Proposal Title

Impact of Public Infrastructure Investment in South Africa: A Dynamic Micro-simulation CGE Analysis

RESEARCH PROPOSAL
Presented to
PEP Network

By
Name of lead researcher
Vanduzai Mbanda (PhD Candidate)
Names of other team members
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COUNTRY
South Africa

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1. Abstract (100 to 250 words)

Policies like the Accelerated and Shared Growth Initiative for South Africa, Critical Infrastructure Programme, Industrial Development Zones, preparations for the 2010 FIFA World Cup and Expanded Public Works Programme were introduced to increase investment in infrastructure in South Africa, among other things. These policies increased the pace of infrastructure investment in South Africa. Investment in infrastructure affects productivity, labour demand, economic growth, prices, consumption, employment, income distribution, poverty and welfare. Static CGE models are invaluable in assessing economy-wide impacts of economic policies but are unable to account for accumulation effects and detailed distribution effects of policies like infrastructure investment. To overcome this shortcoming, a sequential dynamic micro-simulation CGE model, which accounts for accumulation effects and enables the poverty and inequality analysis of policy effects through time, will be used. Dynamics are crucial because infrastructure is a long term investment while micro-simulation is essential for distribution analysis. While many studies on infrastructure investment in South Africa have been done, there are none which use dynamic micro-simulation CGE modelling to assess the economy-wide impact of infrastructure investment. A few studies done on the impact of increasing infrastructure investment neither account for dynamics nor detailed poverty and inequality analysis. This study will assess how public infrastructure investment will affect the whole economy not only in the short but in the long run as well, focusing of poverty and distribution. This will determine if further increases in public infrastructure investment in South Africa are justified

2. Main research questions and core research objectives

Some of the initiatives to increase infrastructure investment which are already on the ground are the Critical Infrastructure Programme (CIP), the Industrial Development Zones (IDZ) programme, the Accelerated and Shared Growth Initiative for South Africa (ASGI-SA), construction for the 2010 FIFA World Cup and the Expanded Public Works
Programme. The CIP seeks to leverage strategic investment projects that are considered as engines of economic growth in the country by targeting infrastructure that enables the expansion of existing defined investment. The CIP partly funds the construction of infrastructure that enables an investor to undertake a defined fixed investment, or the expansion of existing fixed investment. The CIP initiative targets private, public and private-public partnerships that can contribute in the building of needed infrastructure for the country’s development. The IDZs are purpose built industrial estates linked to an international airport or port. There are generally other sets of favourable policies and development in IDZs, for instance infrastructure, which generally do not apply to the rest of the country. IDZs should be strategically located with proximity to markets, supporting infrastructure such as electricity, transport water etc.

ASGI-SA identifies increasing infrastructure investment as one of the six key factors needed to achieve economic growth and reduction in unemployment and poverty by 2014. This policy increased the pace of infrastructure investment in South Africa. ASGISA came with an expansionary public infrastructure expenditure of R482 billion for the period 2008 to 2011 (Government Communications 2008: 35). The Expanded Public Works Programme (EPWP) is an initiative aimed at creating employment for unskilled workers and is involved in such activities as road construction. About R13b was budgeted for infrastructure on Expanded Public Works Programmes for 2006/7 (Altman and Hemson 2007: 13). EPWP was allocated an estimated R52b over the 2010/11 to 2012/13 3-year period (Gordhan 2010: 19).
Despite investing heavily in public infrastructure over the past years, South Africa continues to invest in public infrastructure investment. The planned public infrastructure expenditure for the 3-year period from 2010/11 to 2012/13 is about R850 billion (R846 billion according to Gordhan (2010: 20) and R872 billion for the same period according to the Medium Term Budget Policy Statement (2009: 44)). Further plans for infrastructure programmes for the coming 10-20 years are said to be underway in response to the long-term development challenges of the country (Gordhan 2010: 20).

The infrastructure investment initiatives as mentioned above need to be thoroughly assessed in terms of their long term impact on the economy, particularly the impact on poverty and inequality. The results of this assessment will help determine whether or not continued increases in public infrastructure investment are warranted.

Research Questions

How does public investment in infrastructure affect the South African economy in the short and long run?

What is the impact on:

- Economic performance?
- Rural versus urban development?
- Employment and household income?
- Poverty and inequality?
Research Objective

To quantify impact of public infrastructure investment in SA

To assess effect of infrastructure investment on various socio-economic aspects

To determine achievement of goals: Job creation, poverty reduction, income distribution and economic growth

3. Scientific contribution of the research

Including a short list of key references in the literature and knowledge gaps

The contribution of this study is to analyse the short and long term economy-wide and distributional impacts of public infrastructure investment in South Africa. This will indicate if investment in public infrastructure is successful in achieving economic growth which unemployment reduction and welfare enhancing. The main focus of previous studies has been to estimate the relationship between infrastructure and economic growth. Literature on CGE modelling of the impact of public expenditure in general is not much. The few studies available mostly concentrate “on health and education expenditure and not infrastructure investments specifically” (Estache, Perrault and Savard 2007: 4).

Although a lot of attention was given to the infrastructure-growth relationship in South Africa in the last two years, Fedderke and Garlick (2008: 11) argue that the topic remains understudied and all studies on South Africa measure, directly or indirectly, the relationship between infrastructure and growth. The focus of numerous recent studies has
been either to estimate infrastructure needs in developing countries or an effort to ascertain factors that affect an optimal level of public expenditure on infrastructure (Bogetic and Fedderke 2006: 7). Fedderke and Bogetic (2006: 13) found an implied constant output elasticity of infrastructure investment in the range of 0.3-0.4; total factor productivity increased by 0.04% following a 1% increase in investment in economic infrastructure.

Fedderke and Garlick (2008: 17) fear that the extent of the investment in infrastructure suggested by the ASGI-SA policy might result in detrimental macroeconomic effects. When economic evaluations of public investments are made, the distributional effects of these investments are said to be generally ignored (Duflo and Pande 2005: 2). It is important, according to Davies and Van Seventer (2006: 6), to understand distributional effects as they provide an understanding of the full impact of reforms as well as some insight into the political economy of these reforms. According to Heymens and Thome-Erasmus (1998: 663) if policy and operational interventions are purposefully implemented, the distributional effects of infrastructure can lead to poverty reduction.

A study by the Development Bank Southern Africa (DBSA) (2008) forecasts four levels of infrastructure investment in 2014 and assesses the impact of the different levels of investment on economic variables, poverty and distributional effects at the macro level. The DBSA (2008) study used a linked macro-microeconomic model to evaluate the extent to which poverty and unemployment can be reduced by ASGI-SA’s accelerated infrastructure investment. The results of the above-mentioned study can be further
improved by use of a dynamic micro-simulation CGE analysis to assess economy-wide and poverty and inequality impacts of all infrastructure investment initiatives in the country. The impact of infrastructure investment that is already on the ground also needs to be assessed to explore how the possible gains from economic growth resulting from public infrastructure investment can affect the economy in the long term.

Mabugu and Chitiga (2009) carried out a study to assess the impact of an increase in transport infrastructure investment as well as the investment put for the preparation of the 2010 FIFA World Cup in South Africa. The SAM modelling tool was used in the study. Although the results point to the importance of continued investment in transport, the findings indicate that there is an opportunity cost associated with the investment in transport infrastructure. An extra rand will have a higher return if invested elsewhere because, on average, the aggregated SAM multipliers were found to be below the national average in terms of production, supply and household income. The middle-income households disproportionately benefit more from a unit expansion in transport demand. It is argued that there is need to be cautious with regards to what can be expected from infrastructure spending as huge infrastructure expenditures can lead to inefficiency if they crowd out other investment. (Mabugu and Chitiga 2009: 36).

Jung and Thorbecke (2003) used CGE modelling to assess the human capital growth and poverty impacts of increasing public education expenditure in Tanzania and Zambia. The findings indicate that an increase in education spending results in differential gains or losses among the poor and rich across the urban-rural divide. The poor benefit more in
Tanzania but the opposite is observed for Zambia. (Jung and Thorbecke 2003: 715). Jung and Thorbecke (2003: 716) argue that "similar policies in different countries may lead to different outcomes", depending on the country’s technology and factor endowment structures. South Africa is faced with a serious skills shortage and a rigid labour market.

It is important to evaluate the impact of public infrastructure investment on employment because, according to Jung and Thorbecke (2003: 717), the effectiveness of policies can be limited by a mismatch between labour demand and supply and by labour market inflexibility.

Mabugu, Rakabe and Chitiga (2009) investigated the impact of increasing public infrastructure investment in South Africa. The study, using a static GCE analysis with the representative household approach, simulated 10% increases in each of the infrastructure sectors which are water, health, electricity, roads and communications (Mabugu et al 2009: 34). The results confirm that increases in infrastructure spending are beneficial to the economy because consumption and investment increase, resulting in an increase in GDP. The increase in capital for the affected sectors causes output for the respective sectors to increase. The fall in the overall price of capital is said to cause a general decrease in employment. Wages increase in the capital-intensive sectors but decrease in labour-intensive sectors resulting in differential household effects between urban and rural areas; with an overall improvement in household welfare from the investment policy. (Mabugu et al 2009: 34).
Although infrastructure investment is found to be beneficial for the wellbeing of the economy and of households in the above study, it is useful to have a detailed study to see its effects particularly on poverty and inequality, and over time. This can be done by using a dynamic micro-simulation analysis. Dynamics are important because infrastructure is a long term investment. Go (1994: 231) argues that the effects of adjustments in infrastructure investment are dynamic and cannot be analysed by static CGE models. However, infrastructure investment can be analysed by the use of a dynamic CGE model. Dynamic CGE models, according to Paltsev (2004: 11), are important tools for economic policy evaluation because they enable economists to provide answers for the future and they help policy makers to make decisions about the future. These models are therefore best suited to assess the long run infrastructure investment impacts.

Accounting for within-in group distributional effects, according to Boccanfusso, Estache and Savard (2009: 30), has been shown to totally reverse the results of poverty and income distribution analysis obtained from the representative agents approach. Incorporating a micro-simulation component to the CGE model will make it possible to capture such effects. Hence the poverty impacts of policy over time can be adequately measured by a dynamic micro-simulation CGE model (Annabi, Cisse, Cockburn and Decaluwe 2005: 4).

The contribution of our study to the literature on impact of public infrastructure investment is to incorporate the growth effects (that result from increasing investment in
public infrastructure) with the long run, poverty and distribution impacts. The study will analyse if public infrastructure investment is welfare increasing or reducing; particularly for the poor. By introducing dynamics the study takes into account the long term growth impact of public infrastructure investment. Incorporating micro-simulation enables a detailed analysis of the impact of public infrastructure investment on poverty and income distribution.

4. Policy relevance

With references to specific existing, planned or possible policies where possible. Evidence of consultation with potential users of your proposed research is strongly encouraged.

We carried out a project to assess the impact of infrastructure development in the CIP and the IDZ programme for the Department of Trade and Industry in 2008. The project used regional SAM modelling for only two provinces and a static CGE model for the whole economy to assess the impact of infrastructure investment under the two initiatives. The results of the study were for internal use by the Department of Trade and Industry. We therefore want to extend this study by including all investment (on the ground and planned) for the whole economy and apply dynamic micro-simulation CGE modelling to see the short term and the long term impact of such investment on the economy, focusing on the poverty and distribution impacts. The study also seeks to determine if there is need for continued investment in public infrastructure in South Africa.

According to the Public Service Commission (2007: i), the aim of public investment in infrastructure is to make people self-sufficient through the creation of more jobs to produce income. Thus we believe that evaluating the impact of public infrastructure
investment on the economy and on households will help policy makers to determine whether to continue with the policy.

The project will evaluate the impact of public infrastructure investment on employment, income distribution, poverty reduction and economic growth. This will help inform policy makers whether or not the desired outcomes of the infrastructure investment projects are being realised. If not fully realised policy makers may then decide on additional or complementary policies so that the desired objectives of policies are achieved.

Officials from the Department of Trade and Industry and from the National Treasury were consulted for their input in the research project as well as to seek their interest in the findings of the project. Officials from the National Treasury are interested in knowing the relatively efficient way of financing the investment in public infrastructure. Officials from the Department of Trade and Industry are more interested in how infrastructure investment affects export competitiveness.

5. Methodology

Presentation of the specific techniques that will be used to answer the research questions and how exactly they will be used to do so

Promoting infrastructure investment means increasing public expenditure on infrastructure investment. This has an impact on other investment, sectoral production of the infrastructure sectors as well as other sectors which are directly and indirectly linked to the infrastructure sectors. Cost of production can fall in some sectors and increase in others. As a result capital and labour demand together with returns to capital and wages
will be affected. This has an impact on household income and consumption which affect
distribution and poverty.

Public infrastructure investment affects the economy in two ways – the demand side and
the supply side. On the demand side, public infrastructure investment increases public
expenditure (the investment plus operation and maintenance costs). The effect of this is
an increase in aggregate demand which stimulates an increase in output. Factor demand
changes, which leads to changes in household income.

On the supply side, public infrastructure investment reduces the cost of production, and
improves efficiency and productivity. There are three channels through which
infrastructure investment affects the economy on the supply side. These are as a factor of
production, as a complement to other factors of production and as a stimulus to factor
accumulation (Fedderke and Garlick 2008: 4-5). In this study, infrastructure investment
will be treated as a complement to other factors. Public infrastructure investment
complements other factors of production in two ways; by reducing the cost of production
and by raising the productivity of other inputs that go into the production process
(Fedderke and Garlick 2008: 4). Reliable and adequate infrastructure like electricity and
roads raises the productivity of private capital while good education and health
infrastructure produce an educated and healthy workforce which raises labour
productivity (Fedderke and Garlick 2008: 4). Thus availability of infrastructure which is
up to standard raises total factor productivity.
Public infrastructure investment reduces the cost of production and improves productivity and efficiency. This affects factor demand and household income. In both cases the changes in factor demand and household income are affected by the elasticity of substitution between factors, the flexibility of the labour market and the availability of labour with the relevant skills. As a result of these complexities, the impact of infrastructure investment on factor demands and household income is not clear. There is thus need to analyse how the increase in public infrastructure investment will affect the economy and households via changes in other investment, production, demand and supply in all markets and changes in factor incomes. The dynamic micro-simulation CGE model will be used to analyse the magnitude of this impact.

Data
The datasets that will be used in our study are the 2005 South Africa SAM, the 2005 Income and Expenditure Survey and 2005 Labour Force Survey from Statistics South Africa. The original SAM has 27 activities and 27 commodities. The SAM has been expanded in previous studies depending on the policy issues being analysed (for example see Chitiga, Decaluwé, Mabugu, Maisonnave, Robichaud, Shepherd, Van der Berg and von Fintel 2010). Labour is disaggregated by skill and race. The SAM will be used to calibrate the CGE model. The Income and Expenditure Survey and the Labour Force Survey will be used for the micro-simulation part. Other relevant data and elasticities will be obtained from Statistics South Africa, South African Reserve Bank, previous studies and various other sources. Table 1 shows some elasticities.
Table 1: Elasticities

<table>
<thead>
<tr>
<th>Impact of:</th>
<th>On:</th>
<th>Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity generation capacity</td>
<td>GDP</td>
<td>0.20</td>
</tr>
<tr>
<td>Electricity infrastructure stock</td>
<td>GDP</td>
<td>0.40</td>
</tr>
<tr>
<td>Electricity infrastructure stock</td>
<td>Fixed Capital Stock</td>
<td>1.37</td>
</tr>
<tr>
<td>Fixed Capital Stock</td>
<td>GDP</td>
<td>0.06</td>
</tr>
<tr>
<td>Public sector infrastructure stock</td>
<td>GDP per capita</td>
<td>0.17 to 0.30</td>
</tr>
</tbody>
</table>

Source: Fedderke and Galick (2008:25-27)

**Disaggregation of infrastructure and government account**

In order to carry out a detailed analysis of the impact of public infrastructure investment there is need to disaggregate investment into private and public investment. The current SAM is not disaggregated like this, which will be an innovative contribution. It is also useful to disaggregate the government account. The government account will be disaggregated into public expenditure and public investment.

Public investment can be disaggregated by space (rural/urban, region or province), by sector or by services provided by public utilities (Benin, Pratt, Fan, Breisinger, Mogues, Thurlow and Diao 2005: 11; Babiker: 2007: 109). In our study public investment will be disaggregated by as follows: infrastructure (construction, electricity, roads and transport, communications and water), health and education. It is important to disaggregate the government sector because different forms of public investment have different pathways of impact. However, the disaggregation of the government sector does
not imply that an impact will be attributed to a single type of public investment. This is because, as argued by Benin et al (2005: 11), different types of public investment can have common pathways of impact and also different types of public investment can affect and be affected by other types of investment.

In our study the disaggregation, of investment into private and public as well as, of the government account will be based on the 2005 Input and Output tables and other relevant data from the South Africa Reserve Bank and other sources.

**CGE Model**

The Poverty and Economic Policy (PEP-1- t) standard dynamic CGE model by Decaluwé et al (2010) will be adapted for use in our study. It is a recursive dynamic CGE model which means each period is solved as a static equilibrium. Investment is driven by savings and savings are exogenous. Capital is industry specific thus the rental rate of capital is not uniform. New capital in year t+1 is from the investment made in year t.

The population index, grows at a rate $n_t$.

- $n_t$ can vary from one period to another, can be a constant or can be set to zero.

Labour supply grows at the same rate as the population index $\text{pop}_t$.

The current account balance, the minimum consumption of commodities in the LES demand equations, government current expenditures, public investment by category and by public sector industry, and changes in inventories are also assumed to grow at the population growth rate $n_t$. This assumption for the above variables growing at the same
rate as labour supply is made so that the model will be able to simulate a balanced growth path. A balanced growth path is useful for testing model consistency.

To reflect the South African labour market, labour will be disaggregated into unskilled, semi-skilled and highly-skilled workers (Chitiga et al 2010: 11; Thurlow 2008: 13; Thurlow 2004: 12. The wage will be assumed to decline up to a certain minimum in order to account for the high level of unemployment as well as the rigidity in the labour market caused by a strong labour union (Chitiga et al 2010: 11).

**Micro-simulation**

The effect of macroeconomic shocks on poverty and income distribution can be analysed by CGE modelling supplemented with micro-simulation. Micro-simulation involves the incorporation of household survey data in CGE modelling. The integrated multi-household and the micro-simulation approaches are cited as the models that allow for a rich analysis of income distribution because they both include a large number of households in the model. The micro-simulation approach will be used in this study. Even though the integrated multi-household approach's theoretical basis is said to be the best, its shortcoming is the need to construct a balanced sub-matrix for household accounts in the SAM. When using the micro-simulation approach there is no need to balance household income and expenditure since the micro module is solved sequentially. (Boccanfusso et al 2009: 130-31 and Boccanfusso et al 2009: 7-8).

Simulations of the policy shocks will be run in the CGE model in a first step. Changes in selected variables such as prices, factor payments and employment will be passed on to
the micro-simulation model in a second step. The micro-simulation model will then be used to calculate the impacts on household income and poverty. (Hérault 2010: 38; Chen and Ravillon 2004: 37, Buddelmeyer, Hérault, Kalb and van Zijll de Jong 2009: 1). The poverty index of Foster, Greer and Thorbecke (1984) and the Gini coefficient; which are the two normally used indices in micro-simulation modelling will be used for the analysis of poverty and inequality.

There are not many studies that use dynamic micro-simulation CGE modelling. A few examples are Buddelmeyer, Hérault, Kalb and van Zijll de Jong (2009), Mabugu and Chitiga (2007), and Annabi, Cissé, Cockburn and Decaluwé (2005). Dynamic CGE models make it possible to distinguish the short- and long-run effects arising from a policy initiative. A dynamic CGE model allows investment from earlier period to influence economic growth. The strength of a dynamic micro-simulation CGE model is that it can assess the economy-wide impact of a policy over time as well as evaluating the impact on employment and poverty and inequality in detail (Thurlow 2004: 13; Annabi et al 2005: 1).

Simulations

Increases in public investment in the construction, electricity, roads and transport, communications and water sectors will be simulated. Different forms of financing the increase in infrastructure spending in the sectors mentioned above will be explored: various taxes, an increase in government budget deficit and borrowing. The three
different forms of financing will be simulated to assess the most efficient form to finance public expenditure on infrastructure in South Africa.

In the first scenario we could fix government savings so that government expenditure adjusts to changes in government income.

References


6. Data requirements and sources

<table>
<thead>
<tr>
<th>Data requirement</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGE model</td>
<td>PEP</td>
</tr>
<tr>
<td>SAM</td>
<td>Statistics South Africa</td>
</tr>
<tr>
<td>Other data on updates</td>
<td>Statistics South Africa, Reserve Bank and other various sources</td>
</tr>
<tr>
<td>Income &amp; Expenditure and Labour Force Surveys</td>
<td>Statistics South Africa, National Research Foundation</td>
</tr>
<tr>
<td>Various Elasticities</td>
<td>Previous studies</td>
</tr>
</tbody>
</table>

7. Consultation and Dissemination Strategy

How, in the elaboration and execution of your project, will you consult with relevant policy makers and other stakeholders for the issues examine? How and where research results will be disseminated to policy-makers, other stakeholders, researchers and the public: publications, policy briefs, media, seminars, policy conferences, etc. (see PEP’s consultation and dissemination strategy for ideas)
The results of the project will be disseminated at the academic and policy levels. At the policy level the outcome of the project is planned to be disseminated to the Department of Trade and Industry for whom we did the CIP and IDZ infrastructure assessment, National Treasury which is responsible for the financing of infrastructure investment and office of The Presidency Republic of South Africa and the National Treasury of South Africa which are is also involved in the ASGI_SA infrastructure investment programme.

We are in touch with Department of Trade and Industry and one of the members, Margaret Chitiga (Mabugu), has been invited to a workshop in April 2010 to discuss issues to do with this project - based on our work done in 2008.

At the academic level an article will be published in a peer reviewed journal. More importantly, the project leader, Vandudzai, recently joined the Human Sciences Research Council (HSRC); a research institution whose vision is to produce research-based solutions to inform development in South Africa and the African continent. The HSRC is a key player in informing policy in South Africa. It holds several workshops and policy dialogue seminars with many government department officials for the dissemination of various research works by researchers within HSRC or from other research and academic institutions. These are also open to the general public. This provides a good platform for the dissemination of results for this project not only to policy makers but to other researchers as well.
The University of Pretoria runs a weekly seminar series from academics at the University of Pretoria, academics in other universities and research institutions within South Africa and from international institutions. The research findings will be presented in one of these seminars.

The first annual International Conference on Infrastructure Economics and Development was held in January 2010, if available in future, we will apply to present the results of this research project at the next conference.

Since public infrastructure investment is seen as one of the key policies for tackling the challenges of unemployment and poverty in South Africa, the team plans to arrange a national policy conference to discuss the findings of the research project with interested stakeholders at the national level.

The project will also be published on the working paper series of PEP, HSRC and University of Pretoria.

8. List of team members

Indicating their age (or whether they are under 30), sex, prior training and experience in the issues and techniques involved.

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Sex</th>
<th>Training</th>
<th>Experience</th>
<th>Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanduzai</td>
<td>33</td>
<td>F</td>
<td>Masters level</td>
<td>Masters mini-thesis</td>
<td>IO, SAM and Static CGE</td>
</tr>
<tr>
<td>Name</td>
<td>Age</td>
<td>Gender</td>
<td>Course</td>
<td>Modelling</td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
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<td>-----------------------</td>
<td>------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Mbanda</td>
<td></td>
<td></td>
<td>Two short workshops</td>
<td>Not much Elementary SAM and Static CGE modelling</td>
<td></td>
</tr>
<tr>
<td>Sinqobile Chumi</td>
<td>31</td>
<td>F</td>
<td>Masters level course</td>
<td>Not Much (As a coursework module) IO, SAM and Static CGE modelling</td>
<td></td>
</tr>
<tr>
<td>Patrick Kanda</td>
<td>29</td>
<td>M</td>
<td>Extensive</td>
<td>IO, SAM, Static and Dynamic CGE, Micro-simulation</td>
<td></td>
</tr>
<tr>
<td>Margaret R. Mabugu (nee Chitiga)</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

9. Expected capacity building

Description of the research capacities that team members and their institutions are expected to build through their participation in this project: This is an important aspect in the evaluation of proposals and should be presented in some detail. What techniques, literature, theories, tools, etc. will the team and their institutions learn or deepen their knowledge of? Please also indicate what specific tasks each team member would carry out in executing the project.

Vandudzai Mbanda

Training: Dynamic CGE modelling and micro-simulation analysis

Vandudzai has knowledge on how to apply shocks to a static CGE model but still has to advance her knowledge on how to build or alter an existing model. She will also learn how to convert a static CGE model into a dynamic one as well as to analyse results from a dynamic CGE model. Vandudzai has considerable experience with a static CGE model which she used for her Master’s Thesis.

What will be learnt: This project will help Vandudzai to deepen her understanding of static CGE modelling and to learn dynamic CGE analysis. Through reading, the
knowledge of theories on infrastructure investment as well as of literature on the growth
dynamics of infrastructure investment will also be expanded.

Tasks:  Organise and plan the research
Modify a static CGE model to a dynamic one
Dynamic CGE simulation
Incorporating micro-simulation
Write up and dissemination of results

Margaret R. Mabugu

Tasks:  Providing guidance and technical advice throughout the project

Sinqobile Chumi

Training: CGE modelling, Micro-simulation

Sinqobile has good understanding of static CGE modelling. She used CGE analysis for
her Master’s Thesis and previously worked on a World Bank project. This project will
help deepen her understanding and give her knowledge on how to do CGE micro-
simulation. Since the project uses a dynamic model Sinqobile will gain experience on
dynamic CGE modelling.

Tasks:  Prepare literature review
Help with household survey data and incorporating micro-simulation
component
Assist with simulations
Dissemination of results

Patrick Kanda

Training: CGE modelling
Patrick has fair basic knowledge of static CGE modelling. He will gain from participating in this project by deepening his knowledge of the economy-wide impact of infrastructure investment through the review of literature. He will also learn dynamic modelling and micro-simulation analysis.

Tasks:
- Help prepare literature review
- Analysis of results
- Help Vandudzai with write up

10. Any ethical, social, gender or environmental issues or risks that should be noted.

None

11. List of past, current or pending projects in related areas involving team members

Name of funding institution, title of project, list of team members involved

<table>
<thead>
<tr>
<th>Funding institution</th>
<th>Title</th>
<th>Members</th>
<th>Status</th>
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<tbody>
<tr>
<td>PEP</td>
<td>Poverty and inequality impacts of Trade policy reforms in South Africa</td>
<td>Ramos Mabugu and Margaret Chitiga</td>
<td>Completed</td>
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<tr>
<td>PEP</td>
<td>Textiles protection and poverty in South Africa</td>
<td>Ramos Mabugu and Margaret Chitiga</td>
<td>Completed</td>
</tr>
<tr>
<td>PEP</td>
<td>Does Trade Liberalisation Lead to Poverty Alleviation? A CGE Micro-simulation Approach for Zimbabwe</td>
<td>Margaret Chitiga and Ramos Mabugu</td>
<td>Completed</td>
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<td>PEP</td>
<td>A Computable General Equilibrium Micro-Simulation Analysis of the Impact of Trade Policies on Poverty in Zimbabwe</td>
<td>Margaret Chitiga, Tonia Kandiero and Ramos Mabugu</td>
<td>Completed</td>
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