

KEY QUESTIONS

- What are the options for public infrastructure investment during the next decade?
- Do the options crowd-in or crowd-out private investment? By how much?
- How much will the options affect growth, employment, poverty and inequality?
- Are the options sustainable?
- Are the options affordable?
- Which options produce pro-poor growth?
- Can public investment help industrial development?
- What are the limits of public investment?
- What is the way forward?

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PUBLIC INVESTMENT OPTIONS AND SOUTH AFRICA'S FUTURE GROWTH PATHS

The current international economic crisis has deepened South Africa's socioeconomic challenges as manifested by more than 1 million job losses and low rates of economic growth since 2009. These realities, together with the resolutions of the ANC Polokwane Conference, have galvanized the government plan to use public infrastructure investment to stimulate economic growth with pro-poor outcomes. As policymakers identify different options for public infrastructure investment, they need reliable assessments of the impact their choices will have on key economic and social objectives.

In this first issue of *The Bridge*, we present the simulation results for public investment options for the next 10 years. We use the *ADRS Linked National-Provincial Macro-Micro Economic Model of South Africa* (ADRS-LNPM) to quantify their impact on key growth, development and sustainability indicators.

ADRS-LNPM is one of six economic models of South Africa built by Applied Development Research Solutions. It captures the interactions between economy-wide variables, provincial economies, and household taxes, transfers, poverty, and inequality.

To learn more about the model used in this analysis, visit this issue's [webpage](#).

BY ASGHAR ADELZADEH

KEY FINDINGS

- Government commitment to high public investment will promote pro-poor growth.
- Austerity based cuts to public investment will produce undesirable economic consequences.
- Public investment significantly crowds-in private investment, raises economic growth, and reduces the unemployment rate and the poverty rate.
- Sustained high public investment reinforces government commitment to industrial policy and economic restructuring.
- Public investment, combined with other policies, can play a pivotal role in eradicating poverty and significantly reducing the unemployment rate.

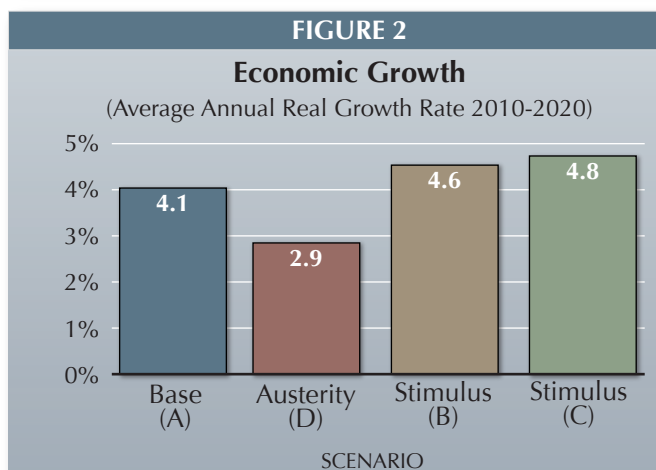
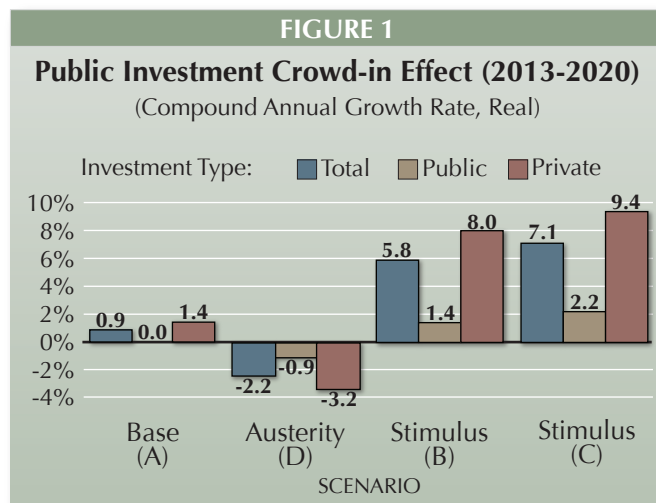
PUBLIC INVESTMENT POLICY SCENARIOS

Thirteen public investment scenarios were designed and their current and future effects simulated using the ADRS-LNPM model. This policy brief presents results for four of these scenarios—a base scenario (A), two stimulus scenarios (B and C) and an austerity scenario (D). See Table 1.

COMPARATIVE ANALYSES OF SCENARIO RESULTS

In light of alternative options for public investment, understanding their potential impact is especially useful for decision-making. This section compares the performance of key indicators for each of the four public investment scenarios.

Title	Base Scenario A	Stimulus Scenario B	Stimulus Scenario C	Austerity Scenario D
Description	Future follows current public investment amount and pattern	Future includes small annual increases in real public investment	Future includes moderate annual increases in real public investment	Future includes annual declines in nominal public investment
Characteristics	2010-2012	As in current MTEF	As in current MTEF	As in current MTEF
	2013-2020	Public investment is pegged to inflation to maintain real expenditure at 2012 levels	Public investment annually grows in real terms by one percentage point plus the population growth rate after 2012	Public investment annually grows in real terms by two percentage points plus the population growth rate after 2012



CROWD-IN EFFECT

The simulation results shed light on the important question of whether public investment in South Africa crowds-in (i.e., attracts) or crowds-out (i.e., repels) private sector investment. A comparison of average annual growth rates of public and private investments over the ten year projection period shows that scenarios with higher (lower) annual public investment induce higher (lower) private investment (Fig. 1). Overall, public investment in South Africa is found to significantly crowd-in private investment.

GROWTH, EMPLOYMENT, POVERTY AND INEQUALITY IMPACT

Growth: The simulation results of different public investment scenarios reveal their significant direct relationship to economic growth given their (a) direct effect on output, (b) crowd-in effect on private sector investment that translates into direct changes in output; and (c) direct effects on capital stock of infrastructure related sectors and other downstream sectors that influence future economic growth. Due to these factors, the macroeconomic output multipliers related to public investment expenditure scenarios are higher in scenarios with greater levels of public investment. Conversely, the output multipliers are lower in scenarios with lower levels of public investment expenditure.

Among the four scenarios, Stimulus Scenario C produces the highest average annual growth rate of 4.8 percent for the period 2010-2020 (Fig.2).

Employment: Higher levels of public investment are found to generate more total employment, which results in relatively lower unemployment rates (Fig. 3). Conversely, lower levels of public investment generate less total employment, which results in higher unemployment rates.

Income inequality: Public investment is found to have a small but favorable impact on income inequality.

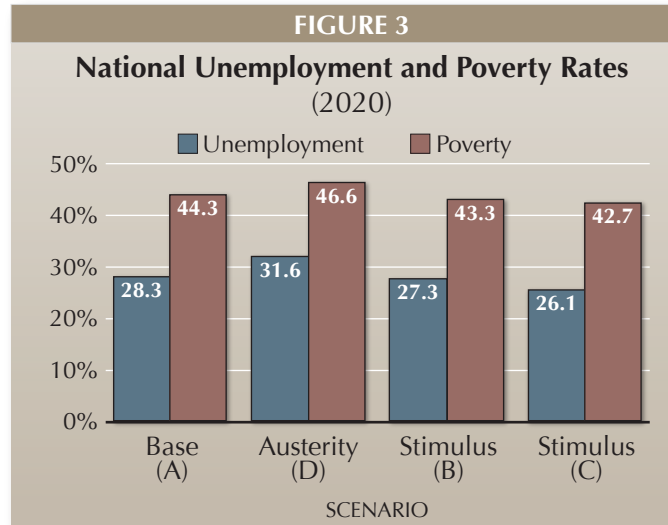
Poverty: Public investment is found to be effective in reducing income poverty (Fig. 3), mainly through its positive effect on economic growth and employment.

FISCAL SUSTAINABILITY

Figure 4 compares public infrastructure scenarios in terms of their impact on four fiscal indicators. The differences in the projected performance of these fiscal indicators stem from the economy-wide dynamic effect of public investment scenarios, specially their direct and indirect effects on growth and government revenue. The simulation results show that:

(a) Even though the level of general government expenditure differs across scenarios, none of the scenarios would cause major deteriorations in one or more of the fiscal indicators over the next 10 years;

(b) Due to their positive effects on growth and government revenue, fiscal indicators related to the stimulus scenarios are projected to perform relatively better than both the base and austerity scenarios. The austerity scenario, due to its

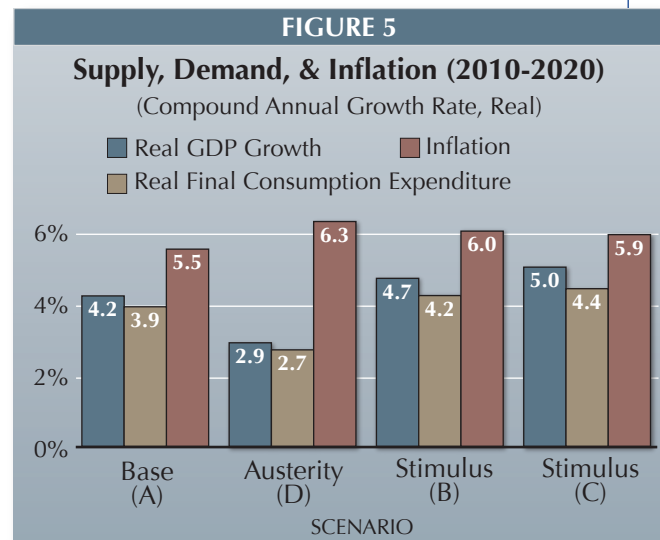
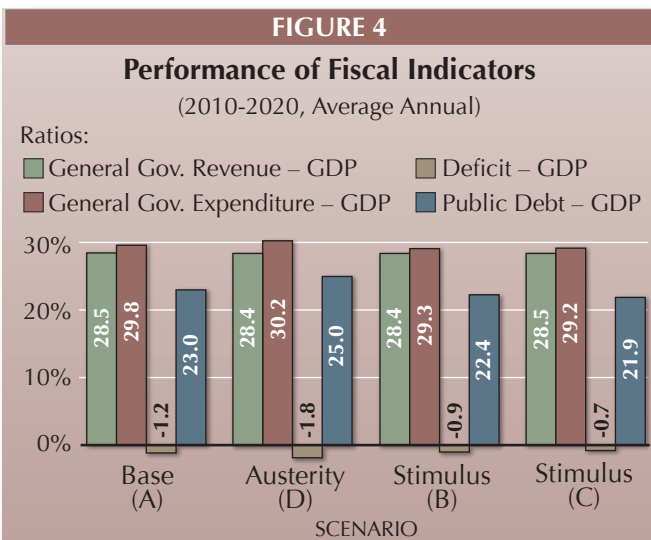


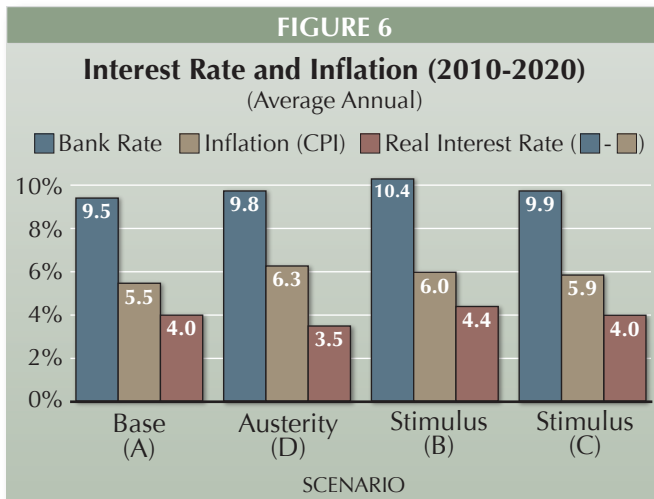
negative effects on growth and government revenue, is found to worsen both deficit- and debt-GDP ratios.

Public investment is found to significantly crowd-in private investment and to contribute to balanced economic growth.

SUPPLY, DEMAND, AND INFLATION INTERACTIONS

Scenarios based on rising public investment in real terms (Scenarios B and C) allow both supply and demand in the economy to evolve more in concert, which helps circumvent demand push inflation outcomes (Fig. 5). In other words, public investment contributes to balanced economic growth.





Fiscal indicators related to public investment stimulus scenarios are projected to perform relatively better than in the austerity scenario.

INTEREST RATE AND INFLATION

Model projections of the interest rate and inflation rate reflect the assumption that the current monetary policy rule of inflation targeting remains in place during the next 10 years. The results show that the potential for public investment to promote balanced growth and subdue demand push inflation helps reduce the need for the monetary authorities to raise the interest rate in order to ensure that inflation remains within the current 3 to 6 percent range over the next decade (Fig. 6).

TRADE INDICATORS

The average annual values of important trade indicators (such as export and import shares of GDP and trade balance–GDP ratio) are found to be relatively similar and stable across scenarios over the next 10 years.

PUBLIC INVESTMENT – GDP RATIO

Given the model’s projection of the impact of each scenario on aggregate output, i.e., GDP, the ex-post comparison of public investment-GDP ratios for the scenarios shows significant declines of the public investment-GDP ratios over the next 10 years (Table 2). This result is due to the high macroeconomic output multiplier effect of public investment.

INDUSTRIAL DEVELOPMENT

Figure 7 compares changes in the sector composition of output for four public infrastructure scenarios over the next 10 years. The results highlight the significance of long-term commitment to public investment for the expansion of the secondary sector in South Africa.

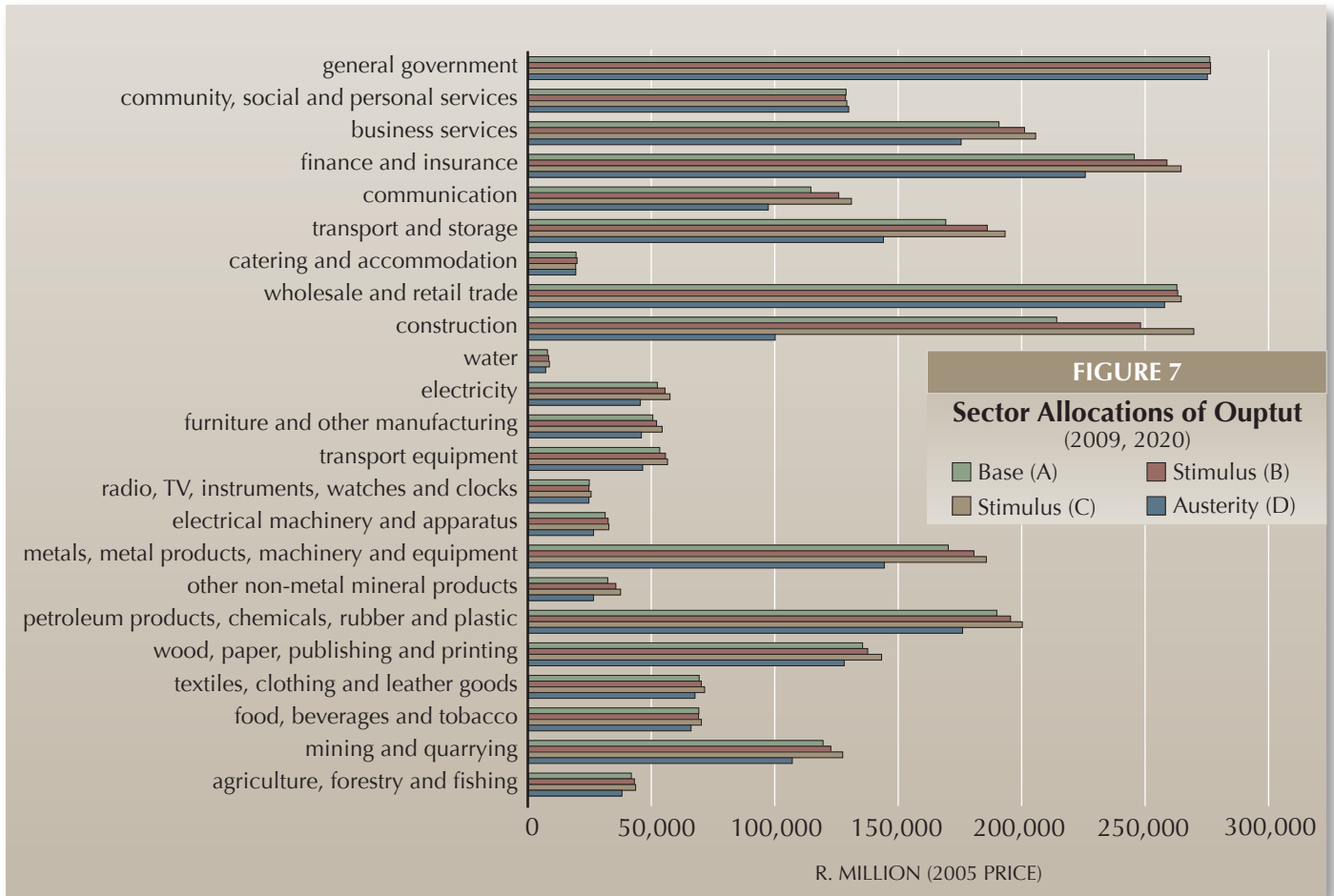
Simulation results for the period 2010-2020 show that public investment can help the secondary sector grow at an average annual rate that would be 1.7 to 2.5 times higher during 2010-2020 than the sector’s growth performance during the previous ten years. As a result, the share of the secondary sector in total output can increase from 28 percent in 2009 to between 46 and 49 percent in 2020. The share of the tertiary sector gradually declines from about 70 percent to close to 50 percent during the same period.

PRO-POOR GROWTH PATHS

Pro-poor growth paths are economic paths that reduce poverty through increases in average income (i.e., the growth effect) and reductions in income inequality (i.e., the distribution effect). Such growth paths are considered pro-poor since proportional benefits received by the

Table 2: Trends in Public Investment - GDP Ratios

Period	SCENARIOS			
	Base (A)	Stim. (B)	Stim. (C)	Aust. (D)
Current	9.7%	9.7%	9.7%	9.7%
MTEF 2010	9.1%	9.1%	9.1%	9.1%
MTEF 2011	9.1%	9.1%	9.1%	9.1%
MTEF 2012	9.1%	9.1%	9.1%	9.1%
MTEF 2013	8.9%	9.0%	9.2%	8.5%
MTEF 2014	9.0%	9.2%	9.4%	8.1%
MTEF 2015	8.9%	9.2%	9.3%	7.6%
MTEF 2016	8.6%	8.9%	9.1%	7.1%
MTEF 2017	8.3%	8.5%	8.9%	6.5%
MTEF 2018	8.1%	8.3%	8.5%	5.9%
MTEF 2019	7.7%	7.8%	8.5%	5.2%
MTEF 2020	7.2%	7.3%	7.8%	4.6%

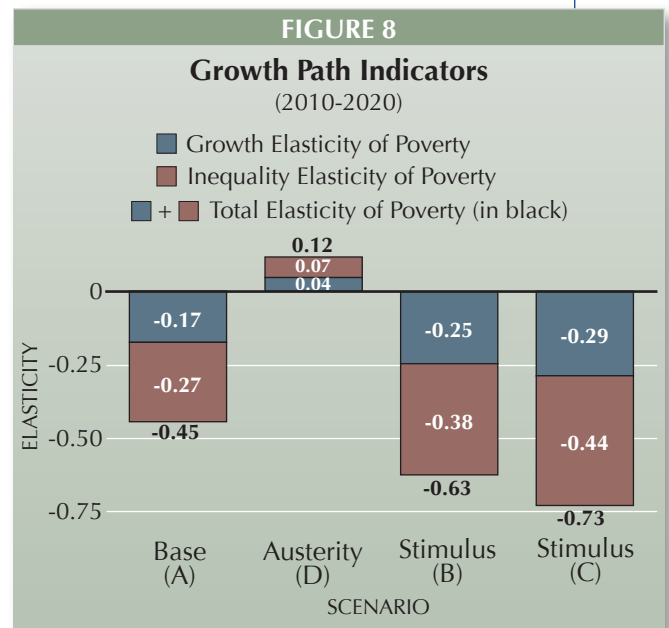


poor are more than those received by the non-poor. Thus, in a strict sense, growth is pro-poor when it is accompanied by a reduction in inequality.

The growth elasticity of poverty and the inequality elasticity of poverty measure the growth and distribution effects on income poverty. Their sum is the total elasticity of poverty, which measures the overall rate of decline in the poverty index, due to a 1 per cent real increase in GDP, and is the sum of the above two elasticities.

The base scenario and two stimulus scenarios (B and C) are expected to generate pro-poor growth paths (Fig. 8). Moreover, the larger is the public investment stimulus, the more pro-poor is the growth path. Thus stimulus scenario C is expected to yield higher direct reduction in poverty, due to relatively higher average income, and higher indirect reduction in poverty, due to relatively lower income inequality. The growth path that follows the adoption of an austerity scenario (D) will not be pro-poor since it will directly (through the trend in mean income) and indirectly (through the trend in income inequality) worsen poverty.

Commitment to long-term high public investment reflects commitment to industrial policy and economic restructuring.



CONCLUSIONS AND RECOMMENDATIONS

The modeling exercise undertaken here highlights the link between various public investment options and the economy's potential future growth paths. It quantitatively demonstrates the connection between magnitudes of public investment and economic growth, industrial restructuring, the rate of unemployment, and income poverty. Specifically, the results show that public investment programmes that keep pace with inflation and population growth and grow by an additional 1 to 2 percent annually (Scenarios B and C) generate sustainable pro-poor growth paths that favourably restructure the economy, raise the rates of employment and economic growth, and lower the poverty rate.

The model results lead to the following recommendations:

1. Government commitment to high public investment over the next decade will promote a pro-poor growth path.

2. Cuts to public investment as part of a multi-year austerity programme will produce undesirable economic consequences including a growth path that will not be pro-poor.

3. A pro-poor growth path requires a macroeconomic policy framework that is anchored on the findings that public investment significantly crowds-in private investment, raises economic growth, and reduces the unemployment rate.

4. By committing to sustained high public investment, government reinforces its commitment to industrial policy (IPAP2) and strengthens the restructuring thrust of its economic policy initiatives.

5. Public investment, combined with other policies, can play a pivotal role in eradicating poverty and significantly reducing the unemployment rate. □

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MORE INFORMATION

THE BRIDGE Online: www.adrs-global.com/bridge/01

Includes:

- More information about the model used in this issue
- Detailed description of policy scenarios

ABOUT



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APPLIED DEVELOPMENT RESEARCH SOLUTIONS is an independent economic consultancy organization with extensive experience in economic model building, capacity building, policy research, and advisory services in Africa. Our innovative web-based interface gives users the power to design policies and test their impact prior to embarking on implementation.

THE BRIDGE is an ADRS policy brief designed to present the main findings of policy simulations on key development challenges. With each issue we present the quantification of policy options in order to support evidence-based policy decision-making and to contribute to current economic policy analysis and debate.

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ADRS MODELS OF THE SOUTH AFRICAN ECONOMY

BRIDGING RESEARCH AND DEVELOPMENT

Appplied Development Research Solutions (ADRS) has developed six economic models of South Africa that interested individuals and institutions can use for projections, policy design and impact analyses. The models include a highly disaggregated macroeconomic model, two tax and transfer microsimulation models of households, a linked macro-micro model, and two linked national-provincial models of South Africa. Following is a brief description of each model:

MACROECONOMETRIC MODEL OF SOUTH AFRICA (MEMSA)TM

This model captures the complex inter-linkages that exist between and within industrial sectors of the economy, macro-economic variables, policy variables, and income and expenditure of government, labour, and business. MEMSA is a bottom up disaggregated model with 7 estimated variables for 41 sectors of the economy. It is most suitable for forecasting and simulating the impact of domestic and international shocks, macroeconomic and industrial policy changes, major public expenditure projects, as well as policies that affect private businesses, government and household income and expenditure. MEMSA is hosted at the ADRS website and is accessible through its user-friendly platform.

SOUTH AFRICAN TAX AND TRANSFER SIMULATION MODEL (SATTSIM)TM

ADRS has built this microsimulation model of South Africa for the projection of costs and benefits of current and future tax and transfer policies. Users of the model can design simple or complex tax and transfer policies for the next 15 years and assess their budgetary, poverty and income distribution effects. Model results are presented in aggregate and disaggregated forms, i.e., by gender, family type, quintile, province, and locality. In addition to a direct and an indirect tax modules, the model includes modules for current social security programmes (i.e., old age grant, child support, disability grant, and care dependency grant), and five additional grant programmes (i.e., care giver support, the basic income grant, youth grant, unemployment grant and adult grant) that are not currently part of the social security system in South Africa but can be used to develop 'what if' scenarios. SATTSIM is hosted at the ADRS website and is accessible through its user-friendly platform.

ADRS MODELS

- **MEMSATM: Macroeconomic Model of South Africa**
- **SATTSIMTM: South African Tax and Transfer Simulation Model**
- **SATTSIM-PlusTM: Augmented South African Tax and Transfer Simulation Model**
- **DIMMSIM-SATM: Dynamically Integrated Macro and Micro Simulation Models of South Africa**
- **LNP-MacroTM: Linked National-Provincial Macroeconomic Model of South Africa**
- **LNP-MMTM: Linked National-Provincial Macro-Micro Model of South Africa**

MEMSA

SATTSIM

AUGMENTED SOUTH AFRICAN TAX AND TRANSFER SIMULATION MODEL (SATTSIM-Plus)TM

This model is an extension of SATTSIM. It allows users to produce projections of the tax revenue, social security beneficiaries and cost, and poverty and income distribution under alternative scenarios for the performance of macroeconomic indicators (e.g., growth, employment, inflation, and wage rate) over the next 15 years. Or, for a given scenario for the future performance of the South African economy (e.g., low or high economic growth during next three years), users can make changes to the social security and tax system and simulate their impact on the rate of poverty and income inequality. SATTSIM-Plus is hosted at the ADRS website and is accessible through its user-friendly platform.

DYNAMICALLY INTEGRATED MACRO AND MICRO SIMULATION MODELS OF SOUTH AFRICA (DIMMSIM-SA)TM

This model integrates the ADRS macroeconomic model (MEMSA) with its household microsimulation model (SATTSIM) to capture the dynamic interactions between the macroeconomic performance and the poverty and income distribution at household level. The model is most suitable for the analysis of poverty and inequality and for the impact analyses of alternative macro and micro policies for growth and development. It includes two-way interactions between its macro and micro components such that (a) changes in macroeconomic variables (e.g., prices, employment, wage rates, benefits, transfers, etc.) influence the welfare of individuals and families, and (b) changes in household level economic conditions (e.g., poverty, inequality, consumption, taxes, eligibility for social grant, etc.) influence macroeconomic outcomes. DIMMSIM-SA is hosted at the ADRS website and is accessible through its user-friendly platform.

DIMMSIM-SA is most suitable for the impact analyses of alternative macro and micro policies for growth and development.

LINKED NATIONAL-PROVINCIAL MACROECONOMETRIC MODEL OF SOUTH AFRICA (LNP-MACRO)TM

The purpose of the ADRS provincial macroeconomic model is to produce projections of growth, investment, and employment for 27 sectors of each of the nine provinces in South Africa. The model captures the economic structure of nine provinces using econometric estimations of sectors of provincial investment, output and employment and nine linked national-provincial input-output tables. The latter captures sector linkages within provinces and between provinces and the rest of the South African economy. The model is most suitable for forecasting the impact of national level policies on provincial economies or the impact of provincial initiatives on the province and the rest of the country. A second version of the model, **LINKED NATIONAL-PROVINCIAL MACRO-MICRO MODEL OF SOUTH AFRICA (LNP-MM)TM**, allows additional assessments of the impact of policy scenarios on national and provincial poverty and income distribution.

For more information on ADRS models, visit the ADRS website or send your enquiries to adelzadeh@adrs-global.com.