# Input-Output Analysis of Turkish Construction Industry by using World Input-Output Database for 2002-2011 Period

*In memory of the coal-miners in Soma*
*They will live in our hearts forever…*

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## Abstract

In the academic literature the construction industry is considered to be one of the main drivers of the overall economy due to its strong inter-industrial linkages. Its backward and forward linkages are ranked to be among the first four out of twenty industries. In the demand side, the construction activity induces growth through use of large amounts of intermediate inputs from other industries while on the supply side it provides basic infrastructure that is required for production of any goods and services. On the other hand, the construction industry also has a significant impact on level of employment, particularly unskilled labour force, as it is a highly labour-intensive industry. In many of the developing countries, the growth of the construction industry is used as an instrument to accelerate the overall growth in the economy. For instance, governments are inclined to implement policies that enhance and support construction investments to achieve a more stable economy. Like in many developing countries, especially after the neoliberal transformation in 1980s, Turkish economy witnessed the growth of construction industry as well. Two main growth periods in construction industry have been observed since 1980. One of these is the 1982-1988 period. The share of construction investment in GDP rose up to 7.3 percent in 1987 from 5.2 percent in 1982. The second growth period began in 2002 and continued until 2008. The growth process was interrupted by the global economic crisis during 2008 and 2009 but growth inclination in construction industry in Turkey maintained its position in the economy. Between 2002 and 2012, on the average the growth rate of construction industry was about 11.1 percent per year, except for 2008 and 2009, which is almost twice as much of the growth rate of national economy. Furthermore, there was a high positive correlation between GDP growth and construction investment during the period. The other important feature of the construction industry for both periods is that governments support the growth of construction industry both by investing directly and implementing policies for the development of infrastructure sector using legal arrangements. Especially for the 2002-2012 period, it can be obviously stated that basic capital accumulation strategy of the state was based on the growth of construction industry in Turkey. The aim of this study is to explore the structure of construction industry in the input-output framework and to reveal the changing trend in construction based inter-industrial linkages over the period of 2002-2011, in Turkey. Some common shortcomings of the construction industry based input-output studies in the academic literature in Turkey are such that input-output tables used in the analyses are not homogeneous and the most recent one belongs to the input-output table of year 2002. In this study, we are going to employ the input-output tables constructed and updated in the WIOD Project from 2002 to 2011. We are also going to decompose

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value-added on the input-output tables into the labour and capital. We are going to calculate backward-forward linkages and output/employment multipliers by using 10 input-output tables. We aim to discuss whether construction industry, which is considered as the key driver of the economy, might solve structural problems of Turkey such as current account deficit and unemployment in the near future.

## 1. Introduction

Construction industry is considered to be one of the main sectors to contribute economic development especially for developing countries in terms of providing infrastructure and housing investments. Studies on the construction industry and its relation to economic development were first specifically introduced with the works of Duccio Turin (1969) and Paul Strassmann (1970) in the late 1960s and 1970s. They found that there is a strong relationship between the per capita Construction Value Added (CVA) and per capita Gross Domestic Product (GDP). The share of CVA in GDP increases as per capita GDP increases (Lewis, 2009; Giang, & Pheng, 2011). Besides, Strassmann (1970) pointed out that construction had overtaken manufacturing as a driving force for economic growth in countries that had begun the process of economic development (Lewis, 2009).

The theoretical explanation about the relationship between growth of construction industry and economic development stages is known as the "Bon Curve" which is exposed by Ranko Bon. Bon (1992) investigated the role of construction industry at different stages of economic development and presented a development pattern for the industry, based on the stage of development of a country's economy (Ruddock, & Lopes, 2006). According to the Bon's analysis, in the early stages of economic development the share of construction in the economy increases but ultimately decreases when the economy reaches a certain higher level that is represented by the industrially advanced countries. Tan (2002) explains this phenomenon depicted as the inverted-U shape as follows: "In low income countries (L),

construction output is low. As industrialization proceeds, factories, offices, infrastructure and houses are required, and construction output as a percentage of gross domestic product (GDP) reaches a peak in middle-income countries (M). It then tapers off in high income countries (H) as the infrastructure becomes more developed and housing shortages are less severe or are eliminated." More recent studies have verified this phenomenon that is summarized as declining the construction share of GDP after a certain level of economic development (Lewis, 2009). Another important point is the share of construction industry in the total investment within the context of national accounts. Lewis (2009) reported that construction sector historically had accounted for around 50 percent of a country's Gross Fixed Capital Formation (GFCF). Nowadays these figures are around 26 and 23 percent for the developed and developing countries respectively.

In this paper, we aim to explore the structure of construction industry in the input-output framework and to reveal the changing trends in construction sector based on inter-industrial linkages for the post 2002 period. For this purpose, we employ the input-output tables constructed in the WIOD Project from 2002 to 2011 for Turkey. For this period, backward and forward linkages on the one hand and on the other hand output, income, investment, employment, type I and II multipliers are calculated by using 10 input-output tables. The motivation of this analysis is to understand whether construction industry can be considered as the main driver industry to solve structural problems of Turkish economy such as unemployment and current account deficit.

The paper is designed as follows. First of all, some basic observations within the construction industry over the last 10 years are summarized. Thereafter literature review is presented. Literature review is especially devoted to the studies using Input-Output (IO) framework to analyse construction industry. In the following section, data and methodology are introduced. In this part, we will focus on the data which we use and how to operationalize

data to calculate backward and forward linkages and multipliers mentioned above. Lastly, empirical findings are analysed and discussed to conclude about the place of construction industry in the overall economy.

## 2. Construction Industry in Turkey

Turkish economy witnessed the growth of construction industry after the neoliberal transformation in 1980s. When the development of construction industry is considered after the period of 1980, there have been two growth periods one of which is in 1980s and the other is in 2000s. In the first growth period of 1982-1988, the share of construction investment in GNP rose up to 7.3 percent in 1987 from 5.2 percent in 1982. The share of CVA in GDP peaked in 1987. The second growth period began in 2002 and continued until 2008. The growth process was interrupted by the global economic crisis in 2008 and 2009, but growth inclination in construction industry in Turkey maintained its position in the economy (Balaban, 2011).

Between 2002 and 2012, on the average the growth rate of construction industry was about 11.1 percent per year, except for 2008 and 2009, which is almost twice as much of the growth rate of national economy. Figure 1 shows the annual growth rate of value added, investment in construction industry and GDP.

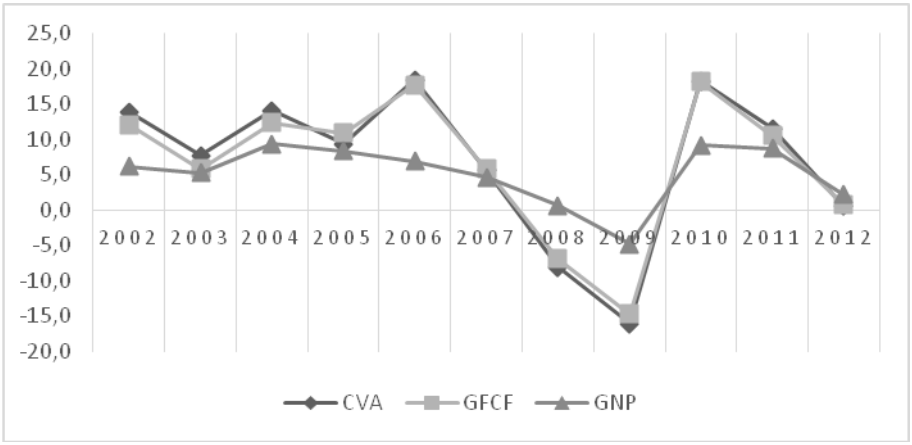


Fig. 1. Growth rate of CVA, Construction GFCF and GDP
Source: Turkish Statistical Institute (TSI)

According to Figure 1, growth paths of CVA and GFCF of construction industry are quite similar. Another observation is that except for 2005-2006 there has been a very similar trend between the growth rate of construction industry (CVA) and overall economy[4]. This indicates that there is a fairly direct relationship between the level of activity in construction industry and the economy as a whole but we cannot tell the direction of causality relationship. Important question: which is the driver and which is the follower?

In order to determine the direction of causality, we can use the cumulative experience function that provides non-parametric evidence on the direction of causality between two variables (Lewis, 2009).

$$Cum\exp x = \sum_{i=t_0}^{t} x_t / \sum_{i=t_0}^{t_1} x_t \qquad (1)$$

Equation 1 gives the formal illustration of a cumulative experience (cumexp) function for a variable *x*, where $t_0$ and $t_1$ are the initial and end years of the data period and *t* is the current time period. Figure 2 corresponds the illustration of cumexp functions of CVA and GDP at fixed prices.

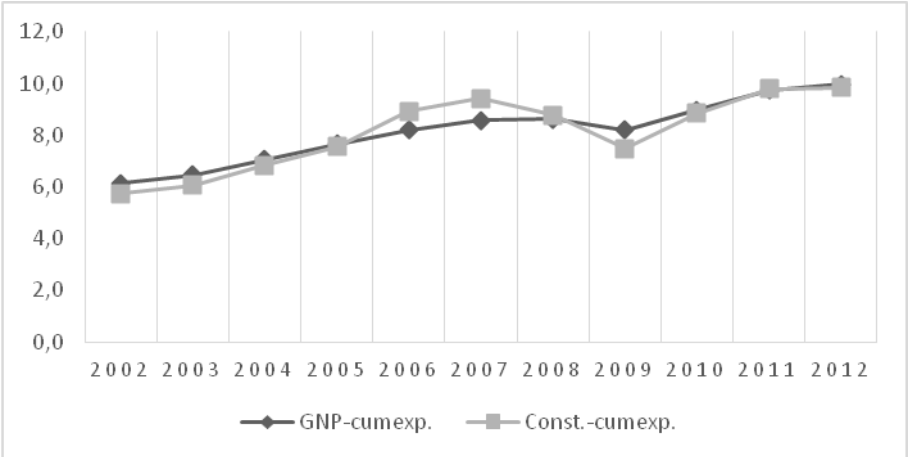


Fig. 2. A Cumulative Experience Function
Source: Adapted from Lewis (2009) and calculated using TSI data.

[4] The ups and downs in the construction growth seem to be sharper compared to overall growth, which is expected as the overall growth might be smoothened by some industries.

Three phases can be underlined in this period. From 2002 to 2005 and 2008-2010 period, the value added of the construction industry was led by that of the overall macro economy. On the other hand, the construction industry drove the whole economy between 2005 and 2008. After the year 2010 construction sector and economy moved together.

The other important dimension of construction industry is the place of construction in the investment capacity of an economy. The share of construction's GFCF in total investment in Turkish economy is 43 per cent on average. This is absolutely an important figure considering the importance of the investment capacity of construction industry and to comprehend the capital accumulation strategy of Turkey based on construction industry for the last decade.

When we take a closer look to the relationship between the growth of construction investment and GDP, GFCF of construction industry might be separated as public and private to understand which is more dominant for capital accumulation and growth rate of the economy.

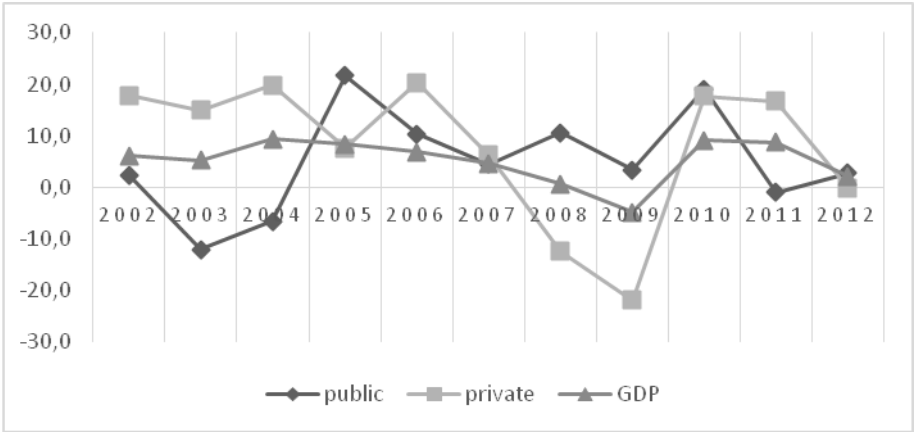


Fig. 3. The growth of public-private investments in construction industry and GDP
Source: TSI

Figure 2 disaggregates growth of total investment in construction industry with respect to the source as public and private sector, and provides growth of GDP. There has been a more one-to-one relationship between growth of private investment in construction and GDP but public investment expenditures in construction sector in some years falls apart from the main trend

(between 2004-05; 2007-08; 2010-12). We might say that in these years public investment expenditures in construction industry are used as an instrument to trigger the economic growth but probably private investment expenditures are triggered by the overall growth.

Governments support the growth of construction industry both by directly investing and implementing policies for the development of infrastructure using legal arrangements for the both growth periods of construction industry in Turkey (Penpecioğlu, 2011). Especially for the 2002-2012 period, it can be obviously stated that basic capital accumulation strategy of the state was based on the growth of construction industry in Turkey.

## 3. Literature Review

There has been a vast amount of literature concerning the construction industry and its relation to the economy as a whole from both the narrow aspect which focuses only on construction industry and economic growth, and from the broader perspective relevant to investigation of construction industry within the development context (Giang, & Pheng, 2011). Besides, the studies on IO analyses of construction industry take up considerably and could not be underestimated in the literature.

In this section, after mentioning various descriptive studies based on the observations of macroeconomic and sectoral indicators briefly, we will especially pay attention to IO analysis of the construction industry in the world. Covering 7 developed and 18 developing countries[5] and using the construction output, GDP and GFCF of construction industry data based on the United Nations Statistics Division for the period of 1970-2006, Lewis (2009) revealed that as an economy develops, construction industry loses its importance in the economy. In the early

[5] Developed Countries: UK, Japan, France, Germany, Canada, USA, Norway
Developing Countries: Afghanistan, India, Kenya, Pakistan, Sri Lanka, Philippines, Nigeria, Thailand, Colombia, Ecuador, Paraguay, Mexico, Greece, Guyana, Jamaica, Trinidad and Tobago, Turkey, Czech Republic.

stages of development, construction can be responsible for a large part of all economic activity, and can play a significant role in modernization.

Another comprehensive study is about the investment in construction and economic growth by Lopes (2009). The indicator used as a proxy for construction investment is CVA and the main indicator of economic activity is GDP. Three main indicators ranking as GDP, GFCF and CVA are used in this analysis and data are adapted from United Nations Yearbook of National Accounts Statistics and World Bank. Data comprise 93 countries disaggregated into three subgroups as the low, middle and high-income countries. In order to give a general picture of different regions of the world, these three groups were divided into eight additional subgroups according to the World Bank nomenclature of world sub-regions. The analysis suggests that the share of construction in gross output tends to increase with the level of per capita income in the first stages of economic development. With the certain level of economic development, the construction output will grow slower than the GDP. That is, it decreases relatively but not absolutely. It is reasonable to conclude that when the countries enter into a period of sustained economic growth, the construction output tends to grow with the same rate of growth of that of the GDP.

The study of Ruddock and Lopes (2006) which used the dataset of gross value added (GVA) in construction and GDP per capita adapted from United Nations to analyse the relationship between a country's level of construction activity and it's stage of economic development for 75 countries, demonstrates that the inverse U-shaped pattern holds for the share of construction in the national economy. That is, the share of construction in total output first rises up and then decreases with economic development.

IO analysis reveals the interconnections of the industries in an economy and provides useful insights as to whether this sector is a driving force of economic growth in both

developed and developing countries. Construction can be divided into subsectors as "new construction" and "maintenance and repair (M&R)"[6] (Gregori, 2009). In the literature, construction industry is considered to be one of the main drivers of the overall economy due to its strong inter-industrial linkages. In general, its backward and forward linkages are ranked to be among the first four out of twenty industries (Balaban, 2011; Giang, & Pheng, 2011). In the demand side, the construction activity induces growth through the use of large amounts of intermediate inputs from other industries while on the supply side it provides basic infrastructure that is required for production of any goods and services. On the other hand, the construction industry also has a significant impact on level of employment, particularly unskilled labour force, as it is a highly labour-intensive industry.

In general, IO analyses of the construction industry point out that the indicators of forward linkages are relatively less extensive than backward linkages (Bon, & Pietroforte, 1990; Giang, & Pheng, 2011). But when focusing on developed countries, the pull effects of the sector as revealed by backward linkage indicators such as output multiplier seem relatively weak by comparison with the push effects represented by forward linkage indicators in the economy (Pietroforte, & Gregori, 2003). Many studies on the IO analyses of construction industry in developing countries emphasize those backward linkage indicators that can be summarized as the pull effects of this industry become more significant than push effects of that (Bon, et.al. 1999; Wu, & Zhang, 2005; Kofoworola, & Gheewala, 2008).

In Turkey, the studies using IO tables to analyse construction industry has been limited because of the backdated IO tables used until recently.[7] Nevertheless a number of studies revealed that the industry had strong backward linkages with the rest of the economy, but

[6] New construction includes private and public new buildings addition and alterations that increase the stock of constructed facilities. Maintenance and Repair (M&R) comprises restoration and upkeeping of existing capital stock performed also on own account.

[7] Turkish Statistics Institute (TSI) published the last IO table for 2002 in 2008.

forward linkages were weak and so far unpromising. From the theoretical explanation of the sectoral importance of an industry, if any sector can be considered as a driving force of an economy, it should have strong linkages in both backward and forward directions. In this case, according to the studies, construction industry cannot be termed as dynamic leading industry in the economy (Bon, et.al. 1999; Türkiye Kalkınma Bankası, 2008; Gündeş, 2011). Looking from the bright side of the industry, about 93 percent of the production of construction industry is produced by domestic input. At the same time, there is no capital outflow to the rest of the world via the profit transfer in the construction industry (Türkiye Kalkınma Bankası, 2008). These two observations point out that the construction industry might relieve the burden of current account deficit to the economy.

## 4. Data and Methodology

Generally speaking two shortcomings can be spelled out with regard to existing input-output tables in Turkey. First of all the industrial classification in various I-O tables is not homogenous. Secondly the last one belongs to year 2002 which is quite backdated.[8] For this reason, rather than using the latest I-O table developed by the Turkish Statistics Institute in 2002, the analyses in this study are carried out by employing the period 2002-2011 input-output matrices of Turkey which are prepared and organized by the World Input-Output Database (WIOD)[9]. Before calculating various linkage and multiplier coefficients from the above matrices labour force compensation is disaggregated with respect the qualifications. While in the original I-O matrices there is only one level for labour compensation in this

[8] Officially, there are six input-output tables (1973, 1979, 1985, 1990, 1998 and 2002) published by the Turkish Statistics Institute (TSI) and the important part of them were compiled and calculated in different methods.

[9] The World Input-Output Database has been developed to analyse the effects of globalization n trade patterns, environmental pressures and socio-economic development across a wide set of countries. The database covers 27 European Union (EU) countries and 13 other major countries in the world from 1995 to 2011. For more detailed information look at Timmer (ed.) (2012).

research compensations are calculated with respect to high, medium and low skilled[10] labour. In the original I-Os there are 35 industries and in this research we aggregated those into 18 industries[11]. The main idea behind the chosen concordance is to explicitly specify backward and forward industries of construction sector in the I-Os. Mainly two types of backward and forward linkage coefficients and both simple and total income, employment, investment and output multipliers are calculated that covers all Type A, B and I, II multipliers.

The two types of backward and forward linkage coefficients are calculated as in equations 2 to 5. In equation 2 and 3, $BL_C$ represents backward and normalized backward linkage coefficients for construction industry respectively. *N* stands for normalized and is calculated by dividing $BL_C$ to industrial average *BL*. In a similar way in equation 4 and 5 forward ($FL_C$) and normalized forward linkage ($FL^N{}_C$) coefficients for construction industry is calculated. $a_{ij}$ stands for inter-industry coefficients where $_i$ is input provider $_j$ is input user industry. $A_C$ is equal to both raw (demand) and column (supply) totals.

$$BL_C = \frac{\sum_{i=1}^{n} a_{iC}}{A_C} \qquad (2)$$

$$BL^N{}_C = \frac{BL_C}{\left(\sum_{i,j=1}^{n} a_{ij}\right)/n} \qquad (3)$$

[10] In WIOD, skill types are defined on the basis of the level of educational attainment of the worker. Because of the fact that educational systems and attainment levels are not always comparable across countries in a straightforward manner, the 1997 International Standard Classification of Education (ISCED) provided by UNESCO is used to define low, medium and high skilled labour. For Turkey, skill distribution of employment is obtained from TSI (Turkstat) labour force survey, for the broad sectors separately. For the sub sectors, the skill distribution of the sectoral aggregate is used (for instance, all manufacturing sectors are assumed to have the same skill distribution). The educational categories used are:

- Low-skilled=Below high school (primary, secondary, illiterate, and others);
- Medium-skilled=High scholl and vocational high school and,
- High-skilled=University and above.

For detailed information, look at Timmer (ed.) (2012) and visit http://www.uis.unesco.org/Pages/international-standard-classification-of-education.aspx

[11] The concordance is given in Appendix.

$$FL_C = \frac{\sum_{j=1}^{n} a_{Cj}}{A_C} \tag{4}$$

$$FL^N{}_C = \frac{FL_C}{\left(\sum_{j,i=1}^{n} a_{ji}\right)/n} \tag{5}$$

To calculate simple and total employment multipliers we use industrial employment figures rather than labour compensation however employment figures are not disaggregated with respect to skill levels. For simple, we multiply employment coefficients with Leontief inverse obtained from transactions matrix while for total, we close the transaction matrix with labour compensation and household expenditures and calculate an augmented Leontief inverse. Therefore to calculate total employment multipliers we multiply employment coefficients with augmented Leontief inverse.

In a similar manner we calculate simple and total income multipliers. For simple, we multiply labour compensation coefficients with Leontief inverse obtained from transactions matrix while for total, we close the transaction matrix with labour compensation and household expenditures and calculate an augmented Leontief inverse. Therefore to calculate total income multipliers we multiply labour compensation coefficients with augmented Leontief inverse. To calculate simple and total investment multipliers we first find coefficients of industrial capital compensation and multiply it with Leontief inverse. Then, similar to what we used in income multipliers, we close the matrix this time by including capital compensation raw and investment expenditures column to obtain augmented Leontief inverse.

Simple and total output multipliers are column sums in Leontief inverse and augmented Leontief inverse closed by household expenditures and labour compensation. Type I and II

multipliers for income and employment are calculated by dividing both simple and total multipliers by labour compensation and employment respectively. The numerator of the Type I and II are called Type A and B respectively.

## 5. Empirical Findings

Our main objective is to understand how valid is the argument of "construction is the main driving force of economy especially in developing countries", as mentioned in the previous sections, in case of Turkish economy. The implicit idea behind this argument is that in developing countries investment expenditures in construction constitute the main demand that triggers the overall growth in the economy. Therefore, construction industry pulls investment expenditures and creates strong backward linkages rather than putting upward pressure on real estate demand and creating forward linkages as it is expected in developed economies. If the above argument is valid for Turkey then construction industry should be considered strategic and crucial in maintain sustained economic growth.

We start by looking at the backward and forward linkage coefficients of the construction industry in Tables A2 and A3. Forward linkage coefficients present that the contribution of the construction industry in terms of creating inputs for other industries is quite low while it has stronger backward linkages. When the relative place of these linkage coefficients among all industries are analysed (Table A3) the forward linkage coefficients are ranked the $17^{th}$ among 18 industries all through the period and backward coefficients are ranked to change between $7^{th}$ and $9^{th}$. More information regarding these linkages can be observed in Tables 1 and 2. These tables provide information regarding dependency relationships of construction and all other industries respectively by using the normalized linkage coefficients.

Table 1
Dependency Relationship-Construction Sector.

| | | Forward Linkage | |
|---|---|---|---|
| | | Low (<1) | High (>1) |
| Backward Linkage | Low (<1) | Generally independent | Dependent on inter-industry demand |
| | High (>1) | Dependent on inter-industry supply | Generally dependent |

Source: Miller and Blair (2009)

Apparently, construction seems to be dependent on inter-industry supply and it is among the four industries which embody this relationship. However, backward linkage coefficients are actually lower than anticipated, considering the role expected from construction industry in overall economy.

Table 2
Dependency Relationship-All Industries*

| | | Forward Linkage | |
|---|---|---|---|
| | | Low (<1) | High (>1) |
| Backward Linkage | Low (<1) | 12, 15, 17, 18 | 1, 2, 4, 11, 12, 14, 16 |
| | High (>1) | 3, 8, 9, 10 | 4, 5, 6, 7, 8, 13 |

*: Industry nomenclature is given in Table A1.

By using various coefficients Table A3 provides the information with regard to relative position of the construction industry among all other industries and the changes in its position over the period of 2002-2011. One of the notable information is that the employment creation impact of the construction industry is ranked to be between the 1$^{st}$ and 4$^{th}$ however when its employment creation impact on other industries is analyzed the construction industry is ranked in the last three sectors. Therefore, this may not signal a relatively strong backward linkage especially in terms of employment. Another remarkable finding is that income creation impact of the construction industry is ranked to be between the 12$^{th}$ and 14$^{th}$ however when its income creation impact on other industries is analyzed the construction industry is

ranked to be between 8th and 10th. Therefore, it may be concluded that the construction industry might have stronger backward linkages in terms of inter-industry supply. A similar finding regarding employment creation effect is observed for investment creation. While the construction industry is ranked about the 7th and 8th in creating investment, its impact on investment in other industries is ranked to be 11th and 12th among 18 industries.

## 6. Conclusions

The main argument we focus on is whether construction industry in Turkey is the main driver of the overall economy as it is in most of the developing countries. To answer this question we analyse the trends in various linkage and multiplier coefficients calculated from the I-O matrices of Turkey over the period of 2002-2011. However, to draw a healthy and reliable framework to analyse the contribution of construction industry we need to mention a few points which are crucial in understanding the contribution but which we couldn't focus on in this study due to various constraints.

The first point we would like to mention is that the relevant literature mentions a considerable amount of value added accrues to this industry that is unrecorded due to the existence of large number of contractors and sub-contractors acting in this market. Particularly, unrecorded unemployment is a serious issue to cope with. The second point is that lot of Turkish investors and builders operate in various North African and former Russian republics for which we do not keep the healthy and reliable records of their income etc. transfers to Turkey. Thirdly, it is such an area that enormous economic rents arise due to huge rental and sales prices due land speculation. Last but not the least, the period we covered was just the post-economic crisis period which ended with collapse of loan providers/banking industry in Turkey and which entered to the global financial crisis just 6 years after that domestic crisis.

Keeping in mind that the effects on economy of the third point above counteract against the effects of the first two points, we may conclude that construction industry in Turkey plays a significant role in the economy especially when it is brought into forefront by policies. However, if its comparative position in domestic economy is analyzed and if its role in other developing economies are considered, we may say that the industry's contribution is far from expected.

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# Appendix

**Table A1**
**Industrial Concordance Table**

| | | | | |
|---|---|---|---|---|
| **1** | Agriculture, Hunting, Forestry and Fishing | 1 | **1** | Agriculture, Hunting, Forestry and Fishing |
| **2** | Mining and Quarrying | 2 | **2** | Mining and Quarrying |
| **3** | Food, Beverages and Tobacco | 3+4+5+6+7+16 | **3** | Manufacturing |
| **4** | Textiles and Textile Products | 8+17 | **4** | Energy supply/distribution |
| **5** | Leather, Leather and Footwear | 9 | **5** | Chemicals and Chemical Products |
| **6** | Wood and Products of Wood and Cork | 10 | **6** | Rubber and Plastics |
| **7** | Pulp, Paper, Paper , Printing and Publishing | 11 | **7** | Other Non-Metallic Mineral |
| **8** | Coke, Refined Petroleum and Nuclear Fuel | 12 | **8** | Basic Metals and Fabricated Metal |
| **9** | Chemicals and Chemical Products | 13+14+15 | **9** | All sorts of machinery |
| **10** | Rubber and Plastics | 18 | **10** | Construction |
| **11** | Other Non-Metallic Mineral | 19+20+21+22 | **11** | Trade |
| **12** | Basic Metals and Fabricated Metal | 23 | **12** | Inland transport |
| **13** | Machinery, Nec | 24+25+26 | **13** | Other transport |
| **14** | Electrical and Optical Equipment | 28 | **14** | Financial Intermediation |
| **15** | Transport Equipment | 29 | **15** | Real Estate Activities |
| **16** | Manufacturing, Nec; Recycling | 30 | **16** | Renting of M&Eq and Other Business Activities |
| **17** | Electricity, Gas and Water Supply | 31 | **17** | Public Admin and Defence; Compulsory Social Security |
| **18** | Construction | 32+33+34+35+27 | **18** | Other services |
| **19** | Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel | | | |
| **20** | Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles | | | |
| **21** | Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods | | | |
| **22** | Hotels and Restaurants | | | |
| **23** | Inland Transport | | | |
| **24** | Water Transport | | | |
| **25** | Air Transport | | | |
| **26** | Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies | | | |
| **27** | Post and Telecommunications | | | |
| **28** | Financial Intermediation | | | |
| **29** | Real Estate Activities | | | |
| **30** | Renting of M&Eq and Other Business Activities | | | |
| **31** | Public Admin and Defence; Compulsory Social Security | | | |
| **32** | Education | | | |
| **33** | Health and Social Work | | | |
| **34** | Other Community, Social and Personal Services | | | |
| **35** | Private Households with Employed Persons | | | |

## Table A2. Trends of Linkages and Multipliers Regarding the Construction Sector

| | Backward Linkage | Forward Linkage | Simple Employment Multiplier (Type A) | Type I | Total Employment Multiplier (Type B) | Type II | Simple Income Multiplier (Type A) | Type I | Total Income Multiplier (Type B) | Type II | Simple Investment Multiplier (Type A) | Type I | Total Investment Multiplier (Type B) | Type II | Simple Output Multiplier | Total Output Multiplier | Simple Investment Multiplier | Total Investment Multiplier |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2002** | 0,452 | 0,092 | 0,059 | 1,277 | 0,062 | 1,341 | 0,221 | 1,916 | 0,310 | 2,685 | 0,553 | 1,747 | 1,209 | 3,822 | 1,792 | 2,615 | 1,792 | 5,136 |
| **2003** | 0,448 | 0,086 | 0,047 | 1,303 | 0,051 | 1,420 | 0,216 | 1,905 | 0,303 | 2,677 | 0,550 | 1,727 | 1,203 | 3,777 | 1,780 | 2,122 | 1,780 | 4,121 |
| **2004** | 0,434 | 0,068 | 0,030 | 1,351 | 0,027 | 1,208 | 0,218 | 1,868 | 0,305 | 2,609 | 0,536 | 1,703 | 1,132 | 3,596 | 1,737 | 2,343 | 1,737 | 4,770 |
| **2005** | 0,433 | 0,063 | 0,029 | 1,360 | 0,029 | 1,392 | 0,229 | 1,880 | 0,323 | 2,650 | 0,522 | 1,686 | 1,076 | 3,474 | 1,734 | 2,502 | 1,734 | 4,825 |
| **2006** | 0,418 | 0,059 | 0,030 | 1,319 | 0,031 | 1,353 | 0,219 | 1,820 | 0,301 | 2,501 | 0,518 | 1,660 | 1,066 | 3,419 | 1,689 | 2,416 | 1,689 | 4,646 |
| **2007** | 0,416 | 0,066 | 0,024 | 1,325 | 0,025 | 1,353 | 0,222 | 1,822 | 0,304 | 2,497 | 0,516 | 1,662 | 1,061 | 3,421 | 1,684 | 2,399 | 1,684 | 4,678 |
| **2008** | 0,411 | 0,068 | 0,021 | 1,326 | 0,021 | 1,349 | 0,229 | 1,857 | 0,318 | 2,577 | 0,529 | 1,715 | 1,123 | 3,641 | 1,713 | 2,461 | 1,713 | 4,953 |
| **2009** | 0,436 | 0,075 | 0,032 | 1,297 | 0,033 | 1,330 | 0,237 | 1,953 | 0,330 | 2,720 | 0,553 | 1,779 | 1,224 | 3,940 | 1,780 | 2,568 | 1,780 | 5,387 |
| **2010** | 0,429 | 0,067 | 0,029 | 1,309 | 0,030 | 1,339 | 0,234 | 1,933 | 0,328 | 2,701 | 0,542 | 1,743 | 1,166 | 3,755 | 1,767 | 2,547 | 1,767 | 5,192 |
| **2011** | 0,407 | 0,055 | 0,028 | 1,290 | 0,029 | 1,319 | 0,226 | 1,866 | 0,315 | 2,594 | 0,523 | 1,685 | 1,087 | 3,498 | 1,708 | 2,448 | 1,708 | 4,827 |

## Table A3. Relative Place of the Construction Sector among 18 Industries

| | Backward Linkage | Forward Linkage | Simple Employment Multiplier (Type A) | Type I | Total Employment Multiplier (Type B) | Type II | Simple Income Multiplier (Type A) | Type I | Total Income Multiplier (Type B) | Type II | Simple Investment Multiplier (Type A) | Type I | Total Investment Multiplier (Type B) | Type II | Simple Output Multiplier | Total Output Multiplier | Simple Investment Multiplier | Total Investment Multiplier |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2002** | 8 | 17 | 1 | 15 | 1 | 14 | 12 | 9 | 12 | 9 | 7 | 11 | 7 | 11 | 8 | 11 | 8 | 7 |
| **2003** | 8 | 17 | 1 | 15 | **1** | **15** | 12 | 9 | 12 | 8 | 7 | 11 | 7 | 11 | 8 | **12** | 8 | 7 |
| **2004** | 7 | 17 | 2 | 15 | **4** | **17** | 12 | 9 | 12 | 9 | 7 | 11 | 7 | 11 | 7 | **9** | 7 | 6 |
| **2005** | 8 | 17 | 3 | 16 | 3 | 16 | 12 | 8 | 12 | 8 | 7 | 11 | 7 | 11 | 8 | **11** | 8 | 7 |
| **2006** | 8 | 17 | 3 | 16 | 3 | 16 | 13 | 8 | 13 | 8 | 7 | 11 | 7 | 11 | 8 | 11 | 8 | 7 |
| **2007** | 8 | 17 | 3 | 16 | 3 | 15 | 13 | 8 | 13 | 8 | 7 | 11 | 7 | 11 | 7 | 11 | 7 | **7** |
| **2008** | 8 | 17 | 3 | 15 | 3 | 15 | 12 | 8 | 12 | 9 | 8 | 12 | 8 | 12 | 8 | 12 | 8 | **11** |
| **2009** | 9 | 17 | 3 | 16 | 3 | 16 | 12 | 9 | 14 | 10 | 8 | 12 | 8 | 12 | 8 | 12 | 8 | 10 |
| **2010** | 9 | 17 | 3 | 15 | 3 | 15 | 12 | 10 | 13 | 10 | 8 | 12 | 8 | 12 | 8 | 12 | 8 | 10 |
| **2011** | 9 | 17 | 2 | 15 | 2 | 15 | 13 | 9 | 13 | 9 | 8 | 12 | 8 | 12 | 8 | 12 | 8 | 10 |