPrivate	-3.114	-3.499	-3.179	0.114	Trend and Intercept
	-3.094	-1.947	-1.613	0.002	None
D2LPrivate	-7.988	-3.500	-3.180	0.000	Trend and Intercept
	-8.117	-1.947	-1.613	0.000	None
LPublic	-3.095	-3.500	-3.180	0.118	Trend and Intercept
	1.194	-1.947	-1.613	0.938	None
DLPublic	-4.486	-3.500	-3.180	0.003	Trend and Intercept

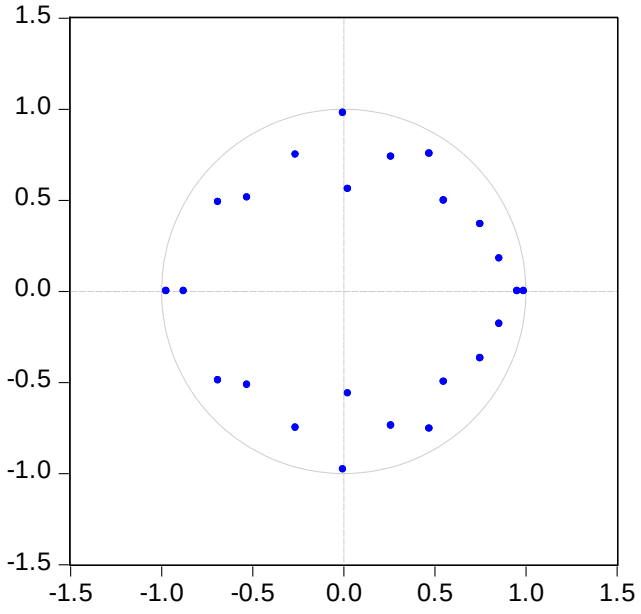
	-3.294	-1.947	-1.613	0.001	None
D2LPublic	-8.630	-3.502	-3.181	0.000	Trend and Intercept
	-8.803	-1.947	-1.613	0.000	None

VAR Lag Order Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	158.6958	NA	2.73e-08	-6.066504	-5.914988	-6.008605
1	280.8406	220.3395	4.25e-10	-10.22904	-9.471464	-9.939550
2	345.6016	106.6652	6.36e-11	-12.14124	-10.77760	-11.62015
3	405.3766	89.07648	1.18e-11	-13.85791	-11.88820	-13.10522
4	439.8933	46.02224*	6.06e-12*	-14.58405*	-12.00828*	-13.59977*
5	450.2290	12.15964	8.38e-12	-14.36192	-11.18009	-13.14605

AR Roots Graph

Inverse Roots of AR Characteristic Polynomial



Autocorrelation LM Test for VAR

Lags	LM-Stat	Prob
1	12.62509	0.6999
2	21.15830	0.1725
3	12.16786	0.7323
4	37.49069	0.0018
5	10.81004	0.8211
6	11.03667	0.8072
7	17.25488	0.3693
8	21.59269	0.1568
9	11.98590	0.7449
10	13.94079	0.6031
11	13.84419	0.6103
12	14.91027	0.5312

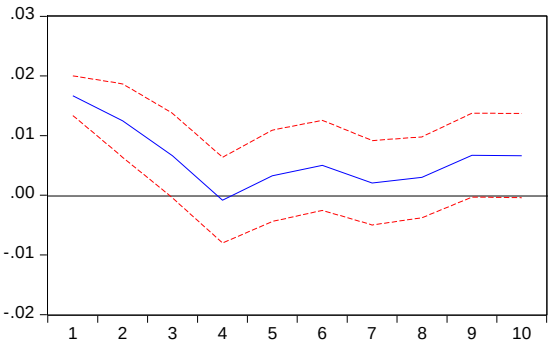
Wald test results

Dependent Variables	**Independent Variables**	**F-Stats**
Employment	GDP (-1,-2,-3,-4)	0.0002
	Private C. (-1,-2,-3,-4)	0.0291
	Public C. (-1,-2,-3,-4)	0.5569
GDP	Employment (-1,-2,-3,-4)	0.0000
	Private C. (-1,-2,-3,-4)	0.0000
	Public C. (-1,-2,-3,-4)	0.0034
Private Construction	Employment (-1,-2,-3,-4)	0.2731
	GDP (-1,-2,-3,-4)	0.0000
	Public (-1,-2,-3,-4)	0.0422
Public Construction	Employment (-1,-2,-3,-4)	0.1316
	GDP (-1,-2,-3,-4)	0.0014
	Private (-1,-2,-3,-4)	0.0024

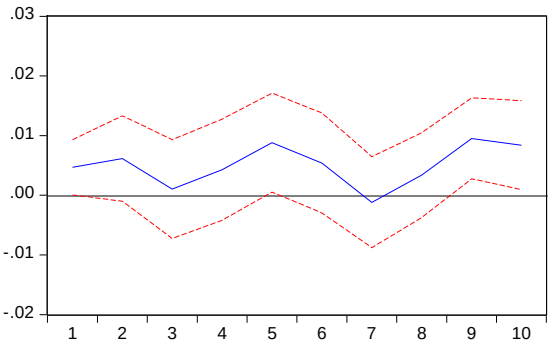
Impulse Response Analysis

Response to Generalized One S.D. Innovations ± 2 S.E.

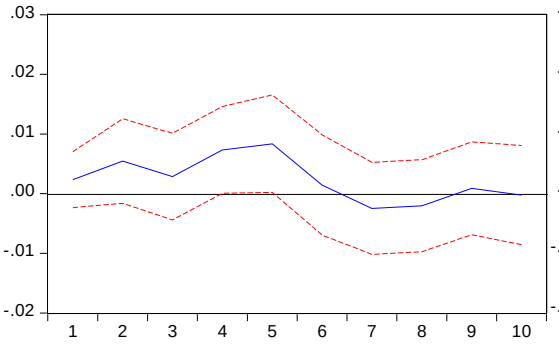
Response of EMPLOYMENT to EMPLOYMENT



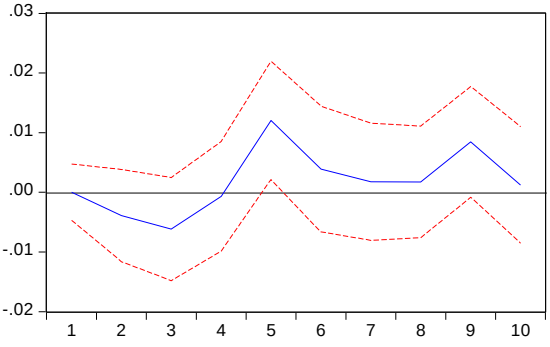
Response of EMPLOYMENT to GDP



Response of EMPLOYMENT to PRIVATE

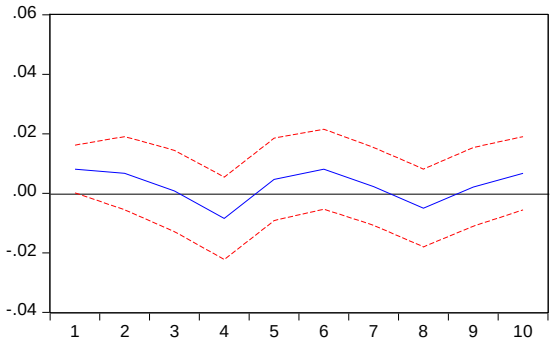


Response of EMPLOYMENT to PUBLIC

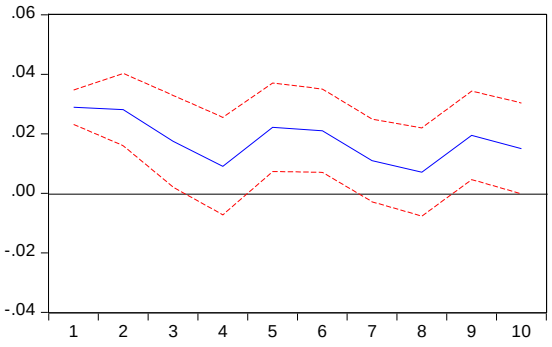


Response to Generalized One S.D. Innovations ± 2 S.E.

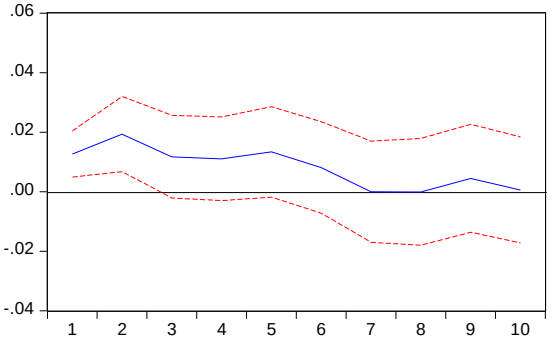
Response of GDP to EMPLOYMENT



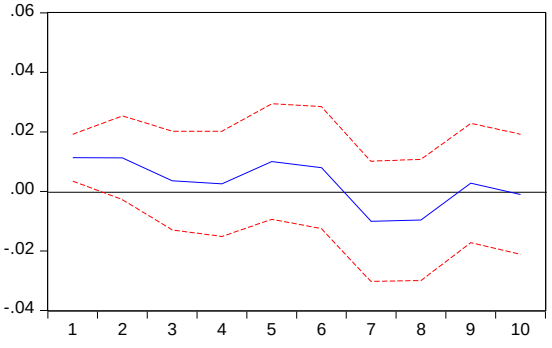
Response of GDP to GDP

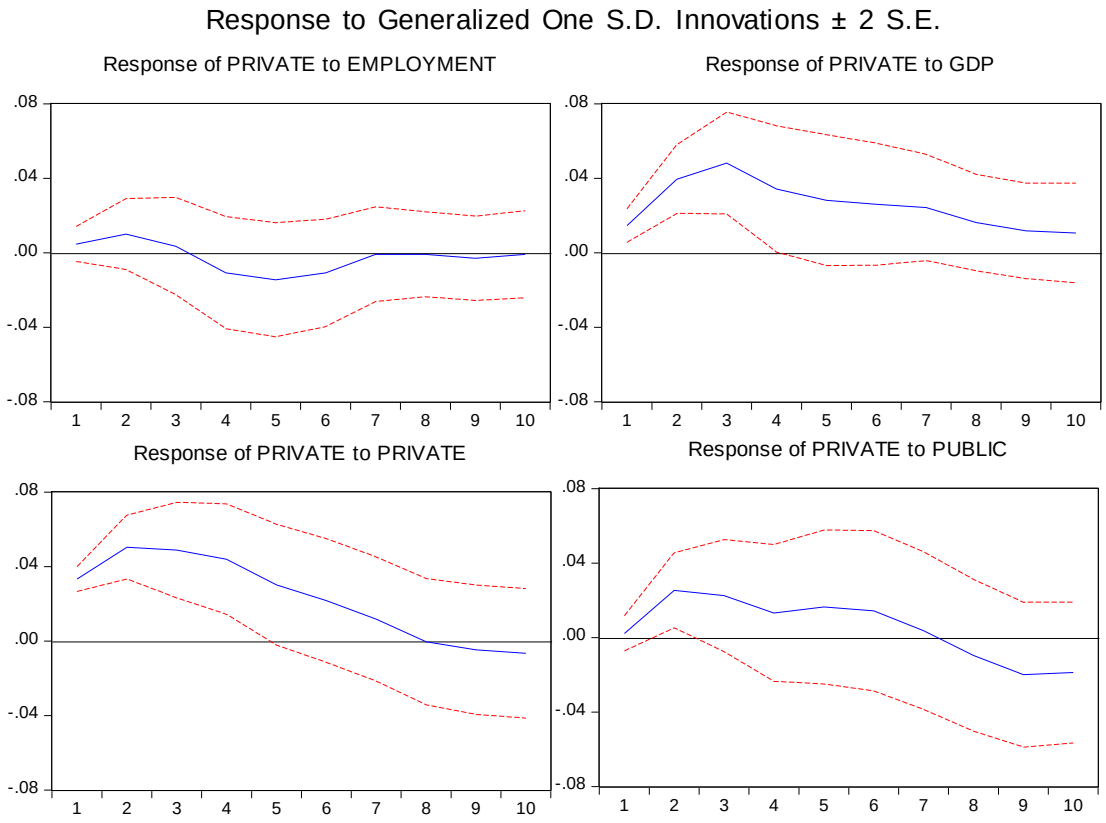


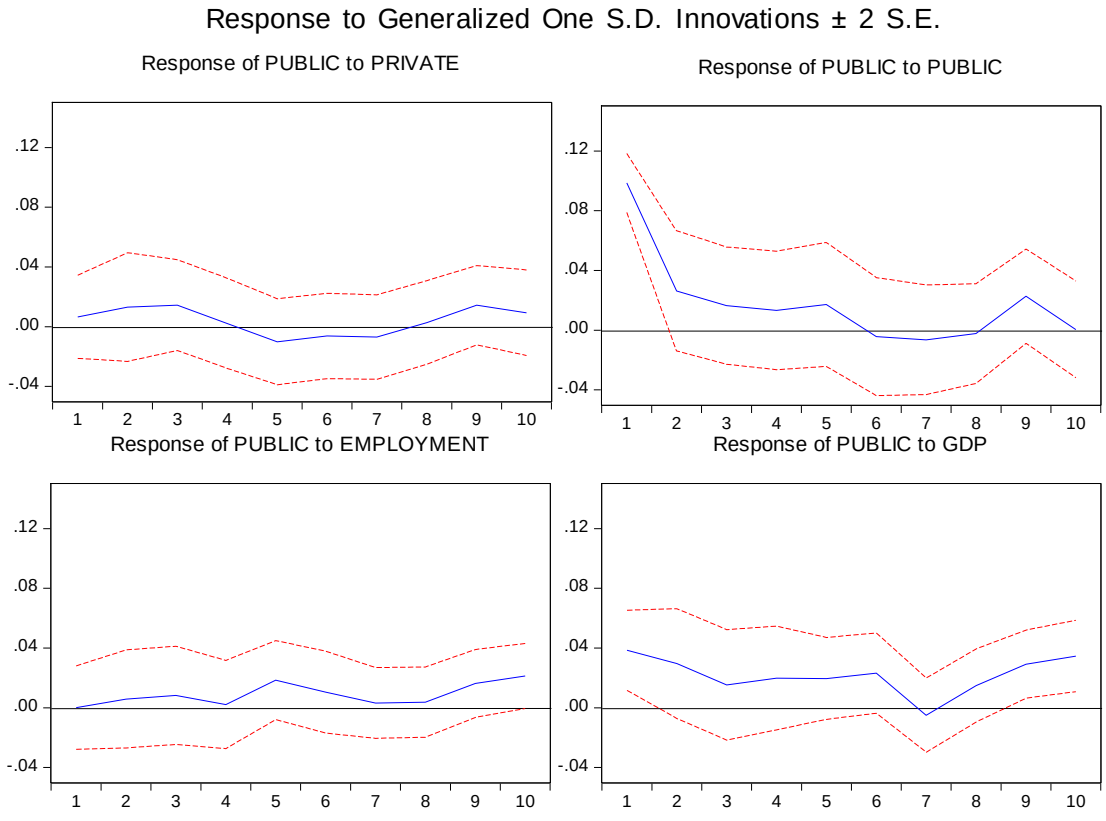
Response of GDP to PRIVATE



Response of GDP to PUBLIC




Response to Generalized One S.D. Innovations ± 2 S.E.
Response of PRIVATE to EMPLOYMENT
Response of PRIVATE to GDP
Response of PRIVATE to PRIVATE
Response of PRIVATE to PUBLIC
.08
.04
.00
-.04
-.08
1 2 3 4 5 6 7 8 9 10


Response to Generalized One S.D. Innovations ± 2 S.E.
Response of PUBLIC to PRIVATE
Response of PUBLIC to PUBLIC
Response of PUBLIC to EMPLOYMENT
Response of PUBLIC to GDP
.12
.08
.04
.00
-.04
1 2 3 4 5 6 7 8 9 10

Appendix B. DETAILS OF Model 2

Data used in Model

Quarter	GDP (thousands TL)	LGDP	Employment (thousands person)	LEmployment
2002Q1	15,469,977	23.462	19,387	16.780
2002Q2	17,214,452	23.569	21,975	16.905
2002Q3	20,876,687	23.762	22,833	16.944
2002Q4	18,958,715	23.665	21,658	16.891
2003Q1	16,716,746	23.540	20,244	16.823
2003Q2	17,898,517	23.608	21,696	16.893
2003Q3	21,774,718	23.804	22,411	16.925
2003Q4	19,948,211	23.716	20,811	16.851
2004Q1	18,380,247	23.634	19,902	16.806
2004Q2	20,035,372	23.721	22,188	16.915
2004Q3	23,528,095	23.881	22,874	16.945
2004Q4	21,541,877	23.793	21,870	16.901
2005Q1	19,947,283	23.716	18,988	16.759
2005Q2	21,577,563	23.795	20,597	16.841
2005Q3	25,323,570	23.955	20,740	16.848
2005Q4	23,651,314	23.887	20,057	16.814
2006Q1	21,133,291	23.774	18,944	16.757
2006Q2	23,678,188	23.888	20,873	16.854
2006Q3	26,916,390	24.016	21,222	16.870
2006Q4	25,010,451	23.943	20,695	16.845
2007Q1	22,844,200	23.852	19,688	16.795
2007Q2	24,581,028	23.925	21,321	16.875
2007Q3	27,772,167	24.047	21,525	16.885
2007Q4	26,057,230	23.984	20,466	16.834
2008Q1	24,445,513	23.920	19,864	16.804
2008Q2	25,226,375	23.951	21,842	16.899
2008Q3	28,009,692	24.056	22,068	16.910
2008Q4	24,240,150	23.911	20,999	16.860
2009Q1	20,842,792	23.760	19,779	16.800
2009Q2	23,267,231	23.870	21,455	16.881
2009Q3	27,233,060	24.028	22,108	16.911
2009Q4	25,660,031	23.968	21,741	16.895
2010Q1	23,467,330	23.879	21,267	16.873
2010Q2	25,692,251	23.969	23,055	16.953

2010Q3	28,669,613	24.079	23,195	16.959
2010Q4	28,056,450	24.057	22,854	16.945
2011Q1	26,382,817	23.996	22,802	16.942
2011Q2	28,082,510	24.058	24,445	17.012
2011Q3	31,176,687	24.163	24,884	17.030
2011Q4	29,532,710	24.109	24,267	17.005
2012Q1	27,196,829	24.026	23,338	16.966
2012Q2	28,854,662	24.085	25,282	17.046
2012Q3	31,643,556	24.178	25,367	17.049
2012Q4	29,929,973	24.122	25,291	17.046
2013Q1	28,047,894	24.057	24,546	17.016
2013Q2	30,204,750	24.131	26,130	17.079
2013Q3	33,005,549	24.220	25,960	17.072
2013Q4	31,298,268	24.167	25,443	17.052

Quarter	Private Commercial (thousands TL)	LPrivateC	Public Commercial (thousands TL)	LPublicC
2002Q1	70,321	18.069	38,687	17.471
2002Q2	148,546	18.816	66,787	18.017
2002Q3	154,968	18.859	42,142	17.557
2002Q4	233,361	19.268	48,928	17.706
2003Q1	124,266	18.638	94,865	18.368
2003Q2	276,959	19.439	40,229	17.510
2003Q3	260,921	19.380	65,991	18.005
2003Q4	335,588	19.631	33,388	17.324
2004Q1	437,804	19.897	25,490	17.054
2004Q2	314,446	19.566	10,742	16.190
2004Q3	404,592	19.818	10,681	16.184
2004Q4	452,130	19.929	264,788	19.394
2005Q1	349,043	19.671	40,936	17.527
2005Q2	490,378	20.011	108,197	18.499
2005Q3	706,611	20.376	78,345	18.177
2005Q4	833,803	20.541	225,258	19.233
2006Q1	523,868	20.077	98,360	18.404
2006Q2	1,155,622	20.868	138,572	18.747
2006Q3	1,252,360	20.948	264,397	19.393
2006Q4	1,130,195	20.846	366,257	19.719
2007Q1	830,054	20.537	77,666	18.168
2007Q2	1,487,823	21.121	338,408	19.640
2007Q3	1,454,461	21.098	186,143	19.042
2007Q4	1,356,042	21.028	171,744	18.961

2008Q1	749,422	20.435	343,161	19.654
2008Q2	1,886,600	21.358	472,026	19.972
2008Q3	1,298,758	20.985	299,377	19.517
2008Q4	1,072,809	20.793	174,119	18.975
2009Q1	1,361,677	21.032	262,702	19.386
2009Q2	1,133,640	20.849	130,506	18.687
2009Q3	490,792	20.011	96,105	18.381
2009Q4	745,770	20.430	268,051	19.407
2010Q1	699,057	20.365	206,588	19.146
2010Q2	1,342,310	21.018	366,212	19.719
2010Q3	860,150	20.573	271,497	19.419
2010Q4	2,451,508	21.620	528,462	20.085
2011Q1	1,147,774	20.861	306,725	19.541
2011Q2	965,033	20.688	384,531	19.767
2011Q3	1,549,367	21.161	326,573	19.604
2011Q4	1,680,944	21.243	413,366	19.840
2012Q1	1,101,909	20.820	1,875,128	21.352
2012Q2	1,795,230	21.308	952,557	20.675
2012Q3	1,491,475	21.123	482,477	19.994
2012Q4	1,729,014	21.271	537,909	20.103
2013Q1	1,144,087	20.858	696,562	20.362
2013Q2	1,674,276	21.239	507,565	20.045
2013Q3	1,900,504	21.365	405,562	19.821
2013Q4	2,321,978	21.566	608,984	20.227

Quarter	**Private Industrial (thousands TL)**	**LPrivateI**	**Public Industrial (thousands TL)**	**LPublicI**
2002Q1	104,642	18.466	5,658	15.549
2002Q2	230,410	19.255	4,563	15.333
2002Q3	201,064	19.119	6,210	15.642
2002Q4	342,238	19.651	2,142	14.577
2003Q1	210,777	19.166	4,130	15.234
2003Q2	296,931	19.509	810	13.605
2003Q3	366,029	19.718	2,256	14.629
2003Q4	534,875	20.097	18,407	16.728
2004Q1	654,857	20.300	856	13.660
2004Q2	400,475	19.808	157	11.963
2004Q3	552,393	20.130	4,356	15.287
2004Q4	657,095	20.303	16,223	16.602
2005Q1	432,767	19.886	2,215	14.610
2005Q2	656,534	20.302	9,534	16.070

2005Q3	704,477	20.373	7,525	15.834
2005Q4	801,044	20.501	38,285	17.461
2006Q1	450,299	19.925	19,271	16.774
2006Q2	1,060,817	20.782	20,382	16.830
2006Q3	1,016,937	20.740	1,287	14.068
2006Q4	1,097,375	20.816	25,601	17.058
2007Q1	865,921	20.579	1,797	14.401
2007Q2	1,310,893	20.994	14,329	16.478
2007Q3	989,695	20.713	39,080	17.481
2007Q4	1,736,507	21.275	12,661	16.354
2008Q1	918,293	20.638	18,932	16.756
2008Q2	1,161,193	20.873	9,788	16.097
2008Q3	839,088	20.548	24,947	17.032
2008Q4	681,127	20.339	20,114	16.817
2009Q1	854,604	20.566	19,139	16.767
2009Q2	286,027	19.471	23,119	16.956
2009Q3	310,478	19.554	26,401	17.089
2009Q4	405,342	19.820	16,623	16.626
2010Q1	460,875	19.949	103,811	18.458
2010Q2	520,888	20.071	39,258	17.486
2010Q3	517,042	20.064	18,455	16.731
2010Q4	1,998,878	21.416	32,042	17.282
2011Q1	544,758	20.116	18,041	16.708
2011Q2	924,497	20.645	18,215	16.718
2011Q3	862,798	20.576	30,458	17.232
2011Q4	1,211,919	20.915	40,298	17.512
2012Q1	730,443	20.409	32,163	17.286
2012Q2	1,291,875	20.979	37,410	17.437
2012Q3	932,956	20.654	32,177	17.287
2012Q4	1,106,502	20.824	113,845	18.550
2013Q1	1,140,719	20.855	40,406	17.514
2013Q2	1,440,343	21.088	35,843	17.395
2013Q3	1,421,103	21.075	30,906	17.246
2013Q4	1,125,779	20.842	44,898	17.620

Quarter	Private Residential (thousands TL)	LPrivateR	Public Residential (thousands TL)	LPublicR
2002Q1	573,915	20.168	32,763	17.305
2002Q2	1,349,011	21.023	73,752	18.116
2002Q3	1,360,816	21.031	54,036	17.805
2002Q4	1,824,170	21.324	48,193	17.691

2003Q1	1,045,450	20.768	44,714	17.616
2003Q2	1,861,272	21.344	66,043	18.006
2003Q3	2,254,673	21.536	209,760	19.161
2003Q4	3,025,376	21.830	58,822	17.890
2004Q1	2,428,976	21.611	124,233	18.638
2004Q2	3,321,626	21.924	155,313	18.861
2004Q3	4,078,271	22.129	101,965	18.440
2004Q4	5,231,424	22.378	598,403	20.210
2005Q1	3,520,176	21.982	465,031	19.958
2005Q2	6,043,499	22.522	1,198,301	20.904
2005Q3	6,997,916	22.669	485,320	20.000
2005Q4	9,897,344	23.015	621,234	20.247
2006Q1	5,841,155	22.488	587,476	20.191
2006Q2	11,434,898	23.160	393,893	19.792
2006Q3	9,028,157	22.924	544,158	20.115
2006Q4	10,484,380	23.073	409,868	19.831
2007Q1	7,254,491	22.705	498,860	20.028
2007Q2	12,112,396	23.217	555,609	20.136
2007Q3	9,704,280	22.996	915,908	20.635
2007Q4	9,857,364	23.011	721,748	20.397
2008Q1	7,910,804	22.791	1,194,041	20.901
2008Q2	11,345,223	23.152	1,419,178	21.073
2008Q3	8,657,357	22.882	560,692	20.145
2008Q4	7,313,778	22.713	1,227,853	20.928
2009Q1	8,860,283	22.905	1,060,067	20.782
2009Q2	7,865,936	22.786	649,753	20.292
2009Q3	7,760,713	22.772	687,050	20.348
2009Q4	11,030,747	23.124	1,408,148	21.065
2010Q1	8,706,372	22.887	1,232,869	20.933
2010Q2	12,190,706	23.224	1,818,487	21.321
2010Q3	12,518,488	23.250	1,602,876	21.195
2010Q4	36,237,457	24.313	1,475,973	21.112
2011Q1	8,120,449	22.818	533,857	20.096
2011Q2	13,421,376	23.320	1,483,163	21.117
2011Q3	13,718,668	23.342	1,250,328	20.947
2011Q4	20,023,902	23.720	1,405,023	21.063
2012Q1	12,355,219	23.237	2,384,519	21.592
2012Q2	20,932,327	23.764	2,549,523	21.659
2012Q3	15,082,719	23.437	1,269,657	20.962
2012Q4	21,059,964	23.771	1,438,558	21.087
2013Q1	15,411,017	23.458	1,024,878	20.748
2013Q2	23,920,259	23.898	2,905,526	21.790

2013Q3	18,806,504	23.657	1,701,615	21.255
2013Q4	24,002,926	23.901	1,707,155	21.258

Augmented Dickey Fuller Unit Root Test Results

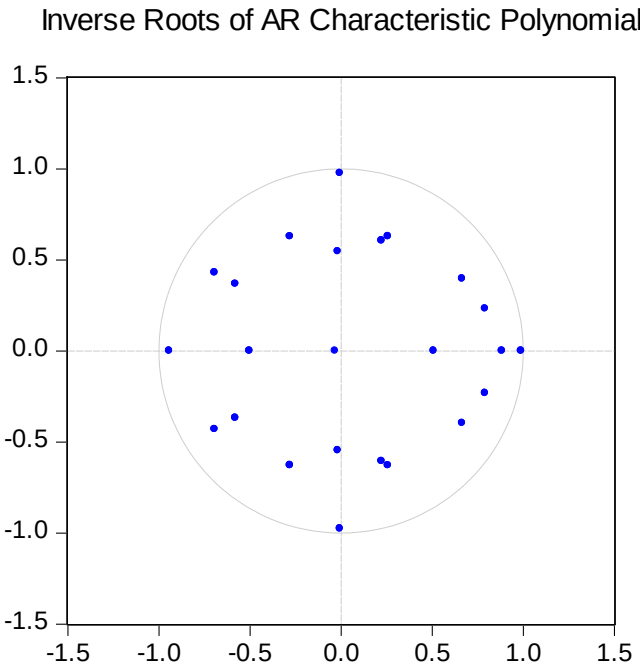
Differences of Variables	T-Stat Value	5% Value	10% Value	P Value	Test Type
LEmployment	-1.492	-3.508	-3.184	0.818	Trend and Intercept
	0.902	-1.948	-1.612	0.899	None
DLEmployment	-2.338	-3.510	-3.185	0.406	Trend and Intercept
	-1.075	-1.947	-1.612	0.251	None
D2LEmployment	-8.063	-3.508	-3.184	0.000	Trend and Intercept
	-8.202	-1.947	-1.612	0.000	None
LGDP	-3.262	-3.500	-3.180	0.084	Trend and Intercept
	2.479	-1.947	-1.613	0.996	None
DLGDP	-3.457	-3.502	-3.181	0.055	Trend and Intercept
	-2.012	-1.947	-1.613	0.043	None
D2LGDP	-21.331	-3.500	-3.180	0.000	Trend and Intercept
	-21.781	-1.947	-1.613	0.000	None
LPrivateC	-4.482	-3.508	-3.184	0.004	Trend and Intercept
	1.594	-1.948	-1.612	0.971	None
DLPrivateC	-11.927	-3.511	-3.185	0.000	Trend and Intercept
	-11.581	-1.948	-1.612	0.000	None
D2LPrivateC	-10.940	-3.518	-3.190	0.000	Trend and Intercept
	-11.225	-1.949	-1.612	0.000	None
LPublicC	-5.443	-3.508	-3.184	0.000	Trend and Intercept
	0.802	-1.948	-1.612	0.882	None
DLPublicC	-5.641	-3.515	-3.188	0.000	Trend and Intercept
	-11.390	-1.948	-1.612	0.000	None

D2LPublicC	-8.500	-3.518	-3.190	0.000	Trend and Intercept
	-8.724	-1.949	-1.612	0.000	None
LPrivateI	-2.519	-3.511	-3.185	0.318	Trend and Intercept
	1.089	-1.948	-1.612	0.926	None
DLPrivateI	-12.992	-3.511	-3.185	0.000	Trend and Intercept
	-12.932	-1.948	-1.612	0.000	None
D2LPrivateI	-8.970	-3.518	-3.190	0.000	Trend and Intercept
	-9.221	-1.949	-1.612	0.000	None
LPublicI	-6.728	-3.508	-3.184	0.000	Trend and Intercept
	0.750	-1.948	-1.612	0.873	None
DLPublicI	-7.024	-3.515	-3.188	0.000	Trend and Intercept
	-10.875	-1.948	-1.612	0.000	None
D2LPublicI	-6.673	-3.524	-3.193	0.000	Trend and Intercept
	-6.798	-1.949	-1.612	0.000	None
LPrivateR	-2.326	-3.518	-3.190	0.412	Trend and Intercept
	1.896	-1.949	-1.612	0.985	None
DLPrivateR	-8.655	-3.515	-3.188	0.000	Trend and Intercept
	-2.556	-1.949	-1.612	0.012	None
D2LPrivateR	-12.770	-3.518	-3.190	0.000	Trend and Intercept
	-13.124	-1.949	-1.612	0.000	None
LPublicR	-4.044	-3.508	-3.184	0.014	Trend and Intercept
	1.298	-1.948	-1.612	0.949	None
DLPublicR	-11.680	-3.511	-3.185	0.000	Trend and Intercept
	-11.474	-1.948	-1.612	0.000	None
D2LPublicR	-6.613	-3.518	-3.190	0.000	Trend and Intercept
	-6.784	-1.949	-1.612	0.000	None

VAR Lag Order Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-67.28070	NA	3.92e-09	3.345809	3.666993	3.465543
1	64.37129	210.6432	2.03e-10	0.339054	3.229714*	1.416663
2	157.5754	115.9874	7.25e-11	-0.958908	4.501227	1.076576
3	274.9779	104.3578*	1.53e-11*	-3.332353*	4.697258	-0.338995*

AR Roots Graph



Autocorrelation LM Test for VAR

Lags	LM-Stat	Prob
1	95.20302	0.0069
2	66.28097	0.3982
3	69.88843	0.2864
4	75.82909	0.1479
5	87.68667	0.0264
6	52.54571	0.8462
7	97.49798	0.0044
8	82.96630	0.0557
9	96.52339	0.0054
10	60.55832	0.5989
11	79.06711	0.0972
12	82.73893	0.0576

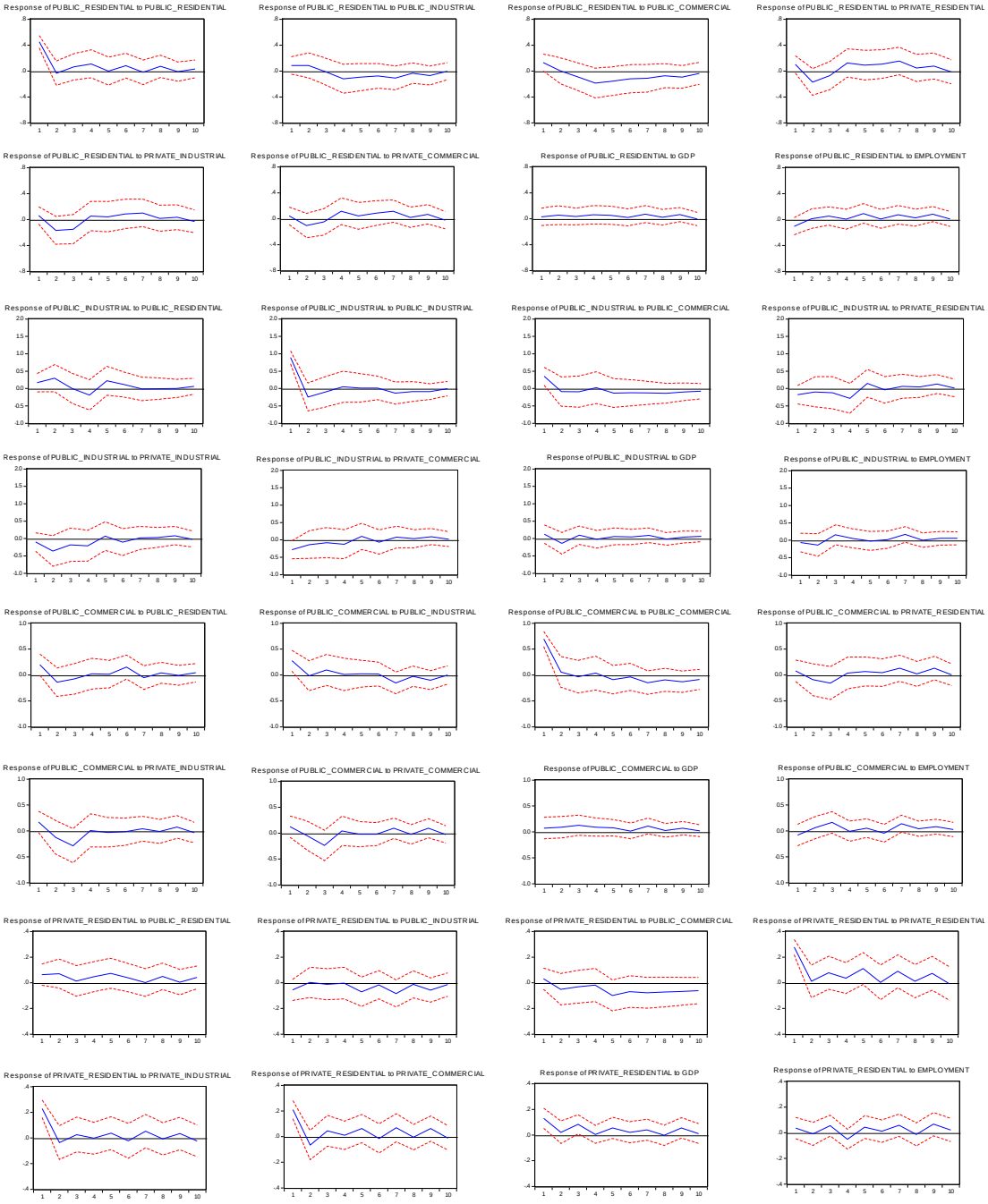
Wald test results

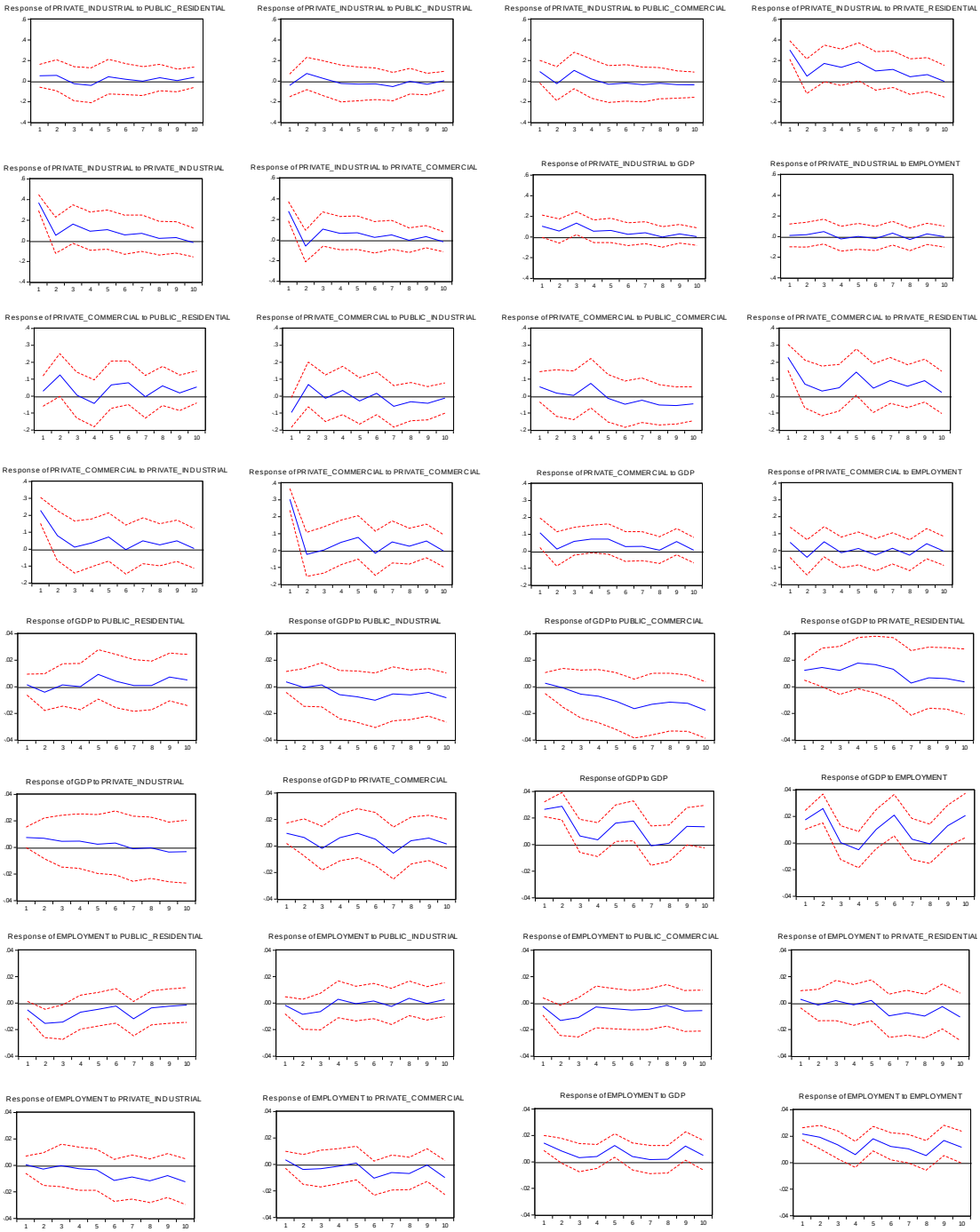
Dependent Variables	**Independent Variables**	**F-Stats**
Employment	Public R. (-1)	0.0180
	Public I. (-1)	0.1626
	Public C. (-1)	0.6222
	Private R. (-1)	0.1751
	Private I. (-1)	0.0437
	Private C. (-1)	0.3836
	GDP (-1)	0.0001
GDP	Public R. (-1)	0.4360
	Public I. (-1)	0.5755
	Public C. (-1)	0.7381
	Private R. (-1)	0.5584
	Private I. (-1)	0.5573
	Private C. (-1)	0.0604
	Employment (-1)	0.0000
Public Residential	Public I. (-1)	0.1940
	Public C. (-1)	0.4038
	Private R. (-1)	0.0634
	Private I. (-1)	0.1623
	Private C. (-1)	0.3410
	GDP (-1)	0.0000
	Employment (-1)	0.0021
Public Industrial	Public C. (-1)	0.7163

	Private R. (-1)	0.2516
	Private I. (-1)	0.0773
	Private C. (-1)	0.9643
	GDP (-1)	0.5429
	Employment (-1)	0.7650
	Public R. (-1)	0.1614
Public Commercial	Private R. (-1)	0.7898
	Private I. (-1)	0.5831
	Private C. (-1)	0.9230
	GDP (-1)	0.0137
	Employment (-1)	0.0632
	Public R. (-1)	0.0818
	Public I. (-1)	0.6283
Private Residential	Private I. (-1)	0.7990
	Private C. (-1)	0.0632
	GDP (-1)	0.0004
	Employment (-1)	0.3805
	Public R. (-1)	0.1836
	Public I. (-1)	0.3806
	Public C. (-1)	0.0637
Private Industrial	Private C. (-1)	0.1603
	GDP (-1)	0.0003
	Employment (-1)	0.0958
	Public R. (-1)	0.9954
	Public I. (-1)	0.6746
	Public C. (-1)	0.4686
	Private R. (-1)	0.4328
Private Commercial	GDP (-1)	0.1574
	Employment (-1)	0.4714
	Public R. (-1)	0.1733
	Public I. (-1)	0.3906
	Public C. (-1)	0.2168
	Private R. (-1)	0.7087
	Private I. (-1)	0.3062

Impulse Response Analysis

Response to Generalized One S.D. Innovations ± 2 S.E.




Response of PRIVATE_INDUSTRIAL to PUBLIC_RESIDENTIAL
Response of PRIVATE_INDUSTRIAL to PUBLIC_INDUSTRIAL
Response of PRIVATE_INDUSTRIAL to PUBLIC_COMMERCIAL
Response of PRIVATE_INDUSTRIAL to PRIVATE_RESIDENTIAL
Response of PRIVATE_INDUSTRIAL to PRIVATE_INDUSTRIAL
Response of PRIVATE_INDUSTRIAL to PRIVATE_COMMERCIAL
Response of PRIVATE_INDUSTRIAL to GDP
Response of PRIVATE_INDUSTRIAL to EMPLOYMENT
Response of PRIVATE_COMMERCIAL to PUBLIC_RESIDENTIAL
Response of PRIVATE_COMMERCIAL to PUBLIC_INDUSTRIAL
Response of PRIVATE_COMMERCIAL to PUBLIC_COMMERCIAL
Response of PRIVATE_COMMERCIAL to PRIVATE_RESIDENTIAL
Response of PRIVATE_COMMERCIAL to PRIVATE_INDUSTRIAL
Response of PRIVATE_COMMERCIAL to PRIVATE_COMMERCIAL
Response of PRIVATE_COMMERCIAL to GDP
Response of PRIVATE_COMMERCIAL to EMPLOYMENT
Response of GDP to PUBLIC_RESIDENTIAL
Response of GDP to PUBLIC_INDUSTRIAL
Response of GDP to PUBLIC_COMMERCIAL
Response of GDP to PRIVATE_RESIDENTIAL
Response of GDP to PRIVATE_INDUSTRIAL
Response of GDP to PRIVATE_COMMERCIAL
Response of GDP to GDP
Response of GDP to EMPLOYMENT
Response of EMPLOYMENT to PUBLIC_RESIDENTIAL
Response of EMPLOYMENT to PUBLIC_INDUSTRIAL
Response of EMPLOYMENT to PUBLIC_COMMERCIAL
Response of EMPLOYMENT to PRIVATE_RESIDENTIAL
Response of EMPLOYMENT to PRIVATE_INDUSTRIAL
Response of EMPLOYMENT to PRIVATE_COMMERCIAL
Response of EMPLOYMENT to GDP
Response of EMPLOYMENT to EMPLOYMENT

Appendix C. TURKISH SUMMARY

İnşaat sektörü ekonomik faaliyetler açısından çok büyük önem arz etmektedir. Sektörün yarattığı iş imkanları ve kendisine bağlı diğer alt sektörleri canlandırması özellikle ekonomisi gelişmekte olan ülkelerde ekonomik durgunluktan çıkış yolu olarak görülmekte ve sektöre büyük yatırımlar yapılmaktadır. Öyle ki, 2020 yılında dünyadaki toplam gayri safi yurtiçi hasıla'nın %11'ini kendi başına oluşturacağı öngörülmektedir. (Rider Levett Bucknall, 2009).

2009 yılında yapılan küresel bir çalışmaya göre dünyadaki toplam inşaat faaliyetlerinin %17.4'üne sahip olan ABD bu konuda zirvede yer alırken %13.7'lik paya sahip olan Çin ikinci sırada kendine yer bulabilmiştir, fakat çalışmanın ortaya koyduğu 2020 tahminlerinde ekonomisi gelişmekte olan ülkelerin artan inşaat aktiviteleri göz önüne alınarak Çin birinci sırada, 2009'da dokuzuncu sırada olan Hindistan ise üçüncü sırada öngörülüp ABD ikinci sıraya yerleştirilmiştir. (Rider Levett Bucknall, 2009). Bu araştırmanın da ortaya çıkardığı ekonomik düzeyine göre farklılaşmış ülkelerdeki inşaat sektörü gelişmeleri göz önüne alınarak Türk inşaat sektörünü detaylı bir şekilde incelemeden önce ekonomisi gelişmekte olan ve gelişmiş ülkelerdeki inşaat sektörü kısaca anlatılıp sektör yapılarına değinilmiştir.

Ekonomisi gelişmekte olan ülkelerdeki sektörel aktivitelerden bahsetmeden önce bu çalışmanın genel hatlarının çizilmesinde önemli rol oynayan Spence, Annez ve Buckley'in 2009 yılındaki araştırmalarında geçen önemli bir noktayı ifade etmek gerekir. Onların da vurguladığı gibi kentleşme ve büyüme birlikte hareket eder. Hiçbir ülke büyük miktarda kentlere göçün olmadığı bir

ortamda orta gelir seviyesine ulaşmamıştır. Bu yüzden Türk inşaat sektörünün analizinde ve diğer ülkelerdeki inşaat sektörü incelemelerinde kentleşme olgusu da dikkate alınacaktır.

Uluslararası Çalışma Örgütü'ne göre kazançların az ve işsizlik oranının yüksek olduğu ülkelerde var olan istihdamı makine gücü ile değiştirmenin hem sosyal hem de ekonomik açıdan anlamlı olmadığı, bu ülkelerde her türlü iş koluna gereksinim olduğu ve inşaat sektörünün bu gereksinimi karşılayabileceği ve hatta daha çok istihdam imkanları sağlayabileceği açıklanmıştır. (2001). Bu bilgilerin ışığında ekonomisi gelişmekte olan ülkelere baktığımızda sanayi devrimi ile tarımda makineleşmenin hem sosyal hem de ekonomik olarak negatif etkilerinin gözlemlendiği anlaşılmaktadır. Sanayi devrimi sonrasında tarımda istihdam azalmış ve pek çok insan çareyi kentlere göç etmekte bulmuştur. İnşaat sektörü ise kentlere göç eden bu insanlar için kendilerine kolaylıkla yer bulabilecekleri bir istihdam kaynağı olmuştur. Örnek olarak Birleşmiş Milletler'in verilerine göre Malezya'ya baktığımızda inşaat sektöründeki istihdamı 1970 yılında 91,000 ve toplam kırsal nüfus oranını %66.5 olarak görmekteyiz. 1980 yılında bu rakamlar sırasıyla 270,200 ve %58 olarak değişirken, 1990 yılında 423,900 ve %50.2 olarak kaydedilmiştir.

Ekonomisi gelişmekte olan ülkelerin çoğunluğunda görülen bu yüksek kentleşme oranı beraberinde altyapı, konut, ulaşım ve daha birçok ihtiyacı doğurmuştur. Her ne kadar bu ihtiyaçlar inşaat sektörü dahilinde karşılanmaya çalışılsa da ekonomisi gelişmekte olan ülkelerin yaşadığı bazı problemler sektör karşısında aşılması güç bariyerler olarak karşımıza çıkmaktadır.

İlk olarak kaynak ve vasıflı personel açısından yaşanan kapasite problemi bu ülkelerin sıradan inşaat aktivitelerini bile çoğu zaman tamamlamalarını engelleyecek duruma gelmiş ve dış kaynak kullanma ihtiyacını doğurmuştur. Bu durum Ofori'ye göre (2001) altyapının gelişmesine olanak sağlayıp, yerel şirketlere yeni işler sağlamış ve yabancı şirketlerin de varlığıyla oluşan rekabeti yüksek market sayesinde projelerin giderleri azaltılmıştır.

Diğer problemler ise ülkelerin ekonomik istikrarının olmaması sebebiyle sektöre yatırımların dönem dönem kısılması, yüksek kentleşme oranı ile kentlere yapılan yatırımların çoğu zaman aynı doğrultuda sağlanamamasından kaynaklanan yoksulluğun artması, araştırma geliştirme eksikliği ve inşaat projelerindeki liderlik eksikliğinden kaynaklanan düşük kaliteli üretim ve uluslararası çalışma ortamının etkili bir şekilde kullanılamaması olarak belirtilebilir.

Bunların dışında sektör dahilinde yaşanan yolsuzluklar, kaynakların yanlış kullanımı, kötü hammadde kullanımı ile ortaya çıkan dayanıksız yapılar, 2008 yılındaki global ekonomik kriz ve özellikle Çin'de gözlemlenen aşırı konut üretimi ile oluşturulan konut balonu inşaat sektörü açısından zorluklar yaşatmaktadır.

Tüm bu zor koşullara rağmen Çin dünyada büyük bir aktör olarak kendini göstermiş ve yaptığı yatırımlarla önümüzdeki yıllarda da üst sıralarda olacağını göstermiştir.

Bu ülkelerdeki inşaat sektörü ve ekonomi arasındaki nedensellik ilişkisini araştıran çalışmalara baktığımızda ise sonuçların karşılıklı yada tek taraflı etkileşim olarak ikiye ayrıldığını görmekteyiz.

Yapılan çalışmalar Granger nedensellik modeli kurularak oluşturulmuş ve farklı ülkeler için farklı zaman dilimleri ve farklı veri türleri kullanılmıştır.

Khan 2008'de Pakistan için yaptığı çalışmasında 55 yıllık verileri kullanarak inşaat sektöründen ekonomik gelişmeye doğru bir nedensellik çıkarımına ulaştığını belirtirken, Nunes ve Balsa (2011) tam tersi yönde bir nedenselliğe 38 yıllık verileri kullanarak Cape Verde örneği için yaptıkları çalışmada ulaşmışlardır.

Siqi ve Honyu (2004), Lean (2001), Hosein ve Lewis (2005), Alkowaish (2015) ve daha birçok araştırmacının ulaştığı sonuçta ise inşaat sektörü ve ekonomik gelişme arasında karşılıklı bir nedensellik saptandığını görmekteyiz.

Dünyadaki inşaat marketinde Çin her ne kadar önemli bir yer tutsa da ekonomisi gelişmiş ülkelerdeki inşaat aktiviteleri de toplamda oldukça fazla bir paya denk gelmektedir, fakat bu ülkelerdeki inşaat sektörünün büyüme hızı ekonomisi gelişmekte olan ülkelerin hızından fazla değildir. (Garcia, 2011, p.22).

Ekonomisi gelişmiş ülkelerden Avustralya'ya baktığımızda inşaat sektöründeki istihdam verimliliğinin %1 artmasının ülkenin gayri safi yurtiçi hasılası'nı 1.252 milyar dolar kadar arttırdığına ulaşılmış (PWC, 2013) ve toplam istihdamın %9'unu içerip 1 milyondan fazla insana iş imkanı sağladığı için sektörün öneminin altı çizilmiştir. (Ai GROUP, 2015).

İnşaat sektörünün ekonomisi gelişmiş ülkelerde yaşadığı sorunlardan en büyüğü 2007'de Amerika'da ortaya çıkan ve kısa süre sonra tüm dünyaya yayılan küresel ekonomik kriz olarak görülmektedir. Konut sahipliği için sağlanan ucuz mortgage

kredileri gayrimenkul sektöründe balon yaratmış ve kredilerini geri ödeme imkanı olmayanların bile ev sahibi olmak için bankalara borçlanmasına neden olmuştur. (Keeley and Love, 2010). Zamanla konut fiyatları düşmüş ve krediler geri ödenemeyip Avrupa bankalarından para transferi gerçekleştirilmesiyle kriz Avrupa'ya da taşınmıştır. (Brauers et al, 2013).

Amerikan inşaat sektörü harcamaları yaşanan bu kriz sonrası hızlı bir düşüş göstermiş, ekonomik aktiviteler yavaşlamış ve sektörde iyileşme ancak 2015 yılında görülebilmiştir.

Sektör yatırımları dışında istihdam da küresel krizden etkilenmiş ve Uluslararası Çalışma Örgütü'ne göre dünyada yaklaşık 5 milyon inşaat sektörü çalışanı 2008 yılında işten çıkarılmıştır. Ülkeler bazında ise istihdamdaki en büyük düşüş %25 ile İspanya'da yaşanmıştır. (OECD, 2010).

Konut yatırımlarının bu krizden kurtulmak adına önemli bir yer tuttuğu gözlenmiştir. İngiltere'deki konut sektöründe yaşanan %3.9'luk büyüme, %10'luk özel sektör yatırımlarının artışı ile en yüksek iyileşmelerden biri olarak dikkat çekmektedir. Buna karşılık İtalya'daki 2017 için olan gelişme tahminleri bile halen 2007 rakamlarından %27 düşüktür. (CECE).

Ekonomisi gelişmiş ülkeler bazında yapılan nedensellik analizlerine baktığımızda ise yıllar içerisinde farklı sonuçlar elde edilen pek çok çalışma görmekteyiz. Chiang, Tao ve Wong (2015) ile birlikte Lean (2001) ve Alkowaish (2015) yaptıkları Granger nedensellik modelleri sonucunda inşaat sektörü ile gayri safi yurtiçi hasıla arasında karşılıklı etkileşim olduğu sonucuna varırken, birçok araştırmacı ise tek yönlü ilişkinin olduğunu belirmiştir. Bunlara örnek olarak inşaat sektöründen Tayvan gayri safi yurtiçi hasılasına

doğru tek yönlü nedensellik olduğunu belirten Chang ve Nieh (2004) verilebilir.

Türkiye örneğine baktığımızda da inşaat sektörünün ekonomide önemli bir rol oynadığını görmekteyiz. Kamu sektörünce sürdürülen inşaat faaliyetlerinde TOKİ konut projeleri, kentsel dönüşüm uygulamaları ve büyük ölçekli altyapı çalışmaları dikkati çekerken özel sektörde ise büyük ölçekli konut projeleri ve AVM inşaatları son dönemlerde daha çok ön plana çıkmıştır. Bunların dışında 1972'de Libyada başlayan uluslararası inşaat faaliyetleri Türk ekonomisi için önemli bir girdi kaynağı olmuş ve dünyanın en iyi 250 inşaat şirketinin girebildiği "Engineering News Record Magazine" dergisinin yayınlanan 2014 yılı listesine 42 Türk şirketi dahil edilmiştir. Ayrıca inşaat sektörü kendisine bağlı yüzlerce alt sektör için tetikleyici görev görüp işsizlik oranının azalmasına katkıda bulunmuş ve Eylül 2015 TÜİK verilerine göre kaydedilen yaklaşık 2 milyon istihdam rakamı ile toplam istihdamın %7.5' ine kendi başına sahip olmuştur.

Bu çalışmada inşaat sektörünün Cumhuriyetin kurulduğu tarihten bu yana gösterdiği gelişme Türkiye'nin kentleşme deneyimi göz önüne alınarak Şengül'ün (2012) çalışmasında ortaya koyduğu dönemlemeye göre ele alınmıştır. Bu çalışmaya göre belirlenen dönemler; 1923-1950 arasını kapsayan ulus-devletin kentleşmesi, 1950-1980 arasını kapsayan emek gücünün kentleşmesi ve 1980 sonrasını temsil eden sermayenin kentleşmesidir.

İlk dönemi kapsayan inşaat sektöründeki gelişmeleri ele almadan önce Osmanlı imparatorluğu'nun mekansal özelliklerini anlamak yararlı olacaktır.

Şengül'ün de bahsettiği üzere Osmanlı imparatorluğu'nda yönetim ve mekansal düzenlemeler merkez çevre modeli etrafında şekillenmekteydi, fakat sınırların zaman içinde sürekli değişmesiyle beraber bu merkeziyetçi model merkezden uzak bölgelerin kontrolünün zorlaşmasına neden olmuştu. Ayrıca yatırımların İstanbul ağırlıklı olmasıyla şehirlerarası eşitsizlik baş göstermiş ve şehirlerin mekansal olarak organik yapıda olması ulaşım ihtiyaçlarının karşılanmasını zorlaştırmıştır.

Bunların dışında Osmanlı imparatorluğu'ndan geriye milyonlarca dış borç, 4000 kilometre demiryolu, 18335 kilometre yol ve 94 köprü kalmıştı. (Batmaz et al., 2006).

Cumhuriyet'in kuruluşundan sonraki ilk inşaat hareketliliği olarak demiryolu projeleri kendini göstermektedir. Türk müteahhitleri tarafından yapılan ilk demiryolu projesi Ankara-Yahşiyan hattını kapsayıp 1925 yılında kullanıma açılmıştır. Fakat bunun dışında 1935 yılına kadar geçen süreçte inşaat faaliyetlerinin büyük bir kısmı yabancı müteahhitler ve şirketler tarafından gerçekleştirilmiştir.

O dönemlerde hissedilen eksiklerden biri teknik eleman yetiştiren enstitülerin yetersizliğidir. Fakat özellikle 2. Dünya savaşı sonrasında Almanya'dan getirilen akademisyenlerle bu eksiklik giderilmeye, eğitim kalitesi arttırılmaya çalışılmıştır.

Bunun dışında Ankara'nın başkent ilan edilmesi, daha önce bahsedilen şehirlerarası yatırım eşitsizliğini önlemeye yönelik bir adım olmuştur. Fakat Ankara'nın başkent ilan edilmesiyle birlikte şehir yüksek bir nüfus artışına maruz kalmış ve fazla sayıda konut ihtiyacı ortaya çıkmıştır. Bu ihtiyacı gidermeye yönelik inşaa edilen

çok katlı binalar da günümüzdeki apartmanlaşmanın temellerini atmıştır.

Devletin yönetildiği yer olarak içinde pekçok bakanlık personelini bulunduran Ankara, bu personellerin konut ihtiyaçlarını çok katlı apartmanlarla birlikte kooperatif tarzı konutlarla da karşılamıştır. O dönemde inşaa edilen ilk kooperatif olan Bahçelievler kooperatifi, günümüzdeki bahçelievler bölgesinin temelini oluşturmaktadır. (Keleş, 2000).

Ankara'nın başkent ilan edilmesiyle birlikte şehrin planlı bir şekilde gelişmesi için açılan uluslararası kentsel yarışmayı Alman plancı Hermann Jansen kazanmış ve projesi uygulanmaya başlanmıştır. Nalbantoğlu'na göre (2000) proje 1928-1938 yılları arasında başarıyla uygulanmış fakat sonraki dönemlerde hızla artan nüfus konut alanında problemlere neden olmuştur. Yukarıda bahsedildiği üzere çok katlı apartmanlar, Jansen'in planında tavsiye edilmese bile uygulanmaya konulmuş ve plandan sapılmıştır.

Tüm bu sorunlara rağmen yeni başkent Ankara, Türk inşaat sektörünün gelişmesi için önemli bir saha yaratmış ve Vehbi Koç gibi girişimcilerin sektörde rol almasına katkıda bulunmuştur.

O dönemde sektördeki yüksek riskin pek çok müteahhiti iflas ettirmiş olmasına karşın büyük ölçekli projelerin uygulanmasına devam edilmiştir. Örnek olarak taşınan buğday miktarının artırılmasını sağlayıp tarımsal üretimi destekleyen demiryolu projesi ile sıtma hastalığını önlemek ve tarımsal aktiviteleri arttırmak için bataklıkların kurutulmasını öngören "büyük su projesi" verilebilir.

Bu dönemde yaşanan bir başka önemli gelişme ise ABD'de gerçekleştirilen "Bretton Woods" kongresi sonrası kurulan

Uluslararası Para Fonu (IMF) ve Dünya Bankası olarak dikkat çekmektedir. Bu gelişmelerin ışığında 1945 yılında Uluslararası İmar ve Kalkınma Bankası kurulmuş ve inşaat projelerinin finansmanının yabancı para birimi ile sağlanması benimsenmeye başlanmıştır.

Emek gücünün kentleşmesi olarak ifade edilen ikinci dönemde ise kırdan kente gerçekleşen büyük miktardaki göç ve bu göçün kentlerde neden olduğu sorunlar dikkat çekmektedir. Kentlerdeki bu sorunlara değinmeden önce bu göçün nedenlerini anlamak önemlidir.

Avrupa ekonomileri ikinci dünya savaşı sonrasında büyük bir ekonomik dar boğaz içindelerdi. 1948 ve 1951 yılları arasında ABD, Avrupa ülkelerinin ekonomik düzlüğe çıkmasına yardımcı olmak adına Marshall Plan adı altında ekonomik bir yardım paketi sunmuştur. Bu finansal yardımdan Türkiye'ye de toplam 137 milyon dolar pay düşmüştür ve bu ekonomik yardım ile birlikte dışa dönük tarımsal üretim modeli benimsenmiştir. Fakat bu üretim şeklinin kırsal alandaki nüfusu önemli bir ölçede arttırdığı gözlelenmiştir. (Sengul, 2012). İnşaat sektörü her ne kadar Marshall paketinden elde edilen yeni makinalar sayesinde yararlandıysa da bu dönemde kırsal alandaki işsizlik artmış ve insanların kentlere göç etmesine neden olmuştur.

Kır hayatındaki düzenlerini bırakıp kentlere gelen insanlar kent çeperlerinde gecekondular oluşturmuş ve kent içindeki yaşam tarzına uymayan kendi yaşam biçimleriyle birlikte kendi yaşam alanlarını kısa bir sürede oluşturmuşlardır. Belli bir düzeni ve yapı şekli olmayan, bir gecede inşaa edilen gecekondular kent ile etkileşime geçtikçe yeni sorunlar ortaya çıkmıştır. Zaman içinde bu

sorunlar gecekondulara altyapı sağlanması, iş imkanlarından faydalanmalarının önünün açılmasıyla birlikte hafifletilmeye çalışılmış fakat gitgide artan gecekondu nüfusu karşısında bu çözümler yeteri kadar etkili olamamıştır.

Bu dönemde kentsel alanda da konut ihtiyacının artmasıyla beraber özel sektör canlanmış ve 1950-1960 süresince sadece Ankara'da 200 kooperatif kurulmuştur. (Batmaz et al., 2006). Fakat özellikle 1945 ve 1960 yılları arasında konut sektörü hizmet olarak görülmektense kazanç yolu olarak algılanmış ve düzensiz konut bölgeleri ile birlikte kalitesiz binalar topraktan yükselmeye başlamıştır. (Keles, 2000).

1960'lardan sonra da bu algı devam etmiş, ekonomideki yüksek enflasyon, düşük ihracat ve dış borçların iyice birikmesiyle beraber inşaat sektörü önemli bir kriz dönemi geçirmiştir. (Ozorhon, 2012). Fakat tüm bu zorluklara rağmen 1972 yılında uluslararası ilk inşaat projesi Libya'da gerçekleştirilmiştir.

1980 sonrası sermayenin kentleşmesi döneminde hem kamu hem de özel sektör tarafından inşaat faaliyetlerinde artış olmuştur. Bu artışlar özellikle 1982'den 1988'e ve 2002'den 2008 küresel ekonomik kriz ile noktalanmasına kadar geçen sürede belirgin olarak gözlemlenmektedir.

Balaban'a göre (2011) devlet tarafından yoğunluğu arttırılan altyapı yatırımları sektörün hızla büyümesine neden olmuştur. 1984'de çıkarılan imar yasasıyla beraber gecekonduların yerlerine çok katlı binalar inşaa edilmeye başlanmış ve bina yapım izinlerinin sayısı 3 yıl içerisinde 189,486'dan 497,674'e kadar artış göstermiştir.

Sektöre yapılan kamu yatırımlarına baktığımızda ise TOKİ tarafından yürütülen çok sayıdaki inşaat projelerinin ve konut kooperatiflerine sağlanan uygun kredilerin özellikle 1982-1988 büyüme döneminde önemli bir yer tuttuğu görülmektedir. Bu süreçte inşaat sektörü %17.4'e varan bir büyüme göstermiş ve gayri safi yurtiçi hasıladaki payı %5.86'dan %7.29'a yükselmiştir.

Bu büyüme dönemi sonrasında ekonomi durgunlaşmış ve 2001 krizi ile beraber inşaat sektöründe %17.4'lük küçülme yaşanmıştır. Fakat bu düşüş çok uzun sürmemiş ve inşaat sektörü 2002 yılında %13.9'luk bir büyüme gösterip 2008 yılında yaşanan küresel kriz ile beraber sonlanmak üzere yeni bir büyüme dönemine girmiştir.

Türkiye'de 2008 krizinin etkileri işsizliğin %16.1'e ulaşıp tavan yapmasıyla ve inşaat sektörünün aynı oranda küçülmesiyle kendini göstermiştir. Fakat 2009'un 3.çeyreğiyle beraber sektör toparlanmaya başlamış ve 2010'un 3.çeyreğinde %23.7'lik bir büyüme göstermiştir.

Sektördeki bu hareketliliğin önemli bir nedeni de eski ve deprem tehlikesi içeren binaların yıkılıp yerine sağlam binalar inşaa edilmesini öngören kentsel dönüşüm hareketi olmuştur.

Özel sektöre baktığımızda ise son dönemlerde artan rezidans tarzı konut projeleri ile birlikte iş ve alışveriş merkezleri öne çıkmaktadır. Bu büyük ölçekli yatırımların çok büyük bir kısmı İstanbul merkezli olup Osmanlı döneminde bahsedilen Anadolu ile İstanbul arasındaki yatırım eşitsizliğini tekrar ortaya çıkarmaktadır.

Uluslararası projelerdeki Türk inşaat sektörünün durumuna baktığımızda ise 1972'de Libya'da başlayan çalışmaların 1980 yılına kadar ki %80'lik kısmı yine Libya'da gerçekleşmiş olduğu

görülmektedir. Fakat zamanla bu coğrafyada yaşanan politik sorunlar ve farklı ülkelerde yeni marketlerin olanaklı hale gelmesi Libya'nın %80'lik payının düşmesine sebep olmuştur.

1972'den 2015'in ağustos ayına kadar geçen sürede Türk inşaat faaliyetlerinin en çok gerçekleştiği yer olarak Rusya %19.4'lük pay ve toplam 61.7 milyar dolarlık proje değeriyle öne çıkmaktadır. Rusya'yı %15 ile Türkmenistan ve %9.2 pazar payı ile Libya takip etmektedir. (T.C. Ekonomi Bakanlığı). Rusya'nın toplam uluslararası inşaat faaliyetlerindeki bu pozisyonu, 2010-2014 döneminde Türkmenistan tarafından toplam faaliyetlerin %24.2'sini elinde bulundurmasıyla geride bırakılmıştır. Bununla birlikte Kuveyt pazarında gözlemlenen yükselen trend, Türkmenistan ile birlikte ilerleyen dönemlerde Rusya'nın toplam payını azaltabileceği düşünülmektedir.

İnşaat sektörünün uluslararası önemine değindikten sonra ekonomideki bazı göstergelere olan katkılarına değinmekte yarar bulunmaktadır. Grafik 13'den de anlaşılacağı gibi Gayri Safi Yurtiçi Hasıla'nın büyüme oranı ile inşaat sektörünün büyüme oranı birbirlerine paralel olarak gelişim göstermiş, 2001 ve 2008 krizlerine gösterdikleri tepkiler ile kriz sonrası yaşanan iyileşme neredeyse eş zamanlı gerçekleşmiştir.

Sektörün Gayri Safi Yurtiçi Hasıla'daki payına baktığımızda ise 1998'den 2014'e kadar geçen sürede %3.8 ile %5.8 arasında değişen değerler aldığını görmekteyiz, fakat bununla beraber inşaat sektörünün kendisine bağlı alt sektörleri harekete geçirmesiyle beraber toplamda %30'lara denk gelen bir etki yarattığı düşünülmektedir.

Bunun dışında 2008 krizi sebebiyle özel sektör harcamaları bir yıllık bir düşüş gösterse de kamusal sektör harcamaları ile birlikte yıllar geçtikçe artan bir yol izlemiştir.

Ayrıca inşaat sektörünün sağladığı geniş iş imkanları ve kriz dönemleri de dahil olmak üzere barındırdığı yüksek çalışan sayısı ile işsizlik oranının düşmesine katkıda bulunarak ekonomiye olumlu etki etmektedir.

Sektörün ekonomiye olan katkısını inceledikten sonra sektördeki rekabeti ve verimliliği analiz etmek için Michael Porter'ın 5 kuvvet modeli inşaat sektörü çerçevesinde uygulanmıştır.

Porter'a göre sektörün cazipliğini belirleyen 5 ana kuvvet bulunmaktadır. Bunların ilki olan sektöre giriş bariyerleri, sektörün verimli ve cazip olmasıyla doğru orantılı olarak önem kazanmaktadır. Türk inşaat sektörüne baktığımızda sektöre girmek için gerekli olan sermaye miktarı çok fazla olmamakla birlikte ürün farklılaştırma seçeneğinin diğer sektörlere göre çok az uygulanabilir olması yeni şirketler açısından önemli bir artı olarak göze çarpmaktadır. Ayrıca sektöre girmek için gerekli olan yasal prosedürün de rahatça uygulanabilir olması Porter'ın ilk kuvvetinin sektör için oldukça zayıf olduğunu göstermektedir.

İkinci kuvvet ise sektör içinde var olan şirketler arasındaki rekabet olarak belirlenmiştir. Normalde sektörde ne kadar çok şirket var ise, rekabetin fazla olduğu ve bu ortamda ön plana çıkmak için şirketlerin ürün farklılaştırma stratejileri uyguladığı bilinmektedir. Fakat inşaat sektörü dahilinde bu durumdan bahsetmek ortaya çıkan yapıların çok farklılaştırılamayacağı sebebiyle oldukça zordur. Sektördeki rekabet daha çok ihalelerde verilen tekliflere göre ölçülmekte ve Uzunkaya'ya göre (2013) bu durum sektördeki

rekabeti kalite ve teknoloji çerçevesinden alıp fiyatlandırma'ya göre rekabete sürüklemiştir.

Bir diğer kuvvet ise Porter tarafından sektörde üretilen ürün ve sağlanan hizmete alternatif olan ürün/hizmet tehdidi olarak belirlenmiştir. Fakat inşaat sektörü dahilinde alternatif ürünün bulunmaması bu kuvvetin geçerli olmamasına neden olmuştur.

Dördüncü kuvvet ise tedarikçilerin fiyat yükseltme gücünü elinde bulundurmasıyla pazara olan hakimiyetlerini içermektedir. İnşaat sektörü dahilinde oldukça fazla sayıda tedarikçi bulunması, şirketler için değişim masrafının oldukça az olmasına neden olmuştur. Ayrıca şirketlerin geriye doğru entegrasyon yolunu izlemesi kendi ham maddelerini üretebilmelerini sağlamış ve tedarikçilerin pazardaki gücünü oldukça azaltmıştır.

Son olarak Porter (1980), eğer bir aktör tarafından pazarda büyük miktarda bir alım gerçekleşiyorsa, bu durumun alıcının önemini arttırdığını ve sektördeki pazarlık gücünün öne çıktığını belirtmiştir. İnşaat sektörüne baktığımızda büyük ölçekli ve bütçeli projelerin genelde devlet tarafından sunulması, devletin pazarlık gücünün geçerli olduğunu göstermektedir.

Sonuç olarak, Porter'ın önerdiği 5 kuvvet modeli dahilinde inşaat sektörü yukarıda açıklanan durumlara göre incelendiğinde sektörün toplam cazipliğinin düşük olduğuna ulaşılmaktadır.

Bu çalışmada kullanılan modeli incelemeden önce benzer konuları işleyen çalışmaları analiz etmek yararlı olacaktır.

İnşaat sektörünün ekonomideki rolünü ve ekonomiye etkisini ele alan ilk çalışmanın 1970'de Strassmann tarafından yapıldığı kabul edilmektedir. Fakat 1973 yılında Turin'in 85 ülkenin verilerini dahil

ettiği çalışması literatürde büyük bir öneme sahiptir. Bu çalışma inşaat sektörü yatırımları ile ekonomik büyüme arasında doğrusal bir ilişki olduğunu ortaya çıkarmış ve ilerleyen zamanlardaki çeşitli çalışmalar için önemli bir kaynak olmuştur.

Sonraki çalışmalar Turin'in çalışmasında elde ettiği doğrusal ilişkinin eğrisel ve U-şekli olarak da ortaya çıkabileceğini göstermiştir. Madison (1987) inşaat sektörünün ilk başta ekonomik büyümeyle birlikte hareket edeceğini kabul etmiş fakat uzun vadede sektörün toplam üretimdeki oranı ekonomik büyüme devam etse bile azalarak devam edeceğini belirterek U-şekli gelişmeyi açıklamıştır.

Ofori 1990 yılındaki çalışmasında bu ilişkinin inşaat sektöründen ekonomik büyümeye doğru tek yönlü olduğu sonucuna varmış ve sonrasında pek çok çalışma ekonomi ve inşaat sektörü arasındaki bu ilişkinin doğrultusuna dikkat etmeye başlamıştır.

1992 yılında ise Bon, Turin'i yaptığı araştırmada çoğunlukla gelişmekte olan ülkeri ele aldığı için eleştirmiş ve kendi çalışmasına her kıtadan pek çok ülkeyi dahil etmiştir. Böylelikle ülkeler arasında az gelişmiş ülkeler, yeni sanayileşmiş ülkeler ve gelişmiş sanayili ülkeler olmak üzere 3 çeşit farklı dönem olduğu sonucuna varmıştır. İnşaat faaliyetleri yoğunluğunu ise az gelişmiş ülkelerden yeni sanayileşmiş ülke durumuna geçerken artan bir yol izlediği, sonrasında ise gelişmiş sanayili ülke statüsüne doğru izlediği yolda giderek azalan bir şekilde ilerlediği sonucuna varmıştır.

Bu temel çalışmalar ele alınarak ilerleyen dönemlerde tekli ülke bazında çok sayıda araştırma yapılmış ve günümüze kadar olan süreçte hem birbirini eleştiren hem de destekleyen sonuçlara ulaşılmıştır. Örneğin, Tse ve Ganesan'ın (1997) Hong Kong için yaptıkları çalışmalarında ülke Gayri Safi Yurtiçi Hasılasından inşaat

sektörü yatırımlarına doğru tek yönlü bir nedensellik olduğu sonucuna varıp aksinin doğru olmadıklarını söyleyerek, tam tersi sonuca ulaşan Chang ve Nieh (2004) gibi pek çok araştırmacının bulgularıyla ters düşmüşlerdir.

Türkiye özelinde yapılan araştırmalara bakıldığında ise kullanılan farklı veriler sonucunda değişik sonuçlar elde edildiği görülmüştür. Örnek olarak Özkan, Özkan ve Gündüz'ün 2012'deki çalışması inşaat sektörü ile Gayri Safi Yurtiçi Hasıla arasında çift yönlü bir nedensellik bulunduğunu belirtirken, Kaya, Yalçınkaya ve Hüseyni 2013 yılında yaptıkları çalışmalarında kamu sektörü inşaat yatırımlarından Gayri Safi Yurtiçi Hasıla'ya doğru tek yönlü bir nedensellik olduğu sonucuna varmışlardır.

Yukarıda bahsedilen ve literatür bölümünde işlenen çalışmaların hepsinde Granger nedensellik testi kullanılmıştır. Yapılan çalışmaların sonuçları, kullanılan veriler, zaman dilimleri ve veri kaynakları 12 numaralı tabloda görülebilir.

Bu çalışmada ise inşaat sektörü ve ekonomik göstergeler arasındaki nedensellik ilişkisi uygun TÜİK verileri kullanılarak 2 farklı model ile incelenmiştir.

İlk model, 1998 sabit fiyatlarıyla 2000 ve 2013 yılları arasındaki çeyrek dönemlik Gayri Safi Yurtiçi Hasıla'yı, bu verideki özel ve kamu sektörü inşaatı, ve toplam istihdam verilerini içermektedir. Bu modelde elde edilmek istenen inşaat sektörünün özel ve kamusal boyutunun istihdama ve Gayri Safi Yurtiçi Hasıla'ya etkisini ölçmektir.

İkinci modelde ise yine 1998 sabit fiyatlarıyla 2002 ve 2013 yıllarını kapsayan çeyrek dönemlik Gayri Safi Yurtiçi Hasıla ve toplam

istihdam verileriyle birlikte ticari, konut ve sanayi amaçlı inşaat verileri hem özel sektör hem de kamusal sektör bazında ele alınmıştır. Bu modelde ulaşılmak istenen sonuç ise inşaat sektörü ile ekonomi arasındaki nedensellik ilişkisinin ayrıntılı olarak, kullanım amaçlarına göre saptanması ve toplam faaliyetlerden alt kademelere indikçe ekonomik gelişmeler ile olan ilişkinin nasıl etkilendiğini saptamaktır.

Bu çalışmada da önceki çalışmalar gibi Granger nedensellik modeli eviews 7 programı kullanılarak uygulanmak üzere yola çıkılmıştır.

Öncelikle modellerde kullanılacak olan zaman serilerinin durağan olup olmadıkları test edilmiştir. Durağan olmayan zaman serileri ile yapılan regresyonlar birbirleri ile hiçbir ilgisi olmayan değişkenlerde bile yüksek R^2 değeri verebileceğinden serilerin durağan değerlerini modele koymak oldukça önemlidir. (Choy, 2012).

Bu aşamada kullanılan Augmented Dickey Fuller (ADF) testinin sonucunda her iki model için de zaman serilerinin farklı düzeylerde durağanlaştığı tespit edilmiş ve daha güvenilebilir bir sonuç elde etmek üzere zaman serilerini düzey seviyesinde kullanmaya imkan veren Toda ve Yamamoto yönteminde karar kılınmıştır.

Toda ve Yamamoto'nun önerdiği Granger nedensellik modeli ile birlikte zaman serileri düzey seviyelerinde Vector Autoregression'a tabi tutulmuş, modellerin gecikme uzunluklarına karar verilmiş ve sonrasında serilerin durağanlaştığı en yüksek seviye de göz önüne alınarak yeni bir VAR modeli kurulmuş ve modelin kararlılığı kontrol edildikten sonra veriler arasındaki uzun vadeli nedensellik Wald testi ile birlikte analiz edilmiştir.

Model 1 için yapılan ADF testleri sonucunda en yüksek durağanlık seviyesi 2 olarak belirlenmiş ve verilerin VAR modeline konulup uygun gecikme uzunluğunun 4 olarak seçilmesi sonucunda VAR modeli son halini almıştır. Modelin güvenilirliği kontrol edildikten sonra uygulanan Wald testi ile beraber elde edilen sonuçlar Gayri Safi Yurtiçi Hasıla'nın istihdam, kamu ve özel sektör inşaat verileri ile birlikte çift yönlü nedenselliğini ortaya çıkarmıştır. Bununla birlikte Özel sektör inşaat verisinden istihdama doğru tek yönlü bir nedenselliğin olduğu da dikkat çekmektedir.

Model 2'ye baktığımızda ise uygun gecikme uzunluğunun 1 ve en yüksek durağanlık seviyesinin yine 2 olduğunu görmekteyiz. Bu bilgiler doğrultusunda kurulan VAR modelinin güvenilirliğini kontrol ettikten sonra yapılan Wald testlerine göre istihdam ve kamusal konut yatırımları arasında çift yönlü nedensellik olduğu sonucuna varılmıştır. Ayrıca, Gayri Safi Yurtiçi Hasıla'dan kamusal konut, kamusal ticari, özel konut ve özel sanayi tarzı yatırımlara doğru tek yönlü nedensellik olduğu da gözlemlenmiştir.

Bu sebeple, ilk modelde görebildiğimiz inşaat sektörü ile GSYİH arasındaki çift yönlü etkileşimin daha ayrıntıya indiğimizde model 2'de de görebileceğimiz üzere korunmadığını görmekte ve bu çift yönlü etkileşimin GSYİH tarafından olmak üzere tek yönlü bir ilişkiye geçtiğine ulaşmaktayız. Bu da ekonomiyi canlandırmak için uzun süredir benimsenen inşaat ile kalkınma düşüncesinin artık ekonomik gelişmeyi tetiklemeyebileceğini göstermektedir.

Appendix D. TEZ FOTOKOPİSİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü	
Sosyal Bilimler Enstitüsü	X
Uygulamalı Matematik Enstitüsü	
Enformatik Enstitüsü	
Deniz Bilimleri Enstitüsü	

YAZARIN

Soyadı : Aydın
Adı : Aykut
Bölümü : İşletme

TEZİN ADI (İngilizce) : Investigating the Relationship between the recent Investments on Construction Sector and Some Economic Indicators of Turkey

TEZİN TÜRÜ : Yüksek Lisans [X] Doktora [ ]

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir. [ ]
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir. [ ]
3. Tezimden bir bir (1) yıl süreyle fotokopi alınamaz. [X]

TEZİN KÜTÜPHANEYE TESLİM TARİHİ: