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KEY QUESTIONS

How many workers will likely benefit from introduction of a NMW?

What impact do alternative NMW policies have on household income and expenditure?

What impact will alternative NMW policies have on poverty and income inequality?

Will a NMW expand or reduce economic growth?

What impact will alternative NMW policies have on total and sector employment?

Which economic sectors will be most and least affected by a NMW?

What impact will a NMW have on other macro and micro economic indicators (e.g., productivity, prices, trade)?

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Impact Analysis of a South African National Minimum Wage

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This issue of *The Bridge* provides a summary of the ADRS research report that was submitted to the National Minimum Wage (NMW) Advisory Panel for their deliberations. With nearly 50 percent of South Africa's population living in poverty, the Gini-coefficient close to 0.7, and almost one third of full-time workers earning less than R2500 a month, the NMW Advisory Panel recently released its proposal for a national minimum wage starting at R3500 per month. The Advisory Panel highlighted that the proposed NMW has the potential to pull people out of poverty, reduce inequality, minimise the danger of job loss, and fuel growth. These observations are in line with the findings from our research.

Linked macro-micro models have been used in South Africa and internationally to examine the potential impact of minimum wages. However, they have predominantly relied on Computable General Equilibrium (CGE) techniques to produce projections of employment, wages and prices. Empirical CGE models have been extensively criticised in the literature from analytical, functional and numerical perspectives, which raise serious doubts about the validity of CGE assessments of the potential impact of policies such as the national minimum wage.

KEY FINDINGS

- A South African NMW has the potential to yield positive overall macro- and micro-economic outcomes.

- A NMW policy will make a demonstrable contribution to the reduction of poverty and inequality.

- A NMW will lead to an upward shift of the aggregate demand curve and an outward shift of the aggregate supply curve, thus spurring modest stable macroeconomic growth.

- The redistributive impact of a NMW policy will stimulate demand for and output of economic sectors, especially in manufacturing. For more than 85% of economic sectors, this positive force outweighs the direct negative impact of marginally higher sectoral average wage rates on employment.

- A NMW will have positive spillover effects beyond its effects on the working poor.

Read the full ADRS report here

Our research used the ADRS' multi-sector macroeconometric model, the Dynamically Integrated Macro-Micro Simulation Model of South Africa (DIMMSIM), to simulate the impact of four alternative NMW scenarios and compared them to a base scenario. One of the scenarios we simulated is similar in detail to the Advisory Panel's recommended R3500 per month.

The parameters of the model, including the sector specific employment elasticities, have been estimated for 41 economic sectors using South African time series data. This important feature of DIMMSIM distinguishes it from the CGE models that have used arbitrary employment elasticities to assess the employment impact of the NMW.

This summary of our research report contains the assumptions of the tested NMW scenarios, the quantification of their impact and the trade-offs associated with each scenario.

Scenarios

Table 1 provides a description of the five economic scenarios examined in our analysis, including their underlying assumptions for a 10-year trajectory.

TABLE 1: SCENARIO DESCRIPTIONS

Business As Usual (BAU) Scenario

Base Assumptions

The Base Scenario, which we refer to as the Business-As-Usual (BAU) Scenario, captures the economy 'as it is' currently, with no NMW. The assumptions for BAU are as follow:

Fiscal Policy: Targets low deficit-GDP ratio as a mechanism to gradually reduce the debt-GDP ratio. The scenario strives to achieve a balanced or close to balanced annual budget.
Monetary Policy: The interest rate varies in order to keep the inflation rate within a 3 to 6 percent target band over time.
Public Investment: Nominal investment by general government and public corporations is designed to annually increase by 6 percent in order to keep pace with inflation.
Government Final Consumption (GFC) Expenditure: GFC is expected to grow by 6.2 percent annually in nominal terms, which closely corresponds to the MTEF's average annual rate.
International Outlook: Average real annual growth rate for OECD and Sub-Saharan countries will be 1 percent and 5 percent respectively, over the next 10 years. The price of a barrel of crude oil is set to gradually increase to 70 US Dollar by 2025.
Taxes, Social Grants and EPWP: All nominal parameters related to direct and indirect taxes, social grants and EPWP (e.g., tax brackets, grant amounts) annually increase by 6 percent.
Poverty Line: A poverty line of R720 per capita and R930 per adult equivalent per month for 2015. Both poverty lines are adjusted by 6 percent annually.

	Minimal Scenario	Index 40% Scenario	Index 45% Scenario	Maximal Scenario
NMW Rate	The NMW is set at a level close to the lowest sectoral determination for 2015, which amounts to R2250 per month for full-time workers in 2016.	In 2016, the NMW is indexed to 40 percent of the inflation adjusted average real wage rate for all full-time workers in 2015, or R3467.	In 2016, the NMW is indexed to 45 percent of the inflation adjusted average real wage rate for full-time formal sector workers in 2015, excluding agriculture and domestic work, or R4623.	The NMW begins in 2016 at R6000 per month for full-time workers.
Annual Adjustments	The NMW is designed to annually adjust for inflation over the next 10 years.	The index is increased annually by 1 percent until it reaches 45 percent of the inflation adjusted 2015 mean real wage rate. After 2021, the index will remain at 45 percent.	The index increases annually by 1 percent until it reaches 50 percent of the inflation adjusted 2015 mean real wage rate. After 2021, the index will remain at 50 percent.	The NMW adjusts annually for inflation plus 2 percent until 2021. After 2021, the NMW is expected to annually adjust to inflation.
Phase-in Sectors		For three very low-wage sectors, different rates are set as a percentage of the NMW for each year. For agriculture, the rate is set to 80 percent of the NMW. For domestic workers and the EPWP workers, the rate is set at 70 percent of the NMW.	For the agriculture sector, the rate is set to 80 percent of the NMW, while for domestic workers and the EPWP the rate is set at 70 percent of the NMW.	The minimum wage for three very low-wage sectors is set as a percentage of the national minimum wage each year. For agriculture, the rate is set to 80 percent of the NMW. For domestic work the rate is pegged at 70 percent of the NMW. For EPWP workers, the rate is set at 60 percent of the NMW.

Comparative Analysis of Scenario Results

The measured potential impact of alternative NMW options are described below. The results provide insight into how a NMW compares to the current situation, as captured in the Business as Usual (BAU) scenario.
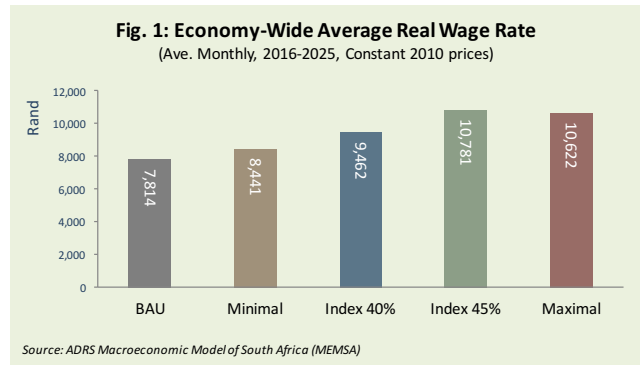
Wage Effect

A NMW is expected to directly impact the wage income of low-paid workers within all economic sectors. Given the heterogeneity of employment structure within economic sectors, the shares of sector employment affected by the NMW will differ. For example, 64 percent of full-time workers in the agriculture sector earned wages below R2250 per month in 2014, while all full-time workers in the "Motor vehicles, parts and accessories" sector earned wages above that amount.

DIMMSIM's estimate of the initial (year 1) shock to the economy-wide average real wage rate spans from 0.32 percent (Minimal scenario), 0.76 percent (Index 40% scenario), 1.57 percent (Index 45% scenario), and 2.54 percent (Maximal scenario).

The average real wage rates for the primary, manufacturing and service sectors are expected to increase by less than one percent under both the Minimal and Index 40% scenarios. Under the Index 45% scenario, the average real wage rates are estimated to increase for the primary, manufacturing, and service sectors by between 1.43 percent and 1.98 percent. The corresponding increases under the Maximal scenario are expected to be between 2.34 percent and 3.1 percent.

Compared to the BAU results, under the NMW scenarios, the average real wage rate for the economy is projected to be between 8 percent (Minimal scenario) and 36 percent (Maximal scenario) higher.

Historically, increases in sector average wage rates have reflected a disproportionate rise in wage rates associated with high level occupations and skilled workers and have contributed to the worsening of income inequality over time. With the NMW, upward wage adjustments of more


Fig. 1: Economy-Wide Average Real Wage Rate
(Ave. Monthly, 2016-2025, Constant 2010 prices)

Source: ADRS Macroeconomic Model of South Africa (MEMSA)

than 4 million full-time workers across all sectors of the economy will increase the average sector wage rates from below.[i] (Figure 1)

Household Income Effect

Compared to the BAU results, a NMW over the next 10 years is projected to increase household income (Figure 2) by benefiting at least 4.26 million (Minimal scenario) workers. The number of workers who benefit far exceed the relatively small number of workers that may lose their jobs as a result of the policy. This result is consistent with similar international studies.[ii]

Therefore, at the macroeconomic level, the future upward trend in total household income under the NMW scenarios reflects the policy's more positive impact on the income of millions of low-wage workers at the bottom of income distribution and less on increases of the income of the higher earning population. The implication for the evolution of poverty and inequality over the next 10 years is highly significant, as explained further below.

Fig. 2: Household Real Gross Income
(Avg. Annual Growth Rate, 2016-2025)
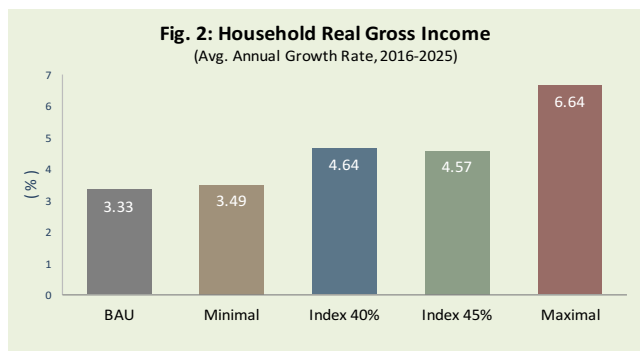
Household Consumption Effect

The boost to real household income from the NMW will positively impact household expenditure (i.e., demand) on goods and services.

Figure 3 depicts trends in household real consumption expenditure under alternative NMW scenarios. Observe that although the Minimal scenario results in higher household consumption expenditure, the scenario does not significantly change the pace at which it grows over time. Conversely, the projected trends for the two indexed scenarios and the Maximal scenario show both higher levels and faster rates of growth of household consumption expenditure relative to the BAU and Minimal scenarios.

On average, over the next 10 years, the share of household consumption expenditure in GDP is projected to increase from 59.2 percent under the BAU scenario to 60.6 percent (Minimal), 62.6 percent (Index 40%), 62.7 percent (Index 45%) and 64.2 percent (Maximal).
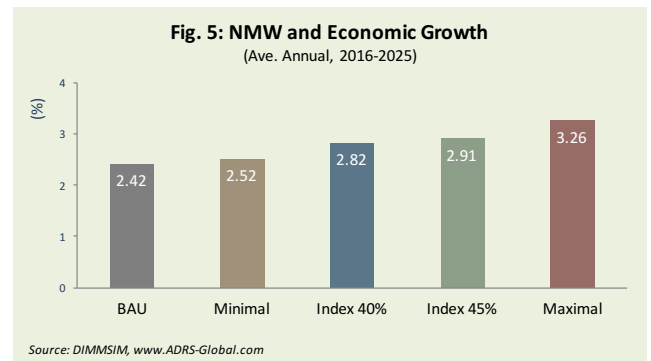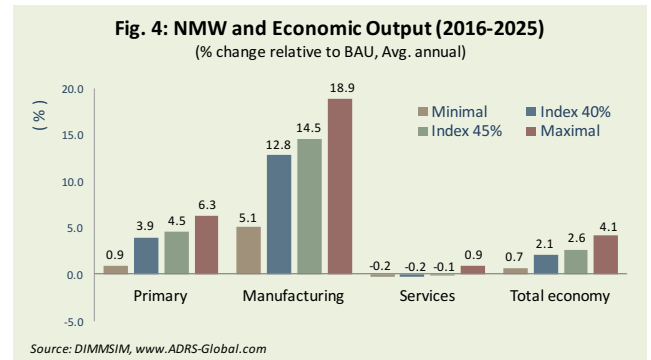

Fig. 3: NMW and Household Consumption Expenditure

Source: DIMMSIM, www.ADRS-Global.com
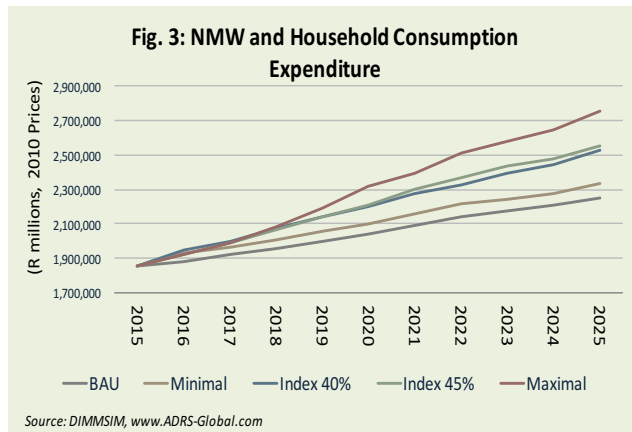
Growth Effect

DIMMSIM's projected outputs for 41 economic sectors reflect the net effect of the NMW scenarios on diverse demand, supply, economy-wide and sector variables that were found, through time series analysis, to determine sector outputs.

Implementation of the NMW is expected to increase total output in the economy (i.e., gross value added at basic prices), relative to the BAU, especially under the Index 40%, Index 45%, and Maximal scenarios (Figure 4). For aggregate sectors of the economy, each of the NMW scenarios will be effective in boosting primary and manufacturing sector output, especially in manufacturing (Figure 4).

Over the next 10 years, each NMW scenario is projected to help the economy grow

faster than the BAU scenario by 0.1 percent (Minimal), 0.4 percent (Index 40%), 0.5 percent (Index 45%) and 0.84 percent (Maximal), Figure 5.[iii]

Fig. 4: NMW and Economic Output (2016-2025)
(% change relative to BAU, Avg. annual)

Source: DIMMSIM, www.ADRS-Global.com

Fig. 5: NMW and Economic Growth
(Ave. Annual, 2016-2025)

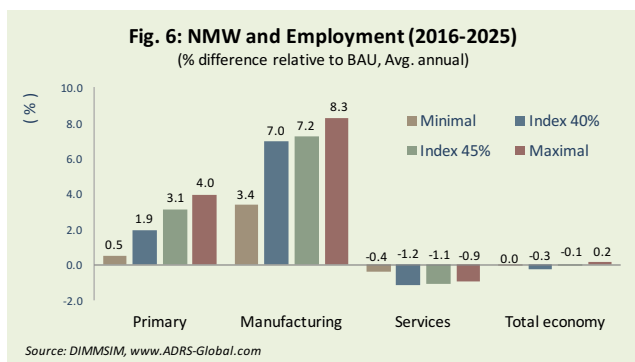*Source: DIMMSIM, www.ADRS-Global.com*

Employment Effect

In DIMMSIM, demand for employment is captured at the sector level through the model's forty time series estimated regression equations. The NMW policy scenarios have a direct negative impact on sector employment, by raising the sector and economy-wide average real wage rates. However, the policy also has various simultaneous indirect effects on sector employment, including a positive impact linked to the increase in the aggregate demand in the economy. Therefore, the total impact of the NMW on sector and total employment is the net effect of all direct, indirect, and dynamic effects of the policy, as the projections from DIMMSIM reflect.

Average annual employment in the primary sector over the next 10 years will be higher under all four NMW scenarios relative to the BAU scenario results (Figure 6). The induced positive impact of a NMW on aggregate demand, which positively stimulates sector production and employment, is found to exceed the negative

direct impact of the policy on the primary sector employment. Overall, the net effect of the two opposite forces on annual employment in the primary sector leads to improved demand for employment, relative to the BAU scenario.

Even though the downward trend in primary sector employment is expected to continue, a NMW policy will slow the decline. Consequently, under all four NMW scenarios, primary sector employment will be, on average, between 0.5 percent and 4.0 percent higher annually, relative to the BAU scenario results, as shown in Figure 6.

Fig. 6: NMW and Employment (2016-2025)
(% difference relative to BAU, Avg. annual)

Source: DIMMSIM, www.ADRS-Global.com

NMW policy has the least effect on average wage rates of the manufacturing sectors. Hence, the direct negative effect of the policy on manufacturing sector employment is limited, allowing the policy's positive effect on employment, through the increase in aggregate demand, to be unmitigated by a significant negative effect. Consequently, the impact of a NMW on manufacturing sector employment is projected to be positive and increasing over time. Under a NMW policy, annual employment in manufacturing is expected to gain momentum after 2017, relative to BAU results. The gaps between the likely BAU future trend and the NMW results grow wider over time, except for the Minimal scenario. Overall, NMW scenario results show that annual manufacturing employment will be, on average, higher by 3.4 percent (Minimal), 7.2 percent (Index 40%), 7.4 percent (Index 45%) and 8.3 percent (Maximal) as compared to the BAU scenario. By 2025, these differences translate to 91,000 (Minimal), 234,000 (Index 40%), 260,000 (Index 45%) and 318,000 (Maximal) more jobs in manufacturing, relative to the BAU scenario.

In the service sector, relative to the BAU, the NMW policy scenarios are projected to lead to small positive increases in demand for employment for all but two service subsectors. The impact on employment in the case of Building Construction and Engineering, and in Wholesale, Retail Trade, Catering and Accommodation Services, is projected to be negative. Overall, average annual employment in the service sector is projected to be lower by 0.4 percent and 1.16 percent (Figure 6) as compared to the BAU results.

For the economy, the average annual employment effect of the NMW is projected to be zero (Minimal) to -0.3 percent (Index 40% and Index 45%), relative to the BAU scenario. This translates into lower annual employment of 1,600 (Minimal) to 43,000 (Index 40% and Index 45%). In the case of the Maximal scenario, the scenario's net effect on total employment is projected to be a small positive of about 30,000 or a 0.18 percent increase in total employment compared to the BAU scenario.

Fig. 7: NMW and Unemployment Rate
(Ave. Annual, 2016-2025)

Source: DIMMSIM, www.ADRS-Global.com
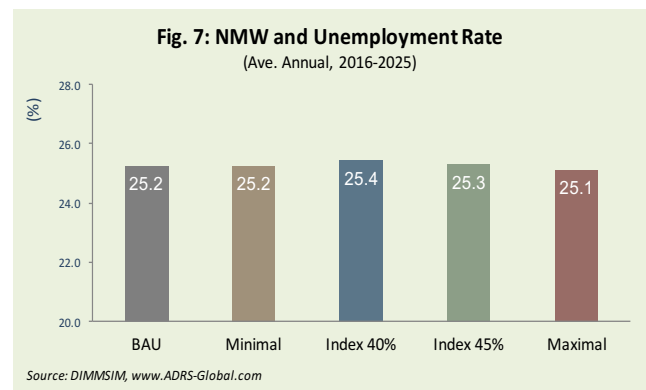
In terms of unemployment outcomes (Figure 7), the average annual unemployment rate under the four NMW scenarios is projected to be between 0 percent (Minimal) to 0.2 percent (Index 40%) higher than the BAU outcomes. Under the Maximal scenario, the unemployment rate is projected to be 0.1 percent lower than in the BAU scenario. These results are consistent with other cross country studies.[iv]
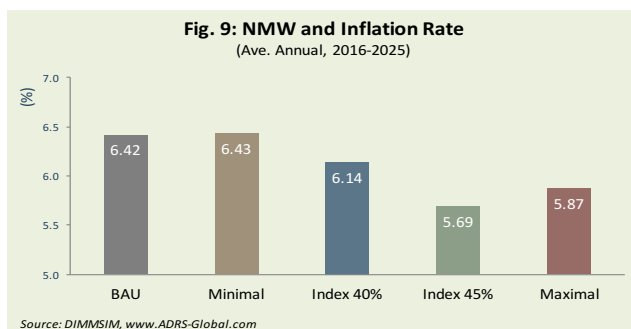
Productivity Effect

Relative to BAU, average annual labour productivity is expected to be higher under the NMW scenarios for the economy and its

sectors (Figure 8). For the economy as a whole, the projected labour productivity differences range from 0.7 percent (Minimal) to 3.8 percent (Maximal), see Figure 8. Average labour productivity in the primary and service sectors over the next 10 years is projected to perform better under NMW policy scenarios than under the BAU scenario. Meanwhile, the improvement of manufacturing labour productivity under the NMW will be significantly stronger than the corresponding productivity increases of the primary and service sectors.

Fig. 8: NMW and Labour Productivity (2016-2025)
(% change relative to BAU, Avg. annual)

Source: DIMMSIM, www.ADRS-Global.com
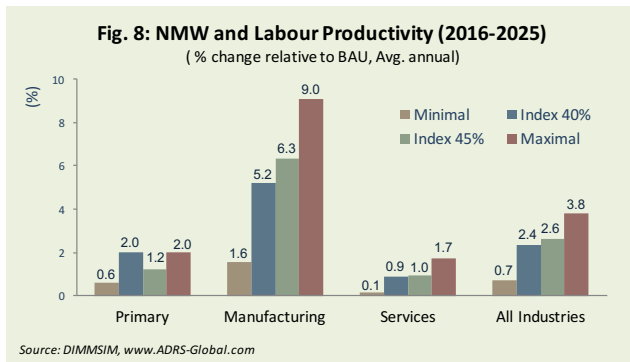
Inflation Effect

The NMW is expected to affect various prices through its direct effects on the cost of labour and its indirect effects on income, expenditure, and production variables. Figure 9 shows DIMMSIM's results in terms of economy-wide producer price inflation. The average inflation rates for the BAU and Minimal scenarios are projected to be almost indistinguishable, which imply that their trajectory will have subdued effects on the average inflation rate over the next 10 years. In this case, a combination of relatively small increases in the average wage rate and labour productivity effectively annul their contradictory effects on price inflation. For the other NMW scenarios, their lower average

Fig. 9: NMW and Inflation Rate
(Ave. Annual, 2016-2025)

Source: DIMMSIM, www.ADRS-Global.com

inflation rates over the next 10 years, relative to the BAU scenario, reflect the extent to which negative effects of labour productivity increases on sector prices prevail over the positive effects of the scenarios' average wage rate increases.

Inequality Effect

The main rationale for a NMW policy in South Africa has been to reduce poverty and income inequality and to deter their future expansion. Figure 10 shows that relative to BAU results, income inequality (measured by the Gini index) is projected to be lower under each NMW scenario. The effectiveness of an economic growth path that includes a NMW that benefits the poor more than the non-poor is reflected in these results. At the national level, the inequality indices for the NMW scenarios in 2025 are projected to be lower than the BAU results by -0.4 percent (Minimal), -0.7 percent (Index 40%), -1.2 percent (Index 45%), and -1.7 (Maximal).

Fig. 10: NMW and Income Inequality
(Difference with BAU, 2025)

Source: DIMMSIM, www.ADRS-Global.com
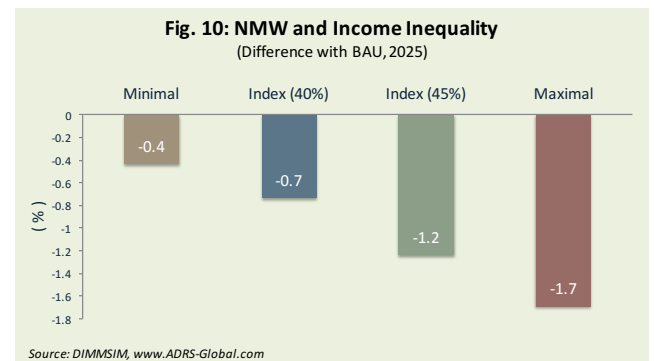
A NMW policy is expected to produce lower rates of inequality among both the urban and non-urban population. The projections also show that for each NMW scenario, the decline in income inequality will be more significant among the non-urban population than among the urban population. In other words, while both rates of inequality are projected to decline, the difference in inequality between the urban and non-urban population is also projected to narrow under a NMW policy.[v]
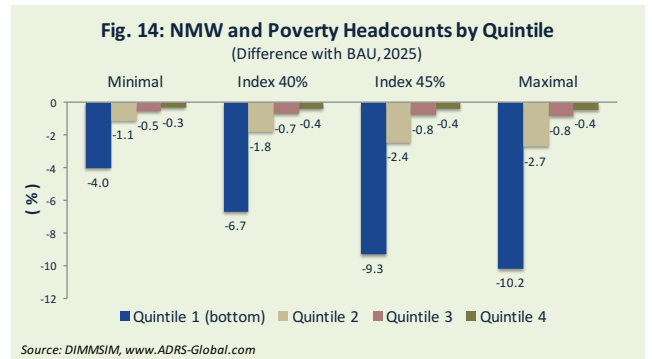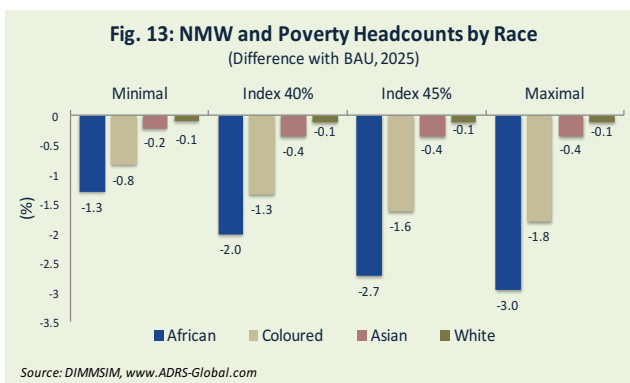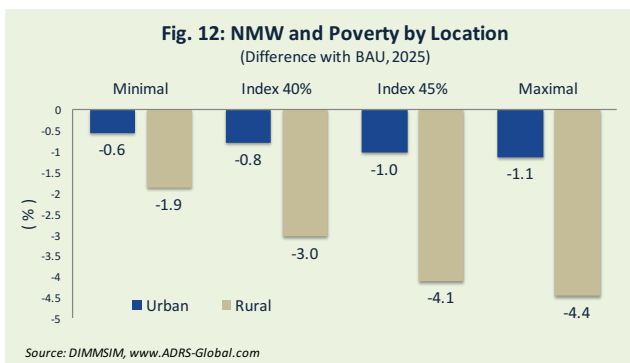
Poverty Effect

DIMMSIM's results on household poverty are based on the adult equivalent poverty line of R930 per month for 2016 adjusted annually to the average inflation rate of 6 percent.

Fig. 11: NMW and Poverty Headcounts
(Difference with BAU, 2025)

Source: DIMMSIM, www.ADRS-Global.com
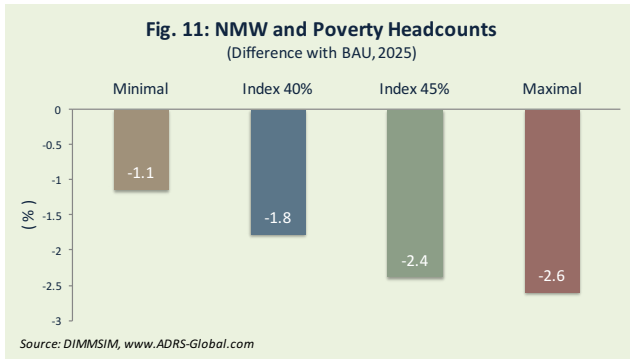
At the national level, DIMMSIM projects improvements of between -1.1 and -2.6 percentage points in the headcount poverty rate (Figure 11) for each NMW scenario, compared to the BAU scenario.

Since NMW policies target low-wage full-time workers, their impact on the poverty rate differs when the population is divided by race, location, and quintiles. Figure 12 depicts the poverty impact of the NMW scenarios on urban and rural populations, compared to the BAU results. Relative to urban workers, low-wage earners constitute a larger portion of the rural population. Hence, the introduction of a NMW is found to lead to greater reductions in rural poverty.

Given the racial segmentation of the South African labour market, the four NMW scenarios

Fig. 12: NMW and Poverty by Location
(Difference with BAU, 2025)

Source: DIMMSIM, www.ADRS-Global.com

Fig. 13: NMW and Poverty Headcounts by Race
(Difference with BAU, 2025)

Source: DIMMSIM, www.ADRS-Global.com

Fig. 14: NMW and Poverty Headcounts by Quintile
(Difference with BAU, 2025)

Source: DIMMSIM, www.ADRS-Global.com

are projected to have the most effect on reducing poverty among African and Coloured households (Figure 13), as compared to the BAU scenario. The differentiated impact of the policy on household poverty is found to be most noticeable when the population is divided by quintile (Figure 14).

On the whole, when compared to the BAU scenario, the NMW will reduce the poverty rate, especially among poorer segments of the population. This result is obtained whether viewed from race, location or quintile of households and stems from the policy's positive effect on economic growth and income equality. Thus, by taking account of all direct, indirect, and dynamic interactions in the economy, the policy is shown to be pro-poor since it benefits South Africa's poor more than its non-poor.[vi]

Conclusions and Recommendations

Our quantification of the impact of a NMW shows that the policy has the potential to yield positive overall macro- and micro-economic outcomes for South Africa. The NMW would prompt direct, indirect and dynamic responses in the labour market, household income and expenditure, and in production. The initial value of the NMW and its future evolution will determine how meaningfully it is able to achieve its core goals of reducing poverty and income inequality.

The net effect of the policy includes an upward shift of the aggregate demand curve and an outward shift of the aggregate supply curve, thus spurring modest stable macroeconomic growth. This overall macroeconomic outcome will result from the policy's positive income distribution impact, represented by an improvement in the income share and spending power of households

in the bottom quintiles that have a relatively higher marginal propensity to consume while also spending a relatively larger portion of each additional rand on domestically produced goods and services. This redistributive impact of the policy will, through the forward and backward linkages, directly and indirectly stimulate demand for and output of economic sectors, especially that of manufacturing. For more than 85 percent of South Africa's economic sectors, this positive force outweighs the direct negative impact of marginally higher sectoral average wage rates on employment.

DIMMSIM's results lead to the following observations:

1 The national minimum wage is an effective policy to modestly foster aggregate demand, which is an important determinant of short and long term economic growth. The introduction of a NMW in South Africa has the potential to enhance economic growth.

2 NMW scenario results show that the number of workers who benefit from the policy will far exceed the relatively small number of workers that may lose their jobs. Moreover, the results provide

evidence of positive spillover effects beyond those affected at the very bottom of the earnings distribution. These results are consistent with and confirm other studies.

3 The results reported here cast serious doubt on the claims that the introduction of a NMW in South Africa will seriously hinder employment. Our results are consistent with and confirm the majority of international studies.

4 A NMW policy will make a demonstrable contribution to the reduction of poverty and inequality, but alone is insufficient to fully overcome the three-pronged challenges of high poverty, inequality, and unemployment in the country.

5 The small negative effects on employment in a few economic sectors neither threaten macroeconomic balance nor hinder economic growth. Moreover, any negative trade-off of the NMW policy must be weighed against its significant positive contributions to household real disposable income, poverty alleviation, income equality, and economic growth.

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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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Endnotes

[i] Our findings that the introduction of a NMW in South Africa will especially increase wages at the bottom of the distribution, mainly in the primary and service sectors, are supported by similar findings of Lee (1999), Autoret al. (2015), and Dubeet al.(2010). Our general finding that a NMW will positively impact the economy-wide average wages in South Africa through its effect on the wage distribution is also in line with findings from DiNardoet al.(1996), Lee (1999), Harris and Kearney (2014). According to Cunningham (2007), in Latin America, a 10 percent increase in minimum wages results in an increase in average wages of between 1 and 6 percent.

[ii] For example, the Alonso (2015) study of US data shows that the minimum wage has a significant and positive impact at the bottom of the labour-income distribution. He shows that a 10 percent increase in the minimum wage would raise labour income by 0.8 percent at the 10th percentile and by 0.6 percent at the 25th. The Dubeet al. (2010), and Allegrettoet al. (2011) studies of the effects of minimum wages on earnings in low wage sectors find strong positive earning effects as a result of minimum wage increases.

[iii] Among studies, empirical analysis of 11 OECD countries (Austria, Belgium, Denmark, France, West Germany, Italy, Luxembourg, the Netherlands, Sweden, the UK, and the US) by Askenazy (2003) estimates the impact of increases in minimum wage on GDP growth across over four five-year intervals between 1970 and 1990. He finds that the minimum wage can significantly – by more than 0.2 percent per annum – improve long-run growth in an open economy. Our findings are also in line with Kaldor's three growth laws related to the causation in economic growth, including the proposition that a faster rate of growth of manufacturing output supports faster rate of growth of non-manufacturing.

[iv] Our findings on the potential impact of the NMW on employment in South Africa are in line with the international consensus on the impact of minimum wages on employment.

[v] Similar to our results for South Africa, almost all national and comparative studies have found that minimum wages lead to a compression of the earnings distribution (See overviews in Katz and Murphy (1992), DiNardoet al. (1996), Katz and Autor (1999), Card and DiNardo (2002), Autoret al.(2008), Goldin and Katz (2008), Lemieux (2008), and Acemoglu and Autor (2011)).They have also found that minimum wages help lower earning differentials across demographic groups, as have been reported for Brazil and Costa Rica (Lemos (2007), Gindling and Terrell (1995), and Fajnzylber (2001)). Since the minimum wage has significantly smaller impact on higher earnings, raising the minimum wage would effectively reduce earning inequality.

[vi] Our results, that show a significant reduction in the poverty rate among the households in the bottom quintiles and a much smaller poverty reduction among households in higher quintiles, are in line with international studies that find between 40 and 60 percent of poverty benefits are concentrated in bottom households and that the benefits gradually die out.

> " *ADRS' web-based models of South Africa help users design and simulate diverse macro and micro economic scenarios to inform policy on a broad range of economic, social, educational, and environmental issues.*

ADRS MODELS OF THE SOUTH AFRICAN ECONOMY
BRIDGING RESEARCH AND DEVELOPMENT

Applied Development Research Solutions (ADRS) has developed eight economic models of South Africa that interested individuals and institutions can use for projections, policy design and impact analyses. The eight models of South Africa are listed in the box below. Following is a brief description of each:

MACROECONOMETRIC MODEL OF SOUTH AFRICA (MEMSA)™

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)™

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, and disability grant), and five additional grant programmes that 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

- **MEMSA™:** Macroeconometric Model of South Africa

- **SATTSIM™:** South African Tax and Transfer Simulation Model

- **SATTSIM-Plus™:** Augmented South African Tax and Transfer Simulation Model

- **DIMMSIM-SA™:** Dynamically Integrated Macro and Micro Simulation Models of South Africa

- **LNP-Macro™:** Linked National-Provincial Macroeconometric Model of South Africa

- **LNP-MM™:** Linked National-Provincial Macro-Micro Model of South Africa

- **LM-EM™:** Linked Macro-Education Model

- **MS3E™:** Multi-Sector Economy-Energy-Emissions Model

SATTSIM Plus

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

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.

DIMMSIM-SA

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

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.

LNP-Macro & LNP-MM

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

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)™**, allows additional assessments of the impact of policy scenarios on national and provincial poverty and income distribution.

LM-EM

LINKED MACRO-EDUCATION MODEL (LM-EM)™

LM-EM is a forecasting tool for skills planning and forecasting. It is built to provide a platform to design economic, labour force, and education policy scenarios, quantify their impact, and forecast trends in economic indicators and the demand and supply of skills. LM-EM combines economic, demographic, and education data with state of the art statistical and modeling techniques to capture key interactions and interdependencies within the economy, including the behaviour of households, the private sector, and government, and the links between the labour market and the education sector. It captures the interactions between macroeconomics and the education sector by linking ADRS' Macroeconomic Model of South Africa (MEMSA) to models of supply and demand for occupations and educational qualifications. LM-EM's user-friendly web platform allows policymakers, analysts, researchers, and scholars to have direct access to the model to design 'what if' questions about the economy, labour force, and the education sector and to obtain corresponding effects on future trends in demand and supply of skills and occupations for the economy, SETAs, and economic sectors.

LM-EM is a forecasting tool for skills planning and forecasting that ombines economic, demographic, and education data with state of the art statistical and modeling techniques.

MS3E

MULTI-SECTOR ECONOMY-ENERGY-EMISSIONS MODEL (MS3E)™

The MS3E model captures the dynamic interactions between the macroeconomic performance and sectoral demand for energy and carbon emissions. ADRS' Macroeconomic Model of South Africa (MEMSA) is the core module of MS3E that generates annual forecasts of a relatively large number of aggregate, sector level, nominal and real variables and indictors. The energy and emissions modules capture the interactions between macroeconomics, industrial structure, energy demand and carbon emissions. They are designed to capture sector demand for energy and carbon emissions; produce annual projections of sector level energy consumption and carbon emissions; assess impact of carbon tax options; and provide projections of indicators that allow monitoring the country's progress towards fulfilling its medium and long terms climate change commitments.

MS3E allows assessing impact of carbon tax options and monitoring the country's progress towards its climate change commitments.

For more information on ADRS models, visit the ADRS website: adrs-global.com

Or send your enquiries to adelzadeh@adrs-global.com.