


Evidence-based Employment Scenarios

Benchmarking the Employment Scenarios

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1 Introduction

Government has said that halving unemployment and poverty by 2014 will require growth to average above 5% per year between 2004 and 2014, split into above 4.5% between 2004 and 2009 and above 6% between 2010 and 2014 (Presidency, 2006 "Accelerated and Shared Growth Initiative – South Africa: a summary" power point presentation, February). The method by which the Presidency arrived at this figure is uncertain, but typically these kinds of macro-estimates use aggregate relations between GDP and employment, such as employment output elasticities. Such relations depend upon the composition and structure of the economy and of the growth: the same GDP growth rate can be associated with very different rates of employment growth, depending on the nature of the sectors in which output growth is concentrated. It is therefore useful to complement the aggregate story with a more disaggregated one.

To do this, we use an economy-wide model of the South African economy. A model of this sort provides a 'laboratory' that allows us to conduct experiments that systematically explore the impact of policy actions and other changes to the economy. Generally this is done by creating a 'benchmark' that reflects the crucial structural features and behavioural aspects of the economy. Particular aspects of the economy are then systematically changed in ways that simulate particular policies or external shocks. The consequent changes generated internally by the model are observed. We can improve our understanding about the working of policies in the real world by examining the chain of interactions that lie behind these outcomes.

In the Scenarios project our principle goal is to translate the halving unemployment target into a number of jobs and then ask where these jobs might be created. There are in principle an infinite number of answers to this question. We impose certain patterns, chosen to reflect broad alternatives in policy orientation, and ask what changes in the economy – to investment, wages, productivity, output, income distribution, the exchange rate and so on – would be consistent with specific patterns. The first step in doing this is to establish the benchmark against which we can measure the outcomes of different scenarios. This paper is primarily concerned with setting out the benchmark. It will be followed by evaluating the plausibility, desirability and sustainability of different configurations.

We want to consider how both the sectoral and the skills composition of employment affect the outcomes. Disaggregating into sectors and skills adds a number of questions to the broad question of how unemployment might be halved. These include:

1. What are the direct job creating capacities of sectors?
2. What are their indirect employment multipliers?
3. What constrains sectors' ability to grow?
4. Where will the additional output associated with a sector's employment expansion be sold?
5. Do shortages of specific skills create impede growth in employment of other labour? Do different sectoral growth patterns mitigate these bottlenecks?

However, although such disaggregations might enrich debates on the employment consequences of policies, they require translation of government's general employment target into specific sectoral and skills targets. It is not clear how this should be done. To some extent we would like to replicate and assess policy-makers' preferences (as with the unemployment and poverty targets), but there is little guidance as to what these are. One might assume a preference for job creation biased

towards low skill jobs, since that is where the bulk of unemployment is. On the other hand, low skill jobs tend to be low paid jobs, so poverty-reducing goals may imply there should be a bias towards higher skill jobs. We may also assume that policy-makers are indifferent about the sectors in which jobs are created, on the basis that a job is a job is a job. However, issues such as on-the-job skills acquisition, or longer run sustainability, or robustness in the face of shocks may bias them towards preferring jobs in some sectors over others. In general, the debate on jobs creation is silent about these issues; one of the intentions of our work is to stimulate discussion on them.

For the present exercise, since we have nothing to guide us, we work with some modified projections of the sectoral composition of employment and leave the skills composition for later. This allows us to focus on broad issues of sectoral balance. We begin by suggesting a configuration of where jobs in the economy might be if trends over the past ten years continue. We are not forecasting – our picture of the economy in 2014 is simply a plausible picture, not a forecast. We use a model of the South African economy to ask what kinds of economy-wide changes might be consistent with these modified extrapolations. We then adjust employment further to meet our interpretation of halving unemployment. This provides a starting point for thinking about the range of concomitant changes in the economy that might occur with reducing unemployment.

We proceed by discussing briefly some aspects of the modelling strategy, then the employment projections, before looking at lessons that are already beginning to emerge from the exercise.

2 Aspects of the model

We will use our model to draw out the implications of our various projections for GDP growth, the structure of output and other aspects of the economy. We impose the projections as exogenous changes on our model, forcing each sector to employ the projected numbers. This causes endogenous adjustments, replicating (according to what we have built into the model) the ways in which the economy in the real world might adjust to accommodate them. Obviously there are a myriad of such ways. These depend on both the microeconomic and the macroeconomic structure of the economy. We will not go into details of the model in this paper. It is a static computable general equilibrium model that was developed by IFPRI and applied to South Africa by Thurlow and van Seventer and has been widely discussed elsewhere (see Thurlow and van Seventer, 2002).

However, we do need to be explicit about the ways in which we constrain the model for the specific purposes of this project:

- Since we impose the employment levels on the economy, we have to allow wages to adjust. There are two adjustments possible. We choose to keep the economy-wide wage rate constant. However, we let sectoral wages vary (in such a way that the real average wage remains constant). These variations are necessary since we are changing the pattern of employment in the economy. Although there are other mechanisms that lead to changes in the pattern of employment, changing relative wages can play a significant role. It is unlikely that we could induce the desired change in employment if we forced it to be brought about entirely by changing patterns of demand, for example.
- One of the responses we are interested in examining is investment in capital stock. What investment would be necessary – both in level and pattern – to

accommodate the employment changes? We therefore allow the capital stock in each sector to vary, in such a way that the sectoral returns to capital remain constant.

- To allow us to focus on issues of resource allocation, we dampen macroeconomic demand effects by assuming that macroeconomic injections – investment demand, the government budget deficit and the current account deficit – remain constant relative to GDP. This is ensured by adjustments in savings rates, income tax rates and the exchange rate. We later will explore the consequences of dropping these assumptions.
- Finally we assume that a number of other variables are either fixed – for example, indirect tax rates – or are fixed relative to GDP – for example, government transfers to households. This is not because we believe that these will remain fixed, but because they are variables of interest in building different scenarios. For example, we want to explore the implications of using government transfers to raise the social wage in certain scenarios. We therefore keep these elements fixed, so that we can change them later.

The model is a real model which only shows relative, not absolute, prices. We use the consumer price index as our fixed yardstick against which we can judge price movements. This is particularly important when we evaluate wage changes. In what follows we often refer to relative real wages. A 'constant real wage' means constant relative to consumer prices: someone earning the wage would be able to afford the same bundle of goods as before[1].

We have again to emphasise that these projections and scenarios are not forecasts. Employment trends in the past will only continue in the future if the same array of causal factors continue to operate; we have made no attempt to replicate these, nor have we attempted to forecast how the causal factors might evolve in the future. We are simply trying to build a picture of the economy allows us to conduct experiments to understand possible implications of different employment scenarios.

3 The projections

We approach our aim – benchmarking halving unemployment – in two stages. Rather than jumping straight to a job configuration that meets the objective, we have found it more useful to first make projections based on past trends, and then add the additional employment to that picture.

3.1 Projecting current trends

It is easiest if we begin with the most aggregate projection and then work down to sectors. Our aggregate projections are given in Table 1. We assume the working age population will grow at 1.5% p.a. and that the (strict) labour force participation rate remains constant at 0.56. Both informal and formal employment continue to grow at

[1] When thinking about employment and wage issues, it is important to keep in mind the distinction between the 'real consumption wage' and the 'real product wage'. A rise in the former would men that a worker could buy a bigger bundle of consumption goods than previously. A rise in the latter would mean the employers have to sell more of their output in order to afford to employ the same amount of labour. It is possible that the two move in opposite directions wage. In this paper, unless explicitly stated otherwise, our measure of real wages is the consumption wage.

around their historical rates of 6.0% and 2.0%, respectively. This gives rise to an unemployment rate of 20.8% in 2014 and an increase in formal employment of 24.2% between 2003 (our base year) and 2014. Our first aim is to model this increase in formal employment. (The bottom row of the table, labelled 2014a, shows our interpretation of the implications of halving unemployment, which we discuss later).

Table 1 - Projections of aggregate labour categories

	Based on OHS/LFS data								SASID	
	Working age pop. '000	Strict unem-ployed '000	Informal employ-ment '000	Formal employ-ment '000	Total employ -ment '000	EAP (strict) '000	Participation rate %	Unemploy-ment rate %	Original '000	Scaled on LFS '000
1995	24 191	1 807	470	9 200	9 670	11 477	47.4	15.7	8 659	8 138
1996	24 894	2 182	304	8 630	8 934	11 116	44.7	19.6	8 709	7 634
1997	25 505	2 375	944	8 161	9 105	11 480	45.0	20.7	8 742	7 219
1998	25 703	3 029	1 102	8 307	9 409	12 438	48.4	24.4	8 601	7 348
1999	26 223	3 206	1 473	8 913	10 386	13 592	51.8	23.6	8 516	7 884
2000	27 774	4 224	1 590	10 615	12 205	16 429	59.2	25.7	8 422	9 390
2001	28 084	4 668	1 560	9 581	11 140	15 808	56.3	29.5	8 486	8 474
2002	28 527	4 883	1 410	9 870	11 280	16 163	56.7	30.2	8 728	8 731
2003	28 938	4 313	1 477	9 931	11 408	15 721	54.3	27.4	8 784	8 784
2004	29 304	4 009	1 574	10 054	11 628	15 637	53.4	25.6	8 883	8 893
2005	29 524	4 244	1 563	10 323	11 886	16 130	54.6	26.3	8 770	9 131
2006	29 967	4 596	1 657	10 529	12 186	16 781	56.0	27.4	8 751	9 313
2007	30 416	4 537	1 756	10 740	12 496	17 033	56.0	26.6	8 766	9 500
2008	30 873	4 473	1 862	10 954	12 816	17 289	56.0	25.9	8 780	9 690
2009	31 336	4 401	1 973	11 173	13 147	17 548	56.0	25.1	8 795	9 883
2010	31 806	4 323	2 092	11 397	13 489	17 811	56.0	24.3	8 809	10 081
2011	32 283	4 236	2 217	11 625	13 842	18 078	56.0	23.4	8 824	10 283
2012	32 767	4 142	2 350	11 857	14 207	18 350	56.0	22.6	8 838	10 488
2013	33 259	4 039	2 491	12 094	14 586	18 625	56.0	21.7	8 853	10 698
2014	33 757	3 927	2 641	12 336	14 977	18 904	56.0	20.8	8 867	10 912
2014a	33 757	2 593	2 876	13 435	16 311	18 904	56.0	13.7		11 884

We next decompose the 24.2% into sectoral employment targets. As for many countries, South Africa's employment data is less reliable the more it is disaggregated. The trends become more volatile and less certain. We therefore based the projections on a combination of sector specific trends, subjective intuition and the economy-wide trend (see Appendix for details). We began by imposing historically consistent growth rates on agriculture, mining and manufacturing and adjusting the remaining major SIC divisions to be consistent with these and the overall growth rate derived above. These are shown in Table 2. It will be seen from columns [5] and [6] that these projections result in the relative shares of primary and secondary sectors declining and of the tertiary sector (services) rising. This trend is consistent not only with recent developments in South Africa but also with the experience of many other middle income developing countries.

Finally, we take these employment projections for the major SIC divisions and use them to modify the individual projections for the 43 SIC sectors used in our model. These modified projections are shown in Table 3.

Table 2 - Composition of employment in 2003 and projected 2014: major SIC divisions

	a) Numbers	2003 [1]	2014 [2]	2014a [3]	2014b [4]
1: Agric	Agriculture, forestry and fishing	842 319	923 940	1 062 475	1 006 241
2: Mining	Mining and quarrying	435 628	474 980	445 641	517 289
3: Manuf	Manufacturing	1 193 984	1 392 545	1 658 446	1 516 588
4: Elec	Electricity, gas and water	52 645	55 782	65 194	60 751
5: Constr	Construction	381 969	532 418	553 006	579 844
6: Trade	Trade, catering and accommodation services	1 273 565	1 693 216	1 766 995	1 844 042
7: Trans	Transport, storage and communication	300 957	341 691	421 860	372 128
8: Finance	Financial intermediation, insurance, real estate and business services	1 597 606	2 293 715	2 229 775	2 498 031
9: Social	Community, social and personal services	2 705 386	3 203 712	3 680 609	3 489 087
	All industries	8 784 059	10 912 000	11 884 000	11 884 000

	b) % Shares	2003 [5]	2014 [6]	2014a [7]	2014b [8]
1: Agric	Agriculture, forestry and fishing	9.6	8.5	8.9	8.5
2: Mining	Mining and quarrying	5.0	4.4	3.7	4.4
3: Manuf	Manufacturing	13.6	12.8	14.0	12.8
4: Elec	Electricity, gas and water	0.6	0.5	0.5	0.5
5: Constr	Construction	4.3	4.9	4.7	4.9
6: Trade	Trade, catering and accommodation services	14.5	15.5	14.9	15.5
7: Trans	Transport, storage and communication	3.4	3.1	3.5	3.1
8: Finance	Financial intermediation, insurance, real estate and business services	18.2	21.0	18.8	21.0
9: Social	Community, social and personal services	30.8	29.4	31.0	29.4
	All industries	100.0	100.0	100.0	100.0

	c) Growth rates	2014		2014a		2014b	
		Total [9]	Annual [10]	Total [11]	Annual [12]	Total [13]	Annual [14]
1: Agric	Agriculture, forestry and fishing	9.7	0.8	26.1	2.1	19.5	1.6
2: Mining	Mining and quarrying	9.0	0.8	2.3	0.2	18.7	1.6
3: Manuf	Manufacturing	16.6	1.4	38.9	3.0	27.0	2.2
4: Elec	Electricity, gas and water	6.0	0.5	23.8	2.0	15.4	1.3
5: Constr	Construction	39.4	3.1	44.8	3.4	51.8	3.9
6: Trade	Trade, catering and accommodation services	33.0	2.6	38.7	3.0	44.8	3.4
7: Trans	Transport, storage and communication	13.5	1.2	40.2	3.1	23.6	1.9
8: Finance	Financial intermediation, insurance, real estate and business services	43.6	3.3	39.6	3.1	56.4	4.1
9: Social	Community, social and personal services	18.4	1.5	36.0	2.8	29.0	2.3
	All industries	24.2	2.0	35.3	2.8	35.3	2.8

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Table 3 - Composition of employment 2003 and projected 2014: 43 sectors

		Numbers				% Shares				% Growth					
										2014		2014a		2014b	
		2003	2014	2014a	2014b	2003	2014	2014a	2014b	Total	p.a.	Total	p.a.	Total	p.a.
AAGRI	Agriculture	842 319	923 940	1 062 475	1 006 241	9.6	8.5	8.9	8.5	9.7	0.8	26.1	2.1	19.5	1.6
ACOAL	Coal	47 239	36 400	65 076	39 642	0.5	0.3	0.5	0.3	-22.9	-2.3	37.8	3.0	-16.1	-1.6
AGOLD	Gold	198 465	160 269	108 785	174 545	2.3	1.5	0.9	1.5	-19.2	-1.9	-45.2	-5.3	-12.1	-1.2
AOTHM	Other mining	189 924	278 311	271 780	303 101	2.2	2.6	2.3	2.6	46.5	3.5	43.1	3.3	59.6	4.3
AFOOD	Food processing	145 050	130 168	198 171	141 763	1.7	1.2	1.7	1.2	-10.3	-1.0	36.6	2.9	-2.3	-0.2
ABEVT	Beverages and tobacco	30 770	18 888	39 759	20 571	0.4	0.2	0.3	0.2	-38.6	-4.3	29.2	2.4	-33.1	-3.6
ATEXT	Textiles	60 267	47 904	83 058	52 171	0.7	0.4	0.7	0.4	-20.5	-2.1	37.8	3.0	-13.4	-1.3
AAPPA	Wearing apparel	102 752	91 037	143 292	99 146	1.2	0.8	1.2	0.8	-11.4	-1.1	39.5	3.1	-3.5	-0.3
ALEAT	Leather products	8 148	5 090	10 343	5 543	0.1	0.0	0.1	0.0	-37.5	-4.2	26.9	2.2	-32.0	-3.4
AFOOT	Footwear	12 725	8 140	15 624	8 865	0.1	0.1	0.1	0.1	-36.0	-4.0	22.8	1.9	-30.3	-3.2
AWOOD	Wood products	52 266	63 375	71 056	69 020	0.6	0.6	0.6	0.6	21.3	1.8	36.0	2.8	32.1	2.6
APAPR	Paper products	37 271	31 707	48 153	34 531	0.4	0.3	0.4	0.3	-14.9	-1.5	29.2	2.4	-7.4	-0.7
APRNT	Printing and publishing	44 862	36 079	60 139	39 293	0.5	0.3	0.5	0.3	-19.6	-2.0	34.1	2.7	-12.4	-1.2
APETR	Petroleum products	13 224	13 765	15 829	14 991	0.2	0.1	0.1	0.1	4.1	0.4	19.7	1.6	13.4	1.1
ABCHM	Chemical products	15 588	23 856	21 629	25 981	0.2	0.2	0.2	0.2	53.0	3.9	38.8	3.0	66.7	4.8
AOCHM	Other chemical products	42 101	48 389	57 814	52 699	0.5	0.4	0.5	0.4	14.9	1.3	37.3	2.9	25.2	2.1
ARUBB	Rubber products	15 469	18 526	21 526	20 176	0.2	0.2	0.2	0.2	19.8	1.7	39.2	3.0	30.4	2.4
APLAS	Plastic products	40 793	36 937	55 465	40 227	0.5	0.3	0.5	0.3	-9.5	-0.9	36.0	2.8	-1.4	-0.1
AGLAS	Glass products	5 932	3 990	8 056	4 346	0.1	0.0	0.1	0.0	-32.7	-3.5	35.8	2.8	-26.7	-2.8
ANMMP	Non-metallic metal products	45 994	52 183	61 281	56 832	0.5	0.5	0.5	0.5	13.5	1.2	33.2	2.6	23.6	1.9
AIRON	Basic iron and steel	32 488	22 119	52 780	24 089	0.4	0.2	0.4	0.2	-31.9	-3.4	62.5	4.5	-25.9	-2.7
ANFRM	Non-ferrous metals	20 537	22 928	32 854	24 970	0.2	0.2	0.3	0.2	11.6	1.0	60.0	4.4	21.6	1.8

AMETP	Metal products	95 856	145 695	133 873	158 672	1.1	1.3	1.1	1.3	52.0	3.9	39.7	3.1	65.5	4.7
AMACH	Machinery	94 982	159 005	138 100	173 168	1.1	1.5	1.2	1.5	67.4	4.8	45.4	3.5	82.3	5.6
AELMA	Electrical machinery	38 536	56 177	53 850	61 181	0.4	0.5	0.5	0.5	45.8	3.5	39.7	3.1	58.8	4.3
ACOME	Communication equipment	7 065	4 568	9 823	4 975	0.1	0.0	0.1	0.0	-35.3	-3.9	39.0	3.0	-29.6	-3.1
ASCIE	Scientific equipment	8 465	38 538	11 784	41 971	0.1	0.4	0.1	0.4	355.3	14.8	39.2	3.1	395.8	15.7
AVEHI	Vehicles	107 477	138 381	152 262	150 707	1.2	1.3	1.3	1.3	28.8	2.3	41.7	3.2	40.2	3.1
ATRNE	Transport equipment	14 374	9 816	14 986	10 691	0.2	0.1	0.1	0.1	-31.7	-3.4	4.3	0.4	-25.6	-2.7
AFURN	Furniture	40 925	56 579	60 601	61 619	0.5	0.5	0.5	0.5	38.3	3.0	48.1	3.6	50.6	3.8
AOTHI	Other industries	60 067	108 705	86 338	118 388	0.7	1.0	0.7	1.0	81.0	5.5	43.7	3.4	97.1	6.4
AELEG	Electricity and gas	41 142	34 118	48 935	37 157	0.5	0.3	0.4	0.3	-17.1	-1.7	18.9	1.6	-9.7	-0.9
AWATR	Water	11 503	21 665	16 259	23 595	0.1	0.2	0.1	0.2	88.3	5.9	41.3	3.2	105.1	6.7
ACONS	Constuction	381 969	532 418	553 006	579 844	4.3	4.9	4.7	4.9	39.4	3.1	44.8	3.4	51.8	3.9
ATRAD	Trade services	1 066 855	1 361 892	1 447 209	1 483 204	12.1	12.5	12.2	12.5	27.7	2.2	35.7	2.8	39.0	3.0
AHCAT	Hotels and catering	206 710	331 324	319 786	360 838	2.4	3.0	2.7	3.0	60.3	4.4	54.7	4.0	74.6	5.2
ATRAN	Transport services	235 409	272 078	329 834	296 314	2.7	2.5	2.8	2.5	15.6	1.3	40.1	3.1	25.9	2.1
ACOMM	Communication services	65 548	69 613	92 026	75 814	0.7	0.6	0.8	0.6	6.2	0.5	40.4	3.1	15.7	1.3
AFINS	Financial and real estate servi	218 725	233 394	291 941	254 184	2.5	2.1	2.5	2.1	6.7	0.6	33.5	2.7	16.2	1.4
ABUSS	Business services	1 378 881	2 060 321	1 937 834	2 243 847	15.7	18.9	16.3	18.9	49.4	3.7	40.5	3.1	62.7	4.5
AMAOS	Medical and other services	126 188	145 333	204 626	158 278	1.4	1.3	1.7	1.3	15.2	1.3	62.2	4.5	25.4	2.1
AOTHP	Other producers	1 143 376	1 525 981	1 547 515	1 661 910	13.0	14.0	13.0	14.0	33.5	2.7	35.3	2.8	45.4	3.5
AGOVS	Government services	1 435 822	1 532 399	1 928 469	1 668 899	16.3	14.0	16.2	14.0	6.7	0.6	34.3	2.7	16.2	1.4
	Total	8 784 059	10 912 000	11 884 000	11 884 000	100.0	100.0	100.0	100.0	24.2	2.0	35.3	2.8	35.3	2.8

We have chosen this 'top down' procedure for making our projections for two reasons. First, the data are more reliable the more aggregated they are. Second, we believe that most people have stronger intuitions about where the economy is headed at the aggregate rather than disaggregated levels. We may think of the numbers in Table 3 as showing one set of disaggregated employment trends that are consistent with the higher level numbers in Table 2, which are consistent with the even more aggregated numbers in Table 1. While there are many other plausible projections possible, the process of making these 'constrained guestimates' is in itself instructive. We hope to modify our initial projections in the light of further discussion.

Along with our projected employment increases we also assume that there is general productivity growth. Other studies suggest that total factor productivity growth in South Africa is about 1 per cent per year, so we impose this as a general trend across all sectors. However, the model does allow us to explore the impact of faster or slower productivity growth in the specific sectors.

Since demand generated by the imposed increase in employment is insufficient to avoid some implausible reductions in relative prices and wages, we simulate exogenous demand increases by improving the terms of trade. We reduce world import prices and raise world export prices by 5% each. This injects export demand into the economy and creates demand for domestic import substituting industries. South Africa's terms of trade have improved over the period on which our trends are based, although it is debatable whether they will continue to do so. However, this is a convenient way of raising demand in our model. We could alternatively have injected demand by raising the budget and current account deficits relative to GDP; however, these are both variables of policy interest that we wish to modify in the later scenarios.

The implications of these projections for GDP, output structure etc are shown in Tables 4 to 6 in the columns headed '2014'. They give rise to a real GDP growth rate of 2.5% per year. Capital stock in the economy rises by 1.8% per year. This is broadly consistent with current levels of fixed investment and capital stock.

Our initial step in constructing the baseline therefore comprises a) the projected changes in employment; b) uniform total factor productivity growth of 12% across all sectors; and c) a 10 percent improvement in the terms of trade. The second step is to raise sectoral employment levels further to meet the halving unemployment target.

Table 4 - Growth rates and structure of SIC major divisions

a) Real GDP	Growth rate			Composition			
	2014	2014a	2014b	2003	2014	2014a	2014b
Agriculture, forestry and fishing	1.5	4.2	2.3	3.9	3.4	3.7	3.4
Mining and quarrying	2.5	2.8	3.3	7.4	7.4	6.2	7.4
Manufacturing	2.2	4.6	3.1	19.7	19.1	19.9	19.1
Electricity, gas and water	2.0	3.8	2.7	2.4	2.3	2.2	2.2
Construction	3.5	5.1	4.4	2.4	2.6	2.5	2.6
Trade, catering and accommodation services	2.6	4.7	3.5	13.9	14.1	14.2	14.1
Transport, storage and communication	2.8	5.0	3.7	9.8	10.1	10.3	10.1
Financial intermediation, insurance, real estate and business services	2.9	4.9	3.8	19.6	20.5	20.5	20.6
Community, social and personal services	2.3	4.2	3.1	21.0	20.5	20.4	20.5
All industries	2.5	4.5	3.4	100.0	100.0	100.0	100.0

b) Employment	Growth rate			Composition			
	2014	2014a	2014b	2003	2014	2014a	2014b
Agriculture, forestry and fishing	0.8	2.1	1.6	9.6	8.5	8.9	8.5
Mining and quarrying	0.8	0.2	1.6	5.0	4.4	3.7	4.4
Manufacturing	1.4	3.0	2.2	13.6	12.8	14.0	12.8
Electricity, gas and water	0.5	2.0	1.3	0.6	0.5	0.5	0.5
Construction	3.1	3.4	3.9	4.3	4.9	4.7	4.9
Trade, catering and accommodation services	2.6	3.0	3.4	14.5	15.5	14.9	15.5
Transport, storage and communication	1.2	3.1	1.9	3.4	3.1	3.5	3.1
Financial intermediation, insurance, real estate and business services	3.3	3.1	4.1	18.2	21.0	18.8	21.0
Community, social and personal services	1.5	2.8	2.3	30.8	29.4	31.0	29.4
All industries	2.0	2.8	2.8	100.0	100.0	100.0	100.0

c) Capital	Growth rate			Composition			
	2014	2014a	2014b	2003	2014	2014a	2014b
Agriculture, forestry and fishing	0.3	3.6	1.1	3.7	3.2	3.5	3.2
Mining and quarrying	2.2	2.3	3.0	8.0	8.3	6.6	8.3
Manufacturing	1.4	3.8	2.1	13.2	12.6	12.8	12.5
Electricity, gas and water	2.1	3.6	2.8	6.0	6.2	5.7	6.1
Construction	1.7	4.9	2.5	0.6	0.6	0.6	0.6
Trade, catering and accommodation services	0.9	4.4	1.8	5.1	4.6	5.3	4.6
Transport, storage and communication	2.3	4.6	3.2	17.2	18.1	18.1	18.2
Financial intermediation, insurance, real estate and business services	1.8	4.4	2.7	22.7	22.7	23.5	22.8
Community, social and personal services	2.0	4.3	2.8	23.4	23.8	23.9	23.8
All industries	1.8	4.1	2.7	100.0	100.0	100.0	100.0

Table 5 - Growth rates and structure of 43 sectors

Final year is 2014a

		GDP			Employment			Capital		
		Growth rate	Composition		Growth rate	Composition		Growth rate	Composition	
		% p.a.	2003	2014a	% p.a.	2003	2014a	% p.a.	2003	2014a
AAGRI	Agriculture	4.2	3.9	3.7	2.1	9.6	8.9	3.6	3.7	3.5
ACOAL	Coal	4.2	1.4	1.3	3.0	0.5	0.5	3.4	0.7	0.6
AGOLD	Gold	-4.2	2.0	0.8	-5.3	2.3	0.9	-4.9	1.9	0.7
AOTHM	Other mining	4.6	4.1	4.1	3.3	2.2	2.3	3.8	5.5	5.3
AFOOD	Food processing	4.1	1.9	1.8	2.9	1.7	1.7	3.2	1.0	0.9
ABEVT	Beverages and tobacco	3.9	1.1	1.1	2.4	0.4	0.3	3.0	0.6	0.6
ATEXT	Textiles	4.1	0.4	0.3	3.0	0.7	0.7	3.3	0.2	0.2
AAPPA	Wearing apparel	4.5	0.4	0.4	3.1	1.2	1.2	4.5	0.1	0.1
ALEAT	Leather products	4.0	0.1	0.1	2.2	0.1	0.1	3.7	0.0	0.0
AFOOT	Footwear	3.3	0.1	0.1	1.9	0.1	0.1	2.7	0.0	0.0
AWOOD	Wood products	4.0	0.5	0.5	2.8	0.6	0.6	3.2	0.1	0.1
APAPR	Paper products	4.4	0.8	0.8	2.4	0.4	0.4	4.1	0.5	0.5
APRNT	Printing and publishing	3.9	0.6	0.6	2.7	0.5	0.5	3.7	0.1	0.1
APETR	Petroleum products	3.9	1.4	1.3	1.6	0.2	0.1	2.9	3.9	3.4
ABCHM	Chemical products	5.0	1.1	1.2	3.0	0.2	0.2	4.5	1.4	1.5
AOCHM	Other chemical products	4.6	1.3	1.3	2.9	0.5	0.5	4.4	0.5	0.5
ARUBB	Rubber products	4.5	0.2	0.2	3.0	0.2	0.2	4.3	0.1	0.1
APLAS	Plastic products	4.2	0.7	0.7	2.8	0.5	0.5	4.1	0.1	0.1
AGLAS	Glass products	4.4	0.1	0.1	2.8	0.1	0.1	3.8	0.1	0.1
ANMMP	Non-metallic metal products	4.9	0.5	0.6	2.6	0.5	0.5	4.4	0.6	0.6
AIRON	Basic iron and steel	5.8	1.3	1.4	4.5	0.4	0.4	4.8	1.3	1.4
ANFRM	Non-ferrous metals	5.7	0.8	0.9	4.4	0.2	0.3	4.6	0.9	1.0
AMETP	Metal products	4.6	1.1	1.1	3.1	1.1	1.1	4.6	0.3	0.3
AMACH	Machinery	4.6	0.9	0.9	3.5	1.1	1.2	3.8	0.2	0.2
AELMA	Electrical machinery	4.6	0.6	0.6	3.1	0.4	0.5	4.6	0.1	0.1
ACOME	Communication equipment	4.7	0.2	0.2	3.0	0.1	0.1	4.5	0.0	0.0
ASCIE	Scientific equipment	4.9	0.1	0.1	3.1	0.1	0.1	4.5	0.0	0.0
AVEHI	Vehicles	4.5	1.6	1.6	3.2	1.2	1.3	3.8	0.7	0.7
ATRNE	Transport equipment	1.5	0.3	0.2	0.4	0.2	0.1	1.0	0.1	0.1
AFURN	Furniture	4.8	0.2	0.2	3.6	0.5	0.5	4.3	0.0	0.0
AOTHI	Other industries	5.6	1.5	1.7	3.4	0.7	0.7	4.8	0.1	0.2
AELEG	Electricity and gas	3.5	2.0	1.8	1.6	0.5	0.4	3.0	4.0	3.6
AWATR	Water	5.3	0.4	0.5	3.2	0.1	0.1	4.7	2.0	2.1
ACONS	Constuction	5.1	2.4	2.5	3.4	4.3	4.7	4.9	0.6	0.6
ATRAD	Trade services	4.6	12.9	13.0	2.8	12.1	12.2	4.3	4.6	4.7
AHCAT	Hotels and catering	6.0	1.0	1.2	4.0	2.4	2.7	5.5	0.5	0.6
ATRAN	Transport services	5.0	5.8	6.1	3.1	2.7	2.8	4.6	15.2	16.0
ACOMM	Communication services	5.1	4.0	4.2	3.1	0.7	0.8	4.6	2.0	2.1
AFINS	Financial and real estate servi	4.5	8.6	8.6	2.7	2.5	2.5	4.1	8.4	8.4
ABUSS	Business services	5.2	11.0	11.9	3.1	15.7	16.3	4.6	14.3	15.1
AMAOS	Medical and other services	6.2	2.2	2.7	4.5	1.4	1.7	6.0	1.5	1.8
AOTHP	Other producers	4.1	3.9	3.8	2.8	13.0	13.0	4.3	0.2	0.2
AGOVS	Government services	4.0	14.8	14.0	2.7	16.3	16.2	4.2	21.7	21.9
	Total	4.5	100.0	100.0	2.8	100.0	100.0	4.1	100.0	100.0

Table 6 - Real GDP and its components

	Rbn				Annual growth rates %		
	2003	**2014**	**2014a**	**2014b**	**2014**	**2014a**	**2014b**
Absorption	1 231	1 649	2 055	1 802	2.7	4.8	3.5
Private consumption	786	1 056	1 337	1 156	2.7	4.9	3.6
Fixed investment	200	297	344	323	3.7	5.1	4.5
Change in inventories	5	6	9	7	1.7	5.5	3.1
Government consumption	239	290	365	316	1.8	3.9	2.6
Exports	340	459	558	502	2.8	4.6	3.6
Imports	- 319	- 477	- 579	- 521	3.7	5.6	4.6
GDP (mp)	1 251	1 632	2 034	1 782	2.4	4.5	3.3
Net indirect taxes	140	170	230	185	1.8	4.6	2.6
GDP (FC)	1 111	1 462	1 804	1 597	2.5	4.5	3.4

3.2 Scaling up to halve unemployment

We assume that when government speaks of halving unemployment it means cutting the strict unemployment rate in 2003 (27.4% in our figures) in half (13.7%) by 2014. With the projections we have made, assuming that the informal sector will adjust at the same rate as the formal and scaling to our model, this means that instead of the number of formal jobs rising from 8.8m to 10.9m (i.e. by 24.2%), they will have to will have to rise to 11.9m (i.e. by 35.3%) (see bottom row of Table 1).

The difficult question is how to allocate this increase to sectors. This begins to take us into scenario building, since it requires us to have a view about the possibilities of where jobs might be created. For our benchmark we want to construct a 'business as usual' scenario: how will the jobs be created if there are no special interventions? However, even this is open to interpretation, and there are alternative ways of doing it. One very obvious and simple way is simply to raise the total quantity of employment, without imposing a specific sectoral pattern, and allow the market (model) to decide in which sectors the demand will be. A second way is to allocate the desired additional employment so that employment grows at a uniform rate across all sectors from the level of our initial projections. While neither of these is particularly plausible, they do give us an initial take, which we can modify. Some results are shown in Tables 2 3 and 4, where '2014' refers to the simple projections, '2014a' refers to the reduced unemployment figures by the first approach and '2014b' the reduced unemployment figures by the second approach.

With the first method, one would expect the market to attempt to allocate labour across sectors in such a way that the change in wage rates is uniform across sectors, so that relative sectoral wages remain constant. If one sector were to experience a wage increase higher than others, labour would be attracted into it, out of other sectors. We assume that capital is allocated between sectors in such a way as to keep rates of return constant, although in the case of capital there is (by assumption) no limit on the total supply. The method means that the absorption of the additional employment results in fairly uniform expansion of output, capital and so on.

One can see some of the difference between the two methods in Table 2. The shares of sectors in total employment are the same for method 2 ('2014b') as the initial projections ('2014'). This is by construction. When we do not impose a structure, however, there are significant changes. Agriculture and manufacturing absorb more of the additional labour, mining and services as a whole less.

Neither of these are particularly plausible scenarios. No one would expect the additional jobs required to be created uniformly across sectors. The 'market' solution produces results that go against trends found in other middle income developing countries. We clearly have to make further modifications if we wish to create a benchmark that might be regarded more widely as plausible. Nonetheless, although it is not normal to draw lessons from the construction of the benchmark, some useful tentative pointers do emerge from these two alternative ways of modelling how the additional employment might be absorbed.

- Other things equal, the 'market' method leads to a bigger increase in GDP than when employment is forced to expand in some specific pattern as with method B (see Table 6). This is because there are no constraints on sectors other than the total labour supply. If there is a high demand for a sector's output, it can not only respond by investing more but also by drawing in more labour. This latter option is no longer available if the economy has to conform to a specific sectoral pattern of employment, and the growth possibilities of sectors may be constrained.
- Changes in relative wages play an important role in absorbing the additional labour, the more so in the 'market' solution. Remember that we constrain the economy so that the real average consumer wage does not change. The additional employment is not accommodated by reducing the real consumption wage across the economy. However, the 'nominal' average wage does fall, not only because of relative wage changes, but also because of compositional effects. Our projected employment pattern is biased towards lower paying sectors. This means that the capital expansion required to accommodate it is lower than otherwise. Taken as a whole, the economy is more able to absorb the additional labour than it would have been if we had tried to expand high wage sectors faster. One fairly obvious lesson from this is that, other things equal, it is easier to meet the overall employment target the more the sectoral expansion is biased towards low paid sectors.
- The changing composition is not sufficient to absorb entirely the numbers in the imposed pattern; there is still a need to change relative wages. A major problem (apart from any ethical and political reservations one might have) is that although the additional employment does generate higher output and income, the income does not stimulate demand sufficiently to allow the additional output to be sold without some sectors reducing prices. This raises real product wages in these sectors, which reduces their labour absorption. The problem can be reduced if there are exogenous injections of demand, so that income effects dominate substitution effects. The scenarios we intend exploring can be seen as alternative stories about how to maximise the endogenous income generation and about where these exogenous injections might come from.
- This naturally raises questions about the way we approach the problem. If we were not concerned about replicating a target pattern and level of employment, it would be more natural to project output trends and see what the consequent employment is. The output growth would be exogenous and the employment growth endogenous. Our approach allows us to see what income and demand is generated by the employment expansion itself.
- At first blush, the results for method A in Table 4 (the '2014a' columns) might appear quite encouraging. The 2.8% p.a. employment growth required to meet the target of halving unemployment generates a 4.5% GDP growth rate. This is lower than the 5% government target. However, the disaggregated growth rates that lie behind this suggest it is not feasible. In Table 4 we see, for example, that agricultural output grows at 4.2% per year, which seems implausible. If we constrain this rate, then rates for other sectors will have to go up, potentially

making them implausible. We have not yet examined this, but even this example shows the merit of trying to think in disaggregated ways that are constrained by economy-wide consistency requirements.

4 Conclusion and future directions

The foregoing has been a preliminary sketch of how we are developing a baseline scenario. We have tentatively arrived at two alternative scenarios that have formal employment at a level that is consistent with our interpretation of 'halving unemployment'. We have additional work to do to arrive at a plausible single baseline scenario. This will entail modifying the trends in some of the exogenous variables in our model, incorporating lessons from Professor Berry's work on global development and incorporating criticisms stimulated by this initial exercise. We conclude with a number of observations.

1. In traditional modelling approaches, the exact nature of the baseline and how it has been arrived at is generally a black box. Simulation results are presented as deviations. Rather than saying 'Devaluing by 10% will raise GDP by R1bn', we typically say 'Devaluing by 10% will raise GDP by 0.1% above will otherwise be'. However, we want to be able to present results in a form which policy analysts will find less theoretical, and therefore are concerned to construct a 'plausible' baseline.
2. Part of the work on constructing a better baseline is contingent on developing better data on employment and incomes, continuing the work already begun under the EGDI Labour Statistics project
3. We need to intensify our work on measuring the informal economy and on understanding not only the behaviour of informal producers but also the way in which the informal economy interacts with the formal.
    a. In estimating the numbers we have assumed informal employment grows at 6% p.a. compared to 2% for formal employment. Given the relative sizes of the two, continuing on these trends would see the informal sector providing employment for 20% of South Africa's employment within 14 years. Is this likely or desirable? Is the recent high rate of growth of the informal sector simply a transitional rate from apartheid to normalcy, or does it represent something more sustained?
    b. We have little understanding of how the behaviour and drivers of informal producers differs from those of their formal counterparts. If they are basically the same, adding them into the model increases its complexity without increasing the knowledge we might get from it. However, if there are important differences, **not** adding them may give misleading results.
    c. We have little understanding of how the informal economy interacts with the formal. Does employment (output, incomes) in the two move together or inversely? Theories suggest both possibilities; what is the case in South Africa?
4. This presentation has not been concerned with the scenarios we intend to develop. However, as mentioned already, there is some element of scenario building in our thinking about how to scale up the projected employment levels and patterns to the 'half unemployment' target. We will draw on the

work by Professor Berry to develop these scenarios, and particular the case studies of Chile and Indonesia. This will entail translating the experiences of those countries into 'South African'. The current exercise allows us to see that there are two alternative approaches to doing this. We can impose similar policy environments on our model and see what the outcomes are or we can impose similar outcomes – patterns of employment etc – and see policy environment is implied. The latter is more in keeping with the approach we have taken to benchmarking. Our experience thus far suggests that there may be different lessons to be learned from each approach.