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ECONOMIC DRIVE EFFECTS OF THE SOUTH AFRICAN CONSTRUCTION SECTOR: 1993-2002

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ABSTRACT:
Over the past decade, the construction sector played an important role with its growing contributions in the gross domestic product and employment in the South African economy. Using the newly released 2002 input-output table and four previously published tables by the Statistics South Africa, this paper aims to measure the economic pull and push effects of the South African construction sector from 1993 to 2002. The quantitative analyse on the South African construction sector provides a better comprehension of its competitive capability and comparative advantage. The findings can aid government and businesses in the development of their policies and strategies.

KEYWORDS:
South Africa, construction sector, input-output table, pull effect, push effect

INTRODUCTION
Construction plays an important role in any economy contributing significantly to economic growth, employment and income generation. It provides the necessary public infrastructure and private physical structures for government, business, and domestic consumption (Polenske and Sivitanides, 1990). In South Africa, investment in infrastructure is perceived by the government as a key driver of economic growth, in that government spending improves infrastructure and in doing so enables the efficient delivery of other services, reduces business costs and so acts as a catalyst for a higher economic growth and employment creation (National Treasury, 2004). The industry currently accounts for some 5.1\% of gross domestic product (GDP) (CIDB, 2004) and contributes about 30\% to gross fixed capital formation (GFCF). The industry employs approximately one million people (520 486 formally and 470 514 informally), of which the formally employed constitute 5.1\% of the total formally employed population (van
Wyk, 2003). The construction industry’s contribution to capital formation is set to increase drastically if projections of future infrastructure provision are realized (DPW, 1997) and this is expected to impact dramatically on employment. Under the government’s ASGISA (Accelerated Shared Growth Initiative - South Africa) programme, infrastructure investment by the government is expected to total R372bn over 2006-2008 (Ngcuka, 2006). The government’s own expectations are that 65% of the one million jobs that the government has committed itself to creating between 2003 and 2008, will be generated through labour-intensive infrastructure development (van Wyk, 2003). This development activity will be almost wholly construction-driven with the construction industry expected to double in size over the next 10 years (van Wyk, 2003; CIDB, 2004). Therefore, identifying and assessing the drive effects of the construction sector will greatly enhance the understating of the impact of this increase in activity on the broader economy.

Founded by Wassily Leontief, the input-output analysis focuses on how inter-sector trading influences the overall demand for labour and capital within an economy (Leontief, 1966). By displaying all flows of goods and services within an economy, the input-output technology has been considered the main tool for determining, defining, measuring and assessing the economic effects between sectors in the literature (Pietroforte and Gregori, 2003; Song et al., 2005). Based on the input-output tables, the economic effects of the construction sector have been extensively discussed in many countries, for example; Italy, Japan, Finland, USA (Bon and Pietroforte, 1990), Turkey (Bon et al., 1999), Portugal (Lopes, 2003), Taiwan (Su et al., 2003), China (Wu and Zhang, 2005), Australia (Liu et al., 2003) and some OECD countries (Pietroforte and Gregori, 2003; Song et al., 2006).

With the construction industry seen as having a central role to play in South Africa’s development and as a key sector where preferential procurement and redistribution policies can be implemented, its relationship to the broader economy needs to be understood to ensure that the full benefits of economic and social development can be gained through the implementation of government policy. Since the election of the ANC led government in 1994, government in partnership with the construction sector has engaged in redirecting the industry’s growth and performance in support of the
country’s social and economic transformation agenda (CIDB, 2004). Hence, economic drive research of the construction sector is urgently needed in the ‘new South Africa’.

Using the newly released 2002 input-output tables and four previously published tables by the Statistics South Africa, this paper aims to measure the economic pull and push effects of the South Africa construction sector from 1993 to 2002. The paper structure first provides a review of the input-output analysis for the construction sector. The construction sector is then examined in terms of their shares in gross national product (GNP) and gross national income (GNI). Furthermore, the pull and push effects of the construction sector are analysed and discussed. Finally, a concluding comment summarises the paper.

DATA
Statistics South Africa (Stats SA) has published fourteen input-output tables since 1967. From the reference year 1967 to 1993, Stats SA compiled nine symmetric input-output tables. From 1995, Stats SA started to implement the 1993 System of National Accounts (1993 SNA), which is an international standard adopted by most countries in the world, to compile the input-output tables. According to the recommendations of the 1993 SNA, Stats SA compiled the first official supply and use tables (SU-tables) for South Africa for the 1993-reference and published it in December 1999. In June 2005, Stats SA published the newest SU-tables for the 2002 reference year, which is the fifth official SU-tables published by Stats SA.

Unlike a symmetric input-output table, the SU-tables contain a supply table and a use table. The supply table gives information about the resources of goods and services, while the use table gives information on the uses of goods and services and also on cost structures of the industries. As an analytical tool, the SU-tables serve as a basis for calculating the economic data contained in the national accounts, and for analyzing the link between final demand and industrial output levels (Stats SA, 2005).

This research adopts the five aggregated SU-tables published by Stat SA for the reference years 1993, 1998, 1999, 2000, 2002 (Stats SA, 2005). For the purposes of analysis, the symmetric input-output tables are compiled based on the five aggregated SU-tables according to the method provided by the Department for Economic and
Social Affairs, Statistic Division of United Nations (United Nations, 1999). Appendix 1 show the structure of a symmetric South African input-output table, which is derived from the SU-tables. This is a 9-industry input-output table, which contains the intermediate flow, final demand and value added values of the Agriculture, Mining, Manufacturing, Electricity, Construction, Trade, Transport, Business service and Community service industries.

The basic structure of the input-output table is composed of two different groups of products namely inputs and outputs. The rows of the table show the outputs or disposal of the output produced by each industry group or sector. These mainly comprise outputs to other industries for further processing, termed intermediate uses (Leontief, 1966). In addition, each sector sells direct to households and other final users, including government, for current consumption, exports goods out of the region, and for capital expenditure and change in inventories. These final uses of goods and services are termed final demand (Leontief, 1966). The row total therefore equals the total production of the sector. Each column of the table shows the inputs which each sector purchases from other sectors. The supplies can be differentiated into primary supplies and intermediate supplies. Intermediate input refers to the input that is produced within the economy and primary supplies is also called value added, which refers to the input that is not produced by the economic sectors (Leontief, 1966).

Using the five compiled input-output tables of South Africa, analysis builds upon the indicators developed by Bon (2000). This paper analyses six indicators. The share of construction in GNP and share of construction in GNI are adopted to explore the weight of the construction sector in the economy. The backward indicators and direct construction inputs from other sectors indicators are used to analyse the pull effect. What is more, the forward indicators and direct construction outputs to other sectors indicators are chosen to investigate the push effect. The reader may refer to Bon (2000) for the mathematical foundations of the indicators used in this paper.

**THE WEIGHT OF THE SOUTH AFRICAN CONSTRUCTION SECTOR**

The shares of construction in GNP and GNI can measure the importance of the construction sector in the entire economy. In terms of domestic product and income accounting conventions, total value added represents GNI, and GNP records the value
of the total final demand (Bon, 2000). A higher value implies larger contributions of the construction sector to the national economy.

Figure 1 shows the shares of South African construction sector in GNP and GNI. Both shares showed a downward trend during the study period. Over ten years, the shares of construction in GNP and GNI decreased 22.78% and 27.25% respectively. This empirical pattern confirms the arguments of Bon (Bon, 2000) and this decline is reflected in a long-term change in the structure of output away from new works toward repair and maintenance (Carassus, 2004). Moreover, previous studies have found that the share of the construction sector of GNP in highly developed countries tends to stabilize at between 10% and 12% (Su et al., 2003), whereas the GNP share in South Africa is under 8% over the study period. The poor performance is due to poor capacity in both the public sector institutions and the contractors, low productivity and poor quality workmanship, and low profit margins for contractors (DPW, 1999). The other reasons may include lack of a “climate” that would encourage investment in the private sector and public debt was out of control during the 1990s etc.

![Figure 1 GNP and GNI shares of the South African construction sector](image)

**Figure 1 GNP and GNI shares of the South African construction sector**

It is noticed that the values of the shares in GNP were far larger than the shares in GNI. Generally, the construction industry consists of two sub-sectors: new construction, and maintenance and repair construction (M&R). The former produces only for final demand, while the latter produces for intermediate use (Pietroforte and Gregori, 2003). The South African construction sector produces very little for maintenance and repair construction uses with a lower share in GNI. Moreover, recent research indicates the construction’s share of GNI in South Africa is significantly below that of the developed countries (DPW, 1997). In an advanced industrial economy, the role of the construction industry shifts from a preponderance of new construction towards an increasing
proportion of refurbishment, repair and maintenance and management of the built environment (Carassus, 2004).

Figure 2 shows the volume of the building construction and other building (i.e. infrastructure and other construction) and the share of other building in construction. Both volume values indicated an increasing pattern and the infrastructure share in the South African construction sector was around 41% and showed a slightly increasing trend (<1%) over 10 years. That means the compositions of the South African construction sector kept constant from 1993 to 2002.

![Figure 2 The composition of South African construction sector](image)

**THE PULL EFFECTS OF THE SOUTH AFRICAN CONSTRUCTION SECTOR**

The backward indicator shows the proportion of the construction sector’s inputs that comes from other sectors, rather than from primary inputs—land, labour, capital, etc. It indicates the degree of the industrialisation and technical level of the construction production process, that is the extent to which building materials and components are manufactured off site (Bon 2000). More importantly, it represents the strength of the construction sector’s economic pull. The larger is the value, the higher is the national technologies level of the intermediate inputs and the stronger is the pull of the construction sector. Previous research found that, construction is mainly an assembly
activity involving products of a large number of industries and 0.5 is a base line of the pull effects in highly industrialised countries (Pietroforte and Gregori, 2003). As shown in Figure 3, it can be found that the pull effects of the South African construction sector are less than 0.5 except for year 2002, which indicated a relative weak national technological level. The potential reason may due to the decline in the research funding (CIDB, 2004). As a result, productivity and output quality have fallen significantly (DPW, 1999). The value of the backward indicator jumped in 2002. This jump may due to South Africa producing its best economic performance since the advent of democracy ten years ago with South Africa having a higher growth rate than the global average around year 2002 (CIDB, 2004). The South African economy keeps continued expansion and acceleration, predicted to exceed 5% in 2005/2006. Hence, a strong upward trend of the pull effects of the South African construction sector is expected.

![Figure 3 The pull effects of the South African construction sector](image)

In the national account of South Africa, the construction activities include both building and other building. Figure 3 also presents the pull effects of the building and other building. This difference between the building and other building sub-sectors also implies that the new construction proportion in the building construction sub-sector was larger than that in the other building construction because the new construction tends to be much more technical-intensive than M&R construction. Moreover, it can be seen that the technical level of the other building sub-sector was a drag on construction in South Africa over the study period.
In order to investigate the intermediate input compositions of the construction sector, the first five inputs from other sectors to the construction sector are shown in Figure 4. The Manufacturing, construction, business service, mining and transport were ranked top five in all sectors and averagely accounted for 27.89%, 13.98%, 4.92%, 2.23% and 1.04% of the construction sector’s inputs respectively over the study period.

![Figure 4](image)

**Figure 4** The intermediate input compositions of the South African construction sector

The input value from manufacturing stabilised at a value over 25%, which indicated that connection between construction and manufacturing is remains close. Moreover, the increasing trend in the service sector was apparent. Due to a lower construction technical level in the South Africa economy, these evidences do not support Bon’s claim which considered the decreasing trend in the manufacturing inputs (Bon, 2001).

### THE PUSH EFFECTS OF THE SOUTH AFRICAN CONSTRUCTION SECTOR

The direct forward linkage indicator shows the strength of the construction sector’s economic push, which indicates the effect of one unit change in value added by the South African construction sector on total output of all other sectors. The higher value implies that the push of the construction sector is larger. Figure 5 shows the push effect of construction in South Africa over ten years. The construction sector in South Africa shows lower economic pushes (lower than 0.4) because of the fact that the construction sector produces very little for intermediate use. The jump in the early 2000s probably was due to the rising in the construction material price and rapid economic growth.
Figure 5 The push effect of the South African construction sector

Figure 5 also shows the push effects of building and other building. The building construction presented a stronger increasing trend than that of the other building construction. The difference can be explained by the new construction and M&R construction activities because different outputs themselves. In South African input-output tables, new and M&R construction are not split, but they can be distinguished as per previous research, which considered that the new construction delivers only to final demand, while the M&R construction produces for intermediate use (Bon 2000). Hence, the value of construction final demand can roughly represent the new construction and the M&R construction can be denoted by the value of intermediate use. With a higher M&R proportion, the other building construction sub-sector has a higher push to other sectors than the residential construction sub-sector over ten years. It should be noted here that the M&R construction expenditures tend to be underestimated in national income accounts because much of this work is done by owners of buildings.

The intermediate outputs from the construction sector to other sectors are shown in Figure 6. Averagely, the outputs of the construction contributed 13.98%, 2.59%, 1.19%, 8.27% and 0.79% to the construction, electricity, community service, trade and business service sectors, which are ranked top five in all sectors. It seems that the main intermediate use of construction is construction.
Figure 6 The intermediate outputs from the construction sector to other sectors

COMPARISONS OF THE PULL AND PUSH EFFECTS

Figure 7 compares the push and pull effects of the South African construction sector. The construction sector reported a larger pull effects than push effects and showed a higher economic pull than the push. The construction sector generally has higher pull effect because the high amount of intermediate inputs reflects the nature of construction operations involving the assembly of many different products purchased from a large number of industries. It also implies that developing South African economy by promoting the construction sector is not as effective as developing construction sector through promoting the national economy. The implication of this is that the South African construction sector should pay more attention on the development of techniques and management and that the South African government may be overly emphasising the role of construction in economic development.

The push and pull effects of the South African construction sector have been compared with 18 OECD countries. The effect values of the OECD countries are calculated using the 2002 edition input-output tables published by OECD in 2004 (OECD, 2004). It has been noted that these input-output tables are not compiled exactly at the same reference year. Theoretically, it is assumed that the technological and allocation relationships in an economy are relatively stable for a period of time (Bon, 2000). Hence, this comparison is still reasonable. 

Error! Reference source not found. compares the push and pull effects of the multinational construction sector. The South African construction sector has the lowest economic pull capability and a moderate economic push effect.
Compared with some middle income countries such as Greece, Hungary etc., the South African construction sector has a stronger economic push capability. In this regard, the empirical result has confirmed that the South African construction industry embodies features of both developed and developing economies (CIDB, 2004).

Figure 7 Comparisons of the push and pull effects of the South African construction sector

Source: OECD input-output tables 2002 edition (OECD, 2004) and the authors’ calculation.

Figure 8 Comparisons of push and pull effects of the multinational construction sector
The weak economic pull capability may due to that reduced public funding over many years has caused erosion in research capability (CIDB, 2004). Since the early 1990s, the R&D (research and development) of several national government departments in South Africa has been undertaken on a more short-term basis to meet operational requirement, as a result, the R&D base to support the construction sector has been severely eroded and is reaching critically low levels (CIDB, 2004). Moreover, the moderate economic push effect may due to the civil engineering and non-residential sectors have experienced positive growth since 1994 (DPW, 1999).

**CONCLUSIONS**

Using the newly released 2002 input-output tables and four previously published tables by the Statistics South Africa, this paper has measured the economic pull and push effects of the South African construction sector from 1993 to 2002. The findings described that the GNP share in South Africa is under 8% over the study period. The poor performance is due to poor capacity in both the public sector institutions and the contractors, low productivity and poor quality workmanship, and low profit margins for contractors. Moreover, the values of the shares in GNP were far larger than the shares in GNI.

The pull effects of the South African construction sector are less than 0.5 except for year 2002, which indicated a relative weak national technological level. The potential reason may due to the decline in the research funding. With a lower pull effects, the technical level of the other building sub-sector was a drag to construction in South Africa over the study period. The construction sector in South Africa shows lower economic pushes which were lower than 0.4 because in fact the construction sector produces very little for intermediate use. With a higher M&R proportion, the other building construction sub-sector has a higher push to other sectors than the residential construction sub-sector over ten years. Compared with other OECD countries, the South African construction sector has the lowest economic pull capability and a moderate economic push effect. In this regard, the empirical result has confirmed that the South African construction industry embodies features of both developed and developing economies. The implication of this is that the South African construction sector should pay more attention on the development of techniques and management in order to keep up with the developing steps of the developed countries.
REFERENCES


### APPENDIX

#### Appendix 1 The schema of the South African input-output table

<table>
<thead>
<tr>
<th>Intermediate supply of industries</th>
<th>Intermediate use of industries</th>
<th>Total intermediate uses</th>
<th>Final demand</th>
<th>Total outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) Agriculture</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
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<tr>
<td>(2) Mining</td>
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<tr>
<td>(3) Manufacturing</td>
<td></td>
<td></td>
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<tr>
<td>(4) Electricity</td>
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<td>(5) Construction</td>
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<td>(6) Trade</td>
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<td>(7) Transport</td>
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<tr>
<td>(8) Business service</td>
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<tr>
<td>(9) Community service</td>
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<tr>
<td>Total intermediate supplies</td>
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<tr>
<td>Valued added</td>
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<tr>
<td>Total inputs</td>
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</tbody>
</table>