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Journal title:

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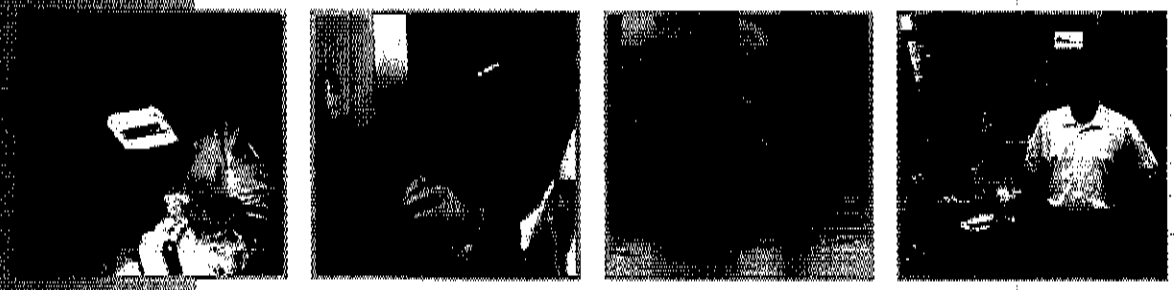

Employment-oriented Industry Studies

Constructing Future Growth Opportunities:

The Potential to Develop an Intensive Civil Engineering and Construction Works Export Strategy

S Lowitt

November 2007

HSRC Human Sciences Research Council

employment growth & development initiative

Innovative employment strategies

CONSTRUCTING FUTURE GROWTH OPPORTUNITIES

The Potential to Develop an Intensive Civil Engineering and Construction Works Export Strategy

Sandra Lowitt

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Employment Growth and Development Initiative (EGDI)
Human Sciences Research Council (HSRC)

November 2007

HSRC Human Sciences Research Council

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Human Sciences Research Council

November 2007

Acknowledgements

Several people have contributed substantial time, effort and resources to helping us understand this complex industry and its export dynamics. I would especially like to thank Miriam Altman, Wendy Lucas Bull, Hylton MacDonald, Brian Bruce, Mike Spicer, Keith Lockwood and especially Henk Langenhoven from SAFCEC who provided invaluable support and assistance. Several other industry players contributed to this study but asked not to be acknowledged.

Financial support from the Department of Trade and Industry (South Africa) is gratefully acknowledged.

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Introduction

The paper is partially a research paper and partly a strategic contribution. It seeks to understand the economic contribution of the civil engineering and construction works sector to the South African economy, both through domestic activity and export activity.

Variability, volatility, irregularity and fluctuation are well-known phenomena in the South African construction industry. Over the past 40 years the sector's contribution to gross domestic product (GDP) has fluctuated between 1.5% and 7%, its employment volumes have swayed from 250,000 to over 800,000 and capacity utilisation has see-sawed between 40% and 110%. While individual firms have developed survival strategies to deal with this inherent volatility, the national economy exhibits less flexibility. This begs two questions. First, could we not be doing something differently from a national economy perspective to stabilise the level of capacity utilisation within the sector and thereby the sector's contribution to employment and output over time? Second, over and above a desire to stabilise the sector's contribution to employment and output, is it not possible for us to do something differently so that we sustainably increase the contribution of the sector to national economic growth and employment?

Export dynamics

The paper begins by considering international case studies and literature related to construction exports. We show that the economic logic of developed countries' expansion into global construction services exports can be traced directly to the maturity of their domestic markets and the shift towards maintenance and repair construction. Export activities are usually taken up to maintain domestic capacity within the sector and to protect the sector's multiplier effects, which range between 1.7 and 2.7 in most developed nations. We then show that the same logic cannot be applied to explain the growth of developing countries' increases in construction exports.

Collectively the literature shows that the majority of developing countries adopting a services export strategy do so because they believe: (1) increased exports are important to grow the local economy, especially if domestic markets are small and variable; (2) increased exports of services are likely to create substantial employment, as most services exports are based on a comparative advantage in labour-intensive sectors; (3) foreign income will be earned; (4) complementary merchandise exports will increase on the back of increased services exports; and (5) services exports are a viable way of diversifying a country's export basket, given that some services exports are not capital intensive and can be undertaken even if domestic savings rates are low. Exports from developing nations thus differ fundamentally from their developed counterparts', as they are driven by reasons other than domestic market saturation or maturity.

The paper goes on to explore the experiences of China and Korea in the construction export market and extrapolate key lessons for South Africa to consider. In summary, the literature shows that the 1970s, 1980s and early 1990s were definitely the heyday of Korea and China's construction export activities. By the 1990s the outlook was becoming bleaker. The paper analyses the four factors which account for the changing fortunes of these countries' construction exports and analyses the implications of these for South Africa. They key lessons learnt are: (1) a comparative advantage in the sector based on low wages cannot be maintained over time, (2) geographic spread in terms of market development is imperative, (3) demand in the export market is becoming increasingly sophisticated and an export strategy based solely on basic infrastructure will fail and (4) a competitive construction sector is insufficient to penetrate this market sustainably – packaging and especially financing of projects via a one-stop shop are increasingly important.

Demand

The demand analysis included in the paper is substantial and considers historic trends, current activity, demand drivers and the composition of demand in detail.

The key growth drivers for the civil engineering and construction works sector are identified as general economic performance, interest rates, inflation rates, access to investment financing and business confidence levels, as well as the most important driver – public sector spending. As fiscal policy in most developing nations is pro-cyclical rather than counter-cyclical, the double trend of non-expansionary fiscal policy and decreasing GDP during periods of economic slow-down and the reverse in periods of strong economic growth create large variations in the construction sector in general and the civil engineering and construction works sector in particular.

This argument is borne out when considering the relative roles of different stakeholders in the economy in driving construction works and civil engineering. The private sector is an important participant in gross fixed capital formation, but it is a relatively small contributor to total demand, and over time it has been less variable than public sector demand. By far, public sector spending (either directly by the three spheres of government or by parastatals) is the crucial driver of the demand for social and economic infrastructure, and hence civil engineering and construction works demand. The paper goes on to reveal that public corporations such as Transnet, the Industrial Development Corporation (IDC) and Eskom are crucial in driving domestic demand in this sector and that this demand has proved historically to be highly variable.

Considering the history of demand for this sector's services, the paper shows that between 1960 and 1970, demand for civil engineering and construction services was predominantly driven by central government spending as the *apartheid* government rolled out strategic economic infrastructure. Driven by a strong domestic economy which was buoyed by high resource prices and a strong military and infrastructure investment programme, the 1970s saw massive infrastructure investment by the old *apartheid* regime. This surge of activity led to the highest ratio of gross fixed capital investment to GDP in the country's history, peaking at 29.68% in 1976. With most developed nations averaging an equivalent ratio of 23% – and most developing nations a mere 15% – the 1970s were indeed a golden period for the civil engineering

and construction works sector in South Africa. Bar a minor surge between 1988 and 1990, the industry suffered subdued levels of demand throughout the next two decades, with the ratio of gross fixed capital formation to GDP falling to a 50-year low of 14.69% in 1993. These 20 years of low demand essentially decimated the industry's capacity. The democratic election of 1994 and the fiscal austerity of the Growth, Employment and Redistribution (GEAR) policy did little to reverse the fortunes of the sector.

In 2002, however, the sector's fortunes changed dramatically. Within the private sector, five years of low inflation, reduced interest rates, growing business confidence and stable domestic growth provided an environment for renewed investment – not only to replenish capital stock but also to add to capital stock in anticipation of continued growth. Within the public sector, the gains from the period of austerity under GEAR allowed government to pursue a strongly expansionary fiscal policy. High on the government's agenda was the provision of economic infrastructure to address the constraints that arose during a decade of economic growth outstripping capital stock investment. Since 2002, demand for the civil engineering and construction works sector has been growing at between 10% and 15% per annum, and if these accelerated growth rates increase, the sector will double in size in the next five years.

Supply

In normal circumstances, any industry would feel challenged when facing growth rates of the magnitude faced by the local civil engineering sector since 2002. When such accelerated growth occurs off a low capacity base which has been decimated systemically over a two-decade period, the challenge is substantially larger. Language found in current sector literature such as "total onslaught on available resources", "tsunami of new contracts" and "fever period" suggests that concerns exist regarding the ability of the industry and its upstream suppliers to meet the aggressive increase in demand for civil engineering services. Several key issues have arisen regarding the overheated environment in which the sector is currently operating. The issues pertain not only to construction companies' capacity to meet demand, but also the capacity of upstream producers to meet the construction industry's demand for inputs.

The issue of greatest concern in meeting accelerated demand is a lack of adequately trained and experienced skilled labour resources – including management, project management, engineers and artisans. Construction companies deal with periods of low demand by laying off workers, retarding salary growth and offering early retirement. With poor demand conditions being perpetuated during the 1980s and 1990s, the skills base available to meet the current boom has all but evaporated. By way of example, in 1975, South African universities were graduating 6,000 engineers per annum. This fell to 1,400 per annum in 2004. Similarly, in 1975 there were 33,000 registered apprentices in the construction sector compared to just 1,400 in 2005. The skills shortage, supported by empirical evidence, has been well acknowledged by government and industry.

The paper then explores the three responses of the sector to this skills shortage. The first includes the Joint Initiative for Priority Skills Acquisition (JIPSA) and other industry initiatives aimed at developing skills, particularly those of engineers and

artisans. The second response to this excess demand for skilled workers relates to retention strategies and rehiring retired professionals. Skilled construction professionals who retired from the industry in the 1990s are being rehired on short-term contracts to see companies through particular projects. In addition to reintroducing skills from the retirement pool, companies are also working hard to retain existing workers who are often canvassed by competing firms. Retention strategies have dominated salary, benefits packages and share option and bonus inducements which have seen a market price effect of premiums of up to 50% to 70% being paid to retain or attract qualified labour. The third response has been to supplement the local resource base with imported skills, acquired either directly via immigration or indirectly via joint venturing with overseas companies on large contracts. Local companies who find themselves short of general or specific skills in relation to a given project are now joint venturing with overseas companies as a method of introducing additional skills into the market. Crucial to South African companies' potential to use this option has been a shift in government policy away from highly fragmented contracts towards the awarding of large contracts in their entirety to a single company.

A further supply consideration analysed in the paper is the ability of upstream suppliers to meet the demand of the sector for intermediate inputs. The seriousness of this constraint appears moot. An industry delegation meeting with the Presidency recently reported that input supplies were not a binding constraint, while industry players and some industry associations believe that the supply of cement, structural steel and other consumable inputs are under pressure from the sector's recent accelerated growth. As market prices reveal an objective measure of supply and demand, the paper shows that despite protestations to the contrary, price increases well above CPIX[1] and the PPI[2] have been recorded in the past three years, leading to a conclusion that in many instances demand is increasing faster than supply with respect to key inputs and that some supply constraints are appearing. This conclusion is backed up by our industry interviews in which several interviewees mention extended time delays in receiving materials ordered.

Domestic multiplier

A crucial argument in the paper is that the civil engineering and construction works sector is important to the South African economy, not only because of activity within the industry but also because of the level of economic activity the sector supports in other parts of the economy. The paper analyses both the concept of the multiplier and quantification of various multipliers for the sector. The key multipliers are shown in table i below.

[1] Consumer Price Index excluding interest rates on mortgage bonds

[2] Producer Price Index

Table i – Estimated multipliers of the civil engineering and other construction sector for 2005

Multiplier arising from a R1 increase in sales/output (based on 2005 figures)	Initial impact (a)	First-round effect (b)	Direct impact (c=a+b)	Indirect effect (d)	Induced effect (e)	Total impact (f=c+d+e)
Output/Sales (Rand)	1.0000	0.6115	1.6115	0.6067	1.2754	3.4936
Gross domestic product/gross value added (Rand)	0.2900	0.2348	0.5248	0.2604	0.3915	1.1767
Labour remuneration (Rand)	0.1453	0.0938	0.2392	0.1060	0.1439	0.4891
Import leakage (Rand)	0.0985	0.0627	0.1612	0.0536	0.0794	0.2942
Average capital requirement (Rand)	0.1190	0.4148	0.5338	0.5600	0.6606	1.7544
Employment (number of jobs/ R-million of sales)	4.3975	1.5525	5.9500	1.3498	2.3008	9.6007

Source: Quantec Research

The summary findings of the total impact of the civil engineering and construction works multipliers can be explained by considering what happens if there is a R1 increase in sales by the civil engineering and other construction sector. The impacts would be as follows: an increase in economy-wide sales of around R3.50, resulting in additional value added of around R1.18 – of which about 49 cents would be labour remuneration and the balance (around 69 cents) would be additional gross operating surplus. About 29 cents of the additional sales would be supplied by foreign suppliers, and the sales would, on average, necessitate about R1.75 worth of gross capital formation. For every R1-million worth of sales by the civil engineering sector, up to 9.6 jobs could be supported throughout the economy. The paper then goes on to show that these multipliers generally compare favourably to those of other sectors in the South African economy and are in the same general ballpark as multiplier effects in other countries.

South African exports

The paper's analysis of South African exports is less about facts and figures than about trying to understand behaviour. The paper begins by analysing in detail the drivers of private sector firms' export activity. The key drivers are identified as levels of domestic demand, risk diversification, client activities outside of South Africa, profit rate differentials and the desire to learn new techniques and technologies from other countries.

We then turn our attention to understanding where and why South African firms operate abroad. The geographic spread of where South African construction exports occur is crucial to the argument being made, as we reveal that export multipliers vary considerably based on where exports occur. Key to the conclusions of the paper is the

fact that, unlike merchandise exports, services exports are not homogenous; in other words, not all services exports are equal – some will be of greater benefit to the domestic economy, while others will be of little or no value to the domestic economy.

The paper shows that the majority of construction exports by South African companies occur within the region, with Namibia, Botswana, Mozambique, Swaziland and Zambia being key markets. Since 1994, activities in Ghana, the Democratic Republic of Congo (DRC), Angola, Ethiopia, Nigeria and Mali have also increased. So too has export activity for the larger companies in the Middle East, eastern Europe and Australia.

The decision to enter an export market either by establishing a subsidiary company in a foreign country or by winning and accepting a contract for a specific project in a foreign country is a complex decision for local companies and one they do not enter into lightly. Risk management is a crucial factor in understanding South African companies' export behaviour, more so than in other developing countries where governments apply different risk criteria and management strategies than individual companies are forced to use.

Real and perceived risks, as well as risk management strategies, have resulted in some key types of behaviour which have a strong bearing on this paper, and especially the calculation of an export multiplier. Four key behaviours are identified.

The first behaviour pattern relates to what contracts South African companies are happy to bid on. In green light countries (developed countries where operational and corporate risk is viewed as low), local companies have no problem in contracting with foreign governments or governmental agencies as well as private sector clients. As the public sector is the primary source of demand for economic infrastructure, a willingness to contract with a government of a foreign nation is key in exporting civil and construction works services. In red and amber light countries (where corporate and operational risk is viewed as high), South African firms will not (as a general rule) contract with foreign governments and will only take contracts offered by the private sector.

The second behaviour pattern we see in local firm exports is a highly sophisticated manner of contracting which ameliorates foreign exchange risk. Crudely put, two types of contracts exist. First there are contracts where relationships with the South African holding company are at arms' length and contracts do not contain a rand-based component. This is true of most Middle Eastern, European, Australian, American and Canadian contracts. The second category of contracts, mainly those in the Southern African Development Community (SADC) and the Rest of Africa do have a strong contractual link to the South African holding company and often have a substantial Rand content. We believe these transaction behaviours are a major contributor to the massive under-valuation of construction exports currently portrayed in the national data system. They also have a large impact on the benefits accruing in the local economy to any export activity.

Local firms' risk perceptions and management strategies give rise to a third behaviour pattern – supply continuity and the crucial issue of getting inputs on site on time and intact. The logistics system and its speed, reliability and continuity appear to be a

crucial issue in project and operational risk assessment, especially in Africa. While opinions differ across different companies in South Africa, it appears that as a general rule, local companies prefer using inputs sourced in South Africa for overseas projects in Africa, simply because they have experience with the products and have a view on their quality and functionality. However, for most countries north of SADC, insufficient logistics systems do not allow South African-sourced inputs to be transported reliably and safely to site. In these instances, inputs are sourced from countries where a superior or alternative logistics package is available.

The final behaviour pattern arising from a local company's risk assessment relates to operating in a hostile physical environment and a non-transparent governance environment. In this section we are referring to issues as diverse as HIV and Aids prevalence, malaria, armed attacks on and kidnapping of personnel, theft of machinery, bribery, corruption, non-payment, changes in regulations and a host of other factors outside the control of a local company operating abroad.

On the basis of these behaviour patterns and companies' risk assessments and risk management strategies, we see the following overall preferences in relation to South African company exports:

- First, South African companies would prefer to export civil engineering and construction works services to first-world countries such as Australia, the Middle East, Europe, America and Canada, as these are viewed as low-risk opportunities.
- Second, in terms of export activity to developing countries, local South African companies are happier operating in SADC countries, with the Rest of Africa occupying last place in terms of preferred geographic locations for exports.
- Third, South African companies prefer to work for private sector clients rather than public sector clients, especially in developing countries.

As suggested earlier, not all off-shore contracts are equivalent – either from a company perspective in terms of risk and profitability or from a South African economy-wide perspective in terms of the sourcing of inputs and labour supply to fulfil foreign contracts. The market preferences developed above are crucial to understanding the current benefits to the South African economy arising from the export of construction services, as well as the potential benefits which could be reaped from an alternative export approach. Essentially the premise of this paper is that exports could potentially be used to supplement domestic demand to either maintain or grow the sector's contribution to GDP and employment, both directly and indirectly through the sector's multiplier effects. For this argument to hold it is necessary to demonstrate the local labour content and local materials content which are supplied to fulfil international contracts.

The paper then moves on to a detailed discussion of how we arrived at an export multiplier. The results are shown for SADC and Sub-Saharan African (SSA) exports. No multiplier for export activity to countries such as the Middle East, Australia, the US and Canada are developed because there is little relationship between these contracts and the South African economy. Essentially in these markets no labour or

materials inputs are sourced from South Africa and hence they have no benefit to the local economy other than perhaps improved returns to shareholders.

The SADC and SSA multipliers are shown in table ii below.

Table ii – Estimated multipliers for civil engineering and construction works exports from South Africa

Multiplier arising from a R1 increase in export sales (based on 2005 figures)	Exports to	Initial impact (a)	First-round effect (b)	Direct impact (c=a+b)	Indirect effect (d)	Induced effect (e)	Total impact (f=c+d+e)
Output/sales (Rand)	SADC countries	1.0000	0.4067	1.4067	0.4035	0.6471	2.4572
	Non-SADC SSA countries	1.0000	0.3138	1.3138	0.3113	0.6471	2.2722
Gross domestic product/gross value added (Rand)	SADC countries	0.1510	0.1562	0.3072	0.1732	0.1986	0.6790
	Non-SADC SSA countries	0.1513	0.1205	0.2718	0.1336	0.1986	0.6041
Labour remuneration (Rand)	SADC countries	0.0060	0.0624	0.0684	0.0705	0.0730	0.2119
	Non-SADC SSA countries	0.0056	0.0482	0.0537	0.0544	0.0730	0.1812
Employment (jobs supported per R1-million sales)	SADC countries	0.1817	1.0325	1.2142	0.8977	1.1673	2.3815
	Non-SADC SSA countries	0.1686	0.7967	0.9653	0.6927	1.1673	2.1326

Source of basic data: Quantec Research; own estimates

When these export multipliers are compared to those of domestic contracts, it is evident that the relative potential benefit to the South African economy for export contracts is substantially lower than for domestic contracts. This overall result was anticipated; however, in some cases the differential was higher than expected and in other cases lower than expected. In the case of sales/output multipliers, exports to SADC countries are about 30% lower than the domestic multiplier effect and those to SSA countries (excluding SADC) are around 35% lower. These sales/output multipliers are higher than anticipated and suggest that upstream industries which produce inputs for the civil engineering and construction works sector in South Africa will benefit from local firms' increased export activity to the SADC and SSA markets. As such, increased exports from this sector will have a positive impact on the overall economy of South Africa, and although the impact is not as great as that gained from local production of these services, the impact is nevertheless not insignificant.

With respect to value added and employment multipliers, however, the multipliers for export contracts perform worse than expected when compared to local contracts. In the case of gross value added, SADC contracts carry multipliers that are 42% lower than domestic contracts, while SSA contracts have associated multipliers that are 49%

lower. The employment impact of export contracts is perhaps the most disappointing of the export multiplier results. In the case of SADC contracts, a R1-million change in final demand would only support up to 2.4 jobs (compared to 9.6 for local contracts). In the case of SSA contracts, the employment multiplier drops to 2.1 jobs per R1-million change in final demand.

Strategic debate

In this section of the paper the author attempts to assess the entire body of information and analysis to see how it supports, or fails to support, the hypothesis posited in the introduction of this paper, namely, could an intensive construction export drive assist in maintaining or growing the civil engineering and construction works sector and thereby direct and indirect GDP and employment? In the event that the answer to this question is affirmative, the next question to pose is: ***should*** South Africa consider such a strategy? And finally, if we decide to support such a strategy, ***can*** we actually deliver the required processes and mechanisms to ensure a positive outcome?

We begin with the first question: could an intensive construction export drive assist in maintaining or growing the civil engineering and construction works sector and thereby increase GDP and employment growth? This question is essentially a theoretical question and quite easy to answer given the research conducted. The answer to the question is clearly yes!

If we view export activity simply as an alternative source of demand for the local industry, then it is clear that increased foreign demand for local civil engineering and construction works services could be used to bolster domestic demand in periods of low domestic demand, and could equally add to domestic demand even when such conditions are favourable. The only time this increased demand could be viewed as having effects other than positive would be in a situation where export activity crowds out domestic activity, that is, when export contracts are substituted for domestic contracts. In the event of substitution, the economic effects of increased export activity would be detrimental to the local economy due to the fact that the domestic multiplier is higher than the export multiplier. An additional negative impact of substitution would be the long-term negative impacts of an under-supply of strategic economic infrastructure to the domestic market and its ability to support growth. This would only materialise if foreign firms did not enter the South African market to 'mop up' local demand. We found no risk of substitution in the local market and therefore answered this question in the affirmative.

We now move on to the second question posed: ***should*** South Africa support an intensive construction export strategy based on the positive potential impacts argued above? This question is far harder to answer, as it is not a theoretical question but one of strategy. Questions of strategy are highly influenced by prevailing circumstances and equally by views of what the future holds. This is very much the case where civil engineering and construction works exports are concerned.

Had a suggestion of an intensified export strategy been tabled in South Africa any time between 1985 and 2000 when the sector was shedding labour and upstream industries were laying off workers and mothballing production facilities due to a lack

of demand, we are confident that an intensive export strategy proposal would have been embraced enthusiastically as a contribution toward GDP and employment growth and the maintenance of the sector's capacity. Suggesting this same strategy in 2007, however, when demand is outstripping supply and the industry is one of the fastest growing sectors in the domestic economy, has produced an almost universally derisory response.

In answering this question, the paper considered current and future views on demand, supply and multiplier differentials. With respect to demand, two schools of thought were considered – the optimists who foresee strong, accelerating demand until 2027 and the pessimists who see growth peaking in 2015 and thereafter slowing down somewhat. On the supply side, the paper shows the potential of excess supply of labour and inputs if demand slows after 2014, while spare capacity is not viewed as a problem if demand conditions continue to improve until 2027.

A key debate in this section relates to the long skills development pipeline for engineers and artisans and considers how the timing of demand slowing down and skills reaching the market may produce differing outcomes. The paper argues that if one embraces the optimists' view of future demand conditions post-2014, the timing of these skills reaching the local market is not problematic. If, however, the pessimistic view of future demand is seen as more likely, it is possible that the additional supply of skills will reach the market at a time when demand for such skills is slowing down and the demand for new skills is dampened by existing compensatory policies. In this scenario, the skills development initiatives currently being undertaken will appear to have been an over-investment in skills, and new artisans and engineers will struggle to find employment locally. In this latter scenario, an intensive export strategy would be an option to ensure that our current investments in skills development have not been wasted.

The final argument to consider in terms of the broader question of whether South Africa should develop an intensive export strategy relates to the differential benefits of local and foreign contracts to the broader South African economy. The issue here is one of relative impact. We have shown clearly that the local multiplier is higher than the export multiplier in the civil engineering and construction works sector. This suggests that to maximise South African GDP growth and employment, a R1-million local contract would be more beneficial to the local economy than an equivalent R1-million export contract. However, if the choice is between no local demand for an additional R1-million contract and effective demand for a R1-million export contract, then the local economy would be better off servicing the international contract than not servicing it.

As such we would argue that despite the relative differences between the local and export multipliers, if spare capacity exists in the domestic industry, growth and employment would be optimised by exporting civil engineering and construction works services if the alternative is for these resources to remain unutilised. A final point to be made with regard to the differential between export and local multipliers is that these quantifications are not stagnant. It is possible that export multipliers can be increased so that export contracts have a greater impact on the South African economy than they do at present.

To summarise the arguments above as they relate to whether South Africa ***should*** adopt an intensive export strategy or not, the paper suggests the following. Strategically one would have to argue that for the next five to seven years adopting an intensive export strategy in the civil engineering and construction works sector would not be a priority. Demand conditions are robust, supply constraints do exist, firms are operating at or above full capacity and the benefit to the domestic economy of local civils contracts is being maximised.

However, for the period post 2014 it would appear that embracing an intensive export strategy in this sector could be a strategically sound option. First, from a macroeconomic perspective, the opportunity to diversify our export basket, to earn foreign exchange and to increase merchandise exports would all be sound principles to follow. From an industry perspective, the development of alternative sources of demand to complement or supplement domestic demand would be a good risk and corporate diversification strategy, given the history of domestic demand and GDP cycles, as well as a viable growth strategy in the long run. Finally, if one is persuaded or concerned regarding the timing of domestic demand peaking in 2014 and the supply of skills released onto the market peaking after that date, then an export strategy is a solid investment in ensuring that our current skills development initiatives are not wasted or lost to other countries.

The paper then turns to the last question: ***can*** South Africa put in place the necessary support initiatives and instruments to achieve such a strategy if it so wished? We answer this question by looking at two types of obstacles to increased export activity. The first is termed traditional and the second non-traditional obstacles. The traditional constraints include market access, corruption and bureaucratic problems, project funding and guarantees and government support. These are dealt with in some detail and potential remdial actions suggested. In the section on non-traditional obstacles, we look at issues specific to South Africa based on its historic model of exporting behaviour as well as corporate attitudes.

As mentioned earlier in the paper, South Africa's historic model for civil engineering and construction works exports varies notably from that of other developing countries. Whereas other developing country construction firms operate abroad with strong government support and often upon direct government decrees, South African firms have to date been exporting in the absence of any governmental direction. The South African government has never adopted a national export imperative or export strategy for the civil engineering and construction works sector. The South African government has also not to date viewed the sector's export activities as an important contributor to national growth or international trade. As such the civil engineering and construction works sector's export activity has been a private sector-driven initiative in response to corporate strategies and market forces. The ability of the government to develop an intensive export strategy would therefore depend on the reaction of the industry to its plans.

Our interviews with industry players exposed a high degree of skepticism over whether, as individual players in the international market, they would be willing to engage in an industry-wide initiative to develop the construction sector in South Africa or to co-operate in an export drive initiative. The skepticism appears to arise from two issues. First there is concern over whether a government-sponsored

initiative would indeed yield any meaningful results. The second concern is that the high level of competition between local construction firms would nullify any meaningful co-operation and collaboration with respect to an industry-wide initiative.

The other non-traditional export obstacle is existing corporate preferred export markets.

In our section on export multipliers it became obvious that not all exports are equal from the perspective of the knock-on effects of foreign activities on South African output and employment. We showed that exports to Europe, the Middle East, South East Asia, Australia, the US and Canada have no impact at all on the local South African economy. As such, if the basis for supporting an intensive export strategy is based on the positive impact of these exports on the South African economy, then an export strategy which results in increased export to these geographic areas will fail to achieve the goals of higher economic growth or employment.

Exports to SADC and SSA, however, exhibit stronger linkages to the South African economy. As such an intensified export strategy would need to focus on exports to SADC and SSA in order to maximise the benefit of such a strategy to the local economy. However, three substantial hurdles exist in relation to developing such a strategy.

The first is the demand hurdle. The demand for civil engineering and construction works in Africa comes predominantly from two sources. The first is foreign direct investment, which mostly arises from the private sector and is largely connected to mining and resource extraction. This demand is high on the back of the current commodity boom. The second source of demand arises from central government activities in African countries. South African firms show a marked resistance to contracting with these potential clients. An intensive export strategy for this sector into Africa would therefore require a major shift in local firms' decisions to contract with foreign African governments as clients. Solving such a problem would require both diplomatic efforts as well as an appropriate pricing of risk.

The second hurdle is the supply hurdle. In addition to reservations about client selection, South African firms are also reticent about operating in the 'hostile environment' of SSA and to a lesser extent SADC. Not only are African construction sites often remotely situated and plagued by high temperatures and excessive dust which impacts on machinery, maintenance and costs, many African construction sites also often raise hazards of disease such as malaria, typhoid and dysentery. In addition, all our interviewees raised the issue of HIV and Aids prevalence and infection of employees who are away from home for an extended period of time. If we add logistical risks and site security issues to this list, African contracts only appear appealing if the returns on such projects more than compensate for the risk and difficulty in fulfilling such contracts. In a perfect world these risks would result in higher margins, with market forces pricing these risks into the contract value. Unfortunately the presence of developing country civil engineering and construction works firms – which engage in these export contracts for reasons other than profit – undermines the market pricing system. The Chinese head the list of culprits in this regard, but in recent years Indian and Brazilian firms have added to the limitation of margins on African contracts issued by African governments. Good margins can still

be earned on private sector contracts, which explains why South African firms are more willing to accept the higher risks of working in Africa when the client is a private sector operator.

The third hurdle relates to procurement processes, preferences and logistics systems. Some South African firms operating abroad in the civil engineering and construction works sector have a strong preference to source materials from South Africa, simply due to the certainty provided by sourcing inputs from a known supplier with an established track record. The majority of firms working abroad, however, have no such concerns and are happy to import products from anywhere in the word to their construction sites in Africa. It was suggested that a rebate system similar to that which was available under the General Export Incentive Scheme (GEIS) would assist in enhancing the procurement of inputs from South Africa. Any increase in locally procured materials would obviously increase the multiplier effect of construction exports. However, a necessary condition to ensure increased procurement of South African inputs into export construction projects is the provision of a safe and reliable transport and logistics system to host export countries. One of the key reasons why SADC export multipliers are higher than SSA multipliers is due to the logistics system. Moving goods from South Africa to countries such as Ghana, Mali and the DRC is close to impossible on land – not only because of a lack of infrastructure but also because of unpredictability of supply due to corrupt border posts and banditry. The implementation of New Partnership for Africa's Development (NEPAD) initiatives to improve logistics and transport systems would help to alleviate such constraints, but for the foreseeable future this hurdle remains in place.

The paper shows that for South Africa to maximise the economic benefits of civil engineering and construction works exports, we would need to shift exporting firms' preferences away from exporting to distant, developed markets such as the Middle East and Australia and rather increase exports to SADC and SSA. It appears that local firms have a rational and sound basis for their current preferences. Changing these preferences is possible, but as argued, it will not be an easy assignment.

Conclusions

An ivory tower academic schooled in industrial strategy and macroeconomics considering the research accumulated in this report would find copious arguments, case studies and data to support a strategic decision to implement an intensified civil engineering and construction works export programme from South Africa to SSA and SADC. Benefits of such an expansion of activity would include, inter alia:

- Export diversification;
- Foreign exchange earnings;
- Opportunities to grow merchandise exports;
- Positive impact on South African GDP;
- Positive impact on South African employment;
- Stabilisation of the construction sector as an industry;

- Stabilisation of the construction sectors contribution to GDP and employment growth; and
- Growth of the construction sector.

The environment within which industrial policy is made, however, differs significantly from the environ of an academic ivory tower. In the real world the policy environment needs to take account of stakeholder attitudes, the tools and levers available to implement change, and trade-offs and cost-benefit analyses, as well as broader agenda priorities and exogenous variables which fall outside the control of policy-makers. In addition, any current policy decision requires a view on prevailing industry and economic circumstances, as well as a view as to how these are likely to change in the future.

These complexities, in light of the information presented in the report, suggest that no clear policy recommendation can be given regarding whether the South African government should commit itself to supporting an intensified export strategy for the civil engineering and construction works sector. What is clear is the following:

- Potential positive economic outcomes can be achieved by increasing exports.
- Civil engineering and construction works exports is a championless cause, as it does not exist on anyone's radar screens at present.
- If as a country we wish to increase exports in this sector in the future, we need to make this decision early – not only because of the time it will take to deal with many of the traditional constraints facing the sector, but also to ensure that we capitalise fully on our current joint venture experiences.
- A decision to adopt such a strategy will require a substantial dialogue and relationship-building exercise between the government and the civil engineering and construction works industry.

1. Introduction

The status of the construction sector as a driver of economic growth in South Africa appears highly variable over time. In the honeymoon period immediately following the 1994 election and the publication of the Reconstruction and Development Programme (RDP), the construction sector was viewed as having a major role to play, not only in terms of its final outputs but also in terms of its economic contribution to employment and GDP. By the time the Accelerated and Shared Growth Initiative – South Africa (Asgi-SA) was published in 2006, the construction sector did not appear as a priority sector within the sector strategies component of the document, and the infrastructure programme dealt only with final infrastructure outputs and not the requirements of the construction sector to achieve these goals. Unsurprisingly, by 2006 and 2007 the industry was back in the limelight, this time in relation to concerns about the sector's ability to meet accelerated demand.

Variability, volatility, irregularity and fluctuation are well-known phenomena in the South African construction industry. The sector's contribution to GDP has fluctuated from 1.5% to 7%, its employment volumes have swayed from 250,000 to over 800,000, and capacity utilisation has seesawed between 40% and 110%. While individual firms have developed survival strategies to deal with this inherent volatility, the national economy exhibits less flexibility. This begs two questions. First, could we not be doing something differently from a national economy perspective to stabilise the level of capacity utilisation within the sector and thereby the sector's contribution to employment and output over time? Second, over and above a desire to stabilise the sector's contribution to employment and output, is it not possible for us to do something differently so that we sustainably increase the contribution of the sector to national economic growth and employment?

Stabilising and growing the national construction sector is an interesting economic issue for several key reasons. First, the construction sector is one of the country's largest single sectors. Second, the construction industry exhibits very high levels of linkages, which means that when the sector grows, it 'pulls along' with it increased output and employment in a wide array of associated industries. Third, the sector shares a large number of characteristics with other services sectors as opposed to the goods sector. These characteristics provide interesting opportunities to leverage services growth, especially in the export market. Finally, the sector is interesting from a South African perspective in terms of its relatively high level of labour intensity and its ability to absorb large numbers of unskilled workers.

Besides being a sector of economic interest and significance, the questions raised in this paper are also highly topical at present (although this view is not shared by all). Domestic demand for civil engineering and construction works is strong and this trend is anticipated to continue for some time. Due to the decimation of the industry in the 1980s and 1990s, this accelerated demand has resulted in substantial ramping up in the construction industry itself, as well as its upstream suppliers, to meet current demand. Virtually all current research in the sector relates to questions of capacity and how to deal with demand exceeding supply in key areas such as skills, cement, steel

and other inputs. The hypothesis in this paper is that despite short-term concerns regarding capacity, at some date domestic demand will inevitably cool down, leaving the country with a massive absolute capacity within the civil engineering and construction works sector. To ensure that this capacity is maintained – within the industry and its upstream suppliers – a supplement to domestic demand will need to be identified in order to avoid massive job shedding and decreases in intermediate product output. This supplementary demand exists in the form of export opportunities for the sector. The key question boils down to ***when*** is an appropriate time to consider positioning the country and the construction sector to increase its export activity intensively. And could such a positioning actually be achieved?

The general view of policy-makers and industry stakeholders is that now is not the time to consider these issues. This paper argues that despite robust domestic demand at present and in the foreseeable future, ***now*** is the appropriate time to at least start debating this issue if not actually taking steps to position South African firms to increase their exports – hence the topical nature of the questions we are posing.

The paper is partly a research paper and partly a strategic contribution. It seeks to understand the economic contribution of the construction sector to the local economy and then to compare the domestic sector and government's approach to export activity with that of other developing countries. The idea of utilising external demand to maintain or grow a domestic construction sector is not new, and innovative and substantial international literature exists. The literature and experience of developing countries in this market suggest that South Africa has not historically followed international practices. We consider whether lessons exist from which South Africa could learn, as well as more specifically consider on-the-ground constraints to increased exports and what steps could be taken to ameliorate these constraints in the future.

While entrenched attitudes, perceptions and timing issues may dominate responses to this paper, at its core is an uncontentious hypothesis – the civil engineering and construction works industry is an important economic sector for South Africa, both in terms of its direct and indirect job creation potential and its direct and indirect output contributions to GDP. Maximising these contributions over time is in the national best interest. The only contentious issue is how and when we act to maximise these contributions.

Section two of this paper deals with construction sector dynamics in developed and developing countries. The section surveys international literature and identifies why countries adopt strong export strategies in this sector and how the export market has changed over the last 20 years. In section three we consider the South African civil engineering and construction works sector. We look at issues of domestic demand and supply, as well as sectoral linkages and various multipliers. In section four we turn our attention to South African construction exports, analysing existing activity and trying to understand the drivers of current export activity. In the final portion of section four we consider the correlation between the type of exports (by sector and geographic region) and the benefit to the domestic economy – showing that not all exports are equal and that export multipliers vary. In section five we consider the obstacles to increased export activity before concluding the paper in section six.

2. Construction sector dynamics in developed and developing countries

The international literature related to the role of the construction sector and its exports within a national economy is enormously interesting as it applies to this paper. As will be demonstrated below, South Africa's current construction export activity fits none of the existing explanatory models or theories pertaining to such activities, leaving large scope in terms of future policy and implementation conceptualisation.

A substantial body of literature exists describing the dynamics of the construction sector in developed countries. While individual country studies abound, it is the cross-country, long-term studies which are most revealing. Two seminal studies have been completed. In 2001, Bon and Pietroforte analysed the construction sectors of Japan, the US, Finland and Italy between 1945 and 2000. In 2003, Pietroforte and Gregori undertook an equivalent study of Australia, Canada, Denmark, France, Germany, the Netherlands, Japan and the US between 1970 and 1980. Both studies found similar results in terms of three key market dynamics.

First, both studies found that construction sectors "ranked very highly in terms of backward linkage indicators and output multipliers". In both studies it was found that "only manufacturing sectors tend to rank higher" (Bon and Pietroforte, 2001: 7 and Pietroforte and Gregori, 2003: 17). Across all the countries, the authors find that output multipliers range from 1.7 to 2.7. These benchmark figures illustrate the high level of interconnectedness between construction and the rest of the economy in developed nations and is the point of departure in arguing the importance of maintaining a robust construction sector even in periods of low or variable domestic demand. The sector's forward linkages, by comparison, are weak and rank on average second lowest of all types of economic activity in terms of forward linkage multipliers and indicators. This is unsurprising, since the majority of construction goods and services are included in *final* demand, with few intermediate goods being produced by the sector.

The second finding of these two seminal works (and other individual country studies) is that the contribution of the construction sector to GDP and national income in developed countries has followed a bell-shaped curve, stabilising at a contribution of 10% to 12% of GDP and 5% to 6% of national income since World War II. The changing nature of this contribution is related to "structural changes affecting the manufacturing sector" (Bon and Pietroforte, 2001: 19). Essentially, the argument is that with the decline of agriculture and deindustrialisation, the amount of new construction demanded in mature economies begins to decline compared to the demand for new construction while the manufacturing sector is growing. This bell-shaped curve of new construction demand rising and falling in tandem with industrialisation and deindustrialisation leads to the third finding of this research.

The third finding identified in the studies is that in developed, mature nations where services takes the place of manufacturing as the core economic driver, new construction activity is substituted by 'maintenance and repair' construction.

Maintenance and repair construction relates to construction activities attached to the upgrading or reusing of existing infrastructure which has become obsolete in the face of the growth of services and decline in manufacturing. As such, in developed countries, new construction is on a downward slope in its life cycle, while maintenance and repair construction is on a sharp upward curve in its ascendancy as a sunrise industry. These two activities vary substantially in their input, technology and skills requirements, and their outputs are also fundamentally different. Coming to terms with understanding these issues is the current focus of researchers in this area.

From these three verifiable and consistent trends emerges the economic rationale for growth in new construction exports by developed countries over the past three decades. As domestic markets for new construction become saturated, governments seek to bolster domestic repair and maintenance construction demand with international new construction demand so as to maintain the overall size of the domestic construction industry and the linkages it has forged upstream. If the benchmark output multipliers are in the range of 1.7 to 2.7 then this argument becomes crystal clear – a US$1-million decrease in overall final construction demand in a mature developed country will result in a US$1.7-million to US$2.7-million decrease in overall demand for goods and services in that economy. Under these circumstances, undertaking remedial action to ensure that lower domestic demand is supplemented by international demand becomes an obvious course of action.

While the economic logic of developed countries' expansion into global construction services exports can be traced directly to the maturity of their domestic markets and the shift towards maintenance and repair construction, the same logic cannot be applied to explain the growth of developing countries' increases in construction exports. We now turn our attention to the phenomena of construction exports emanating from developing countries whose domestic construction markets have not yet reached maturity.

Trade in construction services in developing countries is less well researched and understood than in developed countries. The existing international literature on the topic can be divided into two distinct categories – research related to the gains from trade liberalisation (driven by the UN, the WTO and the OECD[3]) and individual country case studies which consider the impact of construction exports on domestic economies of developing nations.

The gains from trade in services literature argues that developing countries should liberalise their services sectors (including construction), but that the gains they will enjoy will arise not from increased exports but from improved local efficiency due to increased competition and the transfer of technology and skills via the importation of services from developed countries. These benefits are seen as long-term gains, with potential short-term negative adjustment costs to the domestic economy. Gains from services liberalisation are estimated to exceed those from the liberalisation of goods

[3] The United Nations, the World Trade Organisation and the Organisation for Economic Co-operation and Development.

markets by a factor of up to 5, with most gains being welfare gains resulting from improved production, better and more varied product choice, higher quality and lower prices (OECD, 2003). These assertions have been queried in relation to the construction sector.

The counter argument centres around the development of the domestic construction industry in the face of construction imports and the degree of skills and technology transfer that actually occurs. Opponents of the gains from liberalisation argument suggest that if large international players are the only source of sophisticated construction provision in developing countries, whose local firms lack the know-how to deliver such large projects, then the result of importing these services will be the continuation of an under-developed local construction capability. Only if local firms partner with international players and meaningful skills and technology transfer occur will the gains from construction trade actually accrue to the developing nation. Substantial research on technology and skills transfer from developed country construction companies to their less developed counterparts reveals a worrying trend.

Several authors show that in the 1950s and 1960s, substantial skills and technology transfers did indeed occur in this sector. However, by the 1980s and 1990s, construction companies from developed nations became substantially more reticent about such transfer. The change in attitude arose from two market changes. First, in the 1950s and 1960s, construction exports were an insignificant portion of most developed country construction companies' activities. By the 1980s and 1990s, these exports became a very important source of activity, given market saturation and maturity in developed countries, which manifested itself in low levels of domestic demand. As servicing international demand became more important to developed nations' construction companies, they were less keen to see developing countries creating their own improved and increased capacity, which would over time push them out of the market. The second reason for the change in attitude related to the growing trend of developing countries exporting construction services to other developing countries. This phenomenon, led by the Koreans and Chinese, suggested to developed nations that transferring skills to developing countries amounted to transferring skills to competitors.

The majority view appears to be that international construction exporting firms have moved through three phases in their behaviour towards skills and technology transfer to developing nations. Initially, in the 1950s and 1960s, such transfers did occur. Later in the 1970s and 1980s, lip service was paid to the notion of meaningful transfer. By the 1990s, this had deteriorated to international firms taking active measures to avoid skills and technology transfers when working in developing countries. If, as appears to be the case, foreign contractors do not adopt strategies which support the goals of their host countries in terms of construction industry development, then the *a priori* gains from trade liberalisation in construction for developing countries is moot. Several authors who support this view do, importantly, note that this market outcome can be ameliorated if systemic efforts are put in place to ensure mutually beneficial outcomes for the host country and the international contractor.

The trade liberalisation argument is not particularly relevant to South Africa, first because the local industry is highly sophisticated and developed and can compete with most developed nations' construction sectors, and secondly because the local industry

is already highly liberalised. Of greater interest to South Africa is the international literature which studies developing nations who have successfully entered the construction export market.

Unsurprisingly, this second category of developing country literature has a different focus from the liberalisation literature. In this body of work the research focuses on the gains from increased *exports* of construction services, with a generally cautious view of the gains and costs associated with increasing construction services imports. Collectively the literature shows that the majority of developing countries adopting a services export strategy do so because they believe (1) increased exports are important to grow the local economy, especially if domestic markets are small and variable; (2) increased exports of services are likely to create substantial employment as most services exports are based on a comparative advantage in labour-intensive sectors; (3) foreign income will be earned; (4) complementary merchandise exports will increase on the back of increased services exports and (5) services exports are a viable way of diversifying a country's export basket, given that some services exports are not capital intensive and can be undertaken even if domestic savings rates are low.

The majority of research in this area is based on developing Asian countries, most notably Korea and China, which account for the greatest volume and value of international construction contracts awarded to developing countries. These two case studies reveal some interesting lessons and cautions for South Africa.

The Korean construction industry grew on the back of substantial American support, first with reconstruction efforts after the Korean War and then with the reconstruction of Vietnam. Substantial and meaningful technology, skills and business model transfer from the Americans to the Korean construction industry, together with the creation of large multi-national corporations sponsored by the state, positioned Korea to be the first developing nation to enter the construction export market seriously in the early 1970s. Korea's export advantage lay in their abundant labour force and low wages – not only for unskilled workers, but also for skilled artisans and engineers. However, their capacities lay in buildings and basic infrastructure projects and they were less competitive with respect to professional services and the advanced technology required for sophisticated civil engineering and utilities projects. Initially the Korean export drive was highly geographically focused in the Middle East. In 1980, 92% of all Korea's export contracts came from the Middle East. Its market share was considerable and Korean firms accounted for 25% of all foreign contracts from that region throughout the 1980s. Korean firms exported domestic labour to the Middle East to complete these projects. At its peak, 200,000 Korean construction labourers were working abroad. Although the construction firms were paid in foreign currency, the Korean government promulgated laws which forced 80% of workers' wages to be paid in Korea in the local currency. As such, construction exports earned, and freed up, considerable foreign exchange for the government. Between 1979 and 1985, construction foreign exchange earnings accounted for 50% of all foreign exchange earnings by Korea. The profitability of these contracts was extremely low (averaging just 2%), but this was strategically inconsequential to the Koreans at the time as their most pressing domestic issues revolved around their balance of payments constraints.

A total lack of profitability on international contracts is also a dominant feature of Chinese construction exports. The majority of Chinese construction firms who export are state owned. The firms are issued aggressive targets in terms of revenue and foreign employment. Profit targets are not issued. In the 2001-2005 five-year plan issued to exporting construction firms, revenue goals were a 14% increase per annum for 5 years and overseas employment goals a 6% per annum increase so as to reach 600,000 Chinese construction workers employed abroad by 2005. All research into Chinese construction exports suggests that the main drivers of Chinese authorities in supporting construction exports are a political economy agenda, job creation, and more importantly, the sale of complementary merchandise exports, especially machinery, equipment and building materials. Between 1993 and 2001, China exported US$10-billion worth of machinery, equipment and building materials to satisfy the procurement needs of off-shore construction projects won by Chinese contractors.

The 1970s, 1980s and early 1990s were definitely the heyday of Korea and China's construction export activities. By the 1990s the outlook was becoming bleaker. Four factors account for the changing fortunes of these countries' construction exports.

First, both Korea and China's initial construction export successes were based on low labour costs and basic infrastructure and building markets predominantly situated in the Middle East. Both countries have subsequently found that international demand is shifting away from basic infrastructure and building towards more sophisticated projects that require higher levels of technology and professional skills, which neither country is particularly well suited to address. Second, both countries have experienced rising labour costs which have eroded their comparative advantage and decreased their competitiveness. The third negative impact on Korea and China's export activities came from the slow-down of demand in the Middle East for basic infrastructure and building imports. Both countries were highly invested in this market and had failed to meaningfully diversify geographically. The final weakness in the Korean/Chinese export strategy of the 1970s and 1980s was their failure to increase the depth and sophistication of their service offering. By the 1990s, both countries found a substantial weakness in their ability to bundle complete solutions for foreign contracts and began losing contracts to developed nations whose firms offered one-stop-shop servicing, most notably in the field of project financing.

The lack of sustainability of the Chinese and Korean construction export strategy led researchers at the end of the 1990s to survey trends in developing Asian countries which export construction services and to identify what general changes were occurring to deal with the constraints which had emerged. Rafferty (1998), who wrote a seminal paper on this topic argued that "the globalisation and deregulation of markets necessitated by fiscal, technological and managerial constraints has forced developing nations who wish to continue to export construction services to hasten and even leapfrog their capacity". From this he identifies three notable trends that have occurred over the last decade: (1) increased private sector participation in major infrastructure projects, (2) increased vertical integration in the packaging of construction projects and (3) increased foreign participation in the domestic industry via joint ventures and other contractual arrangements.

Other influential thinkers in this area have taken Rafferty's ideas further. They argue that developing countries who wish to export construction services can no longer rely on comparative advantages based on low wages, but need to undertake a "deliberate process" of "continuous improvement" at home to improve the viability and competitiveness of domestic companies so that they can operate in the export market. The point emphasised by these authors is that Rafferty's three trends cannot merely be a market-based response in developing countries but requires deliberate policies and interventions.

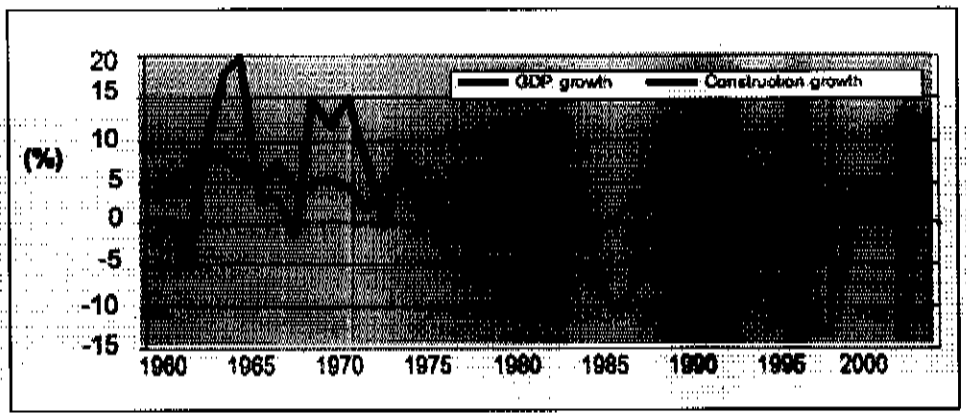
This overview of construction sector dynamics in developed and developing nations raises a host of interesting issues which we will now consider as we analyse South Africa's construction sector performance, both domestically and internationally. In our analysis we will focus on civil engineering and construction works rather than the entire construction sector, which also includes building works (commercial and residential). The motivation for this is that traditionally the majority of construction exports relate to civil engineering and construction work activities, while local firms most often undertake building work.

3. The South African civil engineering and construction works sector

Civil engineering and construction works include all activities related to heavy construction such as highways, bridges, tunnels, railways, airfield, harbours, dams, industrial facilities, pipelines, electricity facilities, mines and township establishment. Activities such as these are statistically captured in gross fixed capital formation time series and often referred to as economic infrastructure. In this section we will consider historic and current demand for civil engineering and construction services, the supply of these services and finally the linkages between civil engineering and construction works and the broader South African economy.

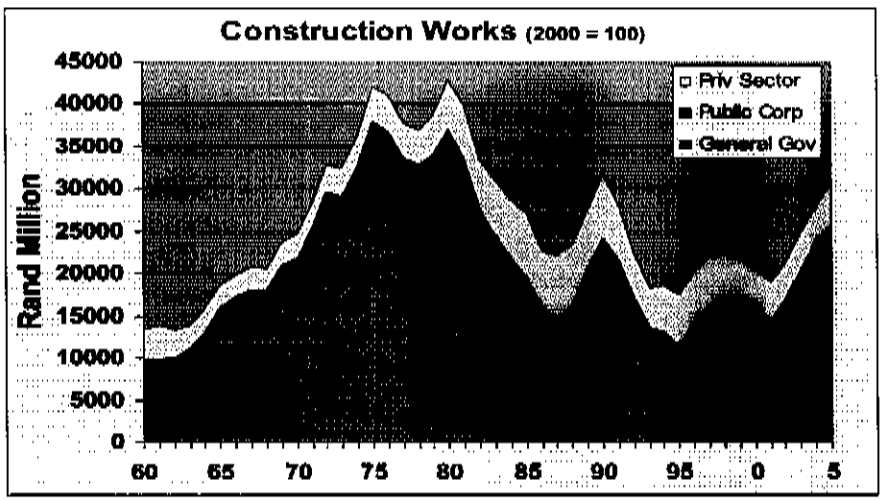
3.1 Demand for South African civil engineering and construction works

Figure 1 – GDP and construction sector growth: South Africa (% change)



Source: South African Civil Engineering Association (SAFCEC), MIG Presentation, 2007d

Figure 2 – Construction works by private sector, central government and public corporations



Source: South African Reserve Bank (SARB) online database

Figures 1 and 2 show three important characteristics of South Africa's civil engineering and construction works industry. Figure 1 clearly indicates the relationship between GDP growth and the growth of the construction industry. This relationship is unsurprising, as the key growth drivers for this sector include general economic performance, interest rates, inflation rates, access to investment financing and business confidence levels. The most important driver of demand is public sector spending. As fiscal policy in most developing nations is pro-cyclical rather than counter-cyclical, the double trend of non-expansionary fiscal policy and decreasing GDP during periods of economic slowdown and the reverse in periods of strong economic growth creates large variations in the construction sector in general, and the civil engineering and construction works sector in particular. The close relationship between economic growth and construction growth can be quantified by calculating the 'income elasticity' of construction growth. That is, for a 1% increase in GDP growth what will be the corresponding growth in the construction industry? Historic calculations undertaken by SAFCEC (1997, 2007b) exclude the period 1977 to 1986 due to an interpretation that politically driven, perverse policies during this period did not reflect the true endogenous nature of the variables. Its calculations show that between 1960 and 1977, the income elasticity of construction works was 1.67 and between 1986 and 2006 it reached 2.97.

The second important characteristic to note from figures 1 and 2 is the relative roles of different stakeholders in the economy in driving construction works and civil engineering. The private sector is an important participant in gross fixed capital formation but it is a relatively small contributor to total demand and over time it has been less variable than public sector demand. By far, public sector spending (either directly by the three spheres of government or by parastatals) is the crucial driver of

the demand for social and economic infrastructure and hence civil engineering and construction work demand. In figure 2 and table 1 it is clear that public corporations such as Transnet, the IDC and Eskom are crucial in driving domestic demand in this sector and that this demand has proved historically to be highly variable.

Table 1 – Civil engineering and construction works spending growth rates (%)

	1970s	1980s	1990s	2001-2006
General government	0.9	-3.4	-1.3	3.3
Public corporations	23.8	10.3	6.9	24
Private sector	7.8	4.9	-3.9	5.1

Source: SARB online database

The third characteristic or analysis to understand from figures 1 and 2 relates to the history of the sector over the past four-and-a-half decades and how this history impacts the current capacity of the sector.

Between 1960 and 1970, demand for civil engineering and construction services was predominantly driven by central government spending as the *apartheid* government rolled out strategic economic infrastructure. Driven by a strong domestic economy which was buoyed by high resource prices and a strong military and infrastructure investment programme, the 1970s saw massive infrastructure investment by the old *apartheid* regime. This surge of activity led to the highest ratio of gross fixed capital investment to GDP in the country's history, peaking at 29.68% in 1976. With most developed nations averaging an equivalent ratio of 23% – and most developing nations a mere 15% – the 1970s were indeed a golden period for the civil engineering and construction works sector in South Africa. Bar a minor surge between 1988 and 1990, the industry suffered subdued levels of demand throughout the next two decades, with the ratio of gross fixed capital formation to GDP falling to a 50-year low of 14.69% in 1993.

It is interesting to note here that many academic researchers have attempted to explain the construction sector's historic growth patterns using theoretical explanations rather than data-driven approaches. Using a developed country construct such as the Kondratieff cycle, which suggests that sectors expand for periods of 15 to 25 years, followed by periods of downturn lasting eight to 15 years, it appears that while South Africa conformed to the growth upswing of 25 years, the downswing essentially lasted 27 years instead of 15. Using a developing country paradigm which suggests that the share of construction in the domestic economy will gradually increase over time as industrialisation occurs produced a better fit with South Africa's experience than the Kondratieff approach, bar the 'structural/political break' between 1982 and 2002.

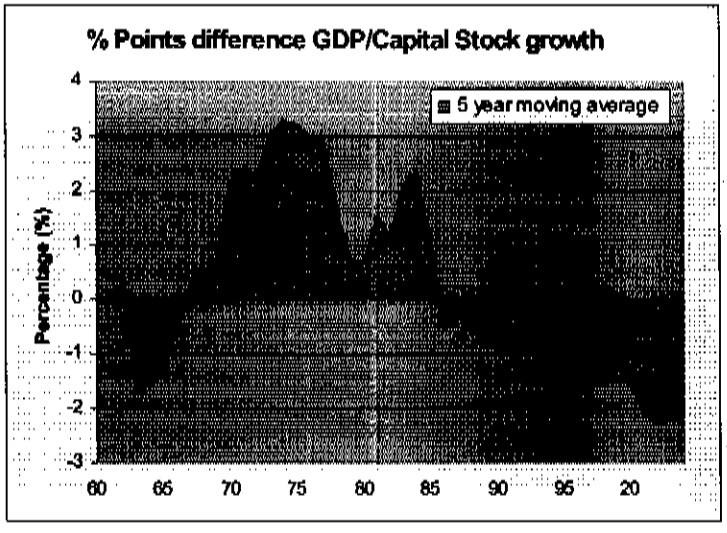
Looking at sectoral demand under the first democratically elected government, two phases are identified. First, demand for the sector's services immediately following the 1994 election remained weak as business confidence was slow in rising and government spending substantially curtailed under the GEAR policy. The tightening

of fiscal policy was particularly evident in the decreased spending of the country's parastatals.

The GEAR period (1997-2001) was crucial to what would happen to the demand of civil engineering and construction services post 2001. Two important elements stand out. First, the general consensus is that GEAR provided a foundation for economic growth which stabilised the manner in which growth occurred. Significant and systemic moderation of lower inflation rates, stable fiscal deficits and debt created an environment conducive to moderate but sustainable GDP growth rather than the stop-start, boom-bust growth which had occurred prior to 1994. Second, the continuous, gradual increase in economic growth since 1994, during GEAR and immediately after GEAR (while fiscal tightening was still at the order of the day), resulted in a deteriorating trend in the ratio of GDP growth to capital stock growth. Simply put, the economy was growing and increased output being produced, but no equivalent investment was being made in the productive capital stock that enabled this production to occur (for example, roads, railways, harbours, etc.).

This is shown in figure 3 below. In the figure, the coloured area *above* the horizontal axis shows that capital stock is growing more rapidly than GDP growth; that is, not all of the country's productive capital stock is being used and spare capacity exists. Areas *under* the horizontal axis indicate that output is growing faster than capital stock is being developed, resulting in a lack of sufficient capacity to support this level of economic activity. In the short run, a negative ratio such as that experienced in South Africa since 1995 results in bottlenecks, which negatively impact effective and efficient production and delivery of outputs, for example, delays at harbours. In the long run, if the situation is not addressed, firms may actually start disinvesting from the country or contracting output, as is happening in India at present.

Figure 3 – GDP/capital stock growth: South Africa



Source: SAFCEC, MIG Presentation, 2007d

Another way of looking at this issue is to consider the capital-output ratio of economic infrastructure. The capital-output ratio of economic infrastructure generated by general government deteriorated from a peak of 53c per 100c of production in 1985 to 28.5c per 100c in 2002 – a 46% decrease. In public corporations, the capital output ratio declined from 45.5c in 1995 to 38c per 100c of production in 2002. In this period even private sector investment lagged in replenishing its economic fixed capital stock. We highlight both of these issues, as they are crucial in the next section of this paper where we consider future demand trends for the sector.

Continuing our analysis of the history of the sector we arrive at 2002, the year in which the fortunes of the sector began to change. Within the private sector, five years of low inflation, reduced interest rates, growing business confidence and stable domestic growth provided an environment for renewed investment – not only to replenish capital stock but also to add to capital stock in anticipation of continued growth. Within the public sector, the gains from the period of austerity under GEAR allowed government to pursue a strongly expansionary fiscal policy. High on the government's agenda was the provision of economic infrastructure to address the constraints that had arisen during a decade of economic growth outstripping capital stock investment (figure 3 above). Of specific concern were investments to increase electricity generating and distribution capacity, rail, port and harbour capacities to turn around transport inefficiencies which had been growing since 1997, as well as investment in telecommunications and road transport (Asgi-SA, 2002).

The government declared its intention to increase gross fixed capital formation from 15% to 25% by 2014, and by 2004 the Medium-Term Expenditure Framework (MTEF) was already showing the translation of these intentions into tangible budgets and projects on the ground.

Table 2 – MTEF 2004-2010 (nominal R-million)

	Rm	Rm	Rm	Total previous MTEF	Rm	Rm	Rm	Total current MTEF	% change
	2004/05	2005/06	2006/07		2007/08	2008/09	2009/10		
Water (DWAF, TCTA, Municipal)	4,296	5,627	7,808	1,7731	3,895	9,098	9,758	27,251	54
Sanitation (DWAF, Municipal)	1,368	2,297	2,926	6,591	3,028	3,180	3,339	9,547	45
Electricity (Eskom, DWAF)	8,110	11,782	16,272	3,6164	17,223	23,100	3,0983	71,306	97
Housing	4,474	4,843	6,822	1,6139	8,238	9,853	1,1531	29,622	84
Education (school buildings)	2,148	2,453	3,127	7,728	3,393	3,984	4,183	11,560	50
Health (hospitals, clinics)	2,222	3,059	4,175	9,456	4,699	5,468	6,086	16,253	72
Roads (SANRAL, provincial, municipal)	10,998	13,299	15,743	4,0040	18,740	20,806	2,2618	62,164	55
Rail (SARCC, Gautrain, Spoornet)	2,147	4,959	12,900	2,0006	15,973	15,857	1,4258	46,088	130
Ports (NPA, SAPO)	2,221	2,843	3,667	8,731	7,122	5,623	3,808	16,553	90
Sports and Recreation (Stadiums)	0	0	0	0	2,700	3,800	1,300	7,800	

Source: National Treasury, MTEF 2004 and MTEF 2007

Driven by this accelerated demand for civil engineering and construction works, the sector has grown at close to 10% per annum over the past five years, leading commentators to predict that the sector will double in size in the next five years.

Considering demand for civil engineering and construction services as represented in the National Accounts, we see that more information about who is demanding these services is available from a discussion of intermediate demand than final demand. Table 3 shows the composition of final domestic demand for civil engineering and other construction services.

Table 3 – Composition of final domestic demand for civil engineering and construction works sector

Final domestic demand	1970		1980		1990		2000		2006	
	Rm	% of total final domestic demand	Rm	% of total final domestic demand	Rm	% of total final domestic demand	Rm	% of total final domestic demand	Rm	% of total final domestic demand
Gross domestic expenditure	557	100.0	3,428	100.0	10,818	100.0	19,142	100.0	47,868	100.0
of which:										
Gross capital formation	549	98.6	3,508	102.3	11076	102.4	19,142	100.0	47578	99.4
of which:										
Fixed capital formation in building and construction works	546	98.1	3,492	101.9	11124	102.8	19,102	99.8	47000	98.2
Change in inventories	3	0.5	15	0.5	-48	-0.4	39	0.2	577	1.2
Residual item	8	1.4	-80	-2.3	-258	-2.4	0	0.0	290	0.6

Source: Quantec Research SA Standardised Industry Data, online database.

Final demand for civil engineering and other construction can be divided into domestic demand – which arises from domestic expenditure on the products of the sector – and the foreign sector – which encompasses imports and exports of civil engineering and other construction services. Not surprisingly, the contribution to gross domestic expenditure comes almost entirely from fixed capital formation in the building and construction sector. In 2006, the value of this contribution was estimated at R47-billion – which amounts to 86% of the total demand for construction works (the balance constituted building construction), around 15% of total expenditure on gross fixed capital formation and about 2.7% of the GDP at market prices. These shares show some variability. For example, in 2000, civil engineering and other construction is estimated to have contributed 94% of construction works capital formation, 14% of total gross fixed capital formation and only 2.1% of the value of GDP.

Greater understanding of who is demanding civil engineering and construction services can, however, be found in an analysis of the sector's intermediate outputs. Table 4 below indicates the sectoral composition of intermediate outputs originating from the civil engineering and construction works sector. It is noteworthy that the sectoral destination of these outputs can vary greatly, even though the major share usually consists of 'work-in-progress' within the construction sector itself. This variability is illustrated by the relative increase in outputs to the tertiary sector – which rose from less than 2% of total intermediate outputs in 1970 to more than 21% in 2006 – and by the marked fall in the share of the secondary sector from more than 92% to around 69% over the same period. The figures are also consistent with the

changing nature of the sector's activity, with an increasing share of 'work-in-progress' being channelled to building construction (as opposed to civil engineering itself) between 1980 and 2006. For most of this period, relatively few major infrastructural projects were undertaken, and the national construction imperative was instead focused on eliminating the housing backlog.

Table 4 – Composition of intermediate output from civil engineering and construction works

Intermediate output to (sector)	1970		1980		1990		2000		2006	
	Rm	% of total intermediate output	Rm	% of total intermediate output	Rm	% of total intermediate output	Rm	% of total intermediate output	Rm	% of total intermediate output
Primary	6	6.0	2	0.7	58	2.2	1199	10.8	1313	10.1
of which:										
Mining and quarrying	6	5.9	1	0.3	50	1.9	1081	9.7	1200	9.2
Gold and uranium ore mining	3	2.4	0	0.1	24	0.9	392	3.5	250	1.9
Other mining	3	3.3	0	0.0	19	0.7	488	4.4	745	5.7
Secondary	97	92.3	242	77.0	1914	72.6	7693	69.1	8974	68.8
of which:										
Construction (contractors)	97	91.7	229	72.7	1648	62.5	6757	60.7	8032	61.6
of which:										
Building construction	52	49.7	3	1.0	271	10.3	4197	37.7	5311	40.7
Civil engineering and other construction	44	42.0	225	71.7	1377	52.2	2560	23.0	2721	20.9
Tertiary	2	1.7	70	22.3	666	25.2	2236	20.1	2751	21.1
of which:										
Business services	1	0.7	37	11.8	288	10.9	896	8.1	944	7.2
General government services	0	0.3	12	3.8	227	8.6	971	8.7	1493	11.5

Source: Quantec Research SA Standardised Industry Data, online database

For the most part, intermediate output represents 'work-in-progress' at the end of a particular period. An analysis of intermediate output over time indicates the sectoral composition of demand for civil engineering and construction works services. This is shown in some detail in table 5 below. Because the scale of some civil engineering projects could extend over more than a year, the average sectoral composition of the past three years (2004-2006) has also been determined. This indicates that primary sector demand originates mainly from the mining and quarrying sector, and within this sector 'other mining' is the dominant customer. In the secondary sector, the bulk

of the civil sector's activity is 'work-in-progress' for the building construction sector – which will in turn become fixed capital formation in other sectors once completed. The electricity, gas and steam sector is an important consumer of civil construction services. In the tertiary sector, demand originates mainly from the government sector, with fairly substantial consumption arising from 'business services'.

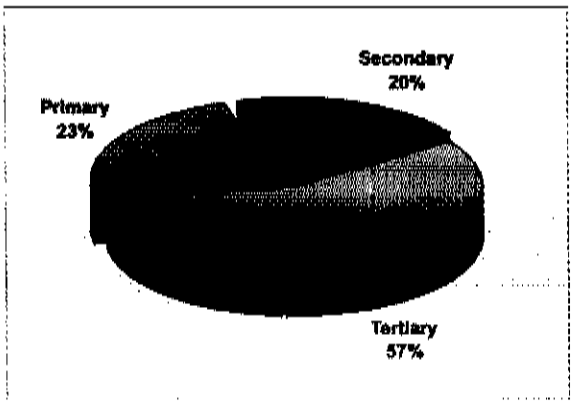
Table 5 – Detailed composition of intermediate output from the civil engineering and construction works sector (%)

Year	2002	2003	2004	2005	2006	Average 2004-2006
Primary	11.8	8.9	8.3	8.0	10.1	8.8
of which:						
Agriculture, forestry and fishing	1.1	1.1	1.0	1.0	0.9	1.0
Mining and quarrying	10.7	7.8	7.2	7.0	9.2	7.8
of which:						
Coal mining	2.3	1.8	1.6	1.6	1.6	1.6
Gold and uranium ore mining	4.1	2.1	1.6	1.3	1.9	1.6
Other mining	4.3	4.0	4.0	4.1	5.7	4.6
Secondary	66.9	69.9	69.7	70.1	68.8	69.5
of which:						
Electricity, gas and water	8.1	7.8	7.6	8.7	7.2	7.8
of which:						
Electricity, gas and steam	8.0	7.7	7.5	8.6	7.1	7.7
Water supply	0.1	0.1	0.1	0.1	0.1	0.1
Construction (contractors)	58.8	62.0	62.1	61.3	61.6	61.7
of which:						
Building construction	37.1	39.0	39.6	39.6	40.7	40.0
Civil engineering and other construction	21.7	23.0	22.5	21.8	20.9	21.7
Tertiary	21.3	21.3	22.0	21.9	21.1	21.7
of which:						
Trade, catering and accommodation services	0.3	0.2	0.2	0.2	0.2	0.2
Transport, storage and communication	1.9	1.8	1.7	1.6	1.4	1.6
Financial intermediation, insurance, real estate and business services	8.2	8.0	7.7	7.6	7.2	7.5
Community, social and personal services	10.9	11.2	12.4	12.5	12.2	12.4
of which:						
Other services	0.8	0.9	0.8	0.8	0.7	0.8
General government services	10.0	10.3	11.5	11.7	11.5	11.5

Source: Quantec Research SA Standardised Industry Data, online database

When the 'work-in-progress' of the construction sector itself is excluded, the sectoral composition of the demand for civil engineering and other construction can be shown in the figures below. Figure 4 indicates the broad sectoral composition of demand amongst the primary, secondary and tertiary sectors, while figure 5 provides a more detailed breakdown of the origins of demand.

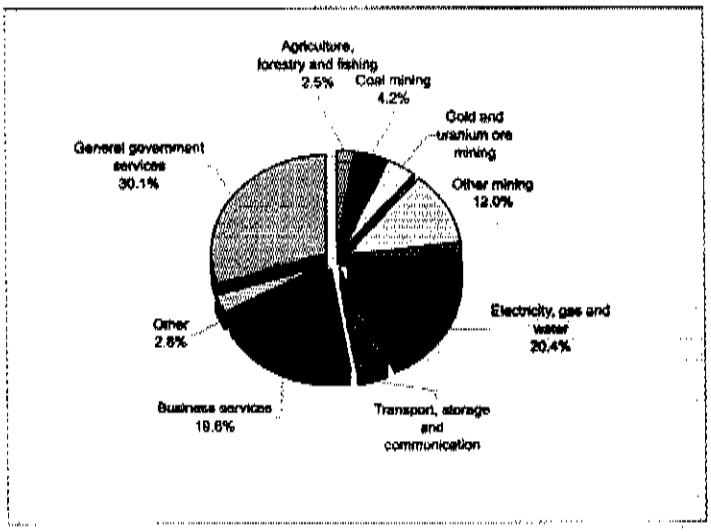
Figure 4 – Average sectoral composition of demand for civil engineering and construction works services (excluding work-in-progress within the construction sector)



Source: Quantec Research SA Standardised Industry Data, online database

It is apparent from figure 5 that general government services constitutes the largest sectoral source of demand for civil construction services, accounting for more than 30% of the total. When other sectors that are dominated by public enterprises and parastatals (such as electricity, gas and water, and transport and storage) are added, it seems likely that around 50% of the demand for civil engineering and other construction services would originate from within the public sector.

Figure 5 – Average sectoral composition of demand for civil engineering and construction works services (excluding work-in-progress in the construction sector)



Source: Quantec Research SA Standardised Industry Data, online database

While this section has devoted considerable time to understanding the current demand for civil engineering and construction works, no analysis has been included on the longevity and scale of the current accelerated demand into the future. This will be dealt with in detail in the next section. For now we turn our attention to how the industry is responding to this increase in demand.

3.2 Supply of civil engineering and construction works in South Africa

In normal circumstances any industry would feel challenged when facing growth rates of the magnitude faced by the local civil engineering sector since 2002. When such accelerated growth occurs off a low capacity base which has been decimated systemically over a two-decade period, the challenge is substantially larger. Language found in current sector literature such as "total onslaught on available resources", "tsunami of new contracts" and "fever period" suggests that concerns exist regarding the ability of the industry and its upstream suppliers to meet the aggressive increase in demand for civil engineering services. Several key issues have arisen regarding the overheated environment in which the sector is currently operating. The issues pertain not only to construction companies' capacity to meet demand, but the capacity of upstream producers to meet the construction industry's demand for inputs.

With respect to the construction industry itself, the issue of greatest concern in meeting accelerated demand is a lack of adequately trained and experienced skilled labour resources, including management, project management, engineers and artisans. Construction companies deal with periods of low demand by laying off workers, retarding salary growth and offering early retirement. With poor demand conditions being perpetuated during the 1980s and 1990s, the skills base available to meet the current boom has all but evaporated. By way of example, in 1975, South African universities were graduating 6,000 engineers per annum. This fell to 1,400 per annum in 2004. Similarly, in 1975, there were 33,000 registered apprentices in the construction sector compared to just 1,400 in 2005. The skills shortage, supported by empirical evidence, has been well acknowledged by government and industry. Moving forward, the skills deficit appears to be on a path where demand will continue to outstrip supply given the substantial growth in infrastructure investment and the growth trajectory of the domestic economy.

Although estimates of the skills gap vary, the JIPSA figures presented below appear to cover the generally accepted magnitude of the problem.

Table 6 – Forecast of supply and demand of artisans

	Best case	Worst case
Supply side		
Current resource volume	134,000	134,000
Current pipelines	7,000	4,000
Annual attrition	9,380	13,400
Net effect by 2012 – current trends	-11,900	-47,000
Net effect by 2012 – with JIPSA initiatives	33,100	-32,000
Resource volume by 2012 – current trends	***122,100***	***87,000***
Resource volume by 2012 – with JIPSA initiatives	***167,100***	***102,000***
Demand side		
State-owned Enterprise increased demand	8,500	8,500
Supplier increased demand	54,000	54,000
Total demand	196,500	196,500
Surplus/deficit		
Surplus/deficit at current trends	***-74,400***	***-109,500***
Surplus/deficit with JIPSA initiatives	***-29,400***	***-94,500***

Assumptions:
- All existing skills are fully utilised.
- Aggregation of data into the broad occupational category may result in distortions.
- Best-case attrition is estimated at 7%.
- Worst-case attrition is estimated at 10%.
Source: JIPSA, 2007

Table 7 – Forecast of supply and demand of technicians, technologists and engineers

	Technicians		Technologists		Engineers	
	Best case	**Worst case**	**Best case**	**Worst case**	**Best case**	**Worst case**
Supply side						
Current resource volume	28,000	28,000	3,800	3,800	28,000	28,000
Current pipelines	2,500	1,250	430	215	1,500	639
Annual attrition	1,960	2,800	266	380	2,800	4,760
Net effect by 2012 – current trends	-3.100	-13,550	820	-825	-6,500	-20,605
Net effect by 2012 – JIPSA	1,900	-7,300	4,470	-740	-1,500	-16,300
Resource volume by 2012 – current trends	***24,900***	***14,450***	***4,620***	***2,975***	***21,500***	***7,395***
Resource volume by 2012 – JIPSA	***29,900***	***20,700***	***8,270***	***3,060***	***26,500***	***11,700***
Demand side						
State-owned Enterprise increased demand	-	-	4,200	4,200	3,100	3,100
Supplier increased demand	32,300	32,300	650	650	18,200	18,200
Total demand	60,300	60,300	8,650	8,650	49,300	49,300
Surplus/deficit						
Surplus/deficit at current trends	***-35,400***	***-45,850***	***-4,030***	***-5,675***	***-27,800***	***-41,905***
Surplus/deficit with JIPSA initiatives	***-30,400***	***-39,600***	***-380***	***-5,590***	***-22,800***	***-37,600***

Assumptions:
- Current resource volumes are based on ECSA registrations and other research; however, it is not known how many of the registered engineers and technologists are actually working in the South African industry.
- All existing skills are fully utilised.
- Aggregation of data into the broad occupational category may result in distortions.
- Best-case attrition is estimated at 7% for technicians and technologists and 10% for engineers.
- Worst-case attrition is estimated at 10% for technicians and technologists and 17% for engineers.
Source: JIPSA, 2007

The current skills deficit in this sector has resulted in three responses. First, government and industry have come together to devise a skills development programme which will address these shortages by developing local skills. JIPSA aims to train 50,000 artisans over the next four years and increase graduate output of engineers from 1,400 per annum to 2,500 per annum. Private sector initiatives through in-house training and bursary programmes will add to this output. The general view, however, remains that in the short to medium term, South Africa will continue to face a situation where demand outstrips supply of skilled and highly skilled professionals in this sector – a phenomenon which is also prevalent in Australia, South East Asia and to a lesser extent in Europe and America.

The second response to this excess demand for skilled workers relates to retention strategies and rehiring retired professionals. Skilled construction professionals who retired from the industry in the 1990s are being rehired on short-term contracts to see

companies through particular projects. In addition to reintroducing skills from the retirement pool, companies are also working hard to retain existing workers who are often canvassed by competing firms. Retention strategies have dominated salary, benefits packages and share option and bonus inducements, which have seen a market price effect of premiums of up to 50% to 70% being paid to retain or attract qualified labour. During our interviews with industry players, several examples were given regarding the necessity to incentivise skilled staff to remain at a particular company, and examples of a skilled professional earning a salary of R400,000 and a bonus of R1-million was not uncommon.

The third response has been to supplement the local resource base with imported skills, acquired either directly via immigration or indirectly via joint venturing with overseas companies on large contracts. Joint venturing is an important element of this paper and will be dealt with in detail in the following sections. For the purposes of this section it is sufficient to point out that local companies which find themselves short of general or specific skills in relation to a given project are now joint venturing with overseas companies as a method of introducing additional skills into the market. Crucial to South African companies' potential to use this option has been a shift in government policy away from highly fragmented contracts towards the awarding of large contracts in their entirety to a single company.

With respect to importing individual skills directly (as opposed to through a joint venture arrangement), in an announcement in April 2007, the Minister of Home Affairs confirmed the availability of 34,825 quota work permits, in 53 skills categories, for skilled foreigners that are able to contribute to the growth of the South African economy in a number of areas that are suffering from a shortage of critical skills. These specific skills were identified jointly with the Ministers of Labour and Trade and Industry, and included further inputs from the Presidency (JIPSA) and the Departments of Public Enterprises, Science and Technology, Education and Public Service and Administration.

The Department of Home Affairs, in offering this specific relaxation to work permit regulations, has sought to simplify its processes and to attract as many skilled people into the economy – especially in areas where there are critical skills shortages – as quickly as possible, and therefore to contribute effectively to the Asgi-SA initiative insofar as addressing specific skills challenges and impediments faced by government and the private sector.

An overview of the infrastructure-related work permit quotas applicable to artisan, technician, technologist and engineering skills are included in Appendix A.

A further skills development issue which is often overlooked applies to skills shortages faced by upstream producers of construction sector inputs. Demand for all building and engineering inputs such as carbon steel, cement, timber, bitumen, etc. is increasing concurrently with civil and construction works demand. Upstream industries are not only increasing output but are increasing capacity, which similarly requires skills, many of which are in short supply in the labour market.

A second concern on the supply side involves the availability and price of inputs into the civil engineering and construction works sector. The seriousness of this constraint

appears moot. An industry delegation meeting with the Presidency recently reported that input supplies were not a binding constraint, while industry players and some industry associations believe that the supply of cement, structural steel and other consumable inputs are under pressure from the sector's recent accelerated growth. As market prices reveal an objective measure of supply and demand, table 8 below suggests that, despite protestations to the contrary, price increases well above CPIX and the PPI would lead to a conclusion that in many instances demand is increasing faster than supply with respect to key inputs and that some supply constraints are appearing. This conclusion is backed up by our industry interviews, in which several interviewees mentioned extended time delays in receiving materials ordered. In several instances, contractors have procured materials off-shore where delivery times are three weeks instead of local delivery estimates of four months.

Table 8 – Input material price changes

Input materials	Percentage price increase, 2004-2006
Profiled aluminium roofing	43
Extruded aluminium section	35
Profiled aluminium roofing – distributor level	33
Bricks – stock	26
Aggregated crushed stone (as from 2/86)	24
Cement building blocks	24
Bricks – face	23
Structural steel, unworked	21
Cement (retail)	18
Flush doors	17
Wash and basin	16
Ordinary and extended cement	16
Glass for the building industry – cut to size	15
WC panels and bidets	10
Structural steel products	10
Civil engineering plant	10
PVC pipes	8
Ceramic and encaustic wall & floor tile and mosaics	2
Sand	2
Concrete	1

Source: Statistics South Africa, online database

Within the industry, the official increase in the cost of inputs is measured by the Baxter contract price adjustment formula (CPAF), which reflects price movements for inputs in the industry (escalation rates). In 2006 the CPAF was up to 8.17% in excess of the CPIX and overall PPI. This would confirm the above argument of increased supply pressure, although some analysts put the escalations down to "an inevitable correction after the preceding period of industry stagnation" (Aveng,

Annual Report, 2006: 33) and not an indication of shortages. SAFCEC disputes both the Baxter calculation and the notion that shortages will not become an issue. They believe that the Baxter formula is an "underestimation of price escalations as it is calculated without including premiums that will be paid as shortages rise" (SAFEC, 2007: 16).

A third concern which arises from high demand, company capacity constraints and particularly labour and potential material input constraints, is the manner in which contracting occurs in South Africa, particularly when the client is government. The traditional contracting model where the client (government) specifies a project and puts it out to tender for contractors to compete has generally been replaced in more developed countries by a variety of alliance models. In this model, potential contractors are brought into the planning process early on so that they can inform clients about constructability, potential constraints and escalations and other risk factors. This alternative contracting approach is crucial in times of excess demand where budget and time overruns are more likely to occur. An associated concern is the fragmentation of contracts where a single contract is parcelled out in small pieces to a number of contractors. This fragmentation stresses stretched resources even further and often increases costs and decreases efficiency.

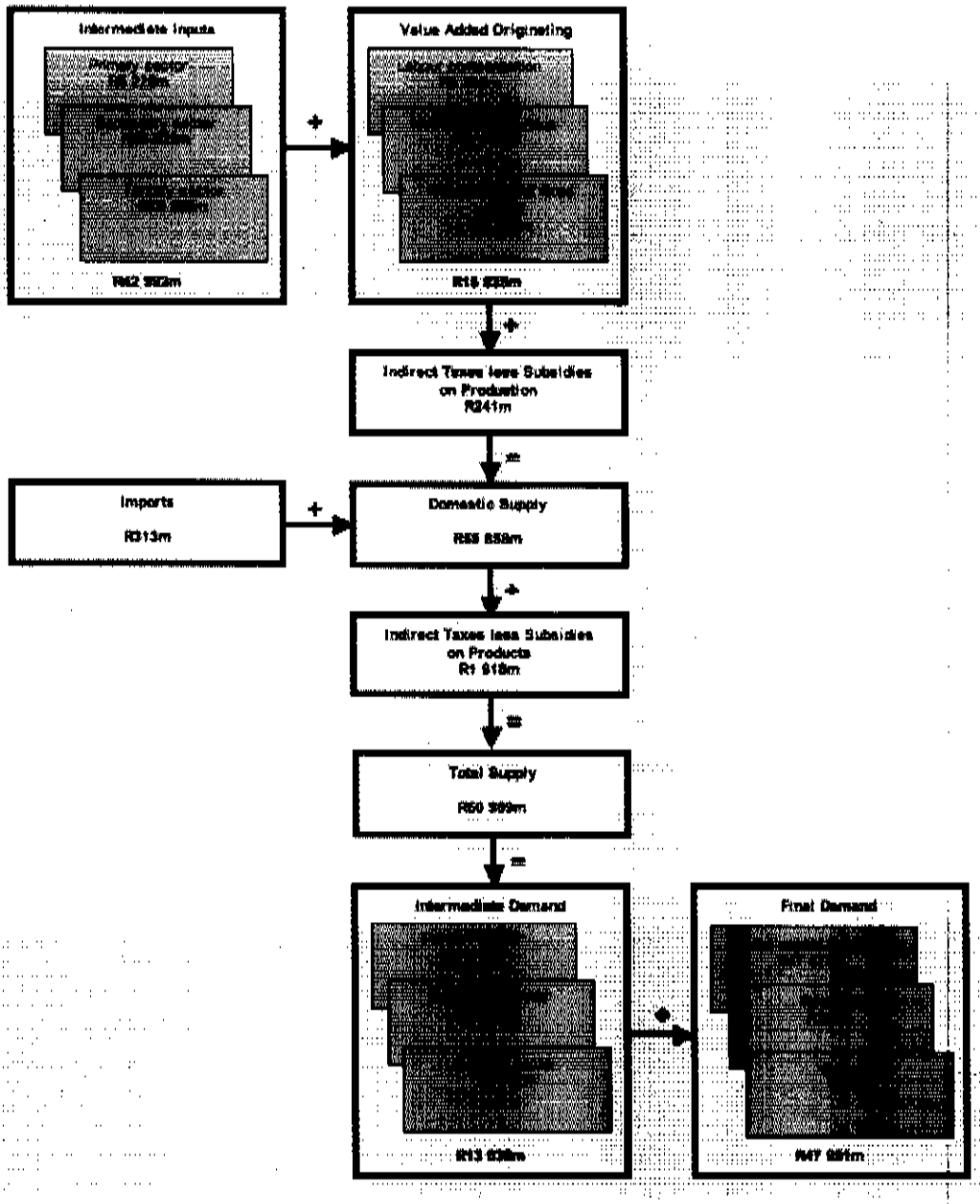
Although no overarching policy decisions have been taken regarding these contractual practices, on the ground the parastatals appear to be moving in the direction of alliance contracting and decreased fragmentation. The industry notes a substantial decrease in contract fragmentation and an increasingly large percentage of mega-contracts being awarded. These large contracts not only allow for contractor integration earlier on in the design process, but importantly, allow large companies bidding for these contracts to create joint ventures with overseas companies to fulfil the contract terms. This practice appears to be the most common manner in which the high skill constraints mentioned above are being dealt with in the short run. As will be argued later, increased joint venturing in this sector is an important step in the development of local construction companies' capabilities, as skills transfers, which occur during these projects, can potentially enable firms to leap-frog their development and core capabilities.

3.3 Employment and linkages in the South African civil engineering and construction works sector

We now turn our attention to one of the key elements of our argument – the role of the civil engineering and construction works industry in generating direct and indirect employment and its role in pulling along other industries in the economy through an extensive set of linkages.

We start with an overview of the structure of the industry as reflected in the official 2006 statistics. Several of the statistics in this overview are considered problematic (especially the export figures), but these will be dealt with in detail in the remainder of the paper. For this section we focus on intermediate inputs and value added as they assist us in determining the multiplier effects of the sector.

Figure 6 – Value and structure of intermediate inputs and value added



Source: Quantec Research SA Standardised Industry Data, online database

Table 9 indicates how the relative value and structure of intermediate inputs into the civil engineering and other construction sector have changed over time.

Table 9 – The sectoral composition of intermediate inputs into the civil engineering and construction works

Sector	1970		1980		1990		2000		2006	
	Rm	% of total inter-mediate inputs	Rm	% of total inter-mediate inputs	Rm	% of total inter-mediate inputs	Rm	% of total inter-mediate inputs	Rm	% of total inter-mediate inputs
Primary	87	17.8	516	20.3	454	5.7	1,705	10.6	5,279	14.2
of which:										
Other mining	86	17.6	515	20.3	448	5.6	1,698	10.5	5,268	14.2
Secondary	286	58.5	1,592	62.7	6,486	81.4	13,805	85.6	26,823	72.2
of which:										
Manufacturing	240	49.2	1,340	52.8	4,759	59.7	9,570	59.3	20,973	56.5
of which:										
Other non-metallic mineral products	60	12.3	386	15.2	1,503	18.9	3,643	22.6	8,110	21.8
Metals, metal products, machinery and equipment	137	28.0	656	25.8	1,829	22.9	2,917	18.1	6,312	17.0
of which:										
Metal products excl. machinery	53	10.8	350	13.8	1,058	13.3	1,670	10.4	3,341	9.0
Civil engineering and other construction	44	9.1	225	8.9	1,377	17.3	2,560	15.9	2,721	7.3
Tertiary	161	33.0	682	26.9	2,759	34.6	4,854	30.1	10,890	29.3
of which:										
Transport and storage	62	12.7	277	10.9	433	5.4	321	2.0	561	1.5
Business services	42	8.6	232	9.1	819	10.3	2,233	13.8	5,263	14.2

Source: Quantec Research SA Standardised Industry Data, online database

It is evident that this sector purchases considerable inputs from the primary, secondary and tertiary sectors, with the largest percentage of inputs coming from the manufacturing sector. However, significant variation in the relative contributions of intermediate inputs from the primary, secondary and tertiary sectors into the civil engineering and other construction sector is also evident. This is indicative of changes in the nature of construction activity (that is, what is being built), as well as the method of construction. For example, the sharp decline in the relative contribution of inputs from the primary sector in the late 1980s and early 1990s coincides with a substantial fall-off in road construction, with corresponding declines in the need for sand and aggregate inputs from the 'other mining' sector. The increased demand for these primary inputs in 2006 coincides with the South African National Roads Agency Ltd.'s (SANRAL's) expanded road works programme. Similarly the significant – and growing – contribution of non-metallic mineral product inputs (primarily cement) is also evident, as is the relative decline in metal (steel) inputs, suggesting relatively less

structural construction activity and a concomitant decline in the need for steel reinforcing.

The large relative increase in the sector's purchases of business services from the tertiary sector can be explained partly by more complex financing and packaging services purchased from the financial intermediation industry and partly by the use of more sophisticated information and communication technology (ICT) systems – not only in the construction process itself but also in the more sophisticated final products being constructed by the sector (that is, more intelligent facilities being built with integrated smart systems).

To add to our understanding of the linkages between the civil engineering and construction works sector and the rest of the economy it is necessary to not only consider the inputs the sector purchases from other industries, but also how the sector generates value added. This value added can be thought of as the income the sector generates for the key factors of production – entrepreneurship earns profits, land earns rent, capital earns interest and labour earns wages. More specifically, the gross value added, at factor cost, of the civil engineering and other construction sector measures remuneration paid to all employees, the consumption of fixed capital and the net operating surplus. In 2006, the sum of these components amounted to R15.6-billion, which was 15.2% higher in nominal terms than in 2005. A disaggregated analysis of the origins and extent of the value added by the sector is shown in table 10 below.

Table 10 – The composition of value added in the civil engineering and construction works

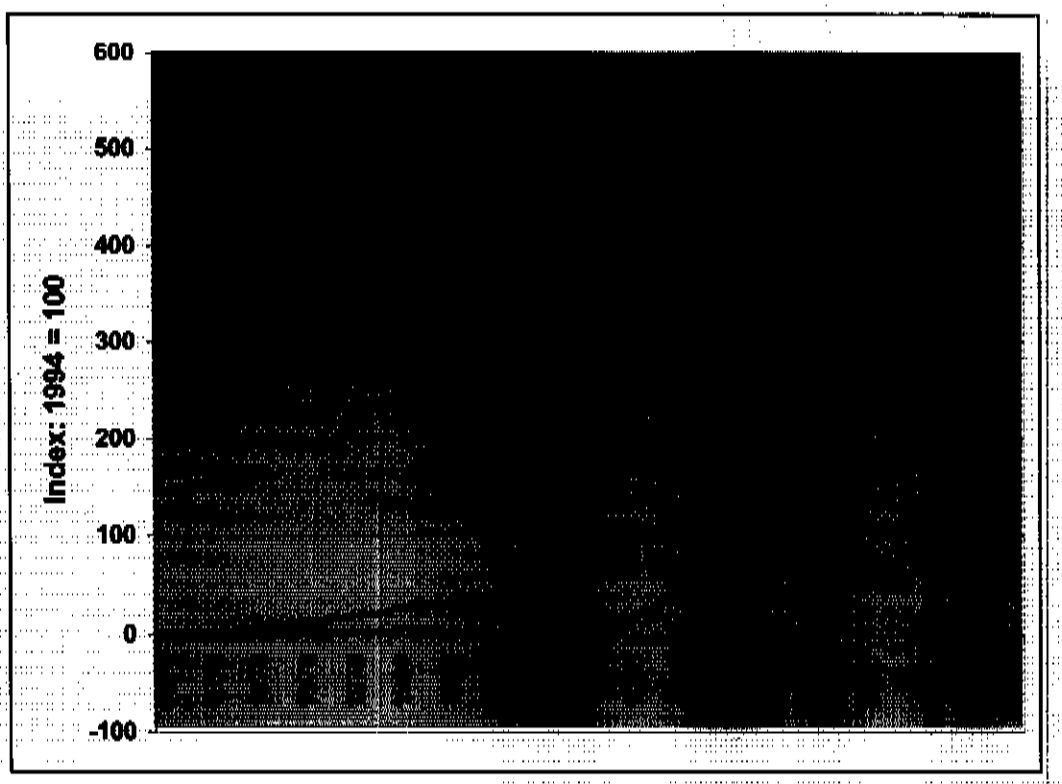
Sector	1970		1980		1990		2000		2006	
	Rm	% of total value added	Rm	% of total value added	Rm	% of total value added	Rm	% of total value added	Rm	% of total value added
Compensation of employees	112	93.1	701	83.6	2,559	83.4	5,334	61.1	8,765	56.1
Net operating surplus	4	3.1	50	6.0	200	6.5	2,851	32.6	5,443	34.8
Consumption of fixed capital	5	3.9	87	10.4	310	10.1	549	6.3	1,418	9.1
Gross value added at factor cost	120	100.0	838	100.0	3,069	100.0	8,734	100.0	15,625	100.0

Source: Quantec Research SA Standardised Industry Data, online database

The figures indicate a dramatic decline in the relative contribution of labour to the gross value added of the sector – from 93% in 1970 to 56% in 2006 – and a corresponding increase in the relative share of the gross operating surplus (the net operating surplus plus the consumption of fixed capital). Taken together with the decline in share of labour, the rising share of the consumption of fixed capital from almost 4% in 1970 to just over 9% in 2006 is indicative of some level of capital deepening in the sector.

Figure 7 below indicates the relative performance of the different components of gross value added. It is noteworthy that, after lagging the consumption of fixed capital and the remuneration of labour during the 1970s and 1980s, the net operating surplus has shown substantially higher rates of growth since 1990. However, the average annual increase in the consumption of fixed capital (17.1% p.a.) between 2000 and 2006 exceeded the growth in the net operating surplus (11.1% p.a.) and labour remuneration (8.6% p.a.) over the same period.

Figure 7 – Relative performance of different components of gross value added in the civil engineering and construction works sector



Source: Quantec Research SA Standardised Industry Data, online database

The growth in the nominal remuneration leads us into our analysis of employment within the sector. Data issues related to official statistics on employment in the civil engineering and construction works sector are problematic. A historic trend of South African Standardised Industry (SASI) data shows an increase year on year every single year from 1960 to 1994. This trend is at odds with industry association data, corporate data of individual companies and the overall acceptance by economists, researchers and industry players that the sector shed substantial jobs between 1985 and 2000. As such, official data since 1994 are shown in table 11 below, as well as industry data collected via SAFCEC.

Table 11 – Employment in civil engineering and construction works

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
SASI data (civil engineering and construction works employment SIC 52, 53)													
High skill	6,415	6,938	7,205	7,872	7,832	7,686	7,764	8,062	8,427	8,543	9,674	9,509	10,470
Skilled	17,230	18,671	19,439	21,305	21,275	20,967	21,277	22,197	23,312	23,739	26,998	26,648	29,451
Semi/unskilled	125,251	130,173	129,972	136,682	131,041	124,088	121,093	121,598	123,059	120,911	132,887	126,947	135,965
Total	148,896	155,782	156,616	165,859	160,148	152,741	150,134	151,857	154,798	153,193	169,559	163,104	175,886
% growth p.a.		*4.62*	*0.54*	*5.90*	*-3.44*	*-4.63*	*-1.71*	*1.15*	*1.94*	*-1.04*	*10.68*	*-3.81*	*7.84*
SAFCEC (civil engineering employment)													
Total		64,424	72,844	82,930	92,906	68,764	66,674	71,066	89,806	93,867	84,318	94,438	107,089
% growth p.a.			*13.07*	*13.85*	*12.03*	*-25.99*	*-3.04*	*6.59*	*26.37*	*4.52*	*-10.17*	*12.00*	*13.40*

Notes: The SASI and SAFCEC data measure different sub-sectors. The SASI data cover SIC 52 and 53, while the SAFCEC data cover only civil engineering. The SASI data are based on StatsSA's Labour Force Survey, while the SAFCEC data are based on company surveys.

Source: Quantec Research online database, SAFCEC Industry Overview 2007, p.19

As expected total employment in the civil engineering and construction works sectors has grown substantially since the acceleration of demand for these services. Comparing employment levels in 1995 and 2006 shows that employment has grown a phenomenal 12.9% for non-building construction and a massive 67% for civil engineering. If current growth rates are maintained, employment in the sector could double in the next five years.

Table 12 below indicates the composition of employment in the civil engineering and construction works sector. The table talks first to the skills mix and secondly to the split between formal and informal labour.

Table 12 – Composition of employment in the civil engineering and construction works sector

Employment by type and skill	1970		1980		1990		2000		2006	
	Number	% share of total employment	Number	% share of total employment	Number	% share of total employment	Number	% share of total employment	Number	% share of total employment
Formal – highly skilled	1,208	1.7	2,532	2.9	4,530	2.4	7,764	2.5	10,470	3.8
Formal – skilled	6,007	8.6	7,554	8.7	11,909	6.3	21,277	7.0	29,451	10.7
Formal – semi- and unskilled	51,762	74.0	54,135	62.4	98,404	52.0	121,093	39.7	135,965	49.4
Total: formal employment	*58,977*	*84.3*	*64,221*	*74.0*	*114,842*	*60.7*	*150,134*	*49.2*	*175,886*	*64.0*
Employment informal: total	*10,982*	*15.7*	*22,583*	*26.0*	*74,318*	*39.3*	*154,942*	*50.8*	*99,129*	*36.0*
Total: formal and informal employment	**69,959**	**100.0**	**86,804**	**100.0**	**189,160**	**100.0**	**305,077**	**100.0**	**275,015**	**100.0**
	Rand		**Rand**		**Rand**		**Rand**		**Rand**	
Average annual remuneration per worker	1,600		8,075		13,527		17,485		31,870	

Source: Quantec Research online database, SAFCEC Industry Overview 2007, p.19

We have not analysed these data in detail, as accuracy concerns exist as suggested above. To the extent that the data are a true indication of employment activity in the sector, it appears that the sector is a large employer of semi- and unskilled labour relative to highly skilled labour, but that the composition of this mix has changed over time. Reasons for this shift may include changes in production methods (increased capital intensity) and changes in the types of projects undertaken (earthworks require more unskilled labour, while more sophisticated projects such as building electricity generators requires less unskilled labour), as well as the casualisation of labour.

All of the preceding analyses of the inputs into, and the outputs from, the civil engineering and construction works sector now lead us to a determination of the sector's multipliers. We have included an introductory section on multipliers and how to interpret them, as often these values are misconstrued.

Multiplier effects – particularly as they relate to fixed capital formation multipliers – are often misinterpreted. In assessing the impact of a R1-million investment in fixed capital in a particular sector, it is important to note that the resulting impact on that sector, and on the economy more generally, can vary substantially. This variation will be influenced by factors such as whether the investment in question constitutes net new investment in the sector or merely contributes to the maintenance of the existing capital stock in that sector. The extent to which existing production capacity in a sector is currently being utilised will also influence the socioeconomic impact of any new investment. Multipliers usually assume full capacity utilisation.

While capital formation within the civil engineering and construction works sector will be less prone to lumpy capital spending, the same cannot be said for many of the sectors which absorb civil engineering outputs. In the case of sectors where civil engineering and other construction inputs tend to be large and lumpy, they have a profound impact on capacity utilisation levels, and the multiplier effects will be prone to large variations. For example, the construction and commissioning of a new power station will result in a substantial increase in the potential electricity generation of that sector. As a result, levels of capacity utilisation in the electricity generation sector will initially fall substantially, and subsequent investment in the sector will not have the same output, value added, remuneration, gross operating surplus and employment effects as a similar investment would have if the sector was operating at, or close to, full capacity.

For these reasons, it is more accurate to argue that a particular investment in fixed capital in a sector will *support* a certain value of output, value added, remuneration and gross operating surplus, and a certain number of jobs. Such support could be of existing economic activity or new activity or a mix of the two, depending on whether the investment is net new investment or simply maintenance of existing capital, and on prevailing capacity utilisation levels.

The concept of multipliers arises from the fact that an increase in spending in one sector leads to an increase in demand for the products of those sectors supplying that sector (intermediate inputs), while the additional incomes generated from the value added lead, in turn, to expenditure on the products of other sectors. The result is that an exogenous increase in final demand for the output of one sector leads to an economy-wide impact that may be substantially greater (a multiple) than the value of the initial increase in spending.

Multipliers can be used to estimate the likely impacts of additional spending on final demand, value added, remuneration, the gross operating surplus, employment and import leakages. It is possible to distinguish the following multiplier effects[4]:

- **Initial impact**: The initial impact is the contribution the specific sector under consideration makes to each one of the above variables. In this context, it would constitute the additional turnover, value added, remuneration, operating surplus or employment injected into the economy directly attributable to a change in activity levels in that sector.
- **First-round effect:** First-round suppliers are those industries which deliver goods and services directly to the particular sector concerned. The first-round effect takes account of the initial impacts of the 'injected activity' on all first-round/direct suppliers.

[4] "Input Output Analysis Sectoral Multipliers for South Africa in 1993", compiled by Gerhard Kuhn and Rentia Jansen, IDC, October 1997.

- **Direct effect:** The direct effect constitutes the sum of the initial impact and the first-round effect.
- **The indirect effect:** Indirect suppliers are those industries which, on their part, deliver goods and services to the first-round suppliers. For example, the purchases by manufacturing from the electricity sector are regarded as first-round impacts of the manufacturing industry, but the backward linkage of the electricity sector with, for instance, the coal mining industry and the linkage of the coal industry, in its turn, with its suppliers of intermediate goods and services, are regarded as part of the indirect impact of the manufacturing industry.
- **Induced effects:** Induced effects arise because of the additional household income generated as a result of the direct and indirect effects. The induced effect multipliers capture the additional (induced) effects of household income generation through payments for labour services and the associated private consumption expenditure on goods produced by the various sectors. In this case, household income is treated as being spent within the system and thereby generating further economic activity and thus resulting in larger multiplier effects throughout the entire economy.
- **Total impact:** The total impact is the sum of the direct, indirect and induced effects. It constitutes the potential economy-wide impact of increased activity in a particular sector

In the following sections, the relevant multipliers for the civil engineering and other construction sector will be examined, with a view to estimate the possible economy-wide effects of increased demand for the output of the sector.

Table 13 – Estimated multipliers of the civil engineering and construction works sector for 2005

Multiplier arising from a R1 increase in sales/output (based on 2005 figures)	Initial impact (a)	First-round effect (b)	Direct impact (c=a+b)	Indirect effect (d)	Induced effect (e)	Total impact (f=c+d+e)
Output/sales (Rand)	1.0000	0.6115	1.6115	0.6067	1.2754	3.4936
GDP/GVA (Rand)	0.2900	0.2348	0.5248	0.2604	0.3915	1.1767
Labour remuneration (Rand)	0.1453	0.0938	0.2392	0.1060	0.1439	0.4891
Import leakage (Rand)	0.0985	0.0627	0.1612	0.0536	0.0794	0.2942
Average capital requirement (Rand)	0.1190	0.4148	0.5338	0.5600	0.6606	1.7544
Employment (number of jobs/Rm of sales)	4.3975	1.5525	5.9500	1.3498	2.3008	9.6007

Source: Quantec Research SA Standardised Industry Data, online database

Based on the multipliers contained in table 13 above, the various effects of an increase in output/sales would be as follows:

Initial impact

An increase in the value of sales of the civil engineering and other construction sector of R1 would generate an initial increase in GDP/value added of up to 29 cents (based on the fact that the ratio of value added to final demand is roughly 29%). Of those 29 cents of value added, roughly 14.5 cents would be made up of labour remuneration (implying that the balance of 14.5 cents would arise from the value added by the gross operating surplus). On average, just less than 10 cents would be paid for imports, while in order to supply the demanded R1 worth of product, the sector would require capital equipment worth just less than 12 cents. Every R1-million of sales by the sector would support roughly 4.4 jobs in the sector.

First-round effect

The first-round effects could be summarised as follows: the R1 increase in sales of the civil engineering and other construction sector would necessitate direct purchases from upstream (intermediate input) suppliers of around 61 cents. Based on the ratio of value added to sales of these suppliers, an additional 23 cents of value added would be generated in the economy, of which roughly 9 cents would be labour remuneration, and the balance (about 14 cents) would come from additional gross operating surpluses in those sectors. In order to be able to supply the 61 cents worth of inputs, the suppliers would, collectively, require gross capital (fixed and inventory) of around 41 cents. For every R1-million of additional sales in the civil engineering and other construction sector, roughly 1.5 jobs would be supported in those upstream industries supplying the sector.

Direct impact

The direct impact would be the sum of the initial impact and the first-round effects.

Indirect effect

The indirect effect of the additional R1 sales in the civil construction sector are summarised as follows: the 61 cents worth of purchases from upstream suppliers would, in turn, generate purchases from their suppliers of around another 61 cents – of which roughly 26 cents would be value added by those (indirect) suppliers. Of that 26 cents, about 11 cents would be labour remuneration, and the balance additional operating surplus. About 5 cents worth of the indirect demand would be sourced by imports, and the various suppliers would, on average, require gross capital of about 56 cents in order to supply the 61 cents worth of demand. For every R1-million worth of sales in the civil engineering and other construction sector, roughly 1.3 jobs could be supported by indirect suppliers.

Induced effect

The induced effect arising from the additional household incomes generated by the above processes would be as follows: additional sales of R1.28, of which about

39 cents would be value added. Of this 39 cents, roughly 14 cents would comprise labour remuneration and about 8 cents of the additional sales would be imported. In order to satisfy the additional induced demand, the various sectors of the economy would require about 66 cents worth of fixed capital and inventories, and for every R1-million of demand in the civil construction sector, the induced demand would support around 2.3 jobs.

Total potential impact

The potential, economy-wide effect of a R1 increase in sales by the civil engineering and other construction sector would therefore be an increase in sales of around R3.50, resulting in additional value added of around R1.18 – of which about 49 cents would be labour remuneration and the balance (around 69 cents) would be additional gross operating surplus. About 29 cents of the additional sales would be supplied by foreign suppliers, and the sales would, on average, necessitate about R1.75 worth of gross capital formation. For every R1-million worth of sales by the civil engineering sector, up to 9.6 jobs could be supported throughout the economy. This, taken together with the labour remuneration, implies average remuneration of around R51,000 per annum.

To put these multipliers in context, table 14 below shows equivalent multipliers for the domestic 'other mining', 'metal products' and 'financial and auxiliary business services'.

Table 14 – Estimated multipliers for 'other mining', 'metal products' and ' financial and auxiliary business services' for 2005

Multiplier arising from a R1 increase in sales/output (based on 2005 figures)	Sector	Initial impact (a)	First-round effect (b)	Direct impact (c=a+b)	Indirect effect (d)	Induced effect (e)	Total impact (f=c+d+e)
Output/sales (Rand)	Other mining	1.0000	0.3937	1.3937	0.3467	1.0836	2.8241
	Metal products excluding machinery	1.0000	0.6057	1.6057	0.5888	1.4665	3.6609
	Financial & business services	1.0000	0.3756	1.3756	0.2874	1.5318	3.1947
GDP/GVA (Rand)	Other mining	0.5395	0.1747	0.7142	0.1484	0.3327	1.1952
	Metal products excluding machinery	0.3032	0.2162	0.5194	0.2590	0.4502	1.2286
	Financial & business services	0.6094	0.2069	0.8163	0.1387	0.4702	1.4252
Labour remuneration (Rand)	Other mining	0.1556	0.0777	0.2333	0.0600	0.1223	0.4156
	Metal products excluding machinery	0.2017	0.0914	0.2931	0.1038	0.1655	0.5624
	Financial & business services	0.2717	0.0860	0.3577	0.0569	0.1728	0.5874
Import leakage (Rand)	Other mining	0.0668	0.0379	0.1047	0.0327	0.0675	0.2049
	Metal products excluding machinery	0.0911	0.0783	0.1694	0.0522	0.0913	0.3129
	Financial & business services	0.0150	0.0127	0.0277	0.0173	0.0954	0.1404
Average capital requirement (Rand)	Other mining	0.9815	0.6758	1.6574	0.3288	0.5613	2.5475
	Metal products excluding machinery	0.1840	0.3922	0.5762	0.5952	0.7596	1.9310
	Financial & business services	1.2562	0.4319	1.6882	0.2880	0.7934	2.7695
Employment (number of jobs/Rm of sales)	Other mining	1.9328	0.7605	2.6933	0.7340	1.9549	5.3822
	Metal products excluding machinery	2.5424	1.2186	3.7610	1.2336	2.6455	7.6401
	Financial & business services	1.8406	0.7928	2.6334	0.6282	2.7633	6.0249

Source: Quantec Research SA Standardised Industry Data, online database

When the respective multipliers are compared, it is apparent that the civil engineering and construction works sector compares favourably with the other sectors analysed. With respect to employment, the civil engineering and construction works sector can

create additional employment up to 9.6 jobs per R1-million of sales, compared to six jobs in the 'financial services' sector, 7.6 jobs in the 'metal products' sector and 5.3 jobs in 'other mining'. With respect to output/sales, the total impact of construction is higher than 'other mining' and 'financial services', but just lower than 'metal products'. The average capital requirement and gross value added of the construction sector is lower than all three other sectors, while the labour remuneration multiplier is higher than 'other mining', but lower than 'metal products' and 'financial services'.

Comparing domestic multipliers with international multipliers is a difficult task, given that cited international multipliers are not fully explained and hence we are unable to confirm exactly how they are constructed. One must be cautious about comparing like concepts if one is to be able to draw any meaningful conclusions. As mentioned in the introductory section of this paper, the average output multiplier for the civil engineering and construction works sector in developed countries averages between 1.7 and 2.7 (Bon and Pietroforte, 2001). In developing countries with strong construction sectors, output multipliers as high as 3 in Korea (Chen, 1998) and 3.2 in China (Wu, 2005) have been recorded. Given the leakages in the South African system, it is hard to believe that our local output multiplier of 3.49 could be measuring an equivalent of what is used to calculate the Chinese and Korean output multipliers. Nevertheless, it appears that South Africa does not exhibit output multipliers that are far off the international norm.

4. South African civil engineering and construction works exports

We now turn our attention to civil engineering and construction works exports by South African companies. This analysis has been severely constrained by a number of important factors. These include (1) the absence of any official disaggregated data pertaining to exports from the sector, (2) a highly complex form of transactional practices for foreign contracting which makes calculating the value of exports extremely difficult, (3) a highly complex and inconsistent manner in which revenues generated abroad are accounted for in local company balance sheets and (4) difficulty in obtaining primary data from local companies regarding their external activities at a detailed project level. Despite these limitations, surveys undertaken by SAFCEC on export activity, information from Annual Reports and a series of interviews with industry players at both a management and project management level have allowed us to develop an initial view on export behaviour in this sector and its potential for growth.

From an industrial strategy development perspective, the first most notable characteristic of South African civil engineering and construction works exports is that the sector's export model shares no commonalities with the models used in all other developing countries. As shown in section one of this paper, all the developing countries which have actively exported construction services in the past two decades have done so as part of a national government programme which actively supported these exports. Government support in these situations is based not only on a desire to grow the sector in its own right but is often linked to other national imperatives such as job creation, foreign exchange earnings, export diversification strategies or cross-selling merchandise export strategies. As such, many developing countries which export civil engineering and construction works services do not strive to earn profits off these contracts but merely to attain related benefits such as foreign exchange earnings or merchandise exports. As will be shown, this complicates the market in which South African construction firms operate, given that they are driven by profits and not related national benefits.

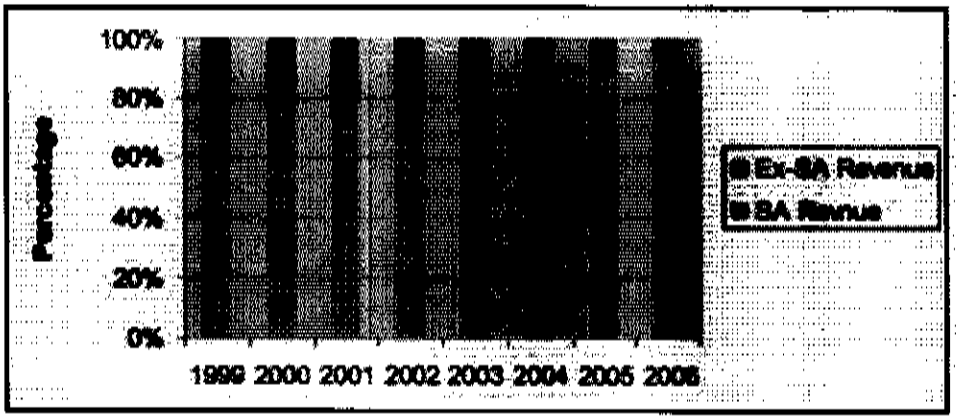
The South African experience with construction exports is systemically different from that of China, Korea and other developing countries such as India, Singapore and Brazil. The key differentiator is that construction exports from South Africa are driven by the private sector and are not part of a broad governmental policy. As such it makes sense to begin our analysis by considering the drivers of construction exports in the private sector.

4.1 Export drivers

We would expect the first driver for exports to be the state of local demand. As argued earlier, construction works and civil engineering local demand is highly volatile and variable. In periods of low domestic demand we would expect that local companies will seek international contracts to supplement low domestic order books,

so as to maintain and effectively utilise their capacity. Data regarding ex-South African revenue[5] in construction works are not collected in official data sources in a disaggregated manner. Only company surveys and company financial statements can be used to show how foreign contracting varies according to local demand. The most comprehensive survey conducted to date was undertaken by SAFCEC for the period 1999 to 2006, the results of which are shown below.

Figure 8 – Percentage contribution of exports to total turnover in civil engineering industry



Source: SAFCEC State of the Industry, 2007a

Although the survey covers a relatively short time period, it supports the above hypothesis that firms undertake greater exports in times of weak domestic demand (1999 to 2002) than in periods of strong domestic demand. This is shown not only in percentage terms but is verified by lower export contract values and number of foreign contracts in years when domestic demand is high (SAFCEC, 2006). Our interpretation of the SAFCEC data was queried in our interviews, particularly by the three largest companies operating in the sector. It appears that while our interpretation may be valid for the majority of firms in the industry, for the three big players (Murray & Roberts, Aveng and Group 5) which have a large number of companies operating permanently outside of South Africa, the analysis is less valid. These top three companies consider themselves global players and include strategic goals to earn up to 30% of their revenue outside of South Africa, irrespective of local levels of demand. These goals are achieved via the establishment of companies in foreign countries which are staffed and resourced independently from local enterprises. This separation of capacity allows these companies to ramp up local capacity without it having a knock-on effect on their international operations. As such, local and international contracts are viewed as complementary activities and not substitute activities. For smaller companies, an element of substitution does exist between local and international contracts, but interviews suggest that such firms will

[5] Revenue generated outside of South Africa.

always choose local contracts over international contracts purely from a risk perspective.

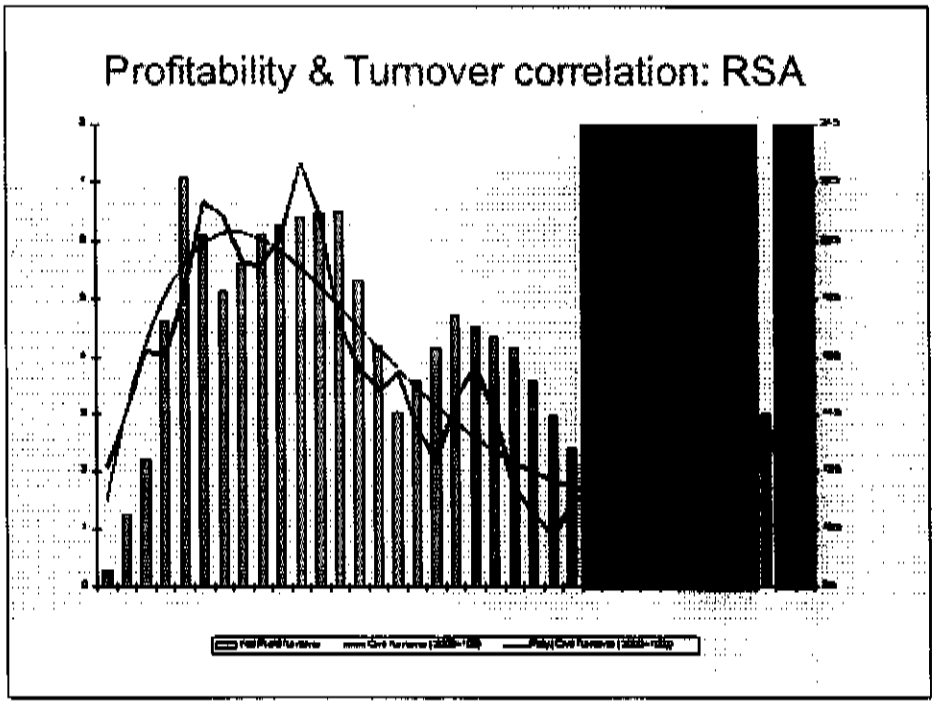
Although local demand conditions are overall a key driver for exports across the industry, a second driver of export activity is risk diversification, and often these two drivers are considered in combination, resulting in variable outcomes. Variable local demand, changing levels of business confidence, concerns regarding skills availability, input prices and profit margins drive firms to establish revenue streams unrelated to South Africa. The Annual Reports of the large construction works and civil engineering companies show that companies are taking different views on diversification.

Group 5 and Murray and Roberts lead the pack in their continued commitment to geographic diversification even in the face of strong domestic growth. Group 5 states that "the company aims to continue to generate one third of its revenue outside of SA" (Group 5 Annual report, 2006: 16). Murray and Roberts in their 2006 Annual Report establishes the company as a "global player" and states that it will continue to "direct its attention into the construction economies of South Africa, Southern Africa, the Middle East, South East Asia and Australia" (Murray and Roberts, Annual Report, 2006: 9). At the other extreme, Basil Read has adopted "a strategy to limit cross-border activities due to the increasing workload in South Africa" (Basil Read, Annual Report 2006: 17). Concor and Grinaker Lta occupy the middle ground. Grinaker's civil engineering construction division will cease to operate in the rest of Africa after it has completed current work in the region and will "only operate in South Africa and neighbouring territories" (Aveng, Market Overview, 2006). Concor states that as a company it "has no immediate plans to aggressively pursue cross-border contracts", but that in the field of civil engineering it "eagerly anticipates the coming opportunities and challenges, both within and outside our national borders" (Concor, Annual Report, 2006: 8-10).

A third driver of construction exports for local companies is existing client activity outside of South Africa. The top construction companies have all developed strong relationships with key clients in South Africa. As these clients move into foreign markets, they often prefer to commission local players to undertake the construction works contracts, and local companies are happy to accept due to the decreased risk of operating with a known client, albeit abroad. This has been especially true in the mining sector where the commodities boom has seen local mining houses more active in the rest of Africa than at anytime previously, and in other mining and oil-intensive economies such as Australia and the Middle East. As will be shown later in detail, civil engineering and construction works related to the mining sector (open cast and deep level) constitutes a large and import component of the local sector's export activity.

A fourth driver of construction exports for local firms is relative profitability levels. Looking first at local profit rates in construction works and civil engineering, a long-term pattern is shown in figure 9 below. From a high in the mid-1970s, the net profit to turnover ratio in the local industry has consistently decreased for two decades, with a recovery upward trend only starting to appear in 2002.

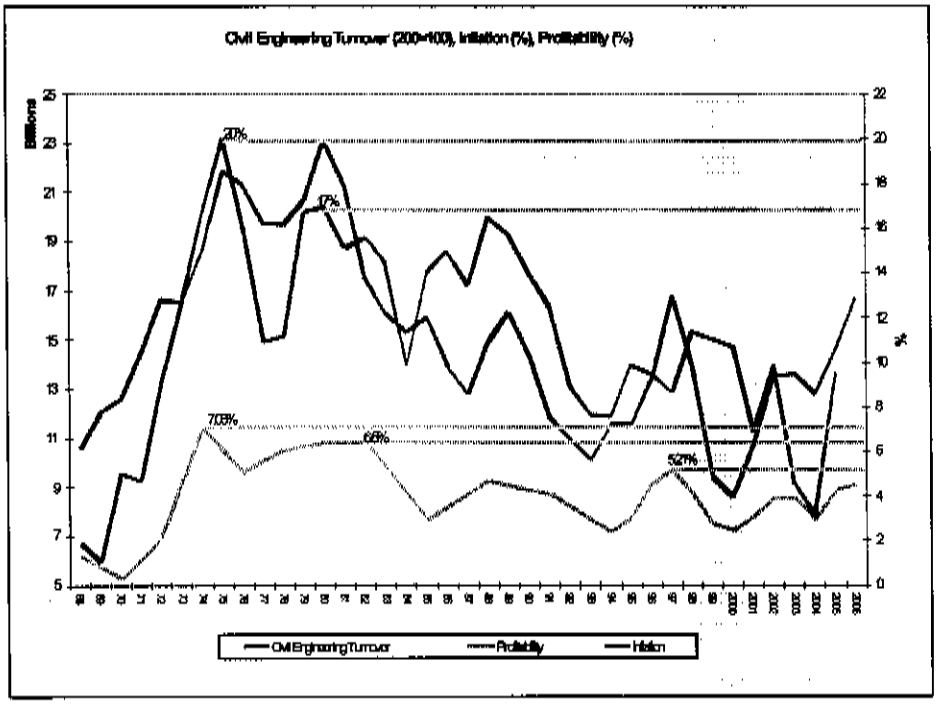
Figure 9 – Profitability and turnover for South African civil engineering firms



Source: SAFCEC, MIG presentation, 2007d

Figure 10 below shows clearly that profitability in this sector has consistently fallen below the inflation rate. In addition, a trend correlation occurs between turnover growth and profitability. However, when expansion in demand is sufficiently strong that competition for inputs increases, margins are traditionally squeezed back down. Views concerning the profitability of the local market are highly divergent. Group 5 anticipates in its 2006 Annual Report that profit margins in the local economy will increasingly come under pressure as input prices increase due to strong demand. Murray and Roberts, on the other hand, believes that profit margins will increase and upgraded its margin expectations from 5%-6% in 2006 to 8%-10% in 2007.

Figure 10 – Civil engineering turnover, profit and inflation



Source: SAFCEC, MIG Presentation, 2007d

All the top local exporting companies believe that in the international markets they have selected to focus on, they will be able to "achieve significantly higher contributions to margins, improving the company's bottom line without increasing volumes" (Group 5, Annual Report 2006, Global Review). This is an important point, as it suggests that these companies are not looking to increase the volume of external work, but that by maintaining current activity levels at anticipated higher margins than are available in the local market, their export diversification strategy will help the company to achieve higher returns for investors than if they limited their order book to local contracts only. As mentioned in the literature review, the profit margin driver of South African exporting companies is fundamentally different from the documented and accepted list of export drivers in the majority of other developing countries.

The sustainability of higher international margins than local margins appears to be in doubt over the long term. It is argued that, over time, international profitability is converging as a result of the globalisation of the industry. However, in the foreseeable future, areas of high profitability continue to be identified by local companies in targeted geographic areas and sub-sectors.

4.2 Export activity

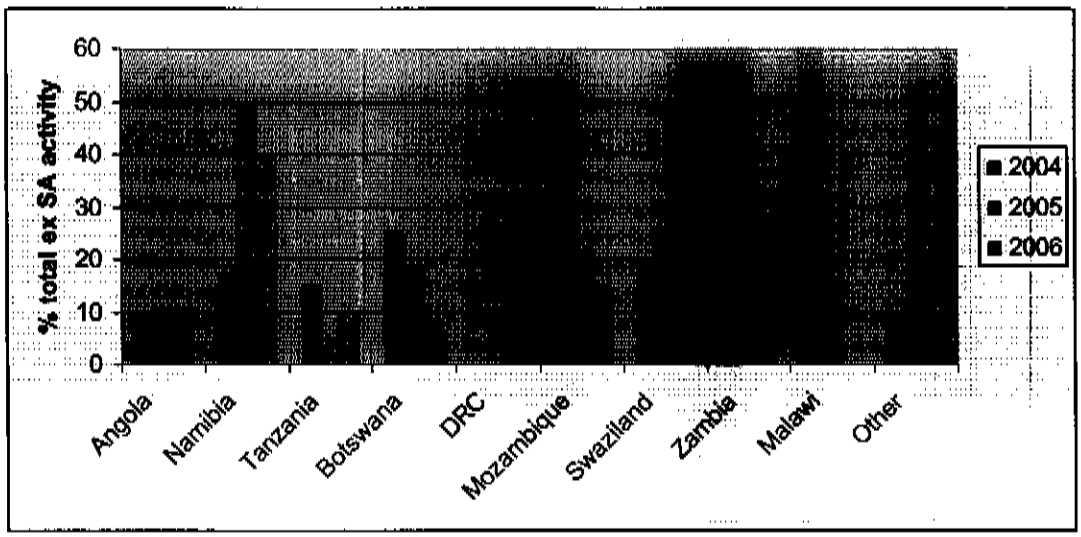
Moving on from the drivers of exports to what is actually being exported, we now turn our attention to export activity on the ground. As mentioned earlier, these exports are not collated in any official statistical data set, hence our analysis is based on the SAFCEC data (which have substantial flaws) and industry information gained from research of public documentation and several interviews with key players.

Since 2001, SAFCEC has conducted industry surveys to track local civil engineering and construction works activities abroad. It is the only survey of its kind in South Africa and is the only source of detailed disaggregated data in the sector. SAFCEC collects data from its members not only on the value of external contracts, but also where these exports occur and in which sectors contracts are secured. The difficulty with the SAFCEC data results from how its members classify and divide their operational activities within the corporate structures and hence how they complete their survey information. All of the large firms approach the issue differently. For example, Murray and Roberts have a civil engineering and construction works division as well as a mining division. When Murray and Roberts completes its SAFCEC survey on civil engineering and construction works exports it does so only for its civil engineering unit and hence the survey fails to capture its mining activity exports. Over and above these divisional differences which tend to lead SAFCEC's survey data to under-represent export activity and to show a bias towards pure civils and construction works activity, the problem is further compounded by the large companies owning entirely separate entities, some of which are not SAFCEC members and which operate solely outside of South Africa. As such the SAFCEC data must be treated with caution and where possible we have accessed individual company information to try to elaborate the SAFCEC survey findings.

The geographic spread of where South African construction exports occur is crucial to the latter part of this paper where we attempt to develop export multipliers to measure the beneficial impact of construction exports to the local economy. Key to the conclusions of this paper is the fact that, unlike merchandise exports, services exports are not homogenous; in other words, not all services exports are equal – some will be of greater benefit to the domestic economy and some will be of little or no value to the domestic economy.

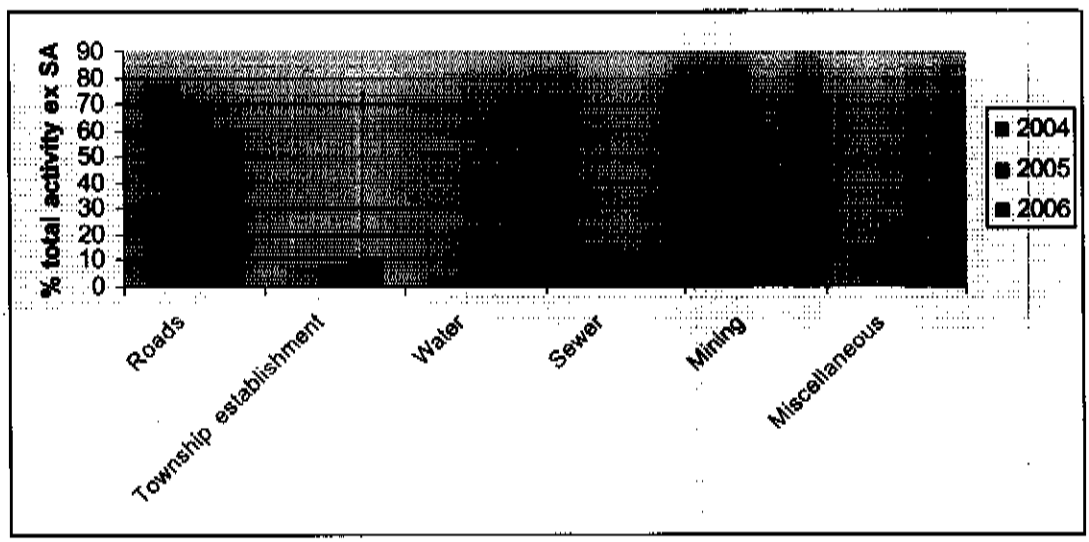
Figure 11 below is based on the SAFCEC survey and suggests that the majority of construction exports by South African companies occur within the region, with Namibia, Botswana, Mozambique, Swaziland and Zambia being key markets. Since 1994, activities in Ghana, the DRC, Angola, Ethiopia, Nigeria and Mali have also increased. So too has export activity for the larger companies in the Middle East, eastern Europe and Australia, although these activities are under-reported in the SAFCEC survey due to contracts being undertaken by wholly owned companies outside of South Africa.

Figure 11 – Civil engineering and construction works undertaken by local companies outside of South Africa



Source: Synthesised from SAFCEC quarterly data in State of the Civil Industry, 2007a

Figure 12 – Type of work undertaken by local firms outside of South Africa



Source: Synthesised from SAFCEC quarterly data, State of the Civil Industry, 2007a

The decision to enter an export market either by establishing a subsidiary company in a foreign country or by winning and accepting a contract for a specific project in a foreign country is a complex decision for local companies and one they do not enter into lightly. Risk management is a crucial factor in understanding South African companies' export behaviour, more so than in other developing countries where governments apply different risk criteria and management strategies than individual companies are forced to do. A highly risk-averse strategy by a South African company wishing to export will result in limited conversion of external opportunities, while insufficient risk management can result in serious negative impacts on a company's balance sheet. Certainly in the 1980s and 1990s when South African firms were unwelcome bidders on construction export contracts in many parts of the world (especially Africa), local companies took greater risks and often parachuted into countries with little knowledge or experience to undertake single contracts. Anecdotal evidence suggests that such approaches were almost always unsuccessful and significantly impacted on these companies' annual results and the strength of their balance sheets. Since the reintroduction of South Africa into the international community, attitudes have changed. Parachuting behaviour has all but evaporated, being replaced instead with systemic and strategic development of foreign markets.

Essentially, local companies thinking about operating outside of South Africa will consider two types of risk: operational level risk and project level risk. Sources of operational risk include competition, credit risk, key supplier continuity, foreign exchange fluctuations, commodity price hikes, capacity and quality. Project level risks typically include scope uncertainty, design, constructability, key supplier and sub-contractor performance, inflation, commodity price fluctuations, changes in law, unknown ground conditions, and weather and physical environmental issues.

Local companies spend considerable resources assessing the operational and project level risks for foreign countries in which they may possibly work. From our interviews we gather that most companies classify countries into three categories: (1) green light countries where they are happy to operate either by setting up a commercial presence or taking on individual projects using consultancy agreements; (2) amber light countries where they would be happy to operate on a particular project but would not set up a commercial presence due to high perceived risk levels and finally (3) red light countries where high levels of risk assessment would preclude the company operating in that country at either a corporate or project level. While we were not given access to specifics related to individual country categorisations it appears working back from projects undertaken and where companies have set up commercial presences that all developed countries and the Middle East have a green light rating. Most SADC countries seem to be accorded either green or amber light status, while most other African countries are rated either amber or red, depending on the degree of internal political stability and the type of government in power.

Real and perceived risks, as well as risk management strategies, have resulted in some key types of behaviour which have a strong bearing on this paper, and especially the calculation of an export multiplier. There are four key behaviours we have identified.

The first behaviour pattern relates to what contracts South African companies are happy to bid on. In green light countries, local companies have no problem in contracting with foreign governments, governmental agencies or private sector clients.

As we have shown, the public sector is the primary source of demand for economic infrastructure, thus a willingness to contract with a government of a foreign nation is key in exporting civil and construction works services. In red and amber light countries, however, South African firms will not (as a general rule) contract with foreign governments and will only take contracts offered by the private sector. This decision obviously decreases the size of the foreign market available to local companies and influences the types of projects which will be undertaken. Certainly the current portfolio of export projects being undertaken by South African firms abroad supports this behavioural interpretation. Bar some government-funded projects in the Middle East, Australia and Canada, more than 95% of the remaining projects being undertaken at present are private-sector-funded projects in Africa. The majority of these are resource related and mining projects arising from the commodity boom.

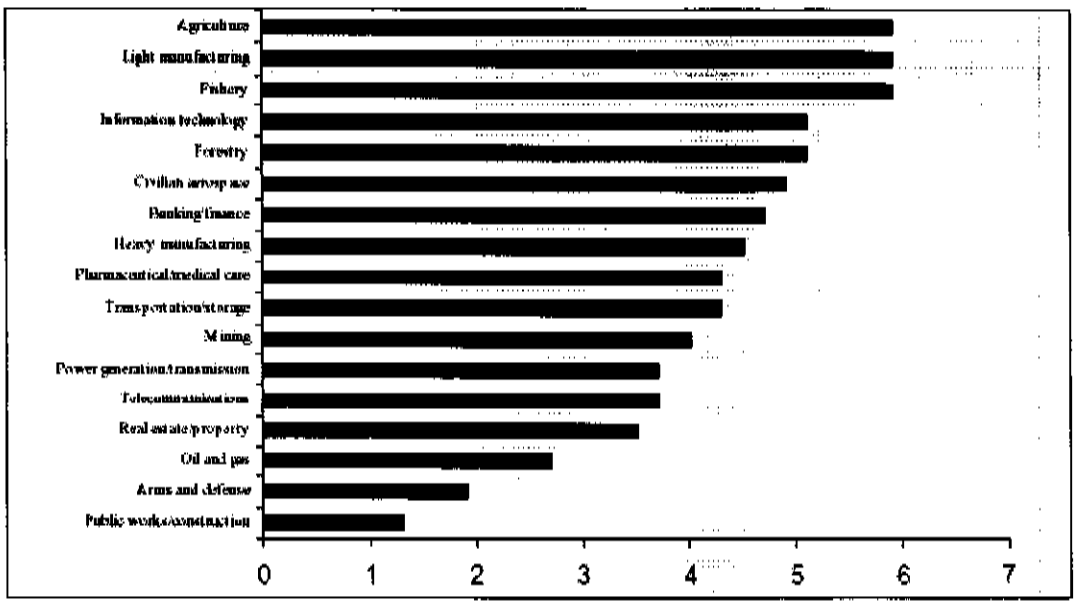
The second behaviour pattern we see in local firm exports is a highly sophisticated manner of contracting, which ameliorates foreign exchange risk. Crudely put, two types of contracts exist. First there are contracts where relationships with the South African Holding company are at arm's length and contracts do not contain a rand-based component. This is true of most Middle Eastern, European, Australian and American and Canadian contracts. The second category of contracts, mainly those in SADC and the Rest of Africa, do have a strong contractual link to the South African Holding company and often have a substantial rand content. As a risk amelioration strategy, most of these second-category contracts are divided into a dollar-based contract and a rand-based contract. Divisions between what is included in each contract is project specific. The impact of this contracting has enormous implications for our official statistics on construction exports. To explain this phenomenon, assume a local mining house (Company M) contracts a local civil engineering and construction works company (Company C) to build a mine in Zambia. Assume that the contract is split between a dollar-based and a rand-based contract and that all material purchased in South Africa for the project forms part of the rand-based contract. Company C will purchased the required inputs in the local market. It will then sell these inputs to Company M at a rand value. Company M will then export the inputs to the project site in Zambia. Similarly, Company C sells its engineering services to Company M through the same rand-based contract. The implications of this from a national accounts perspective are that (1) the material exports used in the construction of the mine in Zambia will be shown as exports from the mining sector and not exports from the construction sector and (2) the civil engineering and construction works services that are applied to the mine in Zambia are accounted for only as domestic activity and not foreign activity because the financial transaction occurred locally, even though the activity occurred in Zambia. We believe these transaction behaviours are a major contributor to the massive under-valuation of construction exports currently portrayed in the national data system. This would explain why the national accounts valued South African exports in 2006 at R47-million, while Murray and Roberts alone posted revenues from external contracts in excess of R3-billion.

The third behaviour pattern we see originating from local firms' risk perceptions and management strategies arises from supply continuity and the crucial issue of getting inputs on site on time and intact. The logistics system and the speed, reliability and

continuity of this system appear to be a crucial issue in project and operational risk assessment, especially in Africa. While opinions differ across different companies in South Africa, it appears that as a general rule, local companies prefer using inputs sourced in South Africa for overseas projects in Africa simply because they have experience with the products and have a view on their quality and functionality. However, for most countries north of the SADC envelope, insufficient logistics systems exist to allow South African-sourced inputs to be transported reliably and safely to site. In these instances inputs are sourced from countries where a superior or alternative logistics package is available.

The final behaviour pattern arising from a local company's risk assessment relates to operating in a hostile physical environment and a non-transparent governance environment. In this section we are referring to issues as diverse as HIV and Aids prevalence, malaria, armed attacks and kidnapping of personnel, theft of machinery, bribery, corruption, non-payment, changes in regulations and a host of other factors outside the control of a local company operating abroad. A paper released in 2007 by the World Bank (Kenny, 2007) identified the construction sector as the most corrupt industry within developing countries. Figure 13 below shows the results of a corruption survey by sector. The public works and construction sectors appear as the most corrupt of all sectors based on a 15-country survey. A score of zero indicates corruption, while a score of 10 indicates no corruption.

Figure 13 – Transparency International survey results: corruption by sector

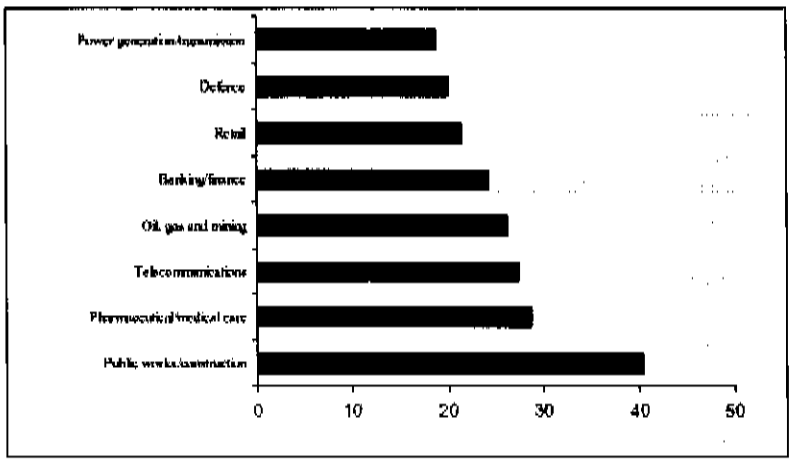


Source: Kenny, 2007: 22

Looking deeper into this issue, the World Bank paper undertook a survey where companies were asked, by sector, which of them has lost business in the past year due to a competitor offering the commissioning client a bribe. The highest percentage of

affirmative answers was recorded in the construction industry, with 40% of construction companies claiming to have lost contracts due to bribery.

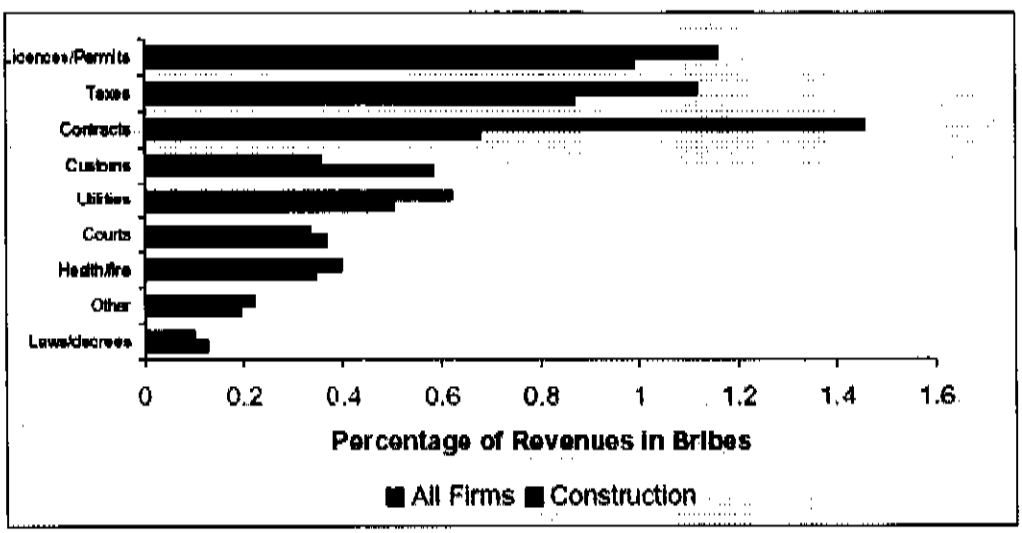
Figure 14 – Percentage of companies who claim to have lost a contract in the past 12 months due to competitors bribing commissioning clients



Source: Kenny, 2007: 22

Figure 15 shows that the majority of bribes and corrupt behaviour in the construction industry occurs at the contracting stage, followed by bribes related to licences being issued and work and building permits issued. Kenny (2007) suggests that up to 7% of the value of a construction project is usually paid in the form of bribes in corrupt countries, but the figure below, developed by Bray (2005), suggests a lower value.

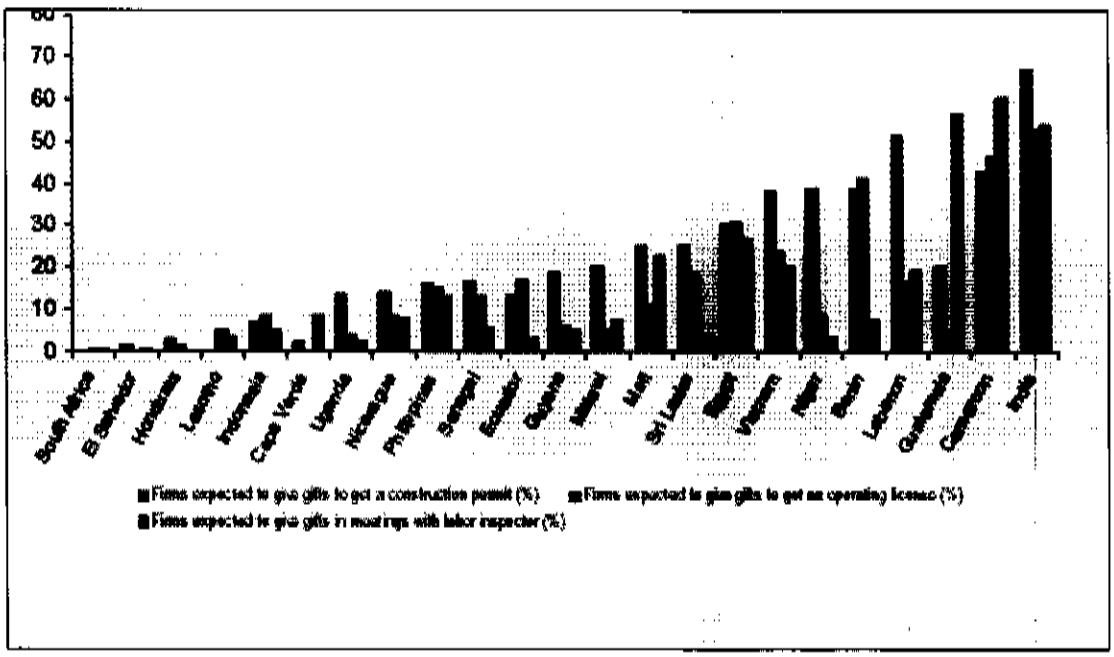
Figure 15 – Bribery sources within a project



Source: Kenny, 2007: 23

The above suggests that corruption and bribery are an accepted and documented element of public works and civil engineering and construction works contracts in developing countries. While we were unable to find a complete data set of relative rates of corruption which included all countries, figure 16 below from the World Bank paper shows that this phenomenon is not unique to Africa, nor is it more prevalent in Africa than in other developing countries.

Figure 16 – Percentage of bribes by type for various countries



Source: Kenny, 2007: 24

These issues of hostile environments and bribery and corruption elicited a mixed response from our interviewees and were a highly emotive topic. The first point we noted was a fundamentally different attitude between management and project managers on the risks and difficulties associated with operating in Africa. Management tended to be more vocal and negative towards these difficulties, while project managers who actually worked on projects in Africa were far less negative towards site conditions, physical risks and bribery issues, and merely viewed them as problems to be dealt with to get the job done. It was also noted by several interviewees that bribery and corruption occur even in developed countries and in nations generally viewed as being non-corrupt. The difference they noted was merely the predictability and systemisation of bribery, which reduced uncertainty. The above suggests that while corruption and bribery should never be condoned or accepted, it does appear to be a common characteristic of the construction industry and one which the majority of firms will have learnt to deal with and plan for.

The second point we noted related to behaviour patterns linked to risk assessment of working in Africa was that South African companies operating abroad (in Africa, but equally in the rest of the world) felt that they needed to be entirely self-sufficient while operating in a foreign country and that they received no support from South African embassies or the national government back home in times of need or crisis. This appears to be the case not only in terms of contractual issues, but equally in terms of South African nationals being in peril, either physically or in run-ins with local law enforcement. This perception/reality is in marked contrast to the experiences of other developing and developed nations operating abroad, where government support is attentive and active. If South African companies operating abroad have no faith in the support they will receive from the national government in times of need in a foreign country, this will certainly impact the companies' risk assessments of where they are happy to operate and how they price their risk.

On the basis of these behaviour patterns and companies' risk assessments and risk management strategies, we see the following overall preferences in relation to South African company export preferences:

- First, South African companies would prefer to export civil engineering and construction works services to first-world countries such as Australia, the Middle East, Europe and America and Canada, as these are viewed as low-risk opportunities.
- Second, in terms of export activity to developing countries, local South African companies are happier operating in SADC countries than the Rest of Africa in terms of preferred geographic locations for exports.
- Third, South African companies prefer to work for private sector clients rather than public sector clients, especially in developing countries.

As suggested earlier, not all off-shore contracts are equivalent – either from a company perspective in terms of risk and profitability or from a South African economy-wide perspective in terms of the sourcing of inputs and supply of labour to fulfil foreign contracts. The market preferences developed above are crucial in understanding the current benefits to the South African economy arising from the export of construction services, as well as the potential benefits which could be reaped from an intensive export approach. Essentially, the premise of this paper is that exports could potentially be used to supplement domestic demand to either maintain or grow the sector's contribution to GDP and employment, both directly and indirectly through the sector's multiplier effects. For this argument to hold, it is necessary to demonstrate the local labour content and local materials content which are supplied to fulfil international contracts. As will be shown, current market preferences have a major impact on the potential of an intensive export strategy to benefit the local economy.

4.3 Developing an export multiplier

Our initial ambition in this project was to collect sufficient detailed data from private sector companies in the industry regarding their export activity across sectors and

geographic areas to develop an export multiplier from primary data. In reality our ambitions could not be met, partly because local firms were too busy to assist us and partly because companies do not record data in a manner which is compatible with the types of data sets required. As such we have used a varied methodology to develop an export multiplier. First we had extensive interviews with senior management from most of the top firms and associations in the industry and gathered general information on cost breakdowns, procurement policies, labour policies and transaction practices governing international work. Second, we interviewed several project managers (all working in Africa) to gain more detailed insights into actual practices on the ground in terms of fulfilling contracts, and finally, from both of the above, we developed a set of assumptions which we then applied to our domestic multiplier data, which has allowed us to present what we believe to be a reasonable estimation of the civil engineering and construction works export multiplier. These calculations have been communicated to key industry players and the consensus view appears to be that they "in the correct ball park" and not fundamentally flawed (although it is noted that they are generalised and that variations do exist between countries and companies).

We begin our development of an export multiplier by considering three distinctive scenarios for South African exports, based upon broad characterisations of how export contracts are fulfilled in terms of sourcing material and the sourcing of highly skilled, skilled and semi-skilled labour. We assume that unskilled labour will in all scenarios be sourced from the host country.

In the first scenario, most of the labour and most of the materials for an international contract are sourced from South Africa. The more closely the fulfilment of such contracts approaches activities within South Africa, the more likely that the multiplier effects will be similar. This scenario is most likely to occur in exports to SADC countries.

The second scenario is a situation where most of the highly skilled and skilled labour to fulfil an international contract is sourced from South Africa, but only a small percentage of materials are sourced from South Africa. In this second scenario, skilled and semi-skilled labour is not sourced from South Africa. This scenario is likely to yield lower multiplier effects than the first scenario and result in an export multiplier lower than the domestic multiplier. This scenario would best describe contracts undertaken in the Rest of Africa, especially SSA.

The third and final scenario is a situation where an international export contract sources no labour and no materials from South Africa, but some profits are repatriated back to the holding company in South Africa. In this scenario all first-round and indirect multipliers would be negated. The direct and induced impacts would be limited to the portion of profit repatriated to South Africa and the only real benefit to South Africa would be to shareholders of the particular company. This scenario describes most export contracts to Australia, the Middle East, Europe, America, Canada and eastern Europe, where such contracts are fulfilled using resources from subsidiary companies established in these developed markets and overseas input suppliers.

Scenario three obviously describes exports where no real economy linkages occur back to the South African economy and thus it is excluded from our calculations of export multipliers in the remainder of this section. What follows are our detailed assumptions and calculations pertaining to exports in scenario one (SADC exports) and exports in scenario two (SSA exports).

4.3.1 Assumptions relating to export contracts

General assumptions

In terms of general assumptions, we make two initial assumptions regarding the nature of work and production in civil engineering and construction works exports. The first assumption is that the majority of projects undertaken in SADC and the Rest of Africa, especially SSA, by local firms exporting in this sector are projects related to mining and large earthworks projects. This assumption is based on the project databases of the large exporting companies and the SAFCEC survey.

The second general assumption is that production methods used in export contracts are largely the same as domestic production methods. Speaking to industry players, we have established no evidence that local firms use alternative production methods to their local methods when fulfilling export contracts, and as such we are confident our assumptions do not need to account for different production methods regarding export contracts.

Intermediate input assumptions

With respect to intermediate inputs, our assumption above regarding consistent production methods in local and export contracts allows us to maintain the broad split between primary, secondary and tertiary inputs in both local and export contracts.

As such we assume that, as for local contracts, international contracts will broadly obtain 14% of its intermediary inputs from the primary sector, 57% of its intermediate inputs from the secondary sector and 29% of its inputs from the tertiary sector.

Looking at these inputs in more detail, we used out interviews with project managers to go through all intermediate inputs in detail to try to understand which products are sourced locally from the host country, which are procured from South Africa and which are purchased from other countries. The first finding was that primary inputs which are dominated by other mining products such as shale, sand and aggregates are almost always sourced from the host country and virtually never imported, either from South Africa or elsewhere in the world. As such we assume that for SADC and SSA contracts, exports of primary intermediate inputs from South Africa to fulfil international contracts are zero.

With respect to tertiary sector inputs, we have assumed that for both SADC and SSA exports, the majority of tertiary inputs are provided from South Africa due to limited capacity in most host countries to provide these services. The only elements of tertiary services which we have sourced from the host country, as opposed to South

Africa, are 100% of accommodation and catering services, 25% of transport and storage and 10% of financial intermediation.

Finally, with respect to secondary intermediate inputs we have assumed that South African contractors are more likely to find less sophisticated secondary inputs in the host country, with the majority of more sophisticated secondary inputs being sourced from South Africa. For example, a South African construction firm operating in Botswana may be able to source cement from a local company in Botswana but would be less likely to find machinery and equipment in Botswana. Many of the percentages applied to a disaggregated list of secondary inputs were compiled using Botswana as a key indicator. The reason for this is that the Botswana government has strict local procurement measures included in their foreign contracts, which compel a foreign civil engineering and construction works firm to prove that it cannot source inputs locally from companies in Botswana before it is able to import these goods. Given this procurement legislation and the fact that Botswana is one of the more developed economies within SADC and SSA, we believed that the local/import split regarding secondary intermediate inputs would be a solid marker on which to base our detailed assumptions.

Overall our assumptions regarding intermediate inputs for SADC contracts are that 66% of all intermediate inputs are sourced from South Africa. Of these exports, 74% are secondary sector inputs and 26% tertiary sector inputs. With respect to intermediate inputs for SSA contracts (excluding SADC), we assume 51% of all intermediate inputs are sourced from South Africa. Of these exports, 70% originate from the secondary sector and 30% from the tertiary sector.

Value-added assumptions

The assumptions regarding value added in foreign contracts needed to take into account two fundamental differences between working in South Africa and working in SADC or SSA: first, what one needs to pay employees for working outside of South Africa and second, what margins would be acceptable for taking a project outside of South Africa.

In relation to labour costs we needed to make assumptions about the premiums paid to employees to 'compensate' them for working away from home, working in a possibly less comfortable and safe environment and dealing with stresses often not encountered when working in South Africa. Our interviews suggested that Africa is broadly divided into three categories of countries, each with their own broad premium. SADC countries tend to carry the lowest premium of approximately 15%. Countries further afield and with harsher environments such as Ghana, Zambia and Tanzania tend to carry premiums of approximately 65%, while 'high-risk' countries such as the DRC and Angola carry premiums as high as 90%-100%.

We have assumed a 15% premium on local contracts for compensation of employees working on projects in SADC countries and a 65% premium for compensation of employees working on projects in SSA countries (excluding SADC).

In relation to margins on foreign contracts, our information collected from interviews suggests a wide range of profitability on projects. We were asked not to make the

details of certain margins public, but certainly it appears that working in SADC and SSA is profitable – even when higher labour costs are factored in. As such we have assumed a net operating surplus premium of 15% on local contracts for SADC and SSA exports. Finally we also included a premium for the consumption of fixed capital – 15% for SADC contracts and 18% for SSA contracts.

Labour assumptions

With respect to labour, our first assumption was that, given the use of equivalent production methods in local and foreign contracts, the ratio of skilled to unskilled workers for a project would be the same for local or foreign contracts. As such we assume that for an export contract, the ratio of skills is 6% highly skilled, 17% skilled and 77% unskilled. From our interviews it was ascertained that 100% of highly skilled labour on foreign export contracts was sourced from South Africa. Similarly, 100% of unskilled labour in foreign export contracts is sourced from the host country, that is, there are no unskilled labourers from South Africa being exported to SSA or SADC countries to fulfil these export contracts.

This leaves only skilled labour to be accounted for (that is, artisans). Our interviews suggested that in general in SADC contracts, 50% of skilled workers are sourced from South Africa and 50% of skilled workers sourced from the host country. We have used this breakdown in our assumptions for SADC countries. With respect to non-SADC SSA countries, our interviews showed that skilled workers were sourced neither from South Africa nor from the host country but were usually sourced from countries such as Pakistan and the Philippines. On this basis we have assumed that no skilled workers are exported from South Africa to fulfil contracts in SSA countries.

Wage rate differentiation (multiples of unskilled worker remuneration)

Using data gained from our interviews we have made the following assumptions regarding wage differentiations between the various skills levels: for SADC contracts, wage differentiation of the following magnitude are assumed: unskilled : 1, skilled : 6.9 and highly skilled : 18.4

In the case of SSA contracts (excluding SADC), it is estimated that the wage differentiation changes to: unskilled : 1, skilled : 6 and highly skilled : 26.4.

4.3.2 Estimated adjusted multipliers for exports of civil engineering and construction works services based on the above assumptions

On the basis of the above assumptions, the estimated multipliers for export contracts to both SADC and non-SADC SSA countries were calculated and are shown in table 15 below.

Table 15 – Estimated multipliers for civil engineering and construction works exports from South Africa

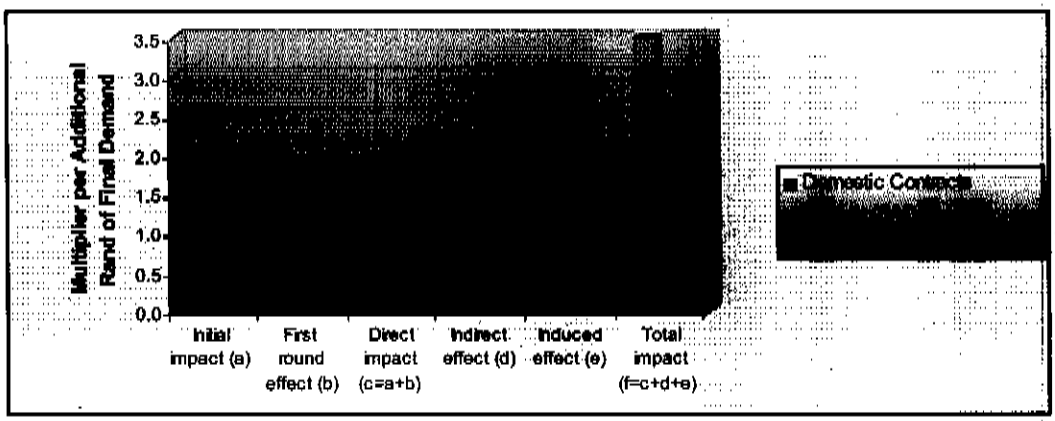
Multiplier arising from a R1 increase in export sales (based on 2005 figures)	Exports to	Initial impact (a)	First-round effect (b)	Direct impact (c=a+b)	Indirect effect (d)	Induced effect (e)	Total impact (f=c+d+e)
Output/sales (Rand)	**SADC countries**	1.0000	0.4067	1.4067	0.4035	0.6471	2.4572
	Non-SADC SSA countries	1.0000	0.3138	1.3138	0.3113	0.6471	2.2722
GDP/GVA (Rand)	**SADC countries**	0.1510	0.1562	0.3072	0.1732	0.1986	0.6790
	Non-SADC SSA countries	0.1513	0.1205	0.2718	0.1336	0.1986	0.6041
Labour remuneration (Rand)	**SADC countries**	0.0060	0.0624	0.0684	0.0705	0.0730	0.2119
	Non-SADC SSA countries	0.0056	0.0482	0.0537	0.0544	0.0730	0.1812
Employment (jobs supported per R1m sales)	**SADC countries**	0.1817	1.0325	1.2142	0.8977	1.1673	2.3815
	Non-SADC SSA countries	0.1686	0.7967	0.9653	0.6927	1.1673	2.1326

Source: Quantec Research SA Standardised Industry Data, online database and own calculations

When these multipliers are compared with those of domestic contracts (as shown in table 13 above), it is evident that the relative potential benefit to the South African economy for export contracts is substantially lower than for domestic contracts. This overall result was anticipated; however, in some cases the differential was higher than expected and in some cases lower than expected. We now consider these findings in a bit more detail.

In the case of sales/output multipliers, exports to SADC countries are about 30% lower than the domestic multiplier effect and those to SSA countries (excluding SADC) are around 35% lower, shown in figure 17 below.

Figure 17 – Comparative estimated sales/output multipliers for local and exported civil engineering and construction works contracts

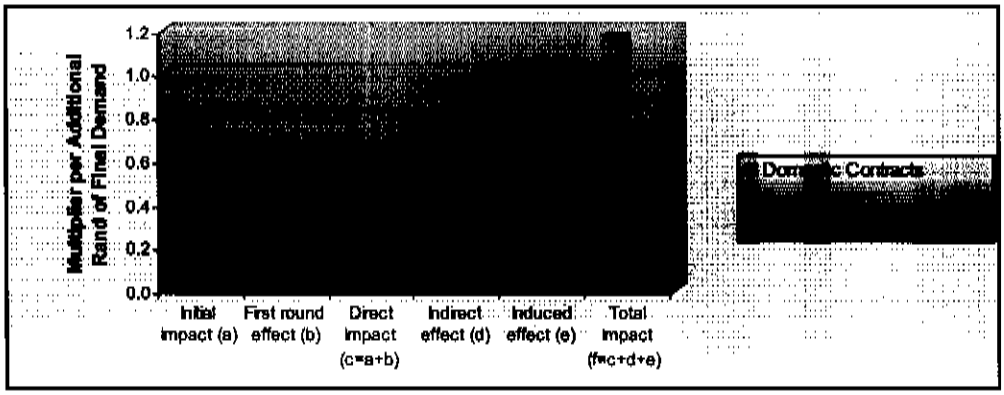


Source: Quantec Research SA Standardised Industry Data, online database and own calculations

Although lower in absolute terms, these sales/output multipliers are higher than anticipated and suggest that overall upstream industries which produce inputs for the civil engineering and construction works sector in South Africa will benefit from increased export activity of local firms to the SADC and SSA markets. As such, increased exports from this sector will have a positive impact on the overall economy of South Africa, and although the impact is not as great as that gained from local production of these services, the impact is nevertheless not insignificant.

With respect to value added and employment multipliers, however, the multipliers for export contracts perform worse than expected when contrasted to local contracts. In the case of gross value added, SADC contracts carry multipliers that are 42% lower than domestic contracts, while SSA contracts have associated multipliers that are 49% lower. The comparisons are shown in figure 18 below.

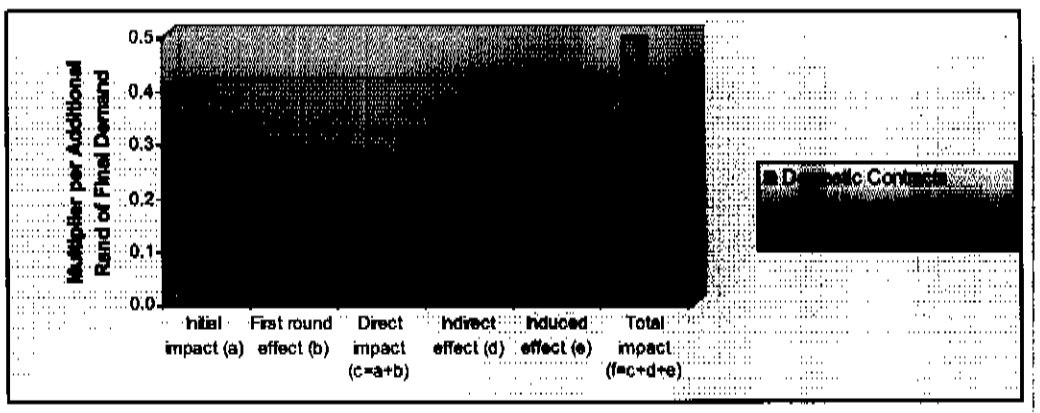
Figure 18 – Comparative estimated gross value added multipliers for local and exported civil engineering and construction works contracts



Source: Quantec Research SA Standardised Industry Data, online database and own calculations

The low value-added multiplier effects are driven by calculations regarding compensation to employees and the fact that only a portion of the labour in SADC and SSA contracts originates from South Africa. Because only highly skilled and 50% of skilled workers are sourced from South Africa in the case on SADC contracts, the labour remuneration multiplier is 57% lower than for domestic contracts. In the case of SSA contracts, where only highly skilled workers are sourced from South Africa, the labour remuneration multiplier is 63% lower than for domestic contracts. The point here is that even though South African workers employed abroad earn substantially higher levels of remuneration because of premiums paid to work outside of South Africa, the ratio of highly skilled to unskilled workers is so substantial (6% highly skilled to 77% unskilled) that the higher wages are insufficient to bring the remuneration multiplier up.

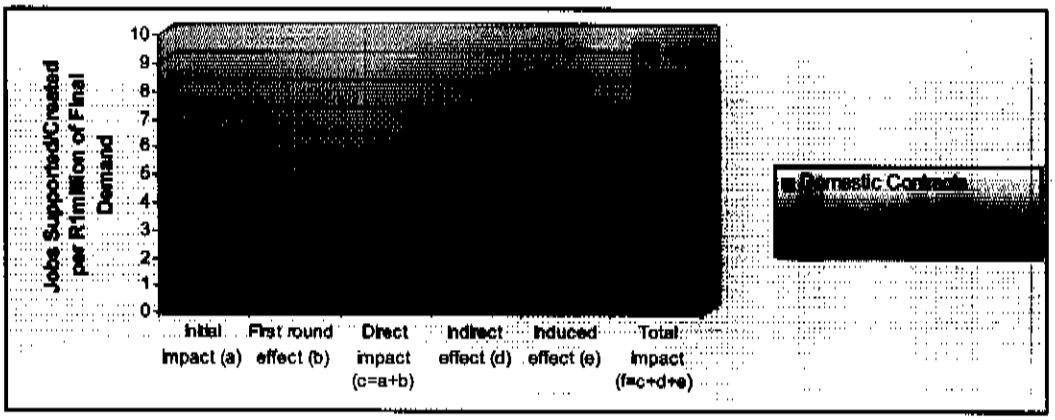
Figure 19 – Comparative estimated labour remuneration multipliers for local and exported civil engineering and construction works contracts



Source: Quantec Research SA Standardised Industry Data, online database and own calculations

Finally we need to look at the employment impact of export contracts. It is perhaps these results which are the most disappointing. In the case of SADC contracts, a R1-million change in final demand would only support up to 2.4 jobs (compared with 9.6 for local contracts). In the case of SSA contracts, the employment multiplier drops to 2.1 jobs per R1-million change in final demand.

Figure 20 – Comparative estimated employment multipliers for local and exported civil engineering and construction works contracts



Source: Quantec Research SA Standardised Industry Data, online database and own calculations

The fuller implications regarding these multipliers, as well as the scope to influence these multipliers, will be considered in detail in the next section.

5 Should South Africa support an intensified civil engineering and construction works export drive?

5.1 Asking the right questions

So far in this paper we have provided information rather than argument. We have shown how and why developed and developing countries export civil engineering and construction works services. We have attempted to explain the historic demand trends of the construction sector in South Africa from the 1970s to the present day and have explored how, after two decades of decimation, since 2002, the sector has been one of the strongest performers in the local economy. Supply issues related to skills and inputs have been examined and the domestic multiplier of the sector unpacked to show how strongly the sector is integrated into the broader economy. Finally we analysed local companies' export activities and considered the drivers of this behaviour, the nature and geographic spread of South African export activity as it currently exists, and the impact of these export on the domestic economy via the creation of an export multiplier.

It is now necessary to stand back and assess the totality of this information and analysis to see how it supports – or fails to support – the hypothesis posited in the introduction of this paper, namely, could an intensive construction export drive assist in maintaining or growing the civil engineering and construction works sector and thereby direct and indirect GDP and employment. In the event that the answer to this question is affirmative, the next question to pose is, ***should*** South Africa consider such a strategy? And finally, if we decide to support such a strategy, ***can*** we actually deliver the required processes and mechanism to ensure a positive outcome?

We begin with the first question: could an intensive construction export drive assist in maintaining or growing the civil engineering and construction works sector and thereby increase GDP and employment growth? This question is essentially a theoretical question and quite easy to answer given the research conducted. The answer to the question is clearly yes!

The size of the civil engineering and construction works sector in terms of employment and its contribution to GDP is clearly determined by the level of demand for its services. We have established that public sector spending priorities and fiscal policy are key drivers of this demand in the domestic economy. Historically we have tracked that as GDP declines, fiscal policy tightens and when government reprioritises spending away from economic infrastructure, the civil engineering and construction works sector contracts. The sector is characterised by high multipliers and strong shifts in employment. When demand is low the industry readily sheds labour and the decrease in the sector's demand for intermediate inputs results in labour shedding in upstream industries and a multiple decrease in economy-wide output.

If we view export activity as simply an alternative source of demand for the local industry, then it is clear that increased foreign demand for local civil engineering and construction works services could be used to bolster domestic demand in period of low domestic demand, and could equally add to domestic demand even when domestic demand conditions are favourable. The only time this increased demand could be viewed as having effects other than positive would be in a situation where export activity crowds out domestic activity, that is, export contracts are substituted for domestic contracts. In the event of substitution, the economic effects of increased export activity would be detrimental to the local economy due to the fact that the domestic multiplier is higher than the export multiplier. An additional negative impact of substitution would be the long-term negative impacts of an under-supply of strategic economic infrastructure to the domestic market and its ability to support growth. This would only materialise if foreign firms did not enter the South African market to 'mop up' local demand.

Our interviews with industry players and our local and international research suggest that the threat of substitution and under-supply of local economic infrastructure is exceptionally small. There are several reasons for this. First, all of the large civil engineering companies in South Africa, especially those who are global players, are well aware that their core business is servicing the local market. They brand and identify their companies strongly as South African companies and are well aware of the devastating impact of not maintaining their local market share and positioning after witnessing the plight of UK construction firms in the 1990s which fell into the substitution trap. Second, all the large civil engineering and construction works exporters from South Africa have external capacity to service international contracts. In the face of increased external demand, additional resources to meet this demand can be sourced internationally and thus do not impinge on the quantity or quality of resources available in the domestic market to meet local demand. As we will argue, this capacity to source resources outside of South Africa dampens the positive impact of increased exports to the local economy, but for the purposes of this argument it supports the view that increased export activity need not occur at the expense of domestic supply, even in situations of full capacity utilisation. The final point to make is that for all but the three largest firms in South Africa, local contracts will always be more appealing in terms of corporate risk appetite than foreign contracts and hence it is unlikely that local firms will snub domestic contracts in favour of local contracts.

Once the substitution argument is laid to rest, the benefits of increased demand arising from foreign sources is a linear argument that results in a positive outcome for the local industry and economy.

We now move on to the second question posed: ***should*** South Africa support an intensive construction export strategy based on the positive potential impacts argued above? This question is far harder to answer. It is not a theoretical question but rather a question of strategy. Questions of strategy are highly influenced by prevailing circumstances and equally by views of what the future holds. This is very much the case with respect to civil engineering and construction works exports.

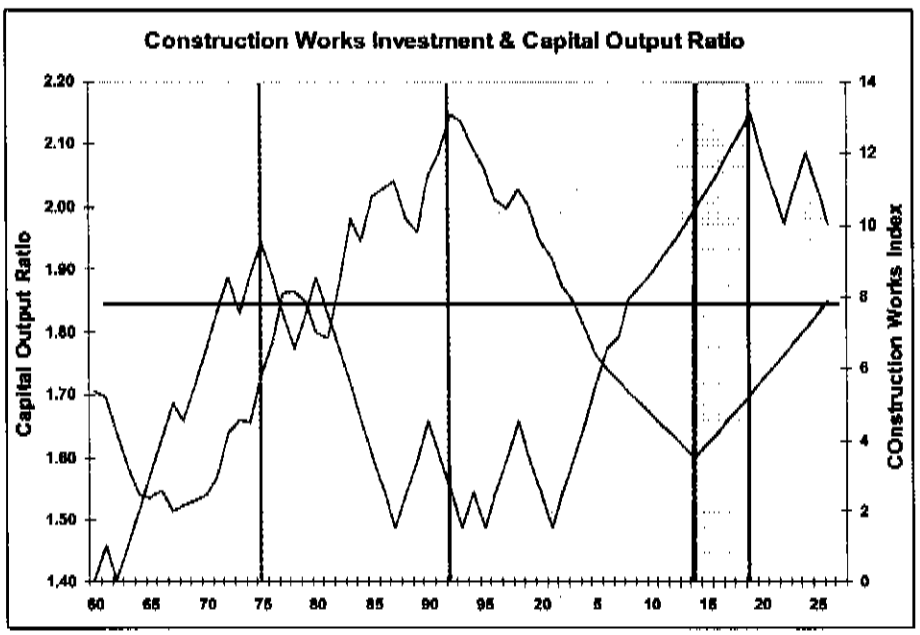
Had a suggestion of an intensified export strategy been tabled in South Africa anytime between 1985 and 2000 when the sector was shedding labour and upstream industries were laying off workers and mothballing production facilities due to a lack of demand,

we are confident that a proposal of an intensive export strategy would have been enthusiastically embraced as a positive contribution toward GDP growth, employment growth and the maintenance of the sector's capacity. Suggesting this same strategy in 2007, however, when demand is outstripping supply and the industry is one of the fastest growing sectors in the domestic economy has produced an almost universally derisory response.

To approach this question we have considered three elements: current and future demand, current and future supply capacity and current and future multiplier differentials (between local and export multipliers).

The issue of future demand for civil engineering and construction works services in the domestic economy is perhaps the most important and emotive argument to deal with. Two main schools of thought exist – the optimists and the pessimists. The optimists believe that the accelerated demand for local civil engineering and construction works services will continue at its current rate (or even an increased rate) until approximately 2024/2027. Their view is strongly influenced figure 3 in section 2.1 where we showed that capital formation was lagging economic growth. The optimists' arguments can be explained using figure 21 below.

Figure 21 – Capital output ratio and construction works expenditure



Source: SAFCEC, 2007b, p.17

In this figure, the red line depicts the capital output ratio. A capital output ratio of between 1.8 and 1.9 is viewed as the optimal ratio for South Africa. The figure shows that from the mid-1980s till approximately 2000, the South African economy experienced high levels of excess capacity and hence low investment in civil engineering and construction works. With continuous years of growth following

GEAR from 1997 until the present day, this spare capacity has now been fully utilised, and the failure of government to invest in economic infrastructure has led to a substantial lack of capacity since the early 2000s. The optimists predict that the capital output ratio will continue to decline until a low point in 2013/2014, after which the rate of investment in economic infrastructure will arrest this decline and slowly build the ratio up again until it reaches between 1.8 and 1.9 by 2027. It is on this basis that the optimists predict accelerated demand until 2027.

The optimists include in their analysis a list of potential threats to the above scenario. These include:

1) The ingrained imprint of history on our minds;
2) Economic policy 'malfunction';
3) Disasters linked to the effects of global warming;
4) Global disasters linked to infectious diseases;
5) Global political disasters leading to war;
6) Domestic political 'winds of change';
7) Domestic institutional collapse; and
8) Domestic human resource stagnation.

These threats are the usual qualifications to any macroeconomic forecast; however, the first threat listed seems particularly interesting. We will briefly consider the threat of ingrained perception and refer the reader to the full SAFCEC paper for a complete explanation of the other threats listed (SAFCEC, 2007b). The starting point of the SAFCEC ingrained imprint analysis is that the current business leaders in the local construction sector have virtually no experience of a strong growth, high profitability environment. They have only ever operated in an industry of contraction. SAFCEC argues that, "we are making profits like never before" (in the memory of the current leaders), yet:

- We just cannot accept that this economy is and will be successful.
- We cannot accept that 'history will not repeat itself'.
- We cannot accept that the infamous statement of De Kiewiet, that "SA progresses politically by disasters and economically by windfalls", those are shocks, stop-starts, boom-busts, etc., is no longer true..."

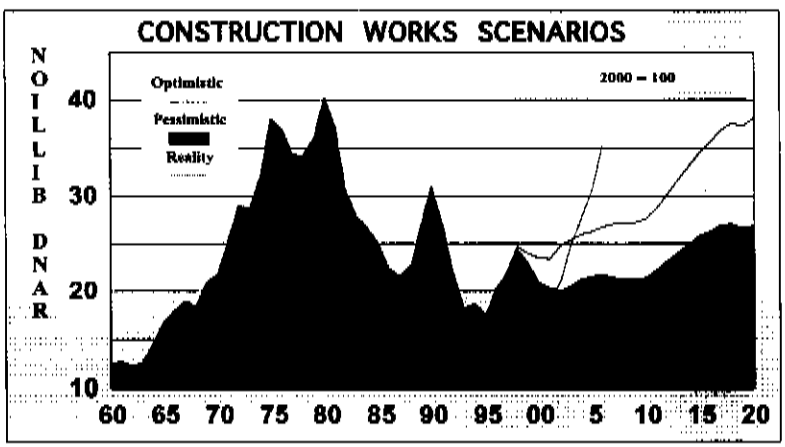
SAFCEC concludes that this ingrained imprint will constrain the current construction sector leadership from properly embracing the current boom and result in under-investment in capacity-building at a corporate level. To a large extent our interviews backed up this potential threat.

So with all the usual qualifiers about GDP growth, government policy, exchange rate variability, monetary and fiscal mix and corporate attitudes, the optimists still believe it is probable that accelerated growth in the demand for civil engineering and

construction works will continue unarrested and undampened until 2024/2027. The pessimists, on the other hand, do not see strong growth continuing past 2015.

The pessimists' view on future demand for civil and construction works services is based on a belief that the world-wide commodity boom will come to an end in five to seven years' time, resulting in local growth slowing down to 2% or 3% per annum. They also predict that the South African government's prioritisation of economic infrastructure investment will be replaced with other pro-poor priorities once the current round of Asgi-SA-led infrastructure projects is completed. What is interesting is that the pessimists do not foresee a total and absolute decline in the demand for their sector's services but merely a substantial slowing in the growth of demand. These two views are shown by SAFCEC in figure 22 below.

Figure 22 – Possible construction works scenarios



Source: SAFCEC, 2007b, p.4

From our interviews with industry players we found that the majority of our interviewees were optimists regarding the prospects of the industry between 2007 and 2015. Much of this optimism was based on existing contracts and programmes of work commissioned by the government which would be rolled out until 2015 due to substantial slippage in project roll-out (especially the Eskom contract). Moving beyond 2015, we observed a roughly 50/50 split between optimists and pessimists, although most interviewees claimed that they did not strongly focus on time periods greater than five years in their strategic processes. This point is supported by the fact that the majority of long-term demand forecasting and analysis regarding the sector has actually been undertaken by upstream industries and not the civil engineering and construction works sector itself.

We can summarise this section by suggesting that local demand conditions for the South African civil engineering and construction works sector look good in the short to medium term. Thereafter views are mixed; however, even the pessimistic scenario identifies a slowing down and levelling off of growth rather than a massive collapse of demand altogether. It is now necessary to juxtapose these demand scenarios with

supply scenarios so as to establish an argument of capacity utilisation and the likelihood of the local industry having either spare, excess or full capacity utilisation in the medium to long term.

Future supply conditions appear to be less contentious than future demand scenarios. The general view is that ramping up processes which are currently under way will in the main be sufficient to meet accelerated local demand until at least 2015. In a detailed study undertaken by the President's Office (Presidency, 2007), expansion plans for key intermediate inputs such as steel, cement and glass were undertaken and capacity concerns laid to rest. Given the concurrent implementation of large lumpy investments by government which peak in 2008/2009 (World Cup stadia, Gautrain, Transnet), the finding that the supply of intermediate inputs will not be a constraint bodes well for either the optimistic or the pessimistic view of future demand. While we have not had the time to focus on this particular issue in detail in this paper, analysts have mentioned to us concerns regarding excess supply capacity in particularly the cement and steel industries post 2015. This view is based not so much on the overall demand for civil engineering and construction works services but rather the type of projects which will be implemented. The current Asgi-SA projects and the World Cup preparations and Gautrain are particularly steel and cement intensive, while future projects such as road upgrading and expansion and social infrastructure projects are likely to be less intensive users of these inputs. This suggests that it is possible that in ramping up to meet immediate supply needs which peak in 2008/2009, upstream industries may experience excess capacity once certain key lumpy projects have been completed.

With respect to the supply of skills, little consensus exists about whether spare capacity will be created. The JIPSA initiative suggests that even with the aggressive current skills development strategy, there will still be an under-supply of engineers and artisans to meet demand by 2014. However, one of the key issues related to ramping up local skills in the civil engineering and construction works sector relates to the length of the training and development pipeline. An engineer requires at least five years of tertiary education to qualify and a further three to five years of on-the-job training to become proficient. Artisans, whose formal pipeline is shorter in duration, require an equal period of the on-the-job training to become proficient. As such it is likely that the full benefits of the JIPSA initiative and other skills development initiatives will only have a real impact on reducing the skills supply constraint after 2014.

If one embraces the optimists' view of future demand conditions post 2014 then the timing of these skills reaching the local market is not problematic. If, however, the pessimistic view of future demand is seen as more likely, a situation exists where it is possible that the additional supply of skills will reach the market at a time when demand for such skills is slowing down and the demand for new skills dampened by existing labour compensatory policies. In this scenario the skills development initiatives currently being undertaken may appear to have been an over-investment in skills, and new artisans and engineers will struggle to find employment locally. In this latter scenario, an intensive export strategy would be an option to ensure that our current investments in skills development have not been wasted, and that our skills do not seek employment overseas, as happened in the 1980s and 1990s.

The final argument to consider in the broader question of whether South Africa should develop an intensive export strategy relates to the differential benefits of local and foreign contracts to the broader South African economy. The issue here is one of relative impact. We have shown clearly that the local multiplier is higher than the export multiplier in the civil engineering and construction works sector. This suggests that to maximise South African GDP growth and employment a R1-million local contract would be more beneficial to the local economy than an equivalent R1-million export contract. However, if the choice is between no local demand for an additional R1-million contract and effective demand for a R1milliion export contract, then the local economy would be better off servicing the international contract than not servicing it.

As such we would argue that despite the relative differences between the local and export multipliers, if spare capacity exists in the domestic industry, growth and employment would be optimised by exporting civil engineering and construction works services, if the alternative is for these resources to remain unutilised. A final point to be made with regard to the differential between export and local multipliers is that these quantifications are not stagnant. It is possible that export multipliers can be increased so that export contracts have a greater impact on the South African economy than they do at present. These issues are considered in the next section, but would include the use of South African artisans in SSA contracts and increased local procurement.

Having looked at these three aspects, we now need to take a stance on whether South Africa should adopt an intensive export strategy or not. Strategically one would have to argue that for the next five to seven years, adopting an intensive export strategy in the civil engineering and construction works sector would not be a priority. Demand conditions are robust, supply constraints do exist, firms are operating at or above full capacity and the benefit to the domestic economy of local civils contracts is being maximised.

However, for the period post 2014 it would appear that embracing an intensive export strategy in this sector could be a strategically sound option. First, from a macroeconomic perspective, the opportunity to diversify our export basket, to earn foreign exchange and to increase merchandise exports would all be sound principles to follow. From an industry perspective, the development of alternative sources of demand to complement or supplement domestic demand would be a good risk and corporate diversification strategy, given the history of domestic demand and GDP cycles, as well as a viable growth strategy in the long run. Finally, if one is persuaded or concerned regarding the timing of domestic demand peaking in 2014 and the supply of skills released onto the market peaking after that date, then an export strategy is a solid investment in ensuring that our current skills development initiatives are not wasted or lost to other countries.

An additional issue related to timing relates to the opportunities currently provided to South Africa in terms of the high number of joint venture relationships currently operating in the local market. The literature in section one, showed in detail the necessity of developing country construction exporters to continuously develop their industry so as to remain internationally competitive. The best leap-frog strategy for the industry is the use of joint ventures to gain access to new methods of contracting,

running projects, new construction techniques and technologies and a variety of other skills which can be transferred in a joint venture. One cannot say for sure that South Africa will maintain its current level of joint venturing into the future, but the fact that such activity exists at present provides a definite opportunity to benefit from this exposure right now. We believe the current environment could be harnessed more deeply in terms of technology and skills transfer, if local companies viewed their current joint ventures not only as a stop-gap measure but as a strategic opportunity to improve their international competitiveness.

So far we have answered two key questions. To the first question, "are exports beneficial to GDP and employment growth?", we have answered "yes". To the second question, "should South Africa consider adopting an export-intensive strategy in this sector?" we have answered, "probably, yes, in the medium to long term". The final question to be answered is *can* South Africa put in place the necessary support initiatives and instruments to achieve such a strategy?

5.2 Implementation of an intensive export strategy

The focus and format of this section of the paper has changed substantially from the first draft of the paper in which traditional constraints to increased export activities were viewed as the most important elements in advising what to do to increase local exports. This focus was based on desktop research. As soon as we began to interview industry players, we realised that traditional export constraints were not in fact the largest hurdle to cross if South Africa hope to increase construction exports. As such we begin this section by considering a standard set of constraints which are viewed currently as characterising the limitations on South African civil engineering and construction works firms increasing their international activity. These traditional constraints include market access, corruption and bureaucratic problems, project funding and guarantees and government support. We then turn to two more nuanced issues – the industry's attitude towards a government-led export drive and the industry's attitude towards geographic preferences for export activity. As we will show, these non-traditional, nuanced constraints may be the binding constraint on any future policy initiative.

5.2.1 Traditional obstacles to increased exports

The majority of research in this area in South Africa has focused on issues related to market liberalisation and barriers to access in terms of the WTO's General Agreement on Trade in Services (GATS) negotiations at an international level and SADC negotiations at a regional level. While these foreign obstacles are an important issue to resolve if South African construction exports are to increase, four additional issues are equally important. These are institutional support, financing, access to international contracts and sectoral capacity development.

The GATS seeks to systematise and promote negotiations among WTO members to liberalise trade in services progressively. Negotiations are conducted on a request-offer basis. Countries identify (request) all barriers that impact on their own services exports, and these requests are then traded off against new commitments (offers) of

access to their domestic market. A country's 'specific schedule of commitments' after these rounds of negotiations thus shows what commitments it has made in terms of market access. The schedule is divided between sub-sectors in which commitments are made and modes of supply.

The sub-sectors in which countries can request and offer commitments within GATS are quite complicated within the WTO classification system. A full analysis of this classification is available in Stern and Teljeur (2002) but for the purposes of this paper we will focus on two key sectors – 'architectural and related engineering professional services' (AES) and 'construction and related engineering services'. Professional architectural and related engineering services include architectural services, engineering services, integrated engineering services, urban planning and architectural landscaping services. Construction and related engineering services include general construction work for building, general construction work for civil engineering, installation and assembly work, and finishing work on buildings.

With respect to modes of supply, the WTO recognises four ways in which services can be supplied between nations. These are shown in table 16 below.

Table 16 – Modes of supplying services to foreign countries

Mode 1: Cross-border supply	The possibility for non-resident service suppliers to supply services cross-border into the Member's territory (e.g. international telephone calls).
Mode 2: Consumption abroad	The freedom for the Member's residents to purchase services in the territory of another member (e.g. hotel accommodation).
Mode 3: Commercial presence	The opportunities for foreign service suppliers to establish, operate or expand a commercial presence in the Member's territory, such as a branch, agency, or wholly-owned subsidiary (e.g. a foreign bank opening a branch).
Mode 4: Presence of natural persons	The possibilities offered for the entry and temporary stay in the Member's territory of foreign individuals in order to supply a service (e.g. consultants).

Source: WTO Council for Trade in Services, 2002

South Africa's own level of liberalisation across these sub sectors and different modes of supply is relevant for two important reasons. First, the level of openness of the South African market impacts on the country's ability to request equal openness in other markets. Second, the degree to which the local market is liberalised impacts the level of foreign involvement in the South African market, which as we have shown, has implications for the development of the local sector via skills and technology transfer.

South Africa's GATS schedules for both sub-sectors are shown below in tables 17 and 18.

Table 17 – South Africa's GATS schedule for architectural and related engineering services

Sub-sector	Limitations on market access	Most Favoured Nation (MFN) exemptions
Professional services	**Mode 1 - 4**	**Mode 1 - 4**
Architectural services (CPC 8671)	Mode 1 & 2: For building plans of 500m² and over the services of a locally registered architect have to be utilised. Mode 4: Unbound except as indicated in the horizontal section.	Mode 4: Unbound except as indicated in the horizontal section.
Engineering services (CPC 8672)	Mode 4: Unbound except as indicated in the horizontal section.	Mode 4: Unbound except as indicated in the horizontal section.
Integrated engineering services (CPC 8673)	Mode 4: Unbound except as indicated in the horizontal section.	Mode 4: Unbound except as indicated in the horizontal section.
Urban planning services (CPC 8674)	Mode 4: Unbound except as indicated in the horizontal section.	Mode 4: Unbound except as indicated in the horizontal section.
Landscape architectural services (CPC 8674)	Mode 4: Unbound except as indicated in the horizontal section.	Mode 4: Unbound except as indicated in the horizontal section.

Source: WTO, 1998b

Table 17 for AES shows that South Africa has close to fully liberalised architectural and related engineering services. Modes of supply 1, 2 and 3 are fully liberalised for all sub-sectors except for architectural services, that is, there are no limitations on market access regarding cross-border supply, consumption abroad and commercial presence. This means that it is possible for a South African company to freely purchase these services abroad for use domestically or overseas and for foreign companies to establish branches or subsidiaries in South Africa. With respect to architectural services, some limitation exists with respect to modes 1 and 2 where a local architect is required for larger projects. This limitation is set in place to ensure safety and that local building codes and regulations are observed. This is a common limitation in developed WTO members but not common in SADC.

The only area of activity where South Africa has not fully liberalised architectural and related engineering services is with respect to mode 4 supply – the presence of natural persons working in South Africa. This exception is covered in a horizontal commitment made by South Africa whereby natural persons seeking to work in South Africa on a temporary basis for up to three years are required to have a work permit which is subject to an economic needs test. All this really means is that South Africa maintains the right to define its immigration and work permit policy and this limitation is standard for most WTO member countries.

Table 18 – South Africa's GATS schedule for construction and related engineering services

Sub-sector	Limitations on market access	Most Favoured Nation (MFN) exemptions
Construction services	**Mode 1 - 4**	**Mode 1 - 4**
General construction work for buildings (CPC 512)	Mode 1: Unbound Mode 4: Unbound except as indicated in the horizontal section.	Mode 1: Unbound Mode 4: Unbound except as indicated in the horizontal section.
General construction work for civil engineering (CPC 513)	Mode 1: Unbound Mode 4: Unbound except as indicated in the horizontal section.	Mode 1: Unbound Mode 4: Unbound except as indicated in the horizontal section.
Installation and assembly work (CPC 514 + CPC 516)	Mode 1: Unbound Mode 4: Unbound except as indicated in the horizontal section.	Mode 1: Unbound Mode 4: Unbound except as indicated in the horizontal section.
Building completion and finishing work (CPC 517)	Mode 1: Unbound Mode 4: Unbound except as indicated in the horizontal section.	Mode 1: Unbound Mode 4: Unbound except as indicated in the horizontal section.

Source: WTO, 1998a

With respect to construction services, South Africa's mode 4 limitations with respect to work permits remain in place as explained above. Modes 2 and 3 are liberalised but mode 1 (cross-border supply) is limited. The reason for this is a lack of technical feasibility, as a construction service cannot be purchased abroad whilst at the same time being rendered domestically. This exception is quite common in the GATS schedules of developed countries, but not in SADC, according to Stern and Teljeur (2002). Stern and Teljeur also note that the notion of technical unfeasibility appears to be in a process of becoming outdated as technological advances allow electronic communication of at least some engineering and design services and increasing use of prefabricated structures creates tangible possibilities for cross-border trade. Moreover, limiting market access based on technical limitations is a rather superfluous restriction, as the technical constraints, if present, would prevent cross-border trade anyway.

Of greater relevance to this paper is obviously how open foreign markets are to South African companies wishing to export architectural, engineering or construction services abroad. We now consider various regions and their commitments to liberalising construction and related engineering services.

From table 19 below it is clear that the majority of SADC members have made no commitments in terms of liberalising construction and engineering services. The DRC, Malawi and Zambia are the most open markets at present, with only Mode 4 supply restricted for reasons similar to those adopted by South Africa. Lesotho is the next most open market, with modes 2 and 3 fully liberalised and Modes 1 and 4 remaining unbound due to technical feasibility and the desire to control work permits

and immigration policy. For the bulk of SADC members, however, no commitments have been made, supporting anecdotal evidence that exporting construction services to SADC member countries remains difficult. The majority of construction exports occur via Modes 3 and 4.

Table 19 – Construction and related engineering services, requests for market access

Country	Current commitments	Request further access in[1]
Angola, Botswana, Namibia, Mauritius, Mozambique, Seychelles, Swaziland, Tanzania and Zimbabwe	No commitments	Mode 1-4
Lesotho	Mode 2, 3 fully liberalised	Mode 1, 4
DRC, Malawi, Zambia	Mode 1-3 fully liberalised	Mode 4

[1] *N.B. South Africa has kept Mode 1 Unbound due to lack of technical feasibility.*

Source: WTO 1994b

In terms of formal market access, the decisions of countries to make commitments in terms of the four modes of supply specified by the WTO are the first gauge in determining the level of liberalisation in a particular market. A complete analysis of WTO and SADC members' commitments regarding construction services, civil engineering services and architectural services is undertaken by Stern and Teljeur (2002). Essentially their analysis reveals that in terms of construction and engineering services, Mode 3 (commercial presence) and Mode 4 (natural person employment) are the most common channel by which services are supplied. Mode 3 and Mode 4 supply is fully liberalised in the DRC, Lesotho, Malawi and Zambia, and Mode 4 in Egypt. In all other SADC member countries and most other African markets[6], no liberalisation has occurred. Even in instances where supply modes are unbound (liberalised), foreign companies or individuals seeking to access these markets are still required to obtain work permits and operations permits. Anecdotal evidence suggests that these are often difficult to obtain, sometimes taking up to two years to be issued, vulnerable to changing and variable compliance requirements and often requiring some type of unofficial payment to the issuing authorities.

A second constraint faced by local firms attempting to operate abroad relates to financing and export credit reinsurance. Companies bidding for construction contracts abroad are increasingly expected to raise finance for the client at an internationally competitive rate. This is usually done through the private banking sector of the exporting country or via a funding agency set up by the exporting country specifically to provide finance for such projects. Either route of funding is

[6] These include Uganda, Nigeria, Equatorial Guinea, Mali, Rwanda, Sudan, Kenya and Eritrea.

highly dependent on guarantees issued by the exporting country government against the political and commercial risks of working abroad. These guarantees not only provide security for the contracting company but are usually a precondition for raising project finance. These guarantees, known as official reinsurance, are provided by export credit agencies (ECAs). In South Africa, the ECA is known as the Export Credit Insurance Corporation of South Africa (ECIC) and was established in 2001.

Most ECAs adhere to a minimum financing rate known as the Commercial Interest Reference rate (CIRR), calculated at 100 basis points above the equivalent US Treasury Bill. The CIRR is in line with the borrowing rates of most international major banks, but many smaller banks cannot provide finance at these levels. As such, in many countries, including South Africa, the ECA also provides interest rate subsidies on finance provided to the buyer. At present the ECIC has operated only in Africa and guaranteed a number of building projects as well as certain civil engineering projects. The corporation limits it exposure in some countries and it is believed that these maximum limits are now being reached, suggesting that continued support for projects in these countries will be curtailed. In addition, commentators suggest that the total amount of interest support budgeted by the Department of Trade and Industry for the ECIC is unlikely to increase significantly in the next few years. Although this area has not been well researched in South Africa and will need to be deeply investigated if a strong export strategy is adopted, it appears from looking at the international research that the volume, value and structure of the ECIC's support for civil engineering and construction works projects abroad (and particularly in Africa) are less competitive than their main competitors in Italy, France, Korea, China, Germany, the UK and Austria.

An additional financing constraint relates to local firms' abilities to access projects financed through large donor organisations and international banks (for example, the World Bank). The majority of these contract require the successful bidder to either be based in the country of origin of the financier, or that the contractor source the majority of inputs from the donor country. To access these market opportunities, the more aggressive South African construction exporters have established a commercial presence in these donor countries to assure their eligibility to bid for these contracts.

In recent years the expansion of Chinese tied loans directly to foreign governments in Africa for economic infrastructure projects (especially related to mineral extraction) have seen local South African firms' market share in countries such as Angola plummet.

The third obstacle to increased exports is identified as weak governmental support for local exporting companies. Based on anecdotal information, domestic construction firms believe that the national government does not provide backing for their export activities at the same level as foreign governments support their competitors. Civil engineering and construction works company participation in governmental trade missions is cited as one area where government could increase its support for the industry. A second area of increased potential support would be adding construction sector exports to the formal agenda of trade and co-operation agreements negotiated with SADC and African countries. The last two areas where the industry feels disadvantaged in the export market in comparison to their competitors who have stronger government support relates to the willingness of the government to support

local company activities during the procurement process of foreign contracts, and the willingness of the government to intervene in relation to safety and security and corruption issues in foreign countries. The industry generally appears to have a negative view on the role of Foreign Affairs and South African embassies abroad, believing that these institutions are disproportionately involved in issues of politics and insufficiently concerned with issues of trade.

The fourth obstacle is sectoral capability and capacity. Within this constraint we are not looking at specific skills constraints but rather the international competitiveness of the domestic industry to compete with international players in the export market. Both Korea and China's impressive construction export performance in the 1970s and 1980s failed to be sustainable due to a lack of technology, skills, contractual and process development within the local industry. This led commentators to suggest that if developing countries wished to continue to compete in the international export markets, they would need to undertake a deliberate development process at home to increase the technical and business competitiveness of their construction industries. Besides allocating resources to this project and developing institutions designed specifically to encourage this development, commentators also listed joint venturing with international companies as a crucial manner by which to achieve skills transfers and the upgrading of local capabilities and capacity.

The capabilities of local firms (as opposed to their capacity) seem hard to gauge. The general view is that South African companies are able to compete on sophisticated technological and engineering projects – especially in relation to mining projects and economic infrastructure projects. Although international isolation cut local companies off from world best practice for a number of years, the three largest players in the economy established representative offices in Europe, North America, Australia and even Israel to access technology and skills. These investments have assured them a competitive edge over local companies which were unable to establish such international access.

In addition, the current shortage of skills in the sector has forced many local firms to buy in international skills via joint venturing. This stop-gap measure, as explained earlier, may indeed prove to be a crucial opportunity for local firms to leap-frog their internal capabilities, positioning them well for future export activity.

Finally, a list of additional miscellaneous constraints was identified. These included issues related to logistics and border crossings, tax treatment of profits and salaries, legislation pertaining to equipment auditing procedures and an overarching issue of corruption in the African market.

5.2.2 Non-traditional obstacles

As mentioned earlier in this paper, South Africa's historic model for civil engineering and construction works exports varies notably from that of other developing countries. Whereas other developing country construction firms operate abroad with strong government support and often upon direct government decrees, South African firms have to date been exporting in the absence of any governmental direction. The South African government has never adopted a national export imperative or export

strategy for the civil engineering and construction works sector. The South African government has also not to date viewed the sector's export activities as an important contributor to national growth or international trade. As such the civil engineering and construction works sector's export activity has been a private-sector-driven initiative in response to corporate strategies and market forces.

Our interviews with industry players exposed a high degree of skepticism from the industry concerning whether, as individual players in the international market, they would be willing to engage in an industry-wide initiative to develop the construction sector in South Africa or to co-operate in an export drive initiative. The skepticism appears to arise from two issues. First there is concern whether a government-sponsored initiative would indeed yield any meaningful results. The second concern was that the high level of competition between local construction firms would nullify any meaningful co-operation and collaboration with respect to an industry-wide initiative.

In all the developed and developing countries we considered in our case studies, a key element in the development of an intensive export strategy in this sector was the creation and operation of a strong institutional framework, led by a construction industry development board, and the participation of all stakeholders in the development process. In all developing countries (and most developed countries), this industry development institution is funded and driven by government. In 2000 in South Africa, the government and the construction industry set up the Construction Industry Development Board (CIDB). According to the Act which created the Board, the CIDB Act mandates the institution to:

- "Establish a national register of contractors and of construction projects to systematically regulate, monitor and promote the performance of the industry for sustainable growth, delivery and empowerment.
- Promote improved delivery management capacity and the uniform application of procurement policy throughout all spheres of government.
- Promote improved performance and best practice of public and private sector clients, contractors and other participants in the construction delivery process.
- Promote sustainable participation of the emerging sector.
- Provide strategic direction and develop effective partnerships for growth, reform and improvement of the construction sector".

To date the CIDB has enjoyed substantial support from the industry. Its focus areas have, however, been limited to issues of industry nuts and bolts, especially standardisation within the industry and issues of empowerment. To date the Board has not developed competencies or prioritised issues related to "strategic direction" or "partnerships for growth, reform and improvement". Indeed, many industry players (especially the larger firms) do not believe that the Board can or should become involved in such matters and their support for such activities is likely to be muted. The manner in which the CIDB was established and is operated is highly divergent from their overseas equivalents. In China, India, Singapore and Korea, state-sponsored construction industry development boards have a strong external focus

and undertake national programmes and interventions to increase the competitiveness and efficiency of the industry predominantly as a means to an end – increased export activity. Given that the South African CIDB has not followed such a path, it is difficult to gauge the level of support it would be able to garner from the industry if it made such a shift.

A final point to note with respect to industry views on co-operation and competition is that the local market is highly competitive, as is local firms' competition for foreign contracts. The larger of the civil engineering and construction works companies have committed substantial resources, time and effort into breaking through into international markets. Many have also undertaken projects for little or no margin in order to establish their export credentials and an overseas track record or 'CV', as is it referred to in the industry. Given these risks and investments, it is hard to fathom why firms which have made this investment on behalf of their shareholders would share their knowledge, insights and practices with other local firms who could become their competitors.

We now move on to the second non-traditional export obstacle – preferred export markets.

In our section on export multipliers it became obvious that not all exports are equal from the perspective of the knock-on effects of foreign activities on South African output and employment. In section three we showed that exports to Europe, the Middle East, South East Asia, Australia, the US and Canada have no impact at all on the local South African economy. Intermediate inputs for contracts in these countries are sourced from mainly Northern Hemisphere suppliers and suppliers close to the area of operation. With respect to labour skills, highly skilled employees such as engineers are sourced from overseas subsidiary offices, skilled and semi-skilled workers are sourced either from the host country or from traditional exporters of the skills such as Pakistan and Malaysia, while unskilled labour is sourced from the host country. When checking these generalisations against individual contracts and projects currently undertaken by local firms in these areas, we found no disparity between the general assertion and the reality on the ground. As such, if the basis for supporting an intensive export strategy is based on the positive impact of these exports on the South African economy, then an export strategy which results in increased exports to these geographic areas will fail to achieve the goals of higher economic growth or employment.

Exports to SADC and SSA, however, exhibit stronger linkages to the South African economy. Section three shows that the export multiplier is highest for projects undertaken in SADC countries, followed by exports to SSA countries. As such an intensified export strategy would need to focus on exports to SADC and SSA in order to maximise the benefit of such a strategy to the local economy. However, three substantial hurdles exist in relation to developing such a strategy.

The first hurdle is the demand hurdle. The demand for civil engineering and construction works in Africa comes predominantly from two sources. The first is foreign direct investment, which mostly arises from the private sector and is largely connected to mining and resource extraction. This demand is currently high on the back of the current commodity boom. The second source of demand arises from

central government activities in African countries. Previously, many of these government-led infrastructure projects were funded and administered by international donor and funding agencies such as the World Bank, the International Monetary Fund (IMF) and the Multilateral Investment Guarantee Agency (MIGA). Nowadays such agencies make funding available to national governments and it is the government of the country which contracts with potential suppliers of these infrastructural investments. Given that we were unable to identify a single South African company who is happy on a consistent basis to contract with a foreign African government as the client, the sources of demand for local firms is limited. An intensive export strategy for this sector into Africa would therefore require a major shift in local firms' decisions to contract with foreign African governments as clients. Solving such a problem would require both diplomatic efforts and an appropriate pricing of risk.

The second hurdle is the supply hurdle. Despite reservations about client selection, South African firms are also reticent about operating in the 'hostile environment' of SSA and to a lesser extent SADC. Not only are African construction sites often remotely situated and plagued by high temperatures and excessive dust which impacts on machinery, maintenance and costs, many African construction sites also often raise hazards of disease such as malaria, typhoid and dysentery. In addition, all our interviewees raised the issue of HIV and Aids prevalence and infection of employees who are away from home for an extended period of time. If we add logistical risks and site security issues to this list, then African contracts only appear appealing if the returns on such projects more than compensate for the risk and difficulty in fulfilling such contracts. In a perfect world these risks would result in higher margins, with market forces pricing these risks into the contract value. Unfortunately, the presence of developing country civil engineering and construction works firms – who engage in these exports contracts for reasons other than profit – undermines this market pricing system. The Chinese head the list of culprits in this regard but in recent years Indian and Brazilian firms have added to the limitation of margins on African contracts issued by African governments. Good margins can still be earned on private sector contracts and hence explains why South African firms are more willing to accept the higher risks of working in Africa when the client is a private sector operator.

The third hurdle relates to procurement processes, preferences and logistics systems. Some South African firms operating abroad in the civil engineering and construction works sector have a strong preference to source materials from South Africa, simply due to the certainty provided to them from sourcing inputs from a known supplier with an established track record. The majority of firms working abroad, however, have no such concerns and are happy to import products from anywhere in the word to their construction sites in Africa. It was suggested that a rebate system similar that that which was available under GEIS would assist in enhancing the procurement of inputs from South Africa. Any increase in locally procured materials would obviously increase the multiplier effect of construction exports. However, a necessary condition to ensure increased procurement of South African inputs into export construction projects is the provision of safe, reliable transport and logistics system to host export countries. One of the key reasons why SADC export multipliers are higher than SSA multipliers is due to the logistics system. For countries such as Ghana, Mali and the DRC, moving goods from South Africa to these countries is close to an impossibility on land, not only because of a lack of infrastructure, but also because of

unpredictability of supply due to corrupt border posts and banditry. The implementation of NEPAD initiatives to improve logistics and transport systems would help to alleviate such constraints, but for the foreseeable future this hurdle remains in place.

We have shown that for South Africa to maximise the economic benefits of civil engineering and construction works exports we would need to shift exporting firms' preferences away from exporting to distant, developed markets such as the Middle East and Australia and rather increase exports to SADC and SSA. It appears that local firms have a rational and sound basis for their current preferences. Changing these preferences is possible, but as argued, it will not be an easy assignment.

6 Conclusion and recommendations

An ivory tower academic schooled in industrial strategy and macroeconomics considering the research accumulated in this report would find copious arguments, case studies and data to support a strategic decision to implement an intensified civil engineering and construction works export programme from South Africa to SSA and the SADC. Benefits of such an expansion of activity would include, inter alia:

- Export diversification;
- Foreign exchange earnings;
- Opportunities to grow merchandise exports;
- Positive impact on South African GDP;
- Positive impact on South African employment;
- Stabilisation of the construction sector as an industry;
- Stabilisation of the construction sector's contribution to GDP and employment growth; and
- Growth of the construction sector.

The environment within which industrial policy is made, however, differs significantly from the environ of an academic ivory tower. In the real world the policy environment needs to take account of stakeholder attitudes, the tools and levers available to implement change, and trade-offs and cost-benefit analyses, as well as broader agenda priorities and exogenous variables which fall outside the control of policy-makers. In addition, any current policy decision requires a view on prevailing industry and economic circumstances, as well as a view on how these are likely to change in the future.

These complexities, in light of the information presented in the report, suggest that no clear policy recommendation can be given regarding whether the South African government should commit itself to supporting an intensified export strategy for the civil engineering and construction works sector. What is clear is the following:

- Potential positive economic outcomes can be achieved by increasing exports.
- Civil engineering and construction works exports is a championless cause, as it does not exist on anyone's radar screens at present.
- If as a country we wish to increase exports in this sector in the future, we need to make this decision early – not only because of the time it will take to deal with many of the traditional constraints facing the sector, but also to ensure that we capitalise fully on our current joint venture experiences and their ability to increase our international competitiveness.

- A decision to adopt such a strategy will require a substantial dialogue and relationship-building exercise between the government and the civil engineering and construction works industry.

A substantial export drive of construction services from South Africa has not been a viable strategy option for the past three decades. In the 1970s and 1980s, sanctions and international condemnation of *apartheid* policies excluded the possibility of a strong export drive, specifically in SADC and the Rest of Africa. In the 1990s, export growth on an intensive level was limited due to the constraints listed above, as well as a lack of domestic capacity. With South Africa's readmission into the global community and the domestic recapacitation of the industry, in the short, medium and long term there is no reason why intensive construction exports should not be a viable growth strategy. In the heat of the current massive domestic demand for civil engineering and construction works services, it is easy to dismiss the need to invest in positioning the industry and the economy to support intensified export activity in the construction sector. However, it would be a sad state of affairs if in 2020 and beyond domestic demand were insufficient to support the capacity of the construction sector and a failure to have developed export markets in the boom period resulted in the contraction of the industry and its upstream suppliers.

This paper is by no means a complete study of this complex sector and its ever-changing dynamics. It is an insufficient basis upon which to develop actual strategy interventions in the event that an intensive export strategy were to be designed. It is, however, (hopefully) a new way of thinking about the civil engineering and construction sector and its role in the South African economy now and in the future, and will hopefully lead to further debate and discussion.

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Appendix A: Infrastructure-related work permit quotas applicable to artisan, technician, technologist and engineering skills

Generic occupation	Specific professional category / specific occupational class	Requirements	Applicable quota
Manufacturing and construction engineering professionals	Chemical and materials engineers	Registration with relevant professional body where applicable. At least 5 years relevant experience	200
	Civil engineers	Registration with relevant professional body where applicable. At least 5 years relevant experience	1,000
	Structural engineers	Registration with relevant professional body where applicable. At least 5 years relevant experience	150
	Electric and electronic engineers	Registration with relevant professional body where applicable. At least 5 years relevant experience	500
	Industrial engineers	Registration with relevant professional body where applicable. At least 5 years relevant experience	100
	Mechanical engineers	Registration with relevant professional body where applicable. At least 5 years relevant experience	100
	Quality engineers and inspectors	Registration with relevant professional body where applicable. At least 5 years relevant experience	250
	Specialist pipe engineering and manufacturing	Registration with relevant professional body where applicable. At least 5 years relevant experience	500
Building and engineering technicians	Civil engineering draughtspersons, technicians and technologists	Registration with relevant professional body where applicable. At least 5 years relevant experience	1,500
	Electrical engineering draughtspersons and technicians	Registration with relevant professional body where applicable. At least 5 years relevant experience	500
	Electronics technicians	Registration with relevant professional body where applicable. At least 5 years relevant experience	250
	Mechanical engineering draughtspersons and technicians	Registration with relevant professional body where applicable. At least 5 years relevant experience	250
	Hydraulics and pneumatics technicians	Registration with relevant professional body where applicable. At least 5 years relevant experience	250
	Industrial/product development technologists and testers	Registration with relevant professional body where applicable. At least 5 years relevant experience	1,000
	Mechatronics technicians	Registration with relevant professional body where applicable.	150

Generic occupation	Specific professional category / specific occupational class	Requirements	Applicable quota
		At least 5 years relevant experience	
Manufacturing and process technicians	Manufacturing technologists and technicians	Registration with relevant professional body where applicable. At least 5 years relevant experience	50
Fabrications engineering trades workers	Sheet metal trades workers	Registration with relevant professional body where applicable. At least 5 years relevant experience	500
	Structural steel and welding trades workers (coded welders)	Registration with relevant professional body where applicable. At least 5 years relevant experience	1,500
	Boilermakers	Registration with relevant professional body where applicable. At least 5 years relevant experience	500
Mechanical engineering trades workers	Metal fitters and machinists (mechanical builders)	Registration with relevant professional body where applicable. At least 5 years relevant experience	500
	Fitter and turner	Registration with relevant professional body where applicable. At least 5 years relevant experience	500
	Precision metal trades workers and toolmakers	Registration with relevant professional body where applicable. At least 5 years relevant experience	1,500
	Millwrights and mechatronics trade workers	Registration with relevant professional body where applicable. At least 5 years relevant experience	800
Electro-technology and telecommunication trades workers	Electricians	Registration with relevant professional body where applicable. At least 5 years relevant experience	150