Financial guarantees that enable public-private infrastructure projects in risky developing market environments

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A research article submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

Johannesburg, 2019

Protocol number: WBS/BA1823279/409

Declaration

I, Dewald Pieter Botha, declare that this research article is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the Graduate School of Business Administration, University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Signed at Kathu, Northern Cape

On the 28th day of February 2019.

Acknowledgements

I want to thank my research supervisor, Mr Pravin Semnarayan, for the guidance he provided and freedom he allowed me in completing this paper. A special thank you to my parents and to Sylvia and Jan for the homes-away-from-home during the past 20 months.

Finally, I must express my heartfelt appreciation to my wife and son for the unfailing support and continuous encouragement throughout. This accomplishment would not have been possible without them.

Supplementary info

Nominated journal:	South African Journal of Economic and Management Sciences (SAJEMS)
Supervisor / Co-author:	Pravin Semnarayan
Word count †:	14293
Supplementary files:	Research instrument and respondent consent form Fuzzy cognitive maps for each financial guarantee

† Including abstract references, etc.

Abstract

The growing need for infrastructure development in sub-Saharan Africa requires increased levels of private investment through public-private partnerships. These investments rely on financial guarantees to ensure that risks are appropriately allocated and managed. Governments in sub-Saharan Africa are not able to finance infrastructure projects and deal with the associated risks in order to promote infrastructure development on their own. The purpose of this research is to determine how significant the financial guarantees' impact on commercial, political and environmental risks associated with infrastructure development is, compared to government guarantees.

Expert opinions were combined with prior research and existing literature to develop fuzzy cognitive maps representing the relationships between financial guarantees and infrastructure risks. While government guarantees outperformed all of the financial guarantees in mitigating infrastructure risks in general, the alternative financial guarantees performed better at mitigating certain specific infrastructure risks.

This study confirmed that financial guarantees alone are unable to negate or mitigate infrastructure risks. A combination of government guarantees and financial guarantees will vastly improve the risk-cover presented, increasing the level of private investment participation in infrastructure development in sub-Saharan Africa.

Key words:

Infrastructure development, public-private partnership, financial guarantee, project risk, sub-Saharan Africa

Glossary of terms

CSF	:	Critical success factor
DFI	:	Development finance institution
ECA	:	Export credit agency
FCM	:	Fuzzy cognitive map
IFI	:	International finance institution
MA	:	Multilateral agency
MDB	:	Multilateral development bank
PPP	:	Public-private partnership
SSA	:	Sub-Saharan Africa

1. Introduction

According to Zen (2016, p. 1), “Emerging economies are subject to a debilitating ‘infrastructure gap’ that hinders growth and development”. Infrastructure demand in emerging economies is estimated to be USD one trillion per year as of 2016, and the gap between needs and available funds for development is growing every year.

According to Estache and Garsous (2012), approximately USD 93 billion, or 15% of Sub-Saharan Africa’s (SSA) gross domestic product, was required annually in infrastructure investment to reach the targets demanded by the Millennium Development Goals. The Millennium Development Goals were set by the United Nations in collaboration with various countries and leading development institutions to meet the needs of the world’s poorest people. They range from halving extreme poverty to halting the spread of HIV/AIDS. The reason for this is that the potential impact infrastructure development can have on a country’s gross domestic product growth and social returns, is far greater if the country is impoverished (Estache & Garsous, 2012).

Economic growth in SSA was expected to grow by only 3.1% in 2018, with growth forecasted to reach 3.6% by 2020 (World Bank Group, 2018). A report on Africa compiled by The McKinsey Global Institute indicated that policy-makers and businesses should work together to further accelerate economic growth through, among other things, the improvement of both physical and digital infrastructure, improvements to the educational systems and expanding electricity generation and supply (Leke & Barton, 2016). Akinwumi Adesina, President of the African Development Bank Group, called infrastructure projects “some of the most profitable investments any society can make” (African Development Bank Group, 2018, p. iii). He added that these projects provide financial resources needed to enable various other developments and improvements (African Development Bank Group, 2018).

Traditionally, emerging markets were funded by banks, governments and international donors. However, these sources are not sufficient to meet infrastructure needs any more according to The World Bank (2018). The international development community,

including the World Bank, have accepted the fact that the private sector will have to play a more significant role in infrastructure projects.

While numerous different financing options exist for the funding of infrastructure development, most of these rely on some guarantee to ensure the risks present are acceptable to the parties involved through the private sector investment. Guarantees encourage financiers to extend loans to project companies. Through guarantees, project companies can shift some of the recovery risks to the guarantor (Vogel & Adams, 1997). All of these elements work together to make project finance possible, as is indicated in figure 1.

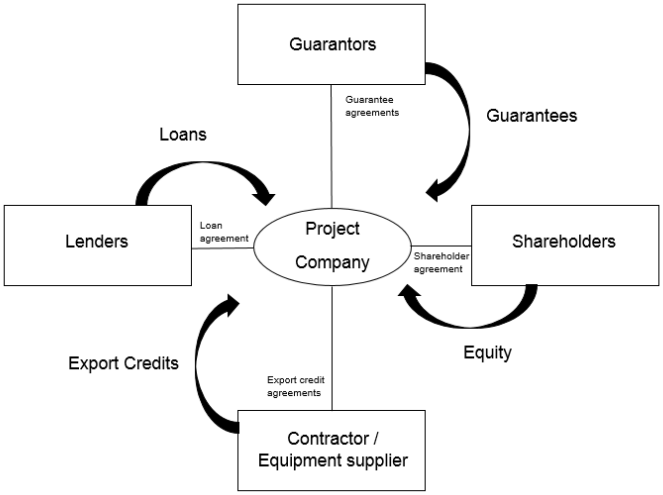

Figure 1 Main elements of project financing, adapted (Trouille et al., 2008)

What is being done by the South African government to increase infrastructure development? Through the National Development Plan (NDP), the government aims to drive and improve infrastructure development. However, expanding and maintaining the established national economic infrastructure will be a challenge. The Banking Association South Africa (2018) raised concerns that the government does not possess the financial or institutional capacity to successfully implement the investment plans required to deliver on the goals set out in the NDP. Greater participation of the private sector should result in improved spending discipline and better decision making, which should result in increased access to investor capital for infrastructure development.

1.1. Research context

Africa's readiness for infrastructure development

A study conducted by the Economic Intelligence Unit, called the Infrascope, focussed on the readiness of African countries to significantly increase infrastructure development through private-public partnerships (Economic Intelligence Unit, 2015). Key indicators were assessed to determine how ready African countries are for the implementation of sustainable, efficient projects in key infrastructure sectors. The countries were rated according to six major categories: legal and regulatory framework, institutional framework, operational maturity, investment climate, financial facilities and subnational adjustment factors. Each of these categories was further broken down into 19 indicators. Combining the scores achieved for each category revealed the overall scores as indicated in figure 2:

MATURE (80–100)	DEVELOPED (60–79.9)	EMERGING (30–59.9)	NASCENT (0–29.9)

Rank		Score
1	South Africa	70.7
2	Morocco	51.8
3	Kenya	51.4
4	Egypt	51.0
5	Tanzania	48.6
6	Côte d'Ivoire	45.5
7	Tunisia	45.4
8	Uganda	45.1
9	Rwanda	43.5
10	Ghana	43.0
11	Cameroon	38.2
12	Nigeria	36.8
13	Zambia	34.2
14	Angola	31.4
15	Democratic Republic of the Congo	20.6

Figure 2 Overall readiness score of African countries for increased implementation of PPPs (Economic Intelligence Unit, 2015)

South Africa is a leader in the SSA region: it has with well regulated and capitalised financial institutions; it has a strong ability to structure finance; its market is large enough to utilise hedging tools. The country, however, is marred by increasing political uncertainty which results in currency volatility and labour unrest (Economic Intelligence Unit, 2015).

A need thus exists for the examination of financial guarantees which can be utilised to promote infrastructure development, with the specific focus on how well these guarantees mitigate the current political, regulatory, commercial and environmental risks.

1.2. Significance of the research

This research was required as most governments and local banks, especially in the SSA region, are not able to finance infrastructure projects and deal with all the associated risks to promote infrastructure development on its own (Sy, 2013). Infrastructure development is key to the increased growth required in the region (Economic Intelligence Unit, 2015). Through the analysis of the relationships between guarantees and project risks, a more unobstructed view of what could enable more successful projects was investigated.

1.3. Research problem

The purpose of the study was to compare the significance of the impact a government guarantee has on infrastructure development risks, with the significance of the impact of four other financial guarantee instruments. The financial guarantees investigated are issued by multilateral agencies, export credit agencies, development finance institutions and private insurance companies.

A government guarantee was defined as an agreement by which a single government bears some or all of the downside risks of a project (Irwin, 2007). These guarantees are usually issued when the government plans to own or operate the assets after completion of the development. A financial guarantee was defined as a contract which requires the issuer of the guarantee to make payments to reimburse the holder of the guarantee for a loss he incurred because of the failure of debtors to make payments when due. Some financial guarantees result in a transfer of significant insurance risks between the issuer and holder (International Accounting Standards Board, 2004). The main difference between a government guarantee and the financial guarantees investigated in this study, is that the financial guarantees are supported by a combination of governments, most likely from developed countries, while the government guarantee is only supported by the government from the country in which the infrastructure development will occur.

The key research question addressed was:

- How does government guarantees compare to the financial guarantees issued by other institutions in addressing the risks confronted during infrastructure development projects in Sub-Saharan Africa?

The sub-questions addressed were:

- Which infrastructure risks are impacted by financial guarantees?
- Are the infrastructure risks' presence and potential consequences mitigated or aggravated by the presence of financial guarantees?
- How big are the financial guarantees' direct impact on the infrastructure risks?

1.4. Key assumptions

The key assumptions of this study were:

- Infrastructure development projects were measured against criteria as identified in prior research conducted into project success and failure, and critical success factors related to public-private partnerships.
- The critical success factors identified in prior research applied without any adjustment for geographical differences.
- The type of infrastructure developed (transport, water, renewable energy) was irrelevant to the outcome of the research.
- Expert respondent opinions on features and relationships were all weighted evenly.
- Risks associated with private or public infrastructure development projects were assumed to translate directly to public-private partnership projects.

1.5. Key delimitations

The key delimitations of this study were:

- The core of the research was based on prior research and existing literature alone.
- The scope of the research was limited to key risk management aspects related to infrastructure development guarantees.
- Only the views and opinions of individuals with experience in infrastructure development or public-private partnerships were included.

1.6. Research objectives

Given the background and scope outlined, it was essential to determine if alternatives to government guarantees existed and to what extent these alternatives were able to address the risks faced during infrastructure development projects in SSA.

The research objectives were thus as follows:

- Determine to what extent government guarantees can address infrastructure development risks.
- Determine if other financial guarantees were equally as efficient at addressing the risks.

2. Literature review

This chapter covers infrastructure projects and their impact on economic growth. General factors influencing infrastructure project success and failure were discussed, while public-private partnerships and their critical success factors were explored in detail. The available sources of development finance and guarantees were then discussed. Finally, the risks inherent to infrastructure projects and the effects financial guarantees have on the risks were examined. The literature review formed the basis of both the research and survey questions. It also formed the basis of the analysis of the findings from the research survey.

2.1. Infrastructure development projects

2.1.1. Impact of infrastructure development on economic performance

Most studies conducted into the effects of infrastructure development concluded that infrastructure development contributed positively to economic development. The magnitude of the contribution, however, differed from one study to another (Prud'Homme, 2005). Calderón and Servén (2004) agreed and included that increased infrastructure quality and quantity lead to a decline in income inequality.

Figure 2 graphically indicates how, instead of by how much, infrastructure development contributes to economic development:

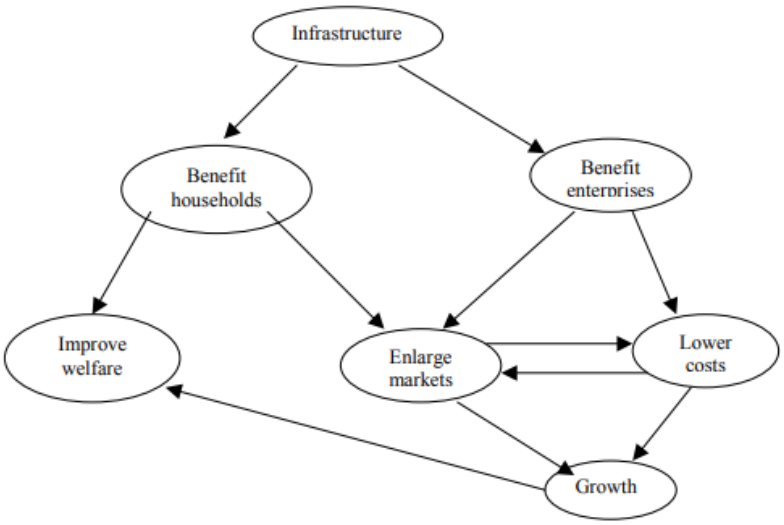

Figure 3 How infrastructure development contributes to economic development (Prud'Homme, 2005, p. 15)

According to Prud'Homme (2005), the results of infrastructure development included an increase in the overall market size. An increase in market size leads to intensified competition, greater specialisation and economies of scale. A country's productivity and market output thus improved through the increase in labour and goods markets. Prud'Homme (2005) further stated that infrastructure development acted similarly to the lowering of trade barriers.

Between 2011 and 2015 nearly half of the top 20 fastest growing economies in the world were from African countries. Increased infrastructure development is required to maintain and improve this performance. In 2015 it was estimated that USD 93 billion annually was required to meet Africa's infrastructure needs for the foreseeable future. A lack of available funds will result in infrastructure development becoming a bottleneck, slowing the continent's growth (Economic Intelligence Unit, 2015).

2.1.2. Project success and failure

Shrnhur, Levy, and Dvir (1997, p. 5) stated that:

> Project success is meaningful only if considered from two vantage points: the degree to which the project's technical performance objective was attained on time and within budget; and the contribution that the project made to the strategic mission of the enterprise.

Shrnhur et al. (1997) listed seven criteria for measuring the success of a project. It included technical performance, the efficiency of execution, customer satisfaction, personal growth, manufacturability, business performance and future gains. From their study, they concluded that project success could be described in four dimensions: project efficiency, impact on the customer, business success and preparing for the future.

The most common reasons for the failure of infrastructure projects were studied by Ikediashi, Ogunlana, and Alotaibi (2014). The results included poor risk management,

budget overruns, poor communication management, scheduling delays, poor estimation practices and cash flow difficulties. All of these factors played significant roles in the failure of infrastructure projects, and investors and developers should guards against these.

2.2. Public-private partnerships

2.2.1. Public-private partnerships and the lack of application

Akintoye and Kumaraswamy (2016) described private-public partnerships (PPP) as a partnership between private business and government, where private business raises the money required to develop and construct public infrastructure, and then recovers its investment by operating the asset over a long period. Users of the asset were either charged for the service or the government paid for the use thereof. This resulted in significant synergies. Akintoye and Kumaraswamy (2016) further argued that the main aim of PPPs was to increase investment in infrastructure projects, irrespective of the limitations which may exist in public spending. The risks are also allocated to the parties best equipped to manage them.

Based on data from the World Bank, Hall (2009) argued that PPPs had failed to mobilise sufficient private investment. The global financial crisis of 2008 and the resultant governance changes resulted in financing for PPPs becoming more challenging to secure. Existing PPPs to the value of USD 70 billion were at risk of failure or stoppage in 2009 because of increased finance costs.

Akintoye and Kumaraswamy (2016); Demirag, Khadaroo, Stapleton, and Stevenson (2012) further built on the argument of Hall (2009) They concluded that multiple barriers existed in the development of PPPs, with several of them resonating in countries where PPPs were used. These barriers included:

- The complexity of PPP procurement processes – people with skills and knowledge of the processes are scarce.

- The negative impact of the global financial crisis resulted in decreased availability and desire of private investors to participate in development projects.
- The complexity of projects resulted in expensive tender costs in comparison with other procurement methods.

Comprehensive project support systems were developed to counteract these barriers. The support systems were designed to guard the role players against cost and time overruns. However, these support systems and mechanisms added additional costs, and directly impacted on the “value for money” of the projects (Demirag et al., 2012).

Finally, according to Brealey, Cooper, and Habib (1996) financing large projects did not only involve finding the cheapest funds, but it also included the correct allocation of risks, the structuring of control and ownership, and the organisation of governance structures. This was referred to as the financial structure of a project. In modern corporate finance, it is widely accepted that the amount of leverage in a project cannot be separated from incentives and controls.

2.2.2. Critical success factors of public-private partnerships

Critical success factors (CSF) were described by Rockart (1980) as the key areas of activity in which favourable results were unquestionably necessary for the set goals to be met.

A list of generally applicable critical success factors for various types of PPPs were presented by Li, Akintoye, Edwards, and Hardcastle (2005). The CSFs included good governance, government support, a stable macro-economic environment, suitable legal frameworks, effective risk allocation, complete feasibility studies, and availability of strong financing markets. The presence of strong private consortiums were shown to be the most important factor of all. From this list they deduced that private parties involved with PPPs should join other private participants whose strengths and weaknesses related well to their own. In that way they would be able to generate sufficient synergies, as well as exploit individual strengths. The presence of government guarantees only ranked at 16 out of 18 CSFs.

A more in depth study of actual PPPs was conducted by Cuttaree (2008). The aim of the study was to use actual projects to confirm CSF, and the findings included:

- Feasibility studies had to include strong emphasis on revenue and cost forecasts.
- The willingness of the public to pay must be assessed ahead of time.
- Government's respect of contractual agreements were critical to the financial profitability and sustainability of a project.
- Solid legal frameworks increased the success rate of PPPs as it reduced the accompanying risks.
- Formal arrangements should be of sufficient nature to ensure coordination between involved parties.
- Macro-economic risks must be mitigated in a flexible manner to prevent any unexpected risks for the government.

In a presentation to the World Bank, Cuttaree (2008) discussed factors that resulted in failures of PPPs. Inadequate or non-existent feasibility studies, including undefined public contributions, was mentioned as the cause of most PPP failures. Other frequent causes of PPP failure included poor legal frameworks and enforcement, weak institutional capacity, unrealistic cost and revenue estimates, inappropriate sharing of risk, and lack of thorough financial and economic analysis.

2.3. Infrastructure development financing and guarantees

Developers wanting to raise capital often believe that bank debt is cheaper than equity. Brealey et al. (1996) argued that in case of project failure, the debt was not intrinsically cheaper than equity. In a well-functioning capital market, the returns of debt and equity would effectively be the same after adjusting for risk. Overall, the cost of capital of a project reflected the risk accepted by the parties financing the project. Brealey et al. (1996) further reasoned that financing choices affected project value and cost of capital if it resulted in the reduction in taxes paid by the project, it improved the operating performance of the project and lowered the expected cost of future renegotiations.

Several sources for financing exist, each with its market focus and application. Each source was reviewed in order to determine the most suitable financier for infrastructure projects.

2.3.1. Sources of infrastructure development finance

Corporate finance

Private companies may fund capital required for projects corporate finance. Corporate financing entails getting finance for a project based on the balance sheet of the private company, instead of basing the finance on the value of the project itself. A major advantage corporate finance has over project finance is that the cost of funding is less. Another advantage is the fact that it is less complicated. Corporate finance is associated with an opportunity cost as the company is only able to raise a limited level of finance against its equity (World Bank Group, 2016).

Corporate finance is typically used for lower value projects. It occurs either because the cost of financing a project is not significant enough to warrant a project finance mechanism, or the private company is large enough to fund the project from its balance sheet (World Bank Group, 2016). Corporate finance uses more classes of debt than project finance does, but still exposes the involved companies to losses up to the value of the total project cost (Switala, 2010).

Project finance

Project finance is a generic term that refers to financing secured only by the assets of a project itself. Therefore, the revenue generated by the project must be sufficient to support the financing obligations. Project financing is often referred to as non-recourse or limited recourse financing. Because of the complex nature of infrastructure projects, project sponsors are making use of more sophisticated products like credit-wrapped bonds, securitisation of future cash flows and political, technical and completion risk insurance to provide a portion of the necessary finance (McNair, 2016).

Mistry and Olesen (2003) indicated that project sponsors usually absorb commercial risks to as great an extent as possible. Through project finance, some financial risks

are shared with creditors. Creditors, however, are only exposed to actual losses when security packages they have developed, fail to produce sufficient value.

Sub-sovereign obligations

Sub-sovereign obligations are debt in the form of government bonds issued to municipalities for the financing of local projects. The government bonds act as collateral to the debt. Municipalities benefit because of the lower interest rates associated with these bonds, the reduced risk associated with the bonds and the fact that the interest accrued is not taxed. The government to whom these bonds are issued, however, need to have a credit rating and sufficient budget capacity (ANON, 2018).

Domestic capital market investors, who are familiar with local governments are usually the targets of bonds issued at a sub-sovereign level. These bonds are issued in local currencies, raising the required finance without being exposed to international currency fluctuations (Platz, 2009).

International development agencies

International development agencies, or multi-donor organisations, such as the Private Infrastructure Development Group, organise private sector investment to develop infrastructure vital for economic growth. It has established specialised financing subsidiaries to generate private sector investment in infrastructure projects, mainly focused on developing countries. The duties of these subsidiaries range from initial project development to the provision of long-term debt and finance for the development of private infrastructure. The Private Infrastructure Development Group membership includes the governments from seven countries and the World Bank Group (PIDG, 2018).

Contractual financing institutions

Contractual finance institutions include life insurance companies, national provident funds, pension funds and social pension insurance systems. Vittas, Skully, and Mundial (1991) argued that contractual financing institutions were the ideal providers of finance to industry and government as they had stable cash flows and long-term liabilities. Contractual finance institutions provide for the collective investment on behalf of individual savers, utilising the benefits of economies of scale, professional management and risk diversification.

2.3.2. Finance guarantees and their sources

According to Brealey et al. (1996), the inclusion of either government or multilateral institutions as either the sources of debt finance or the guarantor of loans, provided the institutions with the incentive to control regulatory, institutional and political risks. The presence of government guarantees lends legitimacy to projects. Brealey et al. (1996) further disputed the argument that government had an advantage over the private sector in financing infrastructure projects because it could raise debt at the risk-free rate. They argued that the argument ignored the cost of the guarantee burdened by taxpayers and that it was this cost to the taxpayer and the resulting guarantee which allowed governments to finance entire projects at the risk-free rate.

In a 2011 study conducted by Mirabile, Benn, and Sangaré (2013), it was found that development activities to the value of USD 6.4 billion were backed by guarantees from aid agencies, development finance institutions (DFI) and international finance institutions (IFI). This seemed significant, but it is was less than one percent of the total international private financial flows for the year. The study also revealed that only 15 percent of the resources mobilised between 2009 and 2011 by guarantees, were domestic. Although Africa benefited significantly from these guarantees (41 percent of all guarantees issued), the contracts were considerably smaller than those issued to other regions.

Government guarantees

According to Irwin (2007), a belief exists that infrastructure development should be done with private money. The belief is based on the fact that private companies are viewed as being more efficient, and governments cannot necessarily afford the cost. The presence of guarantees and other forms of aid issued by governments attract private investors. Without these guarantees and aid, private investors were likely to hold back on investments. Government guarantees, however, have a downside. If investors gain from guarantees, developers and operators of new developments have little reason to manage the associated risks.

Ultimately, government guarantees leave investors less concerned about risk than what they would have been if no guarantee was in place (Irwin, 2007).

Modern-day guarantees only protect firms from risks over which they and their investors have little influence, such as revenue risk and exchange rate risk. Most guarantees ensure a better split between guaranteed and unguaranteed investors. Still, the objective to improve investor incentives while limiting a government's losses is outweighed by the need to attract private investors to projects the government plans to control. Good decisions regarding the issuing of guarantees are also affected by political problems and cognitive problems in decision making (Irwin, 2007). In summary, guarantees satisfy three criteria (Irwin, 2007):

- guarantees are easily justified, either to make use of a government's risk-bearing potential or to encourage investments.
- costs of guarantees are distributed among a broad base of taxpayers.
- no immediate transfer of money is required.

A government's responsibility toward infrastructure development does not only relate to issuing financing guarantees. They are also responsible for the establishment of an adequate legal framework and ensuring the right political and commercial environment. The guarantees issued must be done in such a way as to ensure a balanced risk-return structure. High risks associated with government guarantees may

result in the private sector not participating in government-designated projects (Kumaraswamy & Zhang, 2001).

Development finance institution guarantees

DFIs are development banks or subsidiaries that specialise in private sector development in developing countries. The majority of owners of these DFIs are national governments. DFIs' primary sources of capital are international and national development funds, but they also benefit from government guarantees. This enables them to source large amounts of money in order to provide financing on very competitive terms (Organisation for Economic Co-operation and Development, 2018).

Multilateral DFIs are the private sector arms of IFIs. Their shareholders generally consist of national governments and private institutions. Multilateral DFIs finance private projects through equity investments, long-term loans and guarantees (Organisation for Economic Co-operation and Development, 2018).

In an interview conducted by Yale Insight, Isabel Marques De Sà, Chief Investment Officer for Public-Private Partnerships at the World Bank, indicated that in developing economies, financing of infrastructure projects depended on the participation of mobilising organisations such as the World Bank's International Finance Corporation. She added that although government guarantees would lower the cost of financing, it depended heavily on the structure of the specific project and the country involved (Sà, 2017).

Export credit agency guarantees

Export credit agencies (ECA), or investment insurance agencies, are public organisations that provide private corporations with government-backed loans, guarantees and insurance. ECAs are among the most significant sources of public financial support in infrastructure projects in the world. It is estimated that ECAs support more than double as many oil, gas and mining projects as do all multilateral

development banks (MDB) combined. ECAs collectively fund more private projects in developing countries than any other class of finance institution (ECAWatch, n.d.).

ECAs are known to guarantee infrastructure and industrial projects in developing countries where MDBs are not willing to carry the risk. ECAs allow projects with high environmental, political and social risks, to come to life. ECAs assist companies from their own country to expand into developing countries, where they usually compete against ECAs from other countries. This leads to a subsequent lowering of standards in that projects associated with significant risks are backed by several ECAs resulting in weak projects with no environmental and social defences being implemented (ECAWatch, n.d.).

Multilateral agency guarantees

Multilateral agencies (MA), specifically MDBs, are defined by Harrigan (2017) as being agencies formed by three or more nations who are willing to work together on issues relevant to each of them. Multilateral agencies deal with issues that are seen as global priorities, such as education and poverty alleviation. They can finance and support projects through the funds they receive from multiple governments. Multilateral aid involves the pooling of sovereign donor contributions which are then distributed at the preference of multilateral organisations (Reinsberg, 2016).

The World Bank is probably the most well-known of the MDBs, and actively participates in infrastructure development through (Hofman, 2006):

- sourcing policy advice and technical assistance to improve private sector growth and partnerships.
- organising infrastructure financing through the application of its risk and credit guarantees as credit enhancement instruments.
- providing direct lending and guarantees to support infrastructure projects through its International Finance Corporation and Multilateral Investment Guarantee Agency.

Only 4.5% of the total financing by MDBs in 2013 was allocated to finance guarantees. MDBs' capital structures, financial and operational policies, and staff skill set often limit the use of guarantees. In general, the cost of guarantees offset any advantage gained in improved financial terms for the borrower (Humphrey & Prizzon, 2014).

2.4. Risks faced by infrastructure project stakeholders

Infrastructure projects remain vulnerable to common problems, even though it was proven that infrastructure development has a net-positive effect on economic growth. The most common risks associated with infrastructure development are classified into three groups: commercial, political or regulatory, and environmental risks.

Commercial risks include construction delays, cost overruns, changes in input and output prices, unavailability of supplies and contractor bankruptcy. Other commercial risks associated with infrastructure projects include the fact that financial returns are often very long-term (OECD, 2019). It is possible that the recovery of infrastructure costs directly from the end users can be more difficult than it would be to recover it through service charges (Amos, 2004). Luke Jordan, a private sector development specialist at the World Bank, revealed that nine out of ten infrastructure projects experienced cost overruns. This was according to a 2015 study conducted by an Oxford University research group who looked at infrastructure projects from across the world (Vision2030, 2017). Luke also indicated that in most instances, demand forecasts done to scope those projects were wrong.

Political risks may arise due to actions or inactions taken by a government and include changes to laws which negatively affect a project, and not approving tariff increases when requested. While the project sponsor is more in control of commercial risks, the government is more in control and has more influence over political risks (Griffith-Jones & de Lima, 2004). Griffith-Jones and de Lima (2004) and Irwin, Klein, Perry, and Thobani (1999) argued that currency devaluation often prevented governments from fulfilling their obligations to investors with regards to infrastructure projects. Irwin et al. (1999) further argued the importance of insuring infrastructure investments

against currency volatility, especially when faced with currency devaluation or tariff sensitivity. This was especially true when foreign investors wanted to recover profits in foreign currency. Further risks arise because infrastructure projects mainly provide essential services, and are provided by monopolists. This means that investors are likely to be vulnerable to government actions as these services are usually politicised.

Environmental risks faced by developers and investors remain present throughout the construction and operation of infrastructure projects. The most significant environmental risks are possible pollution to groundwater and the environment, and natural catastrophic events which result in physical damage. Increased environmental regulations and strict enforcement of rules often means that companies are held responsible for any damage to the environment, be it instant or over long periods (Marsh, 2016).

Why do these risks matter? Because they affect a project's cash flow – initial investment, operating costs and revenues. The success of a project thus depends on how these risks are controlled (Brealey et al., 1996).

2.5. Conclusion to literature review

From the literature review, it is clear that infrastructure development is crucial to the continued growth required by developing countries, especially in SSA (Economic Intelligence Unit, 2015; Prud'Homme, 2005). This expansion must continue irrespective of the associated risks. Financial guarantees play an important role in rallying the investment needed for infrastructure development because of its ability to afford investors some risk-cover (Brealey et al., 1996).

The institutions that make guarantees available to project stakeholders are wide-ranging and include governments, development banks, export agencies and private insurers. In general, however, governments are less and less equipped to act as guarantors due to rife corruption and skill shortages(Economic Intelligence Unit, 2015).

Public-private partnerships have been presented as the solution to SSA's struggling infrastructure development, with private institutions collaborating with governments to meet the development goals and needs of the people (Akintoye & Kumaraswamy, 2016). While much research has been conducted into the critical success factors of PPPs (Cuttaree, 2008), the application of these collaborations remain dependent on the involvement of governments to cover most of the associated risks.

What is lacking from the available literature is how guarantors target infrastructure risks, and on which risks they focus their guarantees. More research is also required into the ability of these institutions to take the place of government in PPPs.

3. Research methodology

The research methodology chapter discussed the research plan and design used to select research participants, construct the research instruments and gather the required information in order to answer the research questions. The methods used were practical, inexpensive and required no special software packages. One limitation, however, was that respondents were required to complete the survey independently. This resulted in a sizable number of respondents omitting to complete the survey.

3.1. Basic approach and assumptions

In order to combine the existing literature and prior research with the inputs of experts in the infrastructure development arena, a semi-quantitative approach was followed. The fundamental characteristics of a fuzzy cognitive map (FCM) were supplemented with an online survey. The initial FCM included the five guarantee instruments and the most common infrastructure risks. The nature and strength of each guarantee's impact on the risks were determined using the experts' inputs from the survey.

This approach aimed to develop a set of indicators, or maps, to be used by individuals who participate in infrastructure projects. The indicators would act as a guide, indicating the most appropriate guarantee to put in place to mitigate the risks expected during a project.

3.2. Research design

The initial FCM was created from existing literature and prior research conducted into the CSFs and risks applicable to infrastructure projects. Concepts related to project success and failure, and finance guarantees were also included in the initial model. In order to focus the research sufficiently, the scope of the FCM was limited to the relationship between guarantees and risks.

A supplementary survey was developed to determine the nature and strength of the various guarantees' relationships with infrastructure risks. The survey was distributed to experts with experience in infrastructure development in SSA, and their inputs were

combined into the FCM in order to increase the map's credibility (Stach, Kurgan, & Pedrycz, 2010). The survey focussed the experts' inputs on two concepts at a time – one guarantee and one risk – in order to minimise the respondents' need to come up with direct cause-effect relationships (Stach et al., 2010).

The survey requested respondents to answer a set of three repeating questions. Firstly, did the respondent believe that a direct relationship exists between a guarantee and a risk? Secondly, was the nature of this relationship mitigating or aggravating in nature? In other words, did the guarantee reduce or increase the likelihood and effect of the risk on the project? Finally, the respondent had to indicate the strength of the relationship between the guarantee and the risk. Respondents were guided to provide linguistic terms, e.g. *weak*, *medium*, *strong* and *very strong* for the final question. These terms were mapped as numerical values between zero and one: *weak* to 0.25, *medium* to 0.5, *strong* to 0.75 and *very strong* to 1.0. The reason for this was to avoid the difficult task of specifying the exact numerical values (Stach et al., 2010).

3.3. Research sample

The initial FCM was constructed as a basic causal map. The survey, which was supplementary to the FCM, and focussed on experienced individuals, was distributed to 45 respondents. The number of respondents required for this approach was less than what is needed for standalone surveys. Because of the complexity of the relationships between guarantees and risks, and the diversity of the opinions, Jetter and Kok (2014) indicated that between 7 and 46 responses would be sufficient.

The experts and stakeholders (referred to as respondents) who formed part of the research sample were individuals with extensive experience in infrastructure projects and PPPs. They were representative of every role-player in infrastructure development and included financiers, private investors, project developers, guarantors, construction contractors and government representatives. They also had experience in working in SSA.

3.4. Research instrument

The research instrument used was a combination of FCM modelling and structured online surveys. The basic FCM model was developed from existing literature and prior research into the guarantees and risks associated with infrastructure development. The online survey was used to develop the relationships between guarantees and risks based on the inputs of expert respondents.

FCM modelling bridges the gap between quantitative analysis and qualitative analysis (semi-quantitative) as it allows for the analysis of dynamic properties of systems and the identification of possible future system states and uncertainties (Jetter & Kok, 2014). The complexities present within infrastructure projects made FCM the ideal research instrument.

FCMs are inference networks which allow users to represent knowledge and reasoning and is often used to analyse causal-complex systems. Through the application of FCMs, the user can model, analyse and forecast scenarios. Users can map systems in ways very similar to how humans perceive the systems, allowing for several stakeholder views. Graphical FCMs usually consist of nodes with direct edges between them, resulting in feedback loops. The nodes represent descriptive behavioural concepts of a system, while the edges represent cause-effect relationships between the concepts (Papageorgiou & Salmeron, 2013). While guarantees are used to protect stakeholders against project risks, they do not all carry the same weight. FCMs allow for the adjustment of the degree of activity of individual variables, as well as the degree of causal influence they impact on one another.

Not only are FCMs easy to build and parameterise, but they are also flexible as more concepts can be introduced as required. FCMs easily handle complex issues related to knowledge elicitation and management, while the feedback structure of the system allows for the integration of dynamic effects (Papageorgiou & Salmeron, 2013). This means that the basic FCMs can be developed further to incorporate other variables that impact on the success of infrastructure projects.

Of the three methods used to elicit knowledge to populate FCMs, Jetter and Kok (2014) recommended surveying experts for their opinions. They warned that it was essential to focus respondents' attention on specific knowledge domains in order to capture their knowledge in greater detail.

The research instrument is available as a supplementary file.

3.5. Data collection

An initial casual map was constructed consisting of the guarantees and infrastructure risks identified in the literature review. An online survey was then constructed using Qualtrics software. An email was drafted in Qualtrics in which the respondents were asked to participate in the survey which required them to answer 35 questions. Respondents were informed of the fact that the survey was completely anonymous and that they could exit the survey at any time. The respondents' choice to complete the survey was taken as their consent. The questions were predominantly multiple-choice, meaning the survey took less than 20 minutes to complete.

The survey was distributed to 49 respondents, with two follow-up emails sent to each respondent. In total, 23 respondents completed the survey in the assigned six-week window between October and December 2018 – a response rate of 47 percent.

The consent email is available as a supplementary file.

3.6. Data analysis and interpretation

The survey data was split according to the different guarantees under investigation. As the strength and nature of each guarantee's impact on the same set of risks were measured, the effectiveness of the guarantees could be compared directly to each other. Government guarantees were used as the baseline for the research.

The first part of the analysis involved ranking the infrastructure risks from most significant to least significant, based on their impact on infrastructure and PPP projects. The ranking was based on the average position selected by the respondents.

This ranking order would be used throughout the results presentation to ensure uniformity and ease of comparison.

Secondly, the respondents' answers were grouped according to the five guarantees. All of the results were normalised and weighted, allowing for direct comparisons. The number of respondents who indicated that a direct relationship between a guarantee and a risk existed, were calculated as a percentage of all the possible responses. The respondents then indicated whether the nature of the relationship was mitigating (a positive sign was assigned) or aggravating (a negative sign was assigned). The selections were added together per risk to allocate a sign to the specific relationship.

The respondents' selections for the strength of the relationships were then calculated per risk. The number of responses received for each of the four possible answers was multiplied by the respective numeric values – 0.25 for *weak*, 0.5 for *medium*, 0.75 for *strong* and 1.0 for *very strong*. This value was then multiplied by the initial number of respondents who indicated the direct relationship, resulting in a value that incorporates all the variables. This value is an indication of the net effect of the specific guarantee on the specific risk. This process was repeated for every guarantee and every risk.

In order to interpret the results of the analysis, and ultimately answer the research questions, clustered column charts were drawn up, visually indicating the effect of each guarantee on the complete list of infrastructure risks. The selected approach to the analysis meant that the results were all directly comparable, simplifying the process of selecting a preferred guarantee based on the risks faced during infrastructure and PPP projects.

3.7. Accuracy, validity and reliability

As indicated by Calder, Phillips, and Tybout (1982), the possible number of background factors present were endless and selecting only those applicable practically impossible. By aggregating the knowledge of several respondents into the FCM, the reliability of the final models was improved. The fact that both literature-based data and survey data was used to conduct the research, also known as

methods-triangulation, increased the internal validity of the FCM. The non-overlapping weaknesses and strengths of the two methods improved the overall accuracy of the model (Johnson, 1997).

Through data-triangulation - combining multiple sources of data - both reliability and saturation were improved (Fusch & Ness, 2015). By including the inputs from respondents from diverse fields involved in infrastructure development, the depth of data was significantly improved.

As the FCMs made provision for both positive and negative relations between nodes, the maps were able to confirm if alternative outcomes were possible dependant on the actions taken by the parties involved in an infrastructure project. The size of the effects of certain concepts on other concepts was adjustable, meaning the models were able to accommodate inputs and characteristics specific to certain types of projects and environments (Jetter & Kok, 2014).

3.8. Ethical assurance

As the FCM was developed based on a combination of existing theory, prior research and expert opinions, the possibility of any ethical inconsistencies were minimised. Any information gathered through the supplementary survey, which was outside of the public domain, was treated as anonymous, i.e. all company and individual names were disregarded from the analysis.

All the respondents were informed of these facts in the email they received which accompanied the link to the online survey.

4. Results of empirical study

The results section provides an overview of the results obtained from the research, as well as a summary of the main findings. The results and findings were analysed in an effort to answer the research questions stated earlier.

4.1. Response rate

A total of 23 responses to the online survey were received. Of these 23, five were incomplete to a point where the inputs were discarded completely. The remaining 18 responses were complete and viewed as valid for use in the analysis.

4.2. Characteristics of respondents

This section depicts the demographic profile of the respondents and includes respondents' levels of experience, the role respondents played in infrastructure and PPP projects they participated in, and details of the countries in which the respondents have completed infrastructure and PPP projects.

4.2.1. Respondents' experience in infrastructure development and PPP projects

Respondents' total work experience was evaluated along with their relevant infrastructure development and PPP project experience. The largest proportion had work experience of more than 20 years (44 percent) as well as the highest proportion of infrastructure development experience (17 percent). The second largest proportion had work experience between 15 and 20 years (28 percent) and infrastructure development experience of 8 percent. None of the respondents had less than five years' work experience. While the majority of respondents had significant work experience, their infrastructure development experience was more evenly distributed across the entire range. This differed significantly from the proportions with the most PPP experience – 0 to 5 years (25 percent), 5 to 10 years, 10 to 15 years and 15 to 20 years (8 percent each).

This suggests that PPP projects are relatively new to the SSA region and that a large section of the respondents had limited experience with PPPs.

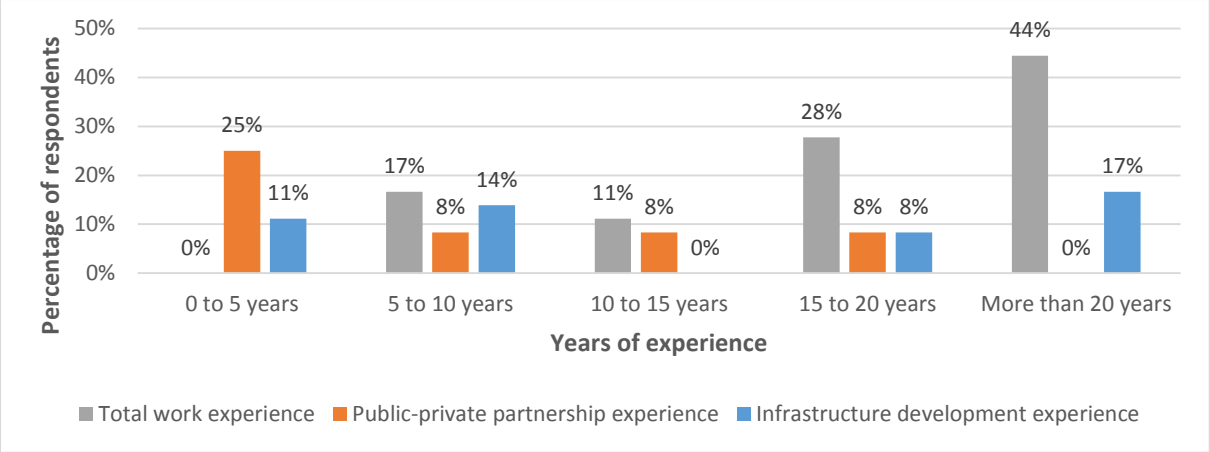

Figure 4 Respondent work, PPP and infrastructure development experience

From the abovementioned, it appears as if the uptake of PPPs in SSA started around 15 to 20 years ago and has steadily increased, being driven by younger generations.

4.2.2. Roles played by respondents in infrastructure projects

Respondents were asked to indicate what roles they had participated in infrastructure development projects. The question aimed to determine if all the relevant stakeholders were included in the research. This was important as the reason, and motivation for attaining or issuing a financial guarantee for an infrastructure or PPP project differs depending on the role of the involved individual.

Contractors made up the most substantial proportion of the respondents (26 percent), followed by investors and financiers (17 percent each), developers (13 percent) and guarantors (8 percent). One government representative participated in the research. The primary role players in infrastructure projects – contractors, investors, financiers and developers – made up almost three-quarters of the respondents.

The respondents also included one legal representative and an insurance representative to developers and contractors, which were listed under *other*.

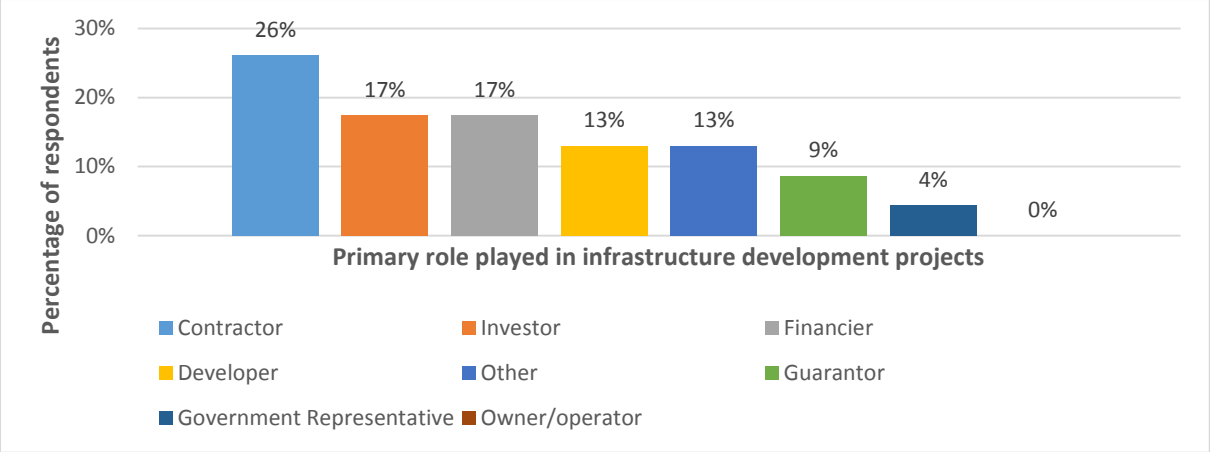

Figure 5 Respondents' longest held position during infrastructure development projects

4.2.3. Geographical locations of completed infrastructure development projects by the respondents

As the geographical focus of the research is SSA, it is encouraging to note that all of the respondents had worked on infrastructure development projects in SSA. The Southern African countries of South Africa, Namibia, Botswana, Zimbabwe, Mozambique, Angola, Zambia, Malawi and Madagascar were all represented.

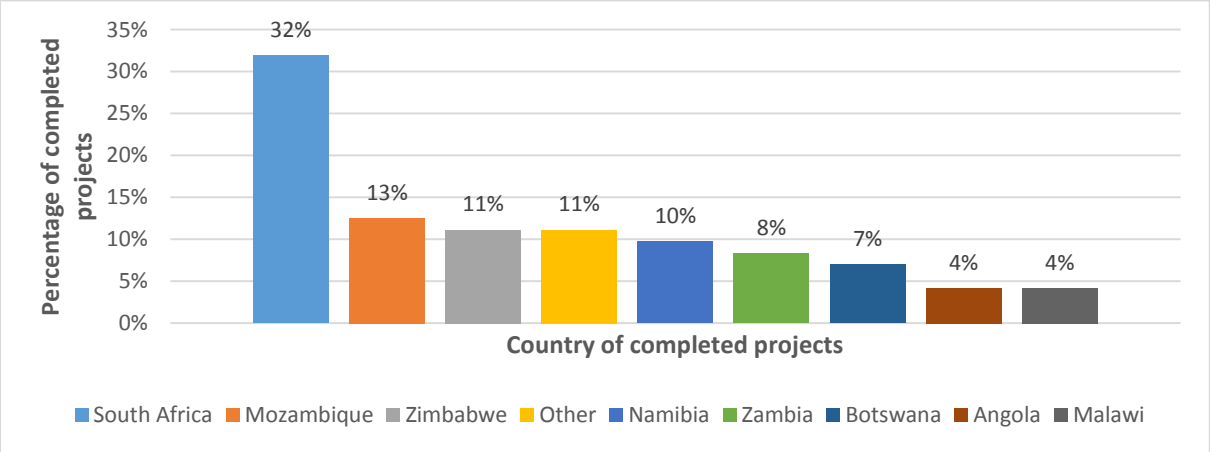

Figure 6 Respondents' geographical experience of successful infrastructure development projects

The most substantial proportion of projects completed were in South Africa (32 percent) and Mozambique (13 percent). Only Angola and Malawi accounted for less than 5 percent of the completed infrastructure projects. Respondent also completed infrastructure projects in countries not stipulated in the survey question. These were

listed under *other* and included Madagascar, Tanzania, Ghana, Mauritius, Lesotho, Swaziland, the United Kingdom and the Middle East.

The respondents who completed projects in the United Kingdom and the Middle East added an international perspective to the research.

4.3. Project risks faced during infrastructure development

4.3.1. Most significant risks to infrastructure development and PPP projects in SSA

Respondents were asked to rank 23 political, regulatory, commercial and environmental risks associated with infrastructure development and PPP projects in SSA, according to the significance of their impact on projects. The opinions of the respondents differed significantly, as can be seen by the standard deviation and variance values. This was expected, taking the diversity of the respondents, the projects, the locations and the external influences acting on the projects into account.

In order to rank the risks from highest to lowest, the mean of each was calculated. Construction delays, corruption, poor revenue forecasting, community opposition and cost overruns made up the top five most significant risks encountered during infrastructure projects in SSA.

To ensure uniformity, the results of the remaining research questions were presented according to this risk ranking.

Table 1 Infrastructure project risk rankings

Risk description	Rank	Standard Deviation	Variance
Construction delays	1	6.14	37.65
Corruption or market-distortion	2	5.55	30.78
Poor demand forecasting (revenue)	3	4.99	24.91
Unwillingness of public to pay and other forms of community opposition	4	6.87	47.25
Cost overruns	5	6.22	38.69
Labour unrest	6	6.08	36.99
Revenue collection risk	7	6.98	48.69
Contractor bankruptcy	8	5.73	32.87
Long waiting time for financial returns	9	5.51	30.35
Contractual agreement disrespect or breach of contract	10	6.37	40.54
Unplanned changes in costs	11	6.66	44.36
Non-renewal of licenses or cancellation of contracts	12	4.67	21.84
Exchange rate volatility	13	6.88	47.28
Revised decommissioning requirements	14	5.36	28.76
Unavailability of supplies	15	5.7	32.47
Currency transfer and convertibility risk	16	6.33	40.02
Pollution and associated costs	17	6.22	38.69
Monopolised essential service providers	18	4.93	24.27
Changes to taxation laws and rates	19	5.17	26.69
Force majeure: risk of man-made events	20	5.66	32
Expropriation of assets	21	5.91	34.89
Natural catastrophe	22	6.4	40.91
War and civil disturbance	23	6.33	40.13

4.4. Financial guarantees and their impact on infrastructure development risks

In order to analyse the impact of different financial guarantees on the risks generally associated with infrastructure development projects, respondents were asked a series of three repeating questions.

Respondents were asked to indicate if a specific risk was directly impacted on by having a specific financial guarantee in place during a project. Respondents were then asked to show if the impact of the financial guarantee on the risk was of a mitigating (reduces the effect or consequence of the risk) or aggravating (increases the effect or

consequence of the risk) nature. Finally, respondents were asked to indicate the significance of the guarantee's impact on the risk – was it *weak*, *medium*, *strong* or *very strong*.

The financial guarantees used for the research were guarantees issued by governments, multilateral agencies, export credit agencies, development finance institutions, as well as private insurance policies.

Out of a total of 394 selections made by respondents, government guarantees was selected as the guarantee that impacted on the most infrastructure project risks. Respondents chose government guarantees 102 times when asked to indicate if it impacted on the 23 project risks. The second was MA guarantees (87), followed by private insurance policies (73), EC guarantees (72) and finally, DFI guarantees (60).

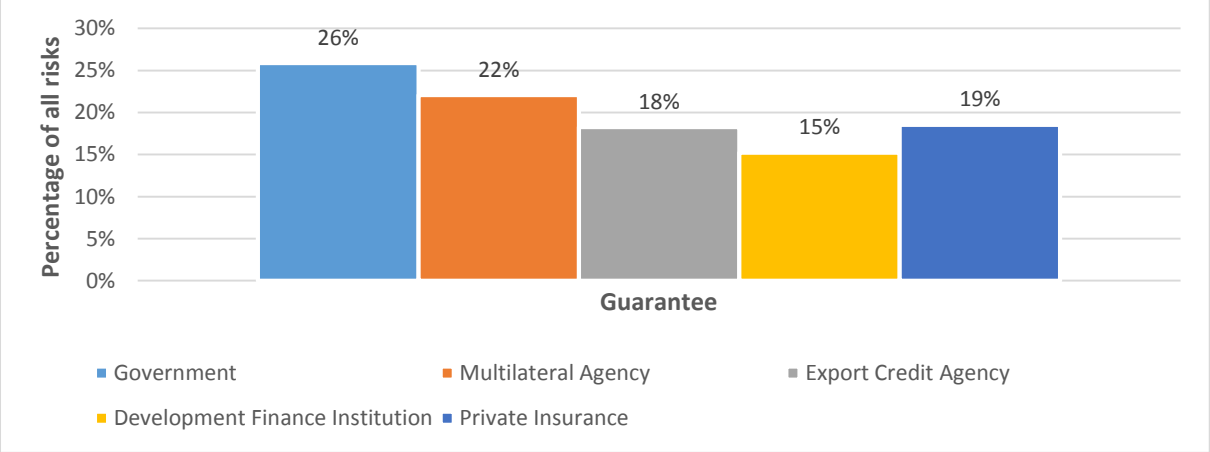

Figure 7 The amount of all risks impacted on by financial guarantees

This suggests that government guarantees impact on more project risks than any other guarantee, a total of 26 percent. DFI guarantees were the least effective at 15 percent.

4.4.1. Government guarantees

Government guarantees' effect on infrastructure development risks

Respondents were asked to indicate which of the 23 infrastructure projects risks were directly impacted by government guarantees. Respondents reported that government guarantees impact on 21 of the 23 risks, all except 'pollution and associated risks' and 'natural catastrophes'. The vast majority of respondents (78 percent) indicated that

government guarantees impact on the ‘revenue collection’ and ‘unwillingness of public to pay and other forms of community opposition’ risks. These were the only risks selected by more than 50 percent of respondents throughout the entire research survey. The only other risk to collect half of the respondents’ selection was ‘poor demand forecast’ risk.

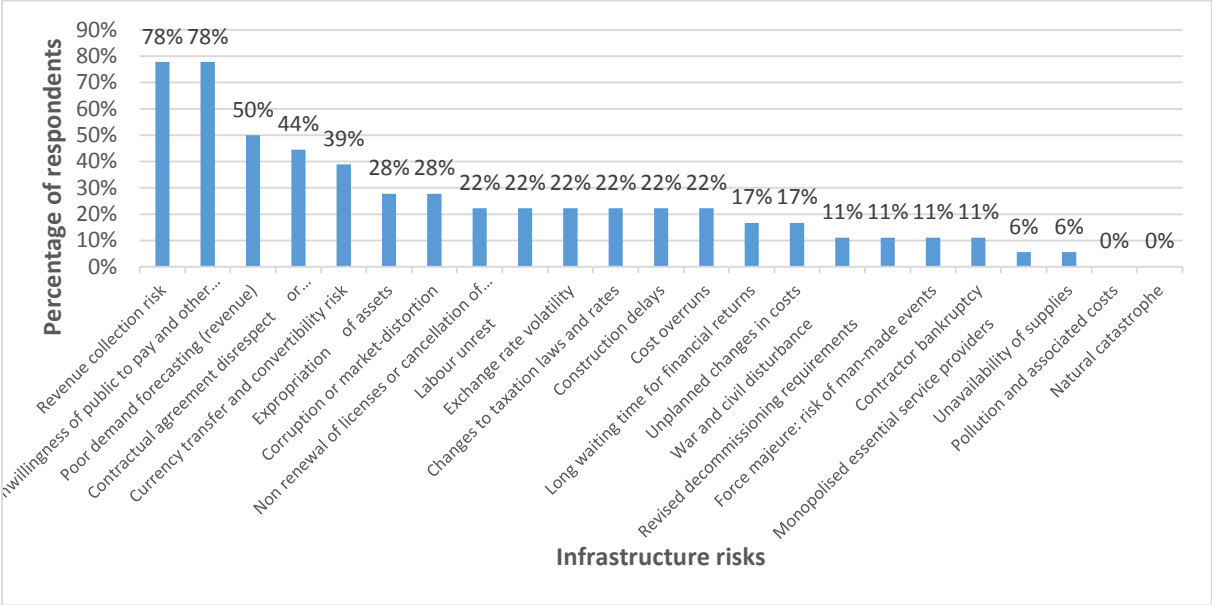

Figure 8 Infrastructure risks impacted by government guarantees

The nature of government guarantees’ effect on infrastructure development risks

Respondents were asked if the impact of the guarantee on each risk, as indicated above, resulted in the risk to the project reducing (mitigating) or increasing (aggravating). Respondents had polar views about some of the natures of the guarantee’s influence on the risks, especially on the top-ranked risks. Respondents’ selections of the guarantee’s impact on four of the top six risks were almost evenly divided between mitigating and aggravating. The respondents’ views were more aligned from ‘revenue collection risk’ downwards. The views of the respondents were totalled per risk, resulting in the guarantee's impact on each risk being identified as either mitigating or aggravating.

Respondents' selections were unanimous for 11 of the 20 risks indicated earlier to be affected by government guarantees. Figure 9 summarises the nature of government guarantees' impact on infrastructure risks.

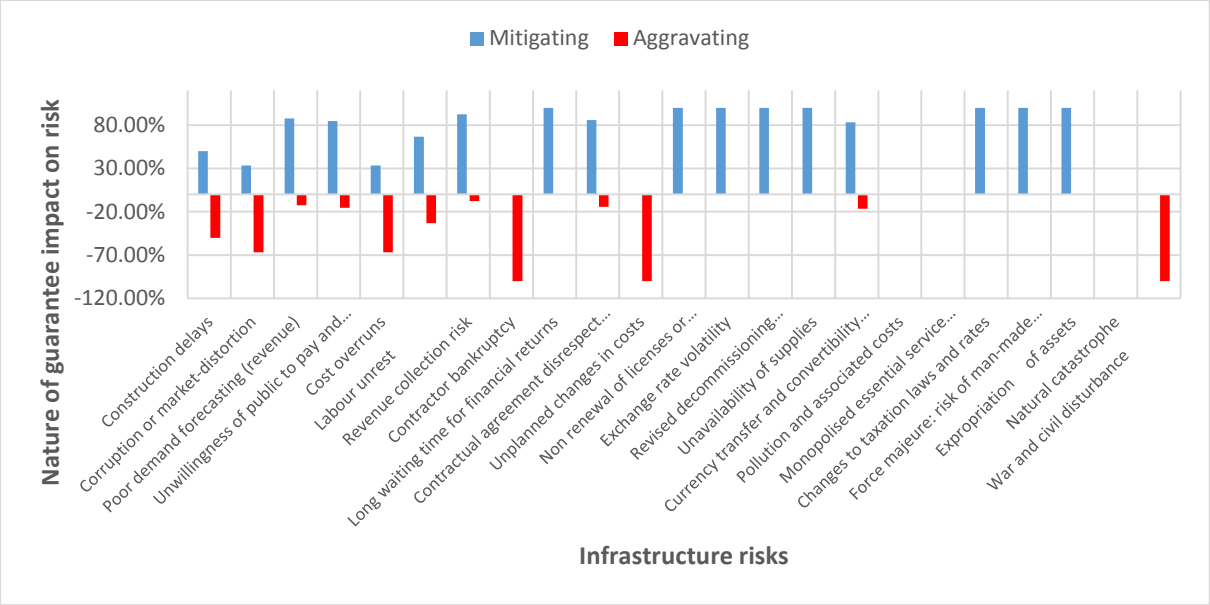

Figure 9 The nature of government guarantees' impact on infrastructure risks

The significance of government guarantees' effect on infrastructure development risks

Respondents were asked to indicate the strength of the impact government guarantees has on the selected infrastructure risks. To simplify the process for both the respondent and the researcher, a four-point scale was introduced. Respondents could choose either *weak*, *medium*, *strong* or *very strong*. Each option was related to a value between zero and one, as was indicated in the methodology section of this report.

Respondents indicated that the strength of government guarantee's impact was *strong* for more than half (53 percent) of the earlier selected risk. Government guarantees *strongly* or *very strongly* impacted almost three-quarters (74 percent) of the risks. Figure 10 illustrates the strength of government guarantees on all the impacted risks.

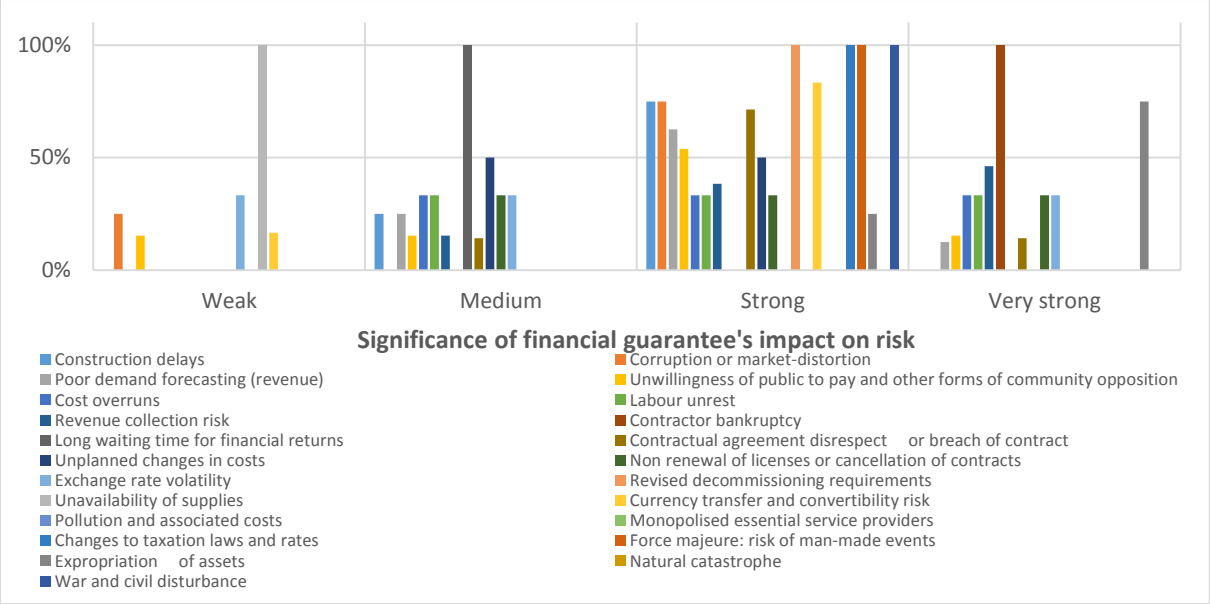

Figure 10 The strength of the impact that government guarantees have on infrastructure risks

4.4.2. Multilateral Agency guarantees

MA guarantees' effect on infrastructure development risks

Similar to government guarantees, MA guarantees impact on 21 of the 23 infrastructure project risks according to respondents. However, the risks not impacted differ from those of government guarantees. Respondents indicated that MA guarantees do not impact on 'monopolised essential service provider' and 'natural catastrophe' risks.

The risks most impacted on by MA guarantees include 'non-renewal of licenses' (50 percent), 'revenue collection risk' (50 percent) and 'unwillingness of public to pay and other forms of community opposition' (44 percent). On average, the impact of MA guarantees on infrastructure risks was less than government guarantees.

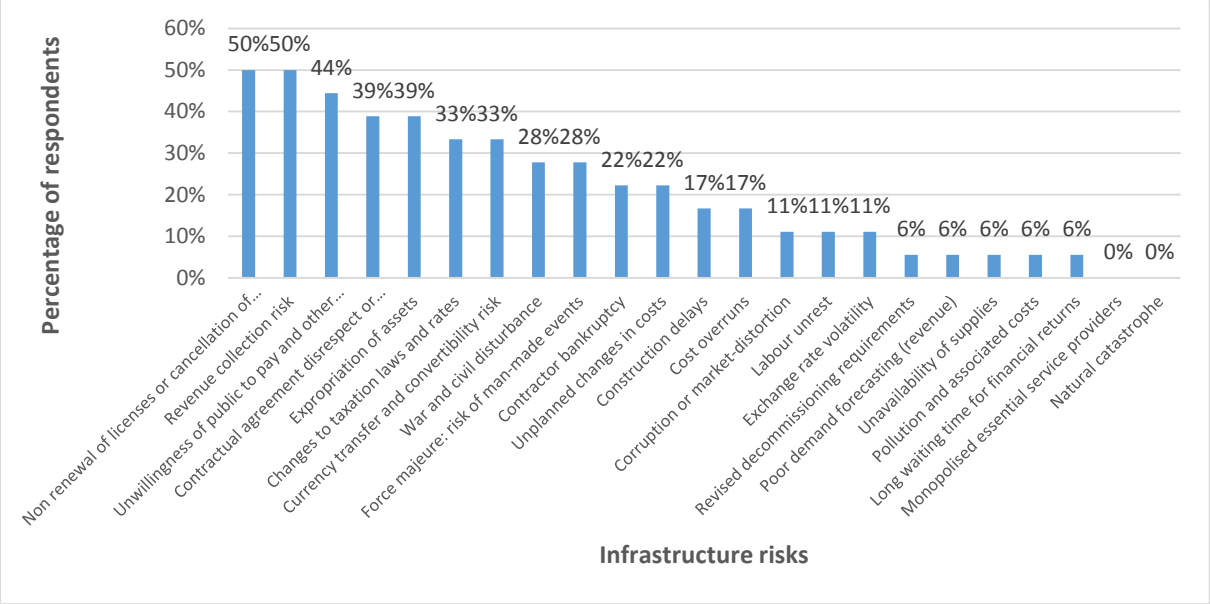

Figure 11 Infrastructure risks impacted by multilateral agency guarantees

The nature of MA guarantees' effect on infrastructure development risks

According to respondents the net effect of MA guarantees on three of the impacted risks was aggravating, rather than mitigating. These risks included 'construction delays', 'corruption or market distortion' and 'contractor bankruptcy'. According to respondents, these risks will increase, or the effect of these risks will increase, should a MA guarantee be in place.

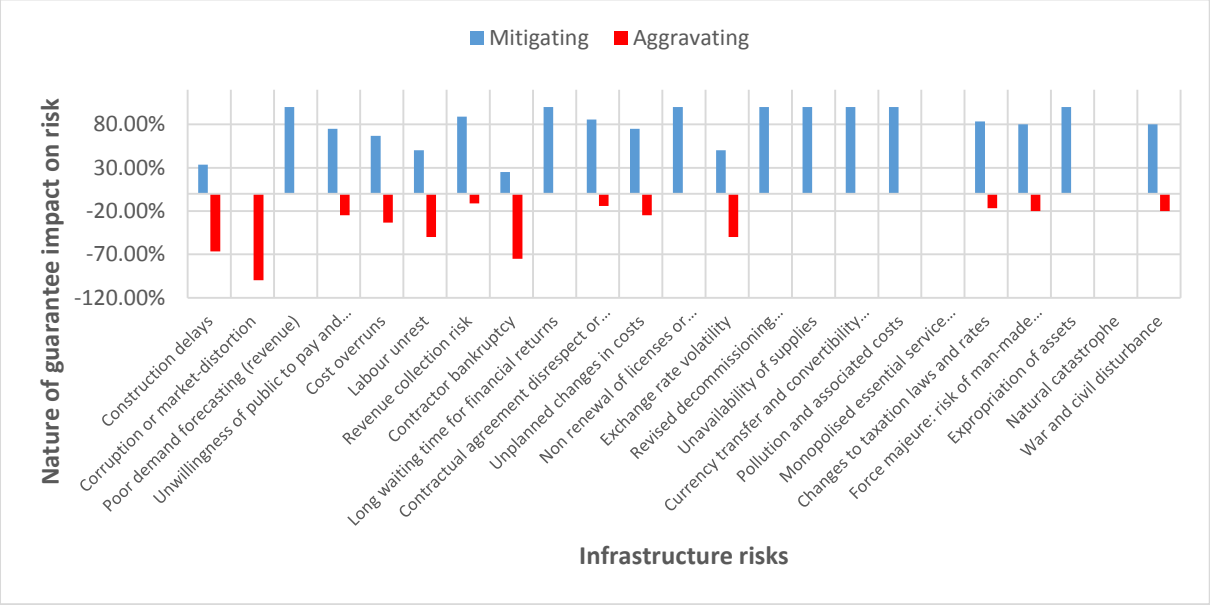

Figure 12 The nature of multilateral agency guarantees' impact on infrastructure risks

Respondents' selections of the nature of MA guarantee's impact on infrastructure risks were unanimous for nine of the 21 risks earlier selected. However, respondents again had extreme views on the nature of the guarantees' effect on three of the risks – 'labour unrest', 'exchange rate volatility' and 'construction delays'. A summary of MA guarantees' impact on infrastructure risks is illustrated in figure 12.

The significance of MA guarantees' effect on infrastructure development risks

Figure 13 illustrates the strength of a MA guarantee's impact on infrastructure risks.

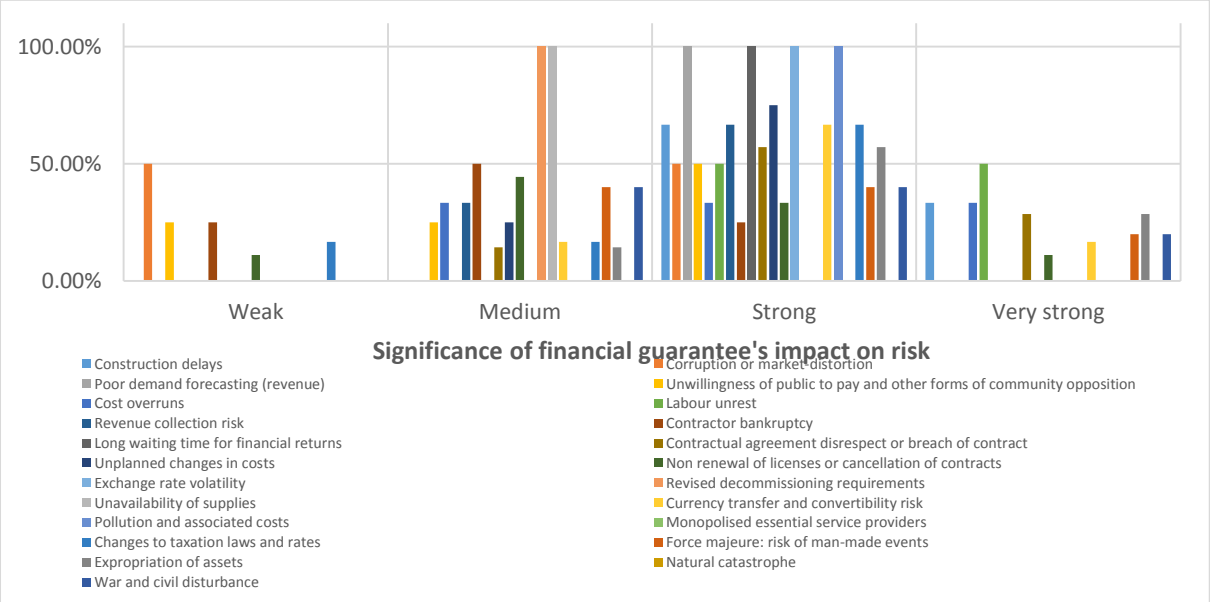

Figure 13 The strength of the impact that multilateral agency guarantees have on infrastructure risks

Similar to the findings of the government guarantees' impact, more than half of the risks (54 percent) were *strongly* impacted. The remaining risks were affected by *medium* impacts (26 percent) and *very strong* impacts (13 percent). Only 7 percent of the risks were impacted *weakly* by MA guarantees. Respondents' views on the strength of MA guarantees differed considerably. They indicated that the guarantee's impact ranged across three or more strengths for 11 of the infrastructure risks. This might indicate significantly different experiences had by respondents who worked with MA guarantees on previous projects.

4.4.3. Export Credit Agency guarantees

ECA guarantees' effect on infrastructure development risks

Four of the examined risks – 'currency transfer and convertibility' (39 percent), 'contractual agreement disrespect or breach of contract' (39 percent), force majeure' (33 percent) and 'unwillingness of public to pay and other forms of community opposition' (33 percent) – were selected by more than 30 percent of respondents when asked if ECA guarantees impact on infrastructure risks.

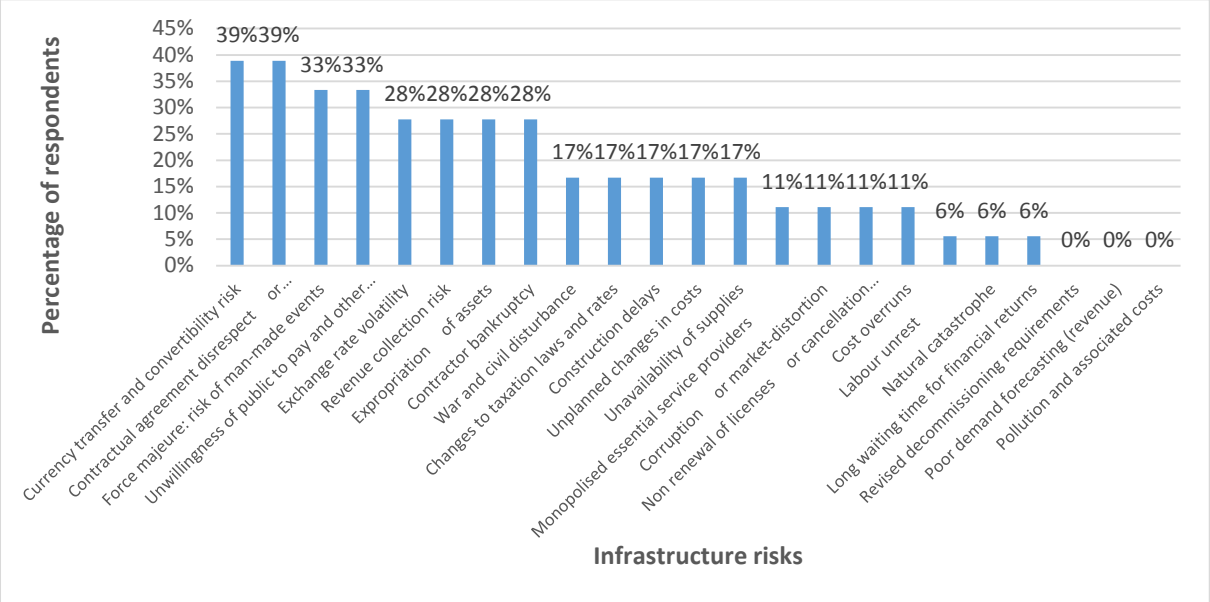

Figure 14 Infrastructure risks impacted by export credit agency guarantees

Overall, ECA guarantees impacted on the second least number of infrastructure risks, an average of only 17.4 percent. ECA guarantees were unable to impact on 'revised decommissioning requirements', 'poor demand forecasting' and 'pollution and associated cost' risks according to respondents.

The nature of ECA guarantees' effect on infrastructure development risks

Respondents indicated that ECA guarantees had the highest number (10 percent) of *weak* impacts on infrastructure risks out of all the guarantees studied. Respondents' views were only unanimous for 8 of the 20 risks earlier indicated to be impacted by ECA guarantees – 'labour unrest', 'long waiting time for financial returns', 'non-renewal of licences', 'unavailability of supplies', 'changes in taxation laws', 'expropriation of assets', 'natural catastrophe' and 'war and civil disturbance' risks. Respondents,

however, had extreme views on the nature of ECA guarantees' impact on eight of the earlier selected risks, as can be seen in figure 15 below.

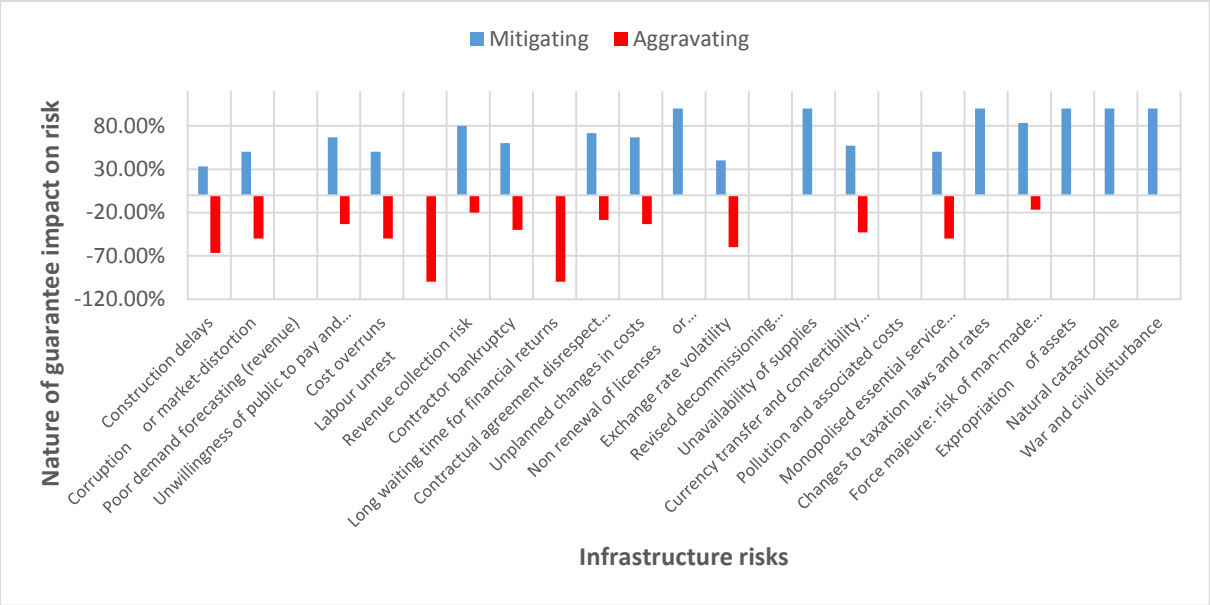

Figure 15 The nature of export credit agency guarantees' impact on infrastructure risks

The significance of ECA guarantees' effect on infrastructure development risks

ECA guarantees' impact strength on infrastructure risks were the most evenly distributed between *medium* (28 percent), *strong* (43 percent) and *very strong* (19 percent) of all the guarantees. Figure 16 illustrates the distribution of impact strength across the infrastructure risks selected earlier by respondents.

The views of respondents were spread across three of the four possible strengths for the following risks: 'construction delays', 'unwillingness of public to pay', 'contractor bankruptcy', 'contractual agreement disrespect', 'exchange rate volatility', 'currency transfer and convertibility', changes in taxation laws' and 'expropriation of asset' risks. This indicated that respondents had polar opinions of the strength of ECA guarantees.

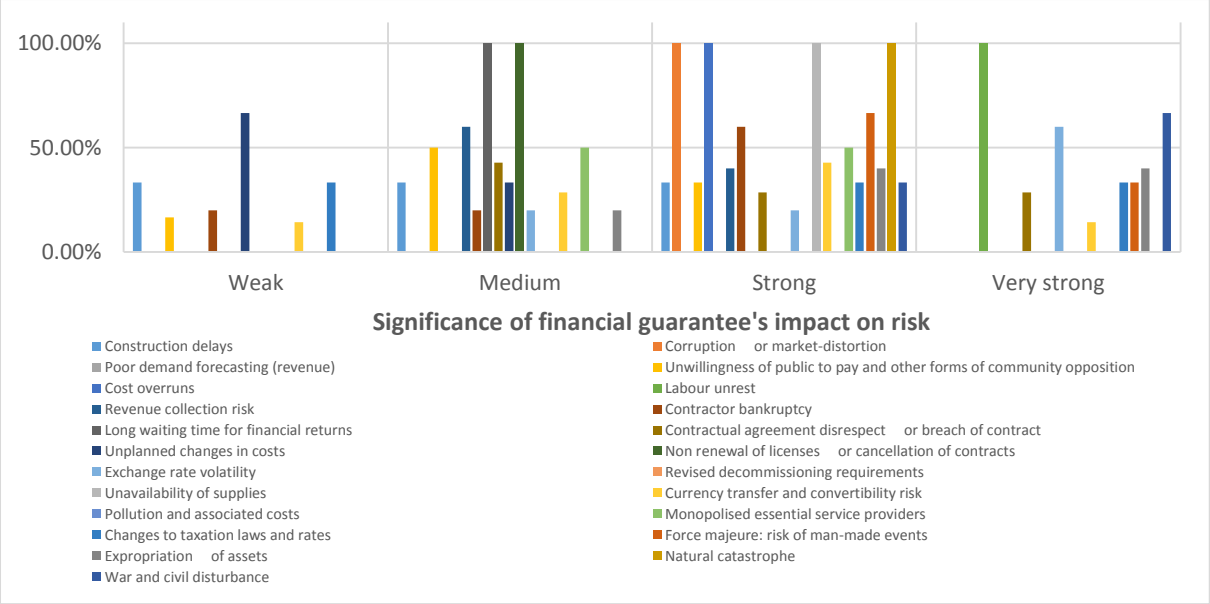

Figure 16 The strength of the impact that export credit agency guarantees have on infrastructure risks

4.4.4. Development Finance Institution guarantees

DFI guarantees' effect on infrastructure development risks

Only 14.5 percent of respondents indicated that DFI guarantees directly impact on infrastructure risks, the least effective of all the guarantees. 'Revenue collection risk' (50 percent) was the risk most impacted upon by DFI guarantees. Four risks – 'monopolised service provider', 'corruption', 'revised decommissioning requirements' and 'labour unrest' – were each only selected by 6 percent of respondents when asked if DFI guarantees directly impact on them.

A further four risks are not impacted on by DFI guarantees according to respondents. They are 'non-renewal of licenses', 'unavailability of supplies', 'pollution' and 'natural catastrophe' risks.

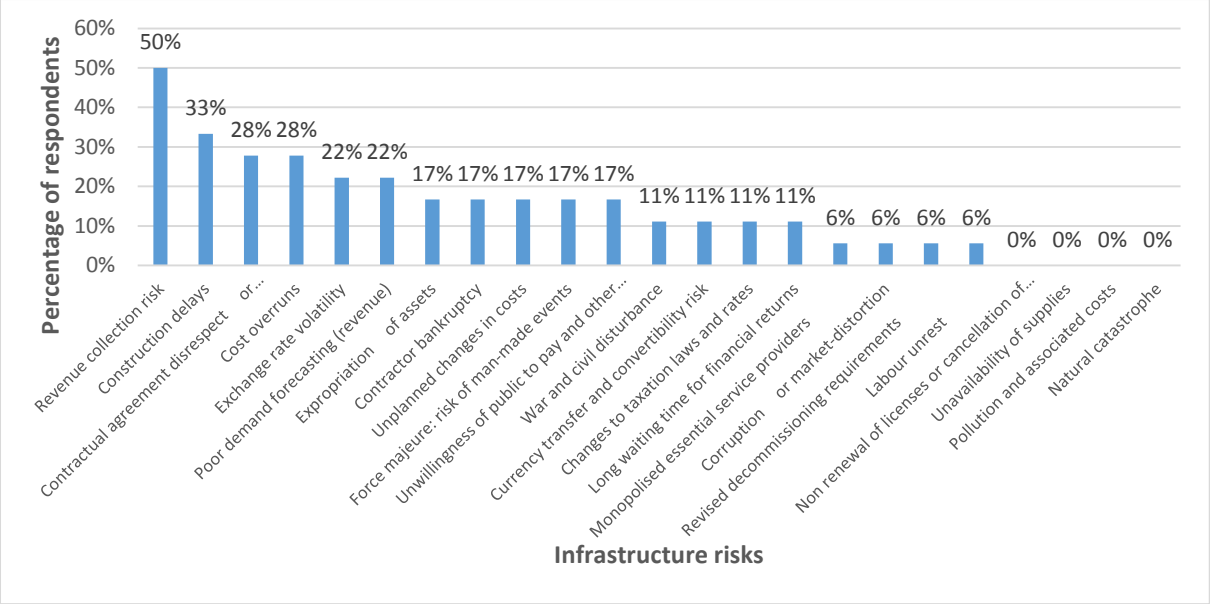

Figure 17 Infrastructure risks impacted by development finance institution guarantees

The nature of DFI guarantees' effect on infrastructure development risks

Respondents were asked to indicate the nature of a DFI guarantee's impact on the infrastructure risks selected earlier. For only eight of the 19 risks did respondents agree unanimously on the nature of the guarantee's impact. Four of the eight were because only one respondent indicated that a DFI guarantee directly impacted the risk. This means that respondents were the most divided about the worth of DFI guarantees when it comes to protecting the interests of infrastructure development stakeholders. Figure 18 illustrates the opinions of the respondents regarding the nature of DFI guarantees' impact on infrastructure risks.

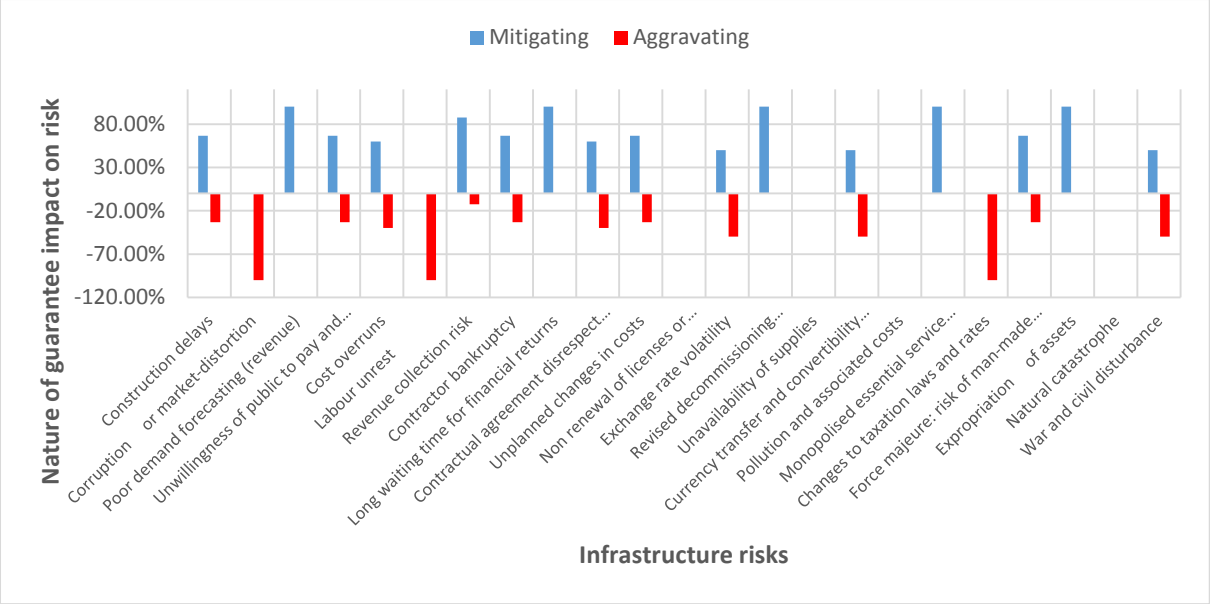

Figure 18 The nature of development finance institution guarantees' impact on infrastructure risks

The significance of DFI guarantees' effect on infrastructure development risks

Although respondents were divided about the effect of DFI guarantees on infrastructure risks, they were aligned on the strength of the guarantee. Only two of the guarantee's direct impacts were spread across more than two of the four strength options – 'revenue collection' and 'exchange rate volatility' risks.

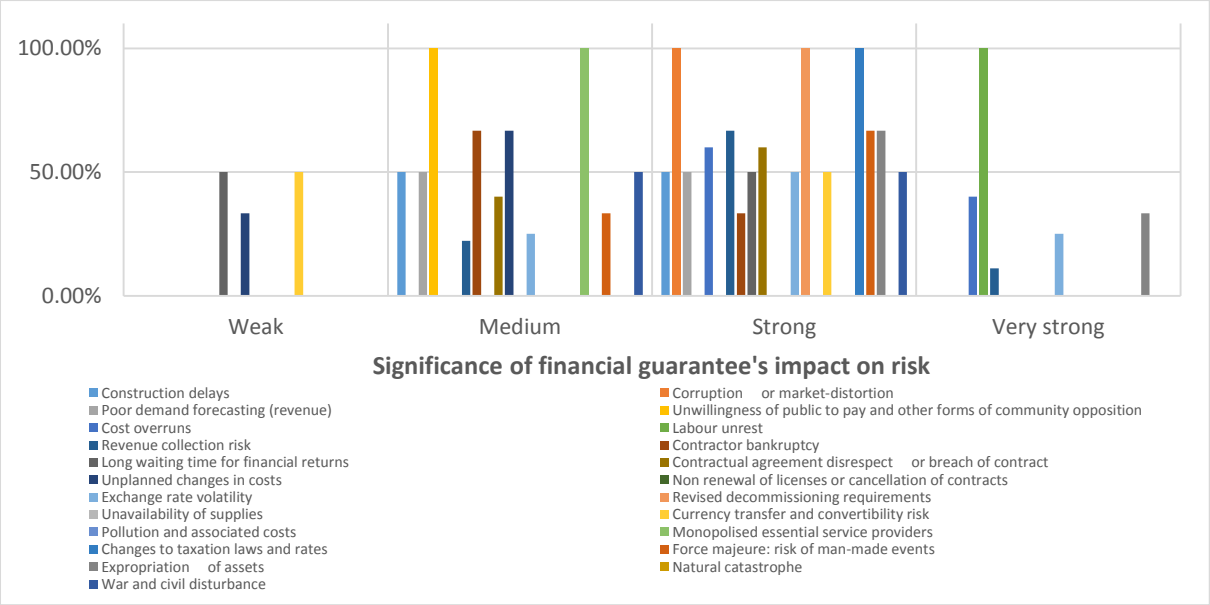

Figure 19 The strength of the impact that development finance institution guarantees have on infrastructure risks

The strength of the guarantee's impact was concentrated on the *medium* (33 percent) and *strong* (52 percent) impact selections. Only 5 percent and 10 percent of the strength selections were for *weak* and *very strong* choices respectively.

4.4.5. Private insurance policies

Private insurance policies' effect on infrastructure development risks

While insurance policies are not classified as financial guarantees, they have been used in the past to safeguard stakeholders involved in infrastructure development projects. Private insurance policies (18 percent) were viewed as more effective overall than both ECA (17 percent) and DFI (15 percent) guarantees by respondents. 39 percent of respondents indicated that 'labour unrest' and 'war and civil disturbances' were impacted by private insurance policies. None of the respondents indicated that insurance policies impact on 'monopolised essential service provider', revised decommissioning requirements', 'poor demand forecasting' or 'long waiting time for financial return' risks.

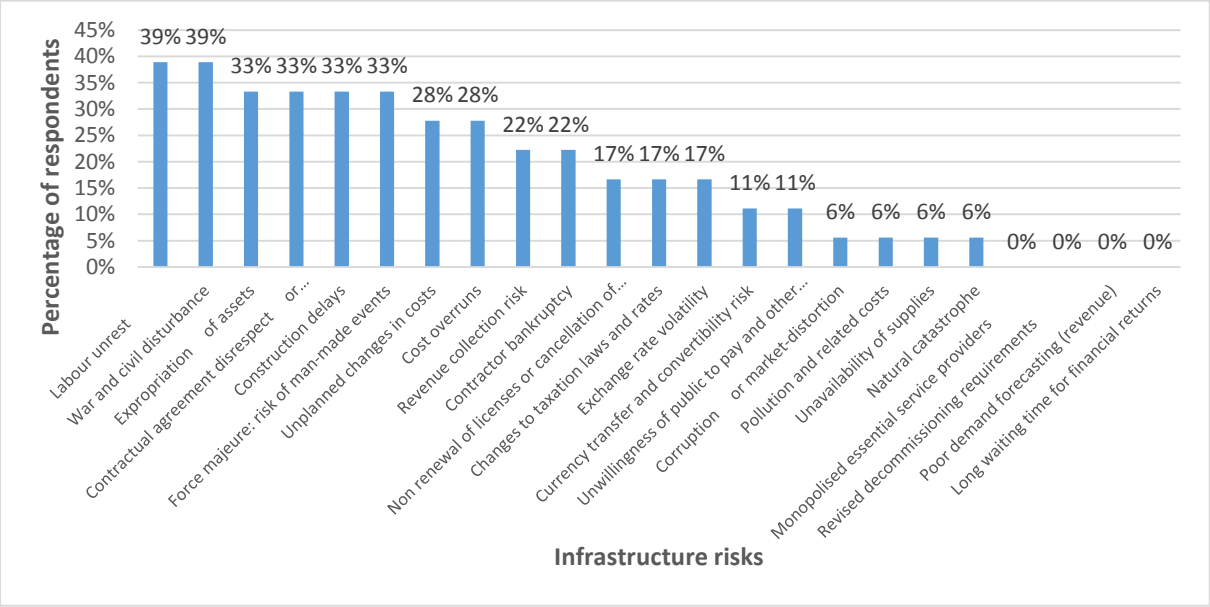

Figure 20 Infrastructure risks impacted by private insurance policies

The nature of private insurance policies' effect on infrastructure development risks

Respondents indicated that private insurance policies aggravate two of the four most prominent infrastructure risks faces in SSA – 'corruption' and 'unwillingness of public to pay' – which is distressing. Respondents also had extreme views regarding the nature of the policy's impact on 'construction delays', 'cost overruns', unplanned changes in cost' and 'changes in taxation rates' risks. A summary of the nature of insurance policies' impact is illustrated in figure 21.

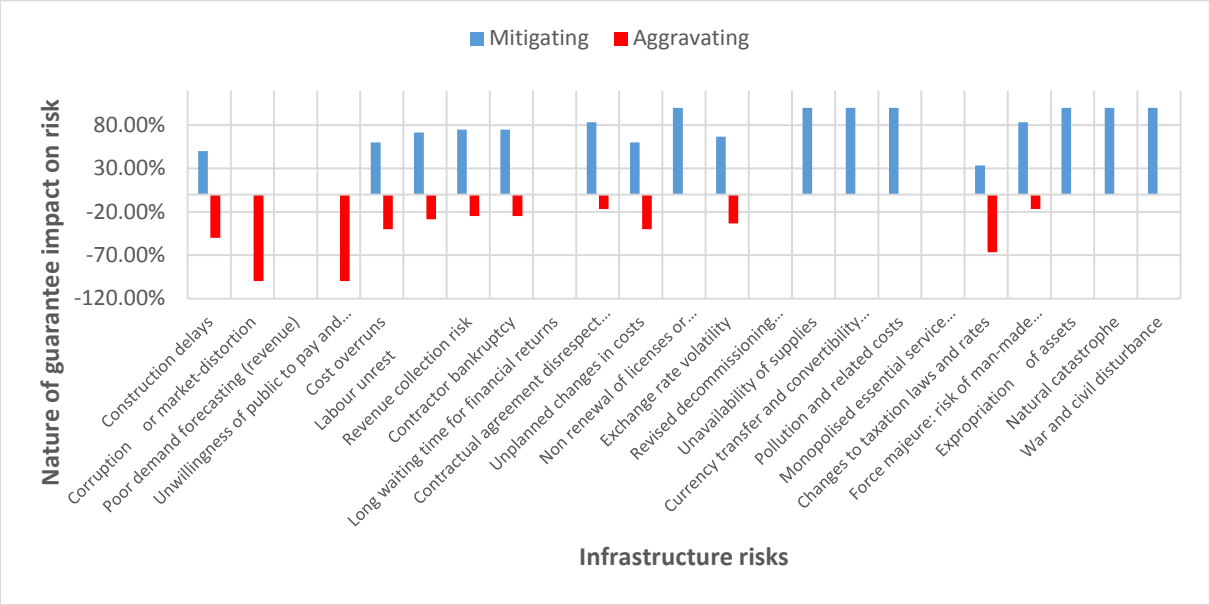

Figure 21 The nature of private insurance policies' impact on infrastructure risks

The significance of private insurance policies' effect on infrastructure development risks

Private insurance policies were rated the strongest overall in impacting infrastructure risks. Respondents indicated that the presence of an insurance policy *strongly* impacted 66 percent of all risks. A further 21 percent of the risks were impacted *very strongly* by the policy's existence.

The significance of the impact on eight of the risks was spread across three or more of the provided strength selections, again demonstrating the differences in respondents' experiences with insurance policies.

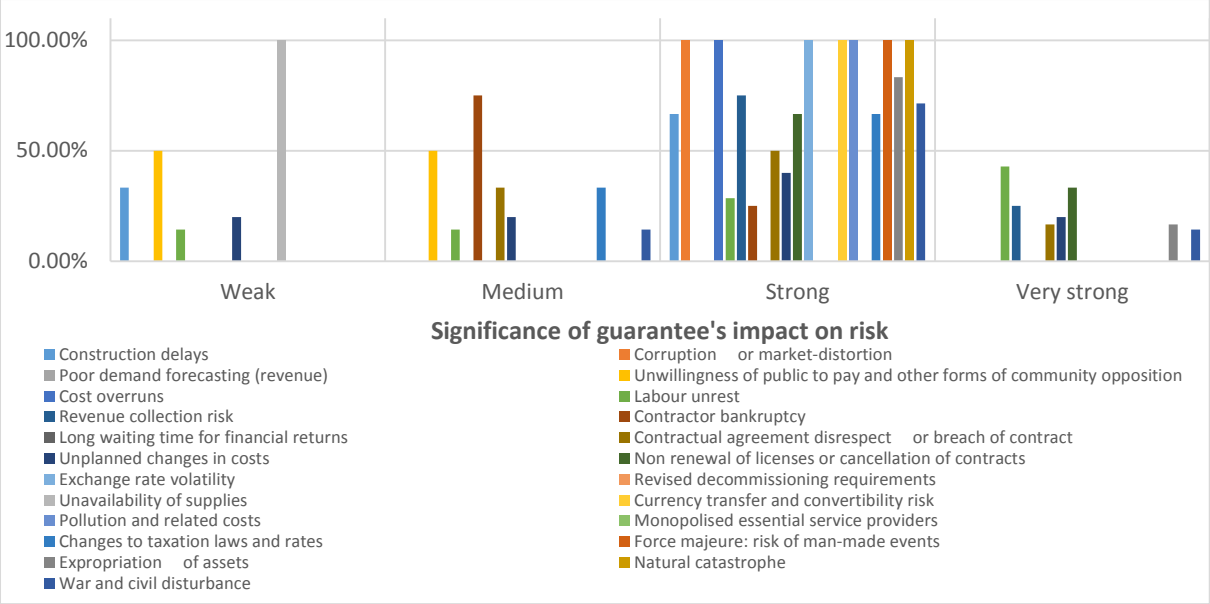

Figure 22 The strength of the impact that private insurance policies have on infrastructure risks

4.5. Summary of the results of the empirical study

The research aimed to determine to what extent five financial guarantee instruments impacted the risks generally associated with infrastructure development projects in SSA. Respondents were asked to complete an online survey as part of the research.

In total, 23 responses to the survey were received, of which 18 were valid and used for further analysis. Respondents all had experience working in infrastructure development, with the most significant proportion (17 percent) having more than 20 years' experience. The largest proportion of respondents with PPP project experience only had between 0 and 5 years' experience (25 percent). From 5 to 20 years, each five year period included 8 percent of the total respondents with PPP project experience. From this, it was deduced that PPPs were only introduced to the SSA region in the last 15 to 20 years and that there had been a steady uptake of the practice during the previous five years.

Countries in SSA where respondents had completed infrastructure projects were then analysed. Respondents who participated in the survey had completed infrastructure projects throughout the entire SSA region, specifically in the southernmost countries

between Angola and South Africa. This meant that the respondents knew the requirements for infrastructure development in the region under investigation. They also understood the risks stakeholders would face when attempting infrastructure development in SSA.

From the literature study, the 23 most common risks associated with infrastructure development were identified. Each respondent was asked to rate the risks from most significant to least significant, based on their experience. ‘Construction delays’, ‘corruption’, ‘poor revenue forecasting’, ‘community opposition’ and ‘cost overruns’ ranked in the top five. According to respondents ‘changes to taxation laws’, ‘expropriation of assets’, ‘natural catastrophes’ and ‘civil disturbances’ were the lowest rated risks encountered during infrastructure development.

To analyse the impact of the five financial guarantee instruments on the 23 most common infrastructure development risks, respondents were asked a repeating series of three questions. They were asked to:

- indicate if the risks were directly impacted by having one of the financial guarantees in place
- suggest if the impact of the financial guarantee on the risk was mitigating or aggravating in nature, and
- rate the strength of the financial guarantee’s impact on the risk, based on a four-point scale.

The results of these three questions, for each financial guarantee, are graphically presented in this chapter.

In order to answer the research questions, the results of the survey were combined, normalised and weighted to evaluate the financial guarantees’ performance consistently.

5. Discussion of results

This chapter discusses the findings outlined in Chapter 4. The research data were analysed to address the research questions, and the results discussions are supported by theoretical foundations taken from the literature review. The conclusion of the research highlights the effectiveness of different financial guarantees in moderating infrastructure development risks in SSA.

5.1. Sub-question 1

Which infrastructure risks are impacted by financial guarantees?

Research sub-question 1 aimed to evaluate respondents' views on how broad financial guarantees' reach is when attempting to impact infrastructure risks. As part of this discussion, reference is made to figure 23 which summarises the results indicated in figures 8, 11, 14, 17 and 20 in Chapter 4. Figure 23 illustrates the respondents' feedback from the survey questionnaire with the risks arranged in order of importance as indicated in table 1. Similar formatting was applied to the successive research questions.

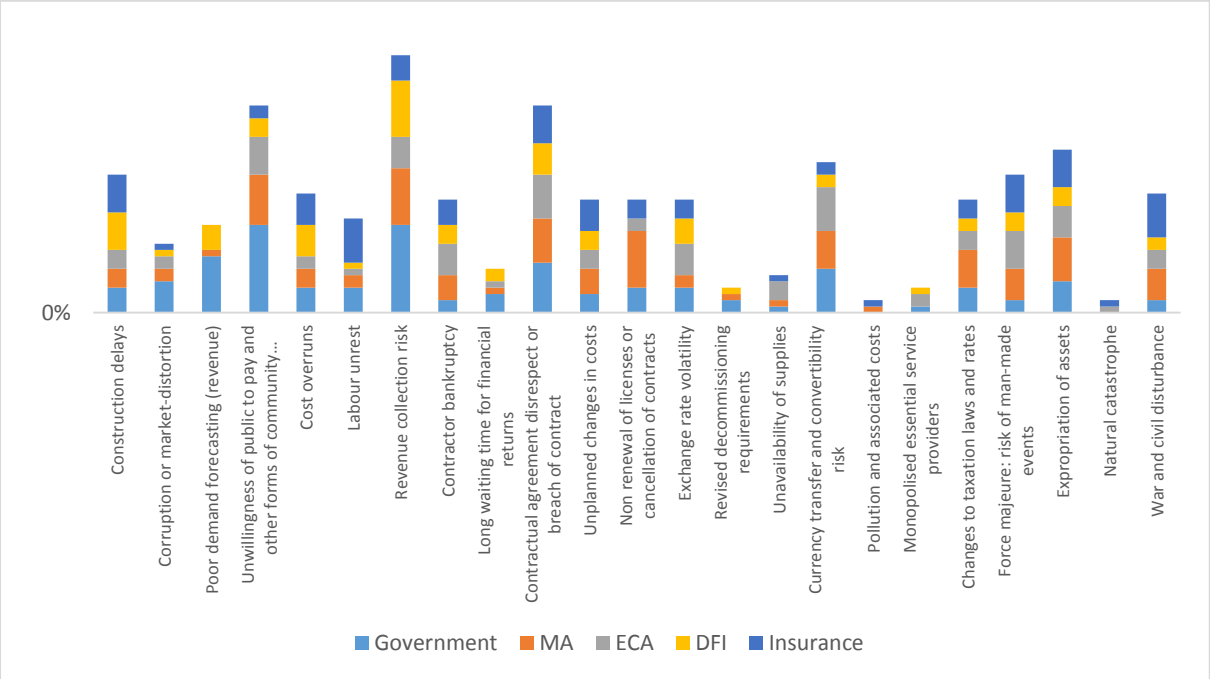

Figure 23 Respondents' view on which infrastructure risks faced in SSA, are impacted directly by the financial guarantees

According to the survey responses, a combination of all the examined guarantees directly impact on all the possible infrastructure risks. However, the probability of having a combination of all of the guarantees in place during an infrastructure project is zero. Viewing each guarantee's performance individually reveals that both government and MA guarantees directly impact on the most number of risks – 21 out of 23. DFI guarantees and insurance policies impact on the least amount of risks – 19 out of 23. All of the guarantees are thus able to directly impact on more than 80 percent of the infrastructure risks, according to respondents.

Of all the risks, 'revenue collection risk' is most impacted by the guarantees. Government guarantees were indicated by 78 percent of respondents to impact on the risk. Fifty percent of respondents indicated that MA and DFI guarantees also impact on the 'revenue collection risk'. Second was 'unwillingness of public to pay and other forms of community opposition' risks. Seventy-eight percent of respondents again indicated that government guarantees impact on the risk, while MA guarantees' impact was selected by 44 percent of respondents.

The risks identified by the respondents to be least impacted by the guarantees were 'pollution and associated costs' and 'natural catastrophes'. Only two respondents indicated that the risks were directly impacted by any of the guarantees, making it clear that a financial guarantee is not a suitable solution to pursue when faced with environmental risks. This result was expected as there is limited control a stakeholder can administer if the initial project plan did not make provision for the risks. The probability is good that projects hampered by 'pollution' risks do so due to negligence and incompetence on the part of the project owner.

Other risks which fall into the same category include 'poor demand forecasting', 'revised decommissioning requirements' and 'monopolised essential service provider'. Only three respondents indicated that these risks were impacted by any of the guarantees, making it unlikely that the risks can be moderated through the application of a financial guarantee. These risks should only occur if a project's planning was not properly completed beforehand and the necessary service delivery and support contracts not put in place. Stakeholders are thus empowered to self-mitigate these

risks. Ultimately, this supports the argument made by Irwin (2007) in that guarantees only protect stakeholders from the risks they have little influence over.

Of the top ten risks identified (see table 1), only two are not impacted by all of the guarantees. ‘Poor demand forecasting’ is not impacted by ECA guarantees or private insurance policies, while ‘long waiting time for financial returns’ is not impacted by private insurance policies. Taking the most pessimistic view of this result reveals that 80 percent of the most severe risks faced during infrastructure development projects are influenceable through financial guarantees. This answers sub-question 1.

5.2. Sub-question 2

Are the infrastructure risks’ presence and potential consequences mitigated or aggravated by the presence of financial guarantees?

Research sub-question 2 endeavoured to identify if the impact of the financial guarantees reduced or increased the likelihood of encountering the infrastructure risks or the potential consequences of the risks. It was expected that all of the guarantees would mitigate risks. However, this turned out to be incorrect. Figure 24 visually illustrates the respondents’ views on the effects of the guarantees on the risks, summarising the findings indicated earlier in figures 9, 12, 15, 18 and 21. The left-hand side of the vertical axis refers to more aggravation, while the right-hand side shows more mitigation by the guarantee. Only the risks identified in research sub-question 1 were investigated.

Respondents indicated that the introduction of financial guarantees aggravated four of the risks. These include ‘construction delays’, ‘corruption or market-distortions’, ‘labour unrest’ and ‘contractor bankruptcy’. This means that stakeholders are less likely to actively manage these risks if the respective guarantee is in place. All of the respondents specified that ‘corruption’ risks were aggravated by the presence of any form of financial guarantee. This is an issue rife throughout SSA and was also mentioned in the report distributed by the Economic Intelligence Unit (2015).

Respondents also indicated that of the five guarantees, only government guarantees aggravate the effects of the 'cost overrun' risk. Taking into account that government guarantees are the most popular form of guarantee utilised in SSA, it seems to add to the fact that nine out of every ten infrastructure projects conducted, experience cost overruns (Vision2030, 2017).

Another interesting finding from the analysis revealed that respondents had extreme views on the nature of the guarantees' impact on nine of the risks. Some respondents felt that the guarantees mitigate the risks while others viewed the effect as aggravating. These risks included 'labour unrest', 'contractor bankruptcy' and 'changes to taxation laws and rates'. No concrete reason for this was found, but it might indicate that respondents had significantly different experiences in working with these risks and guarantees.

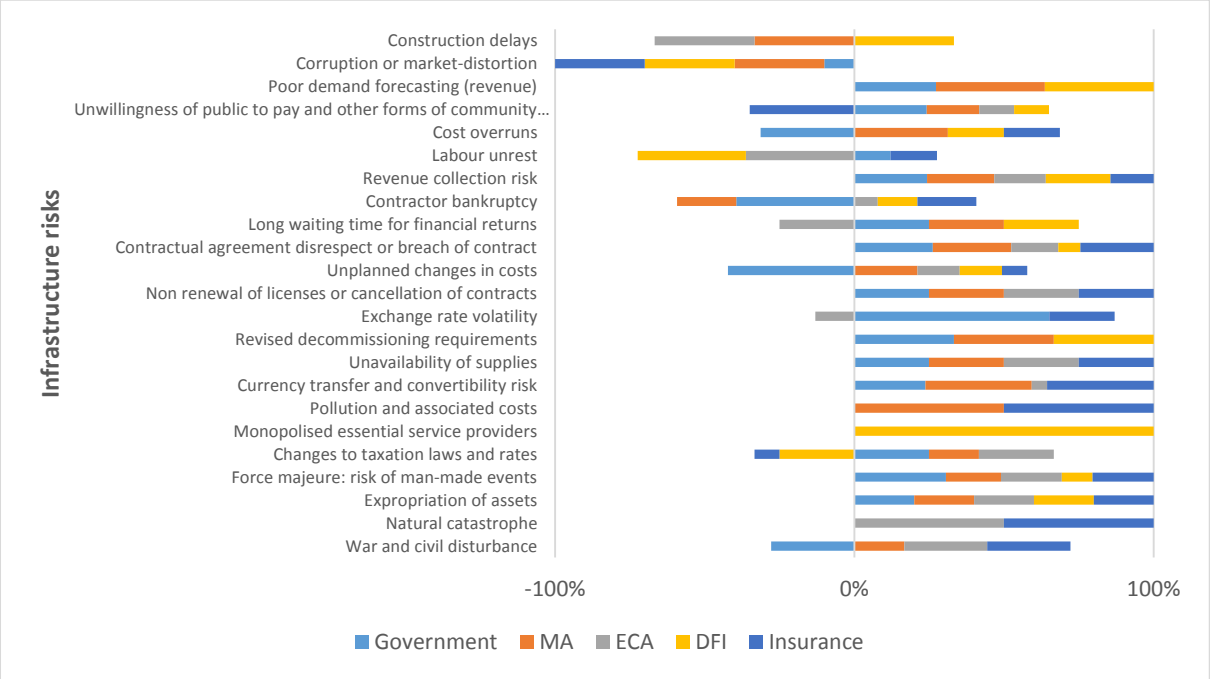

Figure 24 Respondents" view on the nature of the guarantees' impact on infrastructure risks faced in SSA

Although ECA guarantees are more often implemented to bring risky projects to life (ECAWatch, n.d.), government guarantees were indicated to have aggravating effects on more risks than ECA guarantees do. This contradicts the statement that ECA guarantees lead to weaker projects in general. The effects of the guarantees, as illustrated in figure 24, answer research sub-question 2.

5.3. Sub-question 3

How big are the financial guarantees' direct impact on infrastructure risks?

Research sub-question 3 attempted to determine how big the impact of the guarantees identified by the respondents, were on the risks. The aim was to indicate which guarantee had the most significant effect on each of the risks, simplifying the decision-making process required when sourcing a specific guarantee for an infrastructure or PPP project. Figure 25 illustrates the size of the guarantees' impact calculated using the four-point scale discussed in Chapter 3.

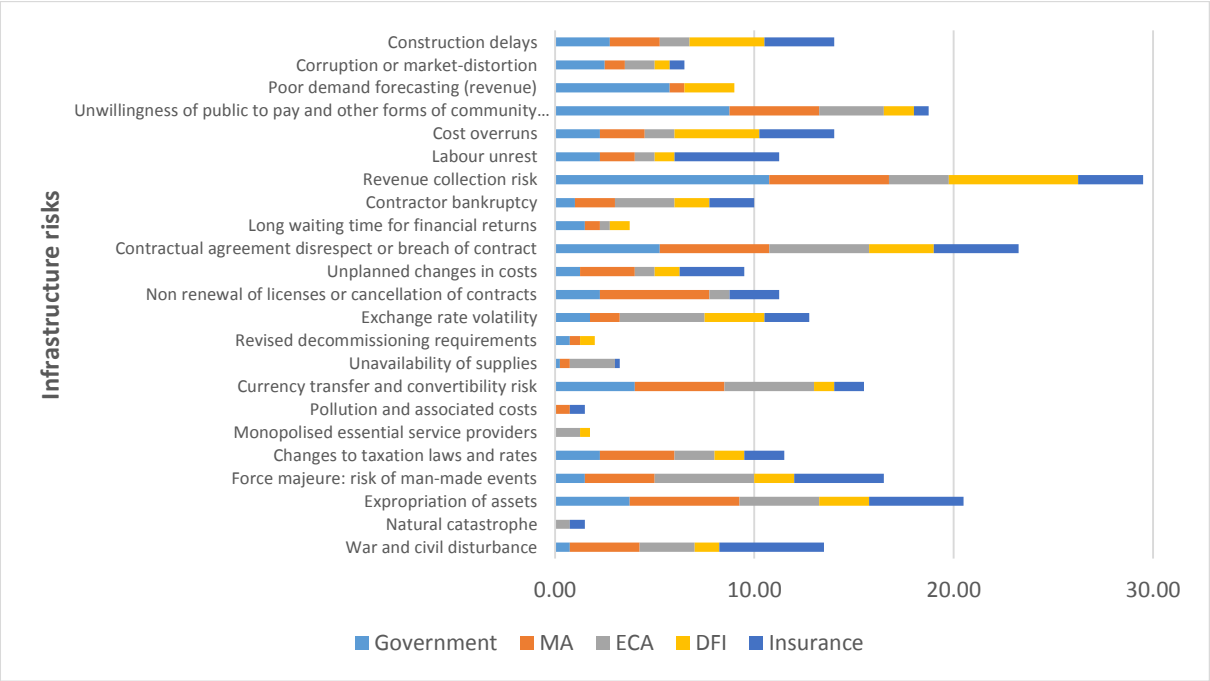

Figure 25 Respondents' view on the strength of the guarantees' impact on infrastructure risks encountered in SSA.

The respondents' selections of the strength of the guarantees' impact on the risks were multiplied by the numerical values ranging between 0 and 1. The results of the calculations are intended to be compared directly to one another in order to determine which guarantee's impact on any of the risks is the biggest. Government guarantees had the highest average score of 2.66 with a maximum of 10.75 linked to its impact on 'revenue collection risk'. Government guarantees were also indicated to have the second biggest impact on a single risk – 'unwillingness of public to pay and other forms of community opposition' (8.75).

Although DFI guarantees had the lowest average score of 1.74, it had the third highest individual risk impact of all the guarantees. The risk impacted is 'revenue collection risk' (6.50).

In total, 34 of the 115 relationships tested between the guarantees and risks resulted in weighted average values of less than one. This means that, in most instances, guarantees are limited in their ability to moderate infrastructure risks. This is especially true when this statistic is compared to government guarantees' impact on 'revenue collection risk' (10.75) and the overall average of all the relationships (2.27).

Figure 25 summarises the answer to research sub-question 3.

5.4. Key research question

How does government guarantees compare to the financial guarantees issued by other institutions in addressing the risks confronted during infrastructure development projects in Sub-Saharan Africa?

The key research question intended to compare the effectiveness of government guarantees to other financial guarantee instruments, in order to simplify the process of pre-selecting a suitable guarantee when commencing or participating in infrastructure development and PPP projects in SSA. This was done by combining the results of the three sub-questions, weighting each to account for the respondents' inputs, and determining the actual significance of each guarantee's impact on each infrastructure risk. All values more than zero (marked in blue), indicate mitigation of the risk and its potential effects.

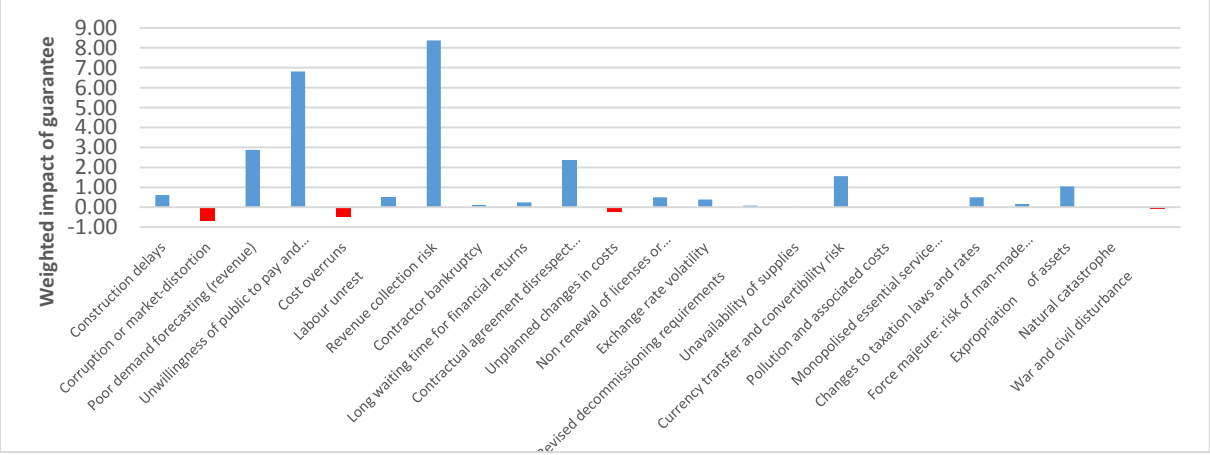

Figure 26 Government guarantee's weighted impact on infrastructure risks encountered in SSA

From figure 26, it is clear that government guarantees are most effective against ‘revenue collection’ (8.36), ‘unwillingness of public to pay’ (6.81), ‘poor demand forecasting’ (2.88) and ‘contractual agreement disrespect’ (2.33) risks.

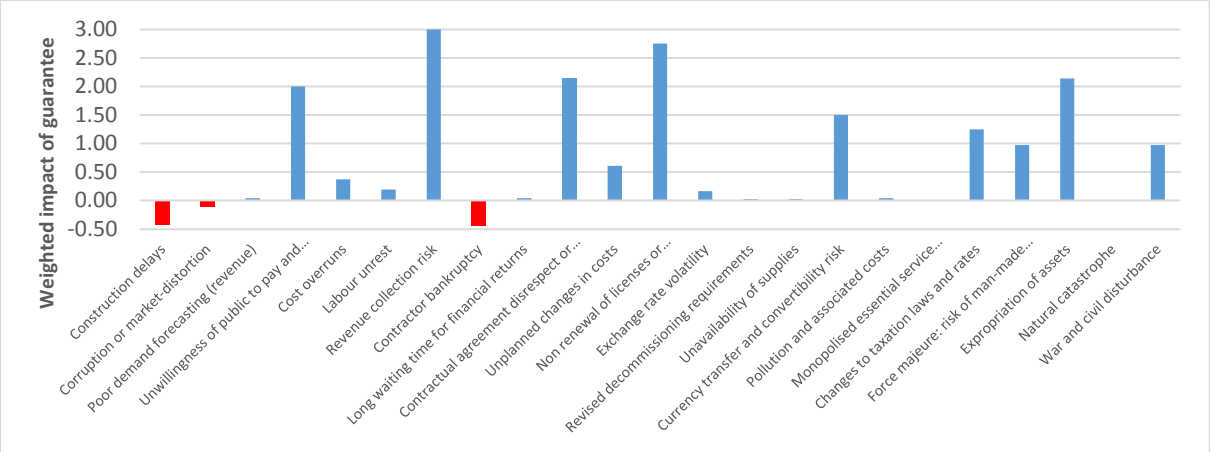

Figure 27 MA guarantee’s weighted impact on infrastructure risks encountered in SSA

MA guarantees are most effective against ‘revenue collection’ (3.00), ‘non-renewal of licences or cancellation of contract’ (2.75), ‘contractual agreement disrespect’ (2.14) and ‘expropriation of asset’ (2.14) risks, as can be seen in figure 27. Its effectiveness remained reasonably constant over another five risks, indicating a wide field of influence. MA guarantees were able to significantly outperform government guarantees on ‘non-renewal of licences or cancellation of contract’, ‘expropriation of assets’ and ‘war and civil disturbance’ risks.

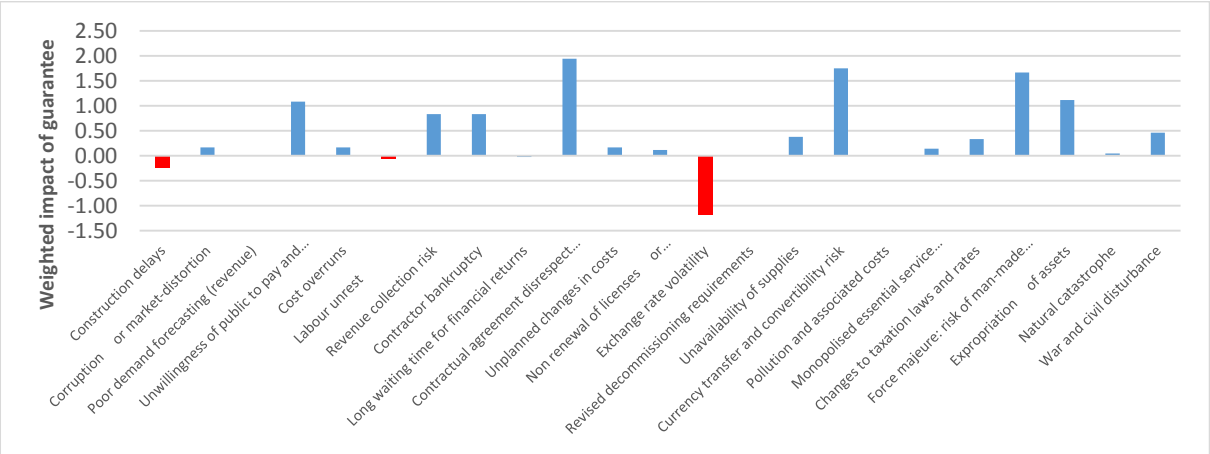

Figure 28 ECA guarantee’s weighted impact on infrastructure risks encountered in SSA

As illustrated in figure 28, ECA guarantees have the most notable aggravating effect on a single risk of all the guarantees – 'exchange rate volatility' (-1.18). ECA guarantees, however, performed well against 'contractual agreement disrespect' (1.94), 'currency transfer and convertibility' (1.75) and 'force majeure' (1.67) risks. ECA guarantees are unable to moderate the risks best moderated by government guarantees to any mentionable degree and was unable to outperform government guarantees to any great extent on the remaining risks.

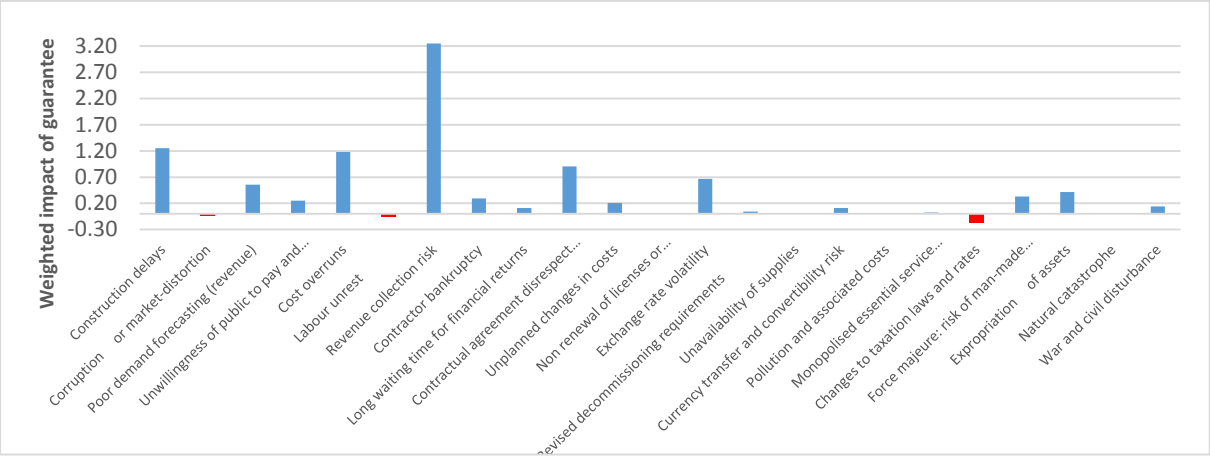

Figure 29 DFI guarantee's weighted impact on infrastructure risks encountered in SSA

'Revenue collection' risk is again the best-moderated risk by DFI guarantees, as is illustrated in figure 29. DFI guarantees are fairly effective against 'construction delays' (1.25) and 'cost overrun' (1.18) risks. These are also the only two risks on which DFI guarantees have more impact than government guarantees.

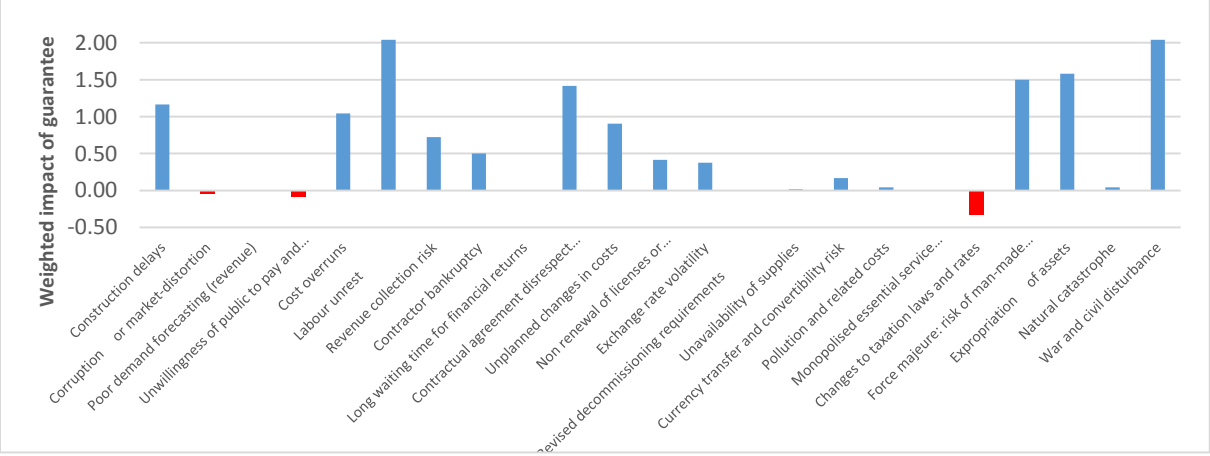

Figure 30 Private insurance policy's weighted impact on infrastructure risks encountered in SSA

Similarly to the other investigated guarantees, insurance policies are unable to match the significance of government guarantees' impact in general. However, it was able to outperform government guarantees in seven risks – 'construction delays' (1.17), 'cost overruns' (1.04), 'labour unrest' (2.04), unplanned changes in cost' (0.90), 'force majeure' (1.50), 'expropriation of assets' (1.58) and 'war and civil disturbance' (2.04). This makes private insurance policies the best alternative to government guarantees when evaluating its performance against all the infrastructure risks together.

Although government guarantees only ranked 16th out of 18 critical success factors related to PPP success (Li et al., 2005), and significantly aggravated the effects of both 'corruption' and 'cost overrun' risks, it is by far the most effective financial guarantee according to respondents. This confirms the argument of Brealey et al. (1996) that government guarantees add legitimacy to infrastructure projects.

Government guarantees faired 30 percent better overall than the second best guarantee, MA guarantees. It outperformed private insurance policies by 45 percent, and both ECA and DFI guarantees by more than 60 percent, according to respondents. DFI guarantees performed the worst out of the five guarantees according to respondents. Only government guarantees were able to meaningfully moderate some of the ten most significant infrastructure risks faced in SSA.

MA guarantees failed to have any impact on only two risks and aggravated a further three. All the other guarantees failed to impact, and had no impact, on seven risks each.

All of the results are combined in figure 31, allowing for easy and direct comparison between the financial guarantees' performance. The higher the value of the weighted impact which is indicated, the more significant the guarantee impacts on the infrastructure risk. Visual representations of the final FCMs are attached as a supplementary file.

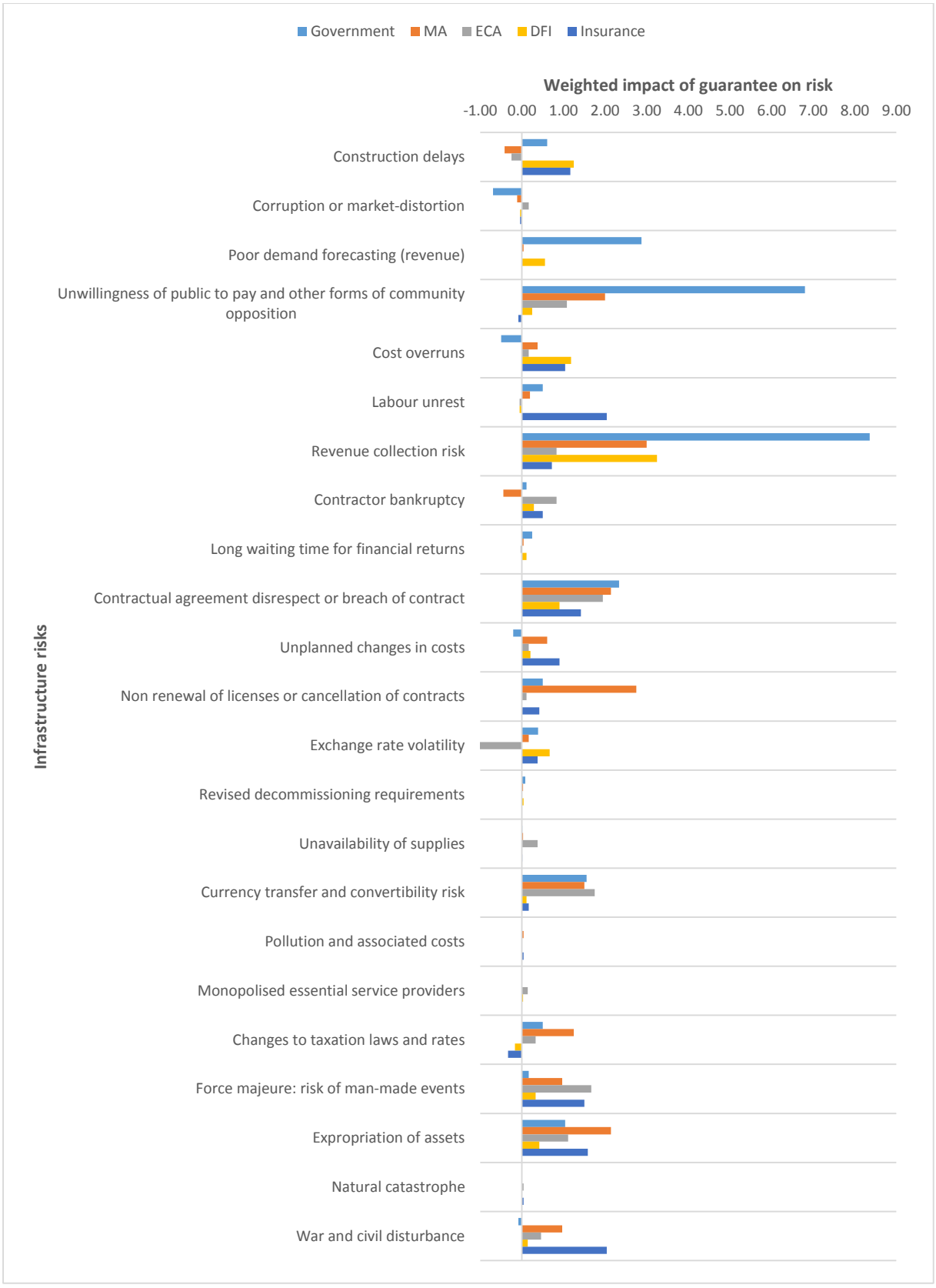

Figure 31 Summary: The weighted impact of all financial guarantees on infrastructure risks faced in SSA

6. Conclusions of the study and recommendations for future research

6.1. Significant findings

Irwin (2007) indicated that government guarantees are primarily used to attract private investors to infrastructure development projects, protecting stakeholders from revenue risks and exchange rate risks.

From this research, government guarantees significantly impact on infrastructure risks related to revenue collection, poor demand forecasting, contractual agreement disrespect, and any possible unwillingness of the public to pay for the use of the development. Although there is slight mitigation of exchange rate risks, the effect is insignificant compared to the previously mentioned risks.

From previous literature, DFI, MA and ECA guarantees are all backed or funded by a combination of governments from various developed countries. This means that these guarantees are themselves dependant on secure and robust government funding. They also all focus on infrastructure development projects in developing countries and regions (ECAWatch, n.d.; Organisation for Economic Co-operation and Development, 2018; Reinsberg, 2016).

From this research, it is clear that none of these guarantees can match the total impact government guarantees have on infrastructure risks. Government guarantees outperformed the best of these guarantees, MA guarantees, by 30 percent. As a stand-alone guarantee then, none of the alternatives can improve on the effectiveness of government guarantees in moderating infrastructure risks or attracting private investment. Government guarantees remain the most favoured and effective guarantees to pursue when participating in infrastructure development and PPP projects.

However, some of the guarantee instruments perform better than government guarantees at mitigating specific risks. MA guarantees better protect stakeholders against contract cancellations and license non-renewals, unexpected changes to taxations laws and rates, expropriation of assets, and civil disturbances. ECA guarantees are better at mitigating risks associated with force majeure, contractor bankruptcy and civil disturbances. DFI guarantees outperform government guarantees in mitigating infrastructure risks associated with cost overruns, exchange rate volatility, and construction delays. Finally, private insurance policies are better at protecting stakeholders from potential loss due to labour unrest, cost overruns, construction delays, civil disturbances, expropriation of assets, force majeure, and unplanned changes in project costs. Each guarantee has its own areas of strength and weakness.

It is clear from the research that financial guarantees cannot negate or mitigate infrastructure risks on their own. This is especially true when focussing on the results for the ten most significant infrastructure risks. Combining one or more of the alternative guarantees with a government guarantee could vastly improve the level of protection, thus increasing private investor participation in infrastructure projects in SSA.

Therefore, for infrastructure projects to work in risky developing market environments, a combination of government guarantees and financial guarantees are required. Selecting which financial guarantee to pare with a government guarantee depends on the project-specific risks. As a minimum, government guarantees need to cover all risks associated with poor demand forecasting, community opposition, revenue collection, and license renewals. Financial guarantees need to cover the risks associated with construction delays, cost overruns, labour unrest, cancellation of contracts, currency transfers and convertibility, force majeure, and civil disturbance.

6.2. Considerations and limitations

Although extensive efforts were made to ensure that the research was as exhaustive as possible, it is important to remember that the findings were based on the inputs of 18 experienced stakeholders, and how their responses related to existing literature and prior research. The results, as illustrated through figures 26 to 30 and the FCM supplementary files, are intended to supplement and support investors' and developers' decision-making processes regarding new infrastructure projects.

6.3. Recommended future research

Recommended future research flowing from this paper include:

- Understanding the reasons behind the polar views held by stakeholders regarding the nature of financial guarantees' impact on infrastructure risks.

- In what ways, except through financial guarantees, do stakeholders attempt to moderate the most significant infrastructure risks?

- Why do financial guarantee strengths differ so significantly, even for similar types of infrastructure risks?

- What makes alternative guarantees more effective against certain infrastructure risks, and how can this advantage be developed to cover more of the risks?

- How substantially do financial guarantees increase the risks associated with corruption when performing infrastructure and PPP projects?

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