

Linked Macro-Education Model (LM-EM)

A Tool for Strategic Decision-making

Asghar Adelzadeh, Ph.D.
Director and Chief Economic Modeller
Applied Development Research Solutions (ADRS)
asghar@adrs-global.com

Presentation at the DHET workshop on:
Forecasting Skills Supply and Demand using LM-EM
University of Witwatersrand
7 October 2015

Key goal of National Skills Development Strategy (NSDS III)

- “There is currently no institutional mechanism that provides credible information and analysis with regard to the supply and demand for skills. While there are a number of disparate information databases and research initiatives, there is no standardised framework for determining skills supply, shortages and vacancies, and there is no integrated information system for skills supply and demand across government.” NSDS III
- Key goal of NSDS III: To establish a credible institutional mechanism for skills planning

ADRS

Applied Development
Research Solutions

Objectives

- To provide a non-technical presentation of the Linked Macro-Education Model of South Africa (LM-EM)
- To explain the architecture and outputs of the LM-EM
- To illustrate the diverse model results and how they are consistent with each other

What this presentation does NOT cover

Earlier presentations of the LM-EM to the Reserve Bank and the Treasury's modelling teams, the Stats SA and the Economic Cluster provided a more technical review of the modelling work that underlie the LM-EM. For example, those presentations covered following areas that are not included in the current presentation:

- Data sources and data preparation
- Model's specification, estimation and validation techniques and processes
- Exogenous inputs into the model
- Verification and validation techniques used

The three economic scenarios discussed in this presentation do not necessarily represent the NDP or NGP or any other official future economic scenarios.

ADRS

Applied Development
Research Solutions

Linked Macro-Education Model

- ❖ The LM-EM is a forecasting tool for strategic decision-making. Specifically, LM-EM enables you to design economic and education policy scenarios, quantify their impact, and project future trends in economic indicators and the demand for and supply of educational qualifications.
- ❖ To capture the interactions between macroeconomics and the education sector, LM-EM uses ADRS' full macroeconomic model of South Africa and has been extended to incorporate modules of supply and demand for occupations and educational qualifications.

ADRS

Applied Development
Research Solutions

How Does LM-EM Provide Intelligence? Low Scenario

The rest of this presentation provides an overview of LM-EM's results for three policy scenarios for the next 10 years. Details of the scenarios will be presented at the workshop.

Low Scenario:

- This scenario envisions the future of South African economy as an extension of the recent economic path where the average real GDP growth rate and the unemployment rate have oscillated around 2 percent and 24 percent, respectively.
- The purpose of the Low scenario is to examine 'what if' the economic performance over the next 10 years is relatively weak in terms of growth and employment creation.
- What are the implications of this path for the demand and supply of occupations and skills?
- The details of the scenario are provided in the Report.

ADRS

Applied Development
Research Solutions

How Does LM-EM Provide Intelligence? Moderate Scenario

Moderate Scenario:

- What if the economy follows a path that results in 'moderate' rates of economic growth and substantial reductions in the unemployment rate over the next 10 years?
- What will be the implication of such a growth path for the size of job openings and job seekers, and what will be its effect on the skills gap and demand for occupations?
- The details of the scenario are provided in the Report.

How Does LM-EM Provide Intelligence? High Scenario

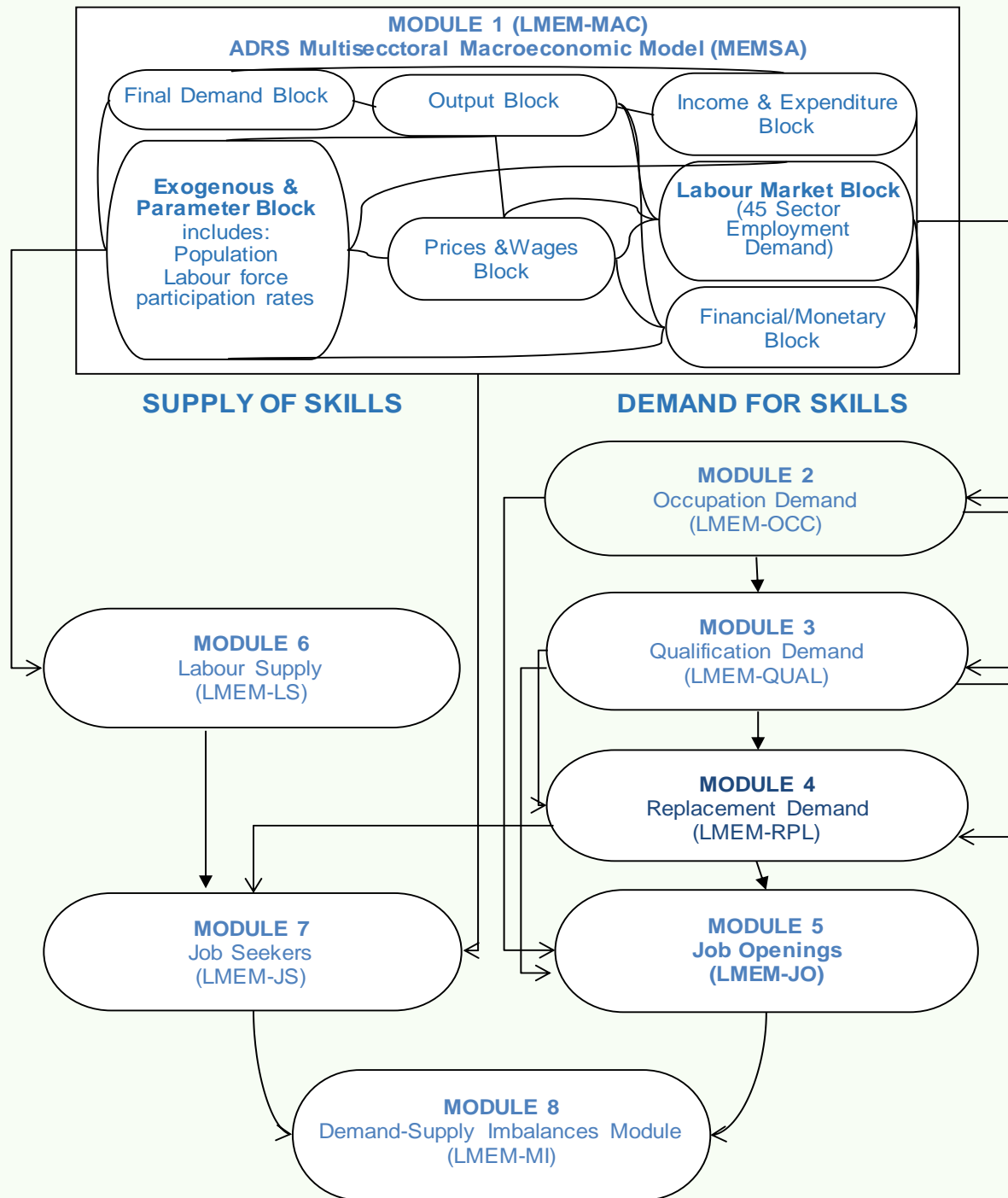
High Scenario

- The purpose of this scenario is to demonstrate the implications for job openings, job seekers as well as skills demand and supply if the economy follows a path of high growth and employment.
- A scenario whose simulation produces such a growth path encompasses macroeconomic, public investment, industrial, trade, and international assumptions that are included in the Report.

ADRS

Applied Development
Research Solutions

LM-EM Module Structure



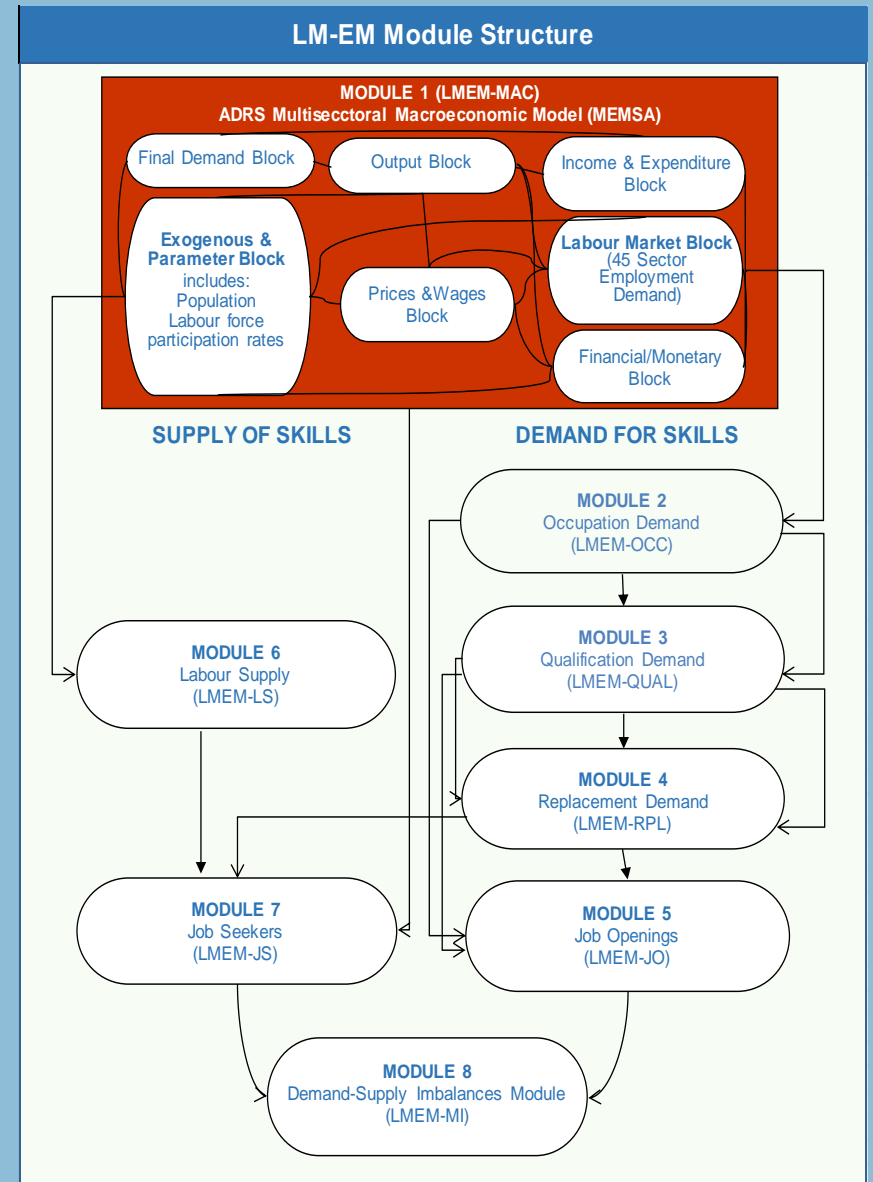
Multi-Sectoral Macroeconomic Model of South Africa (LMEM-MAC)

Aim:

- To capture the structure of the South African economy.
- To allow design and analysis of macroeconomics and industrial policies.

Outputs:

- Produces projections of key macroeconomic and sector indicators under various domestic and international contexts and policy options.
- Produces projections of employment for all 21 SETAs



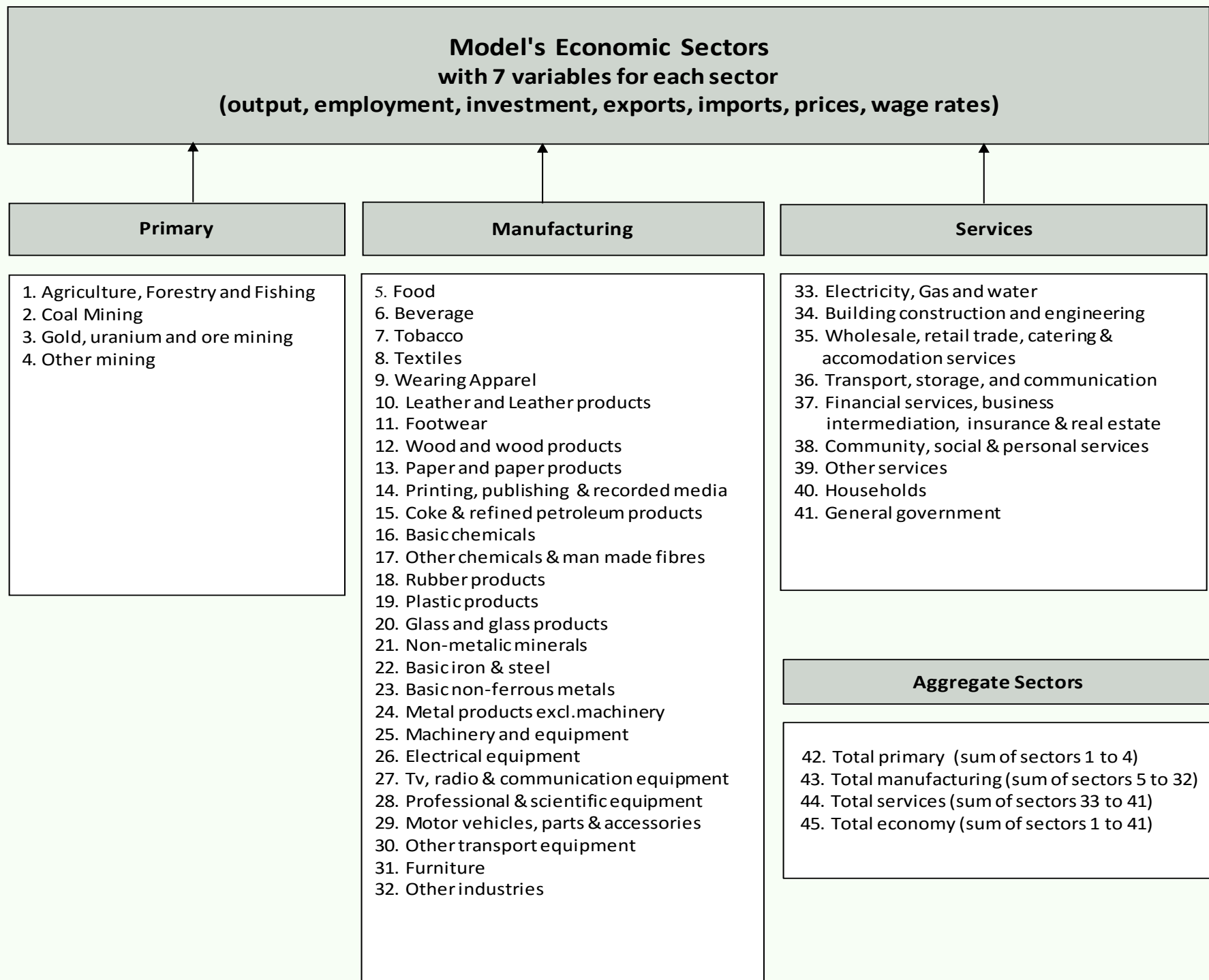
About ADRS Macroeconomic Model

- It is a bottom up model with more than 3200 equations and more than 400 behavioural equations designed to capture the complexity and the laws of motion of the South African economy.
- It is an econometric model.
- It has a user-friendly web platform that has been available and used on ADRS website since 2006.
- It has been used to build other ADRS specialised models such: Linked Macro-Provincial Model, Economy-Energy-Emissions Model, and Macro-Social Security Model-Income Tax model.

ADRS

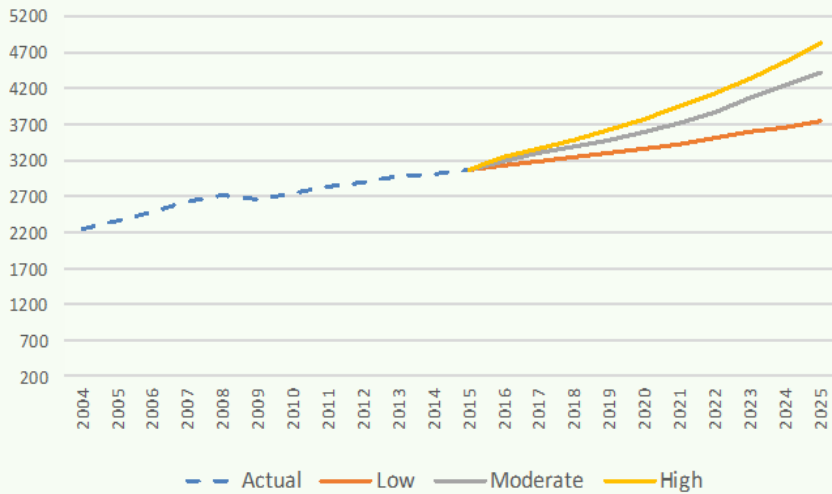
Applied Development
Research Solutions

Diagram 3: Macro-Econometric Model of South Africa (MEMSA) Sectors



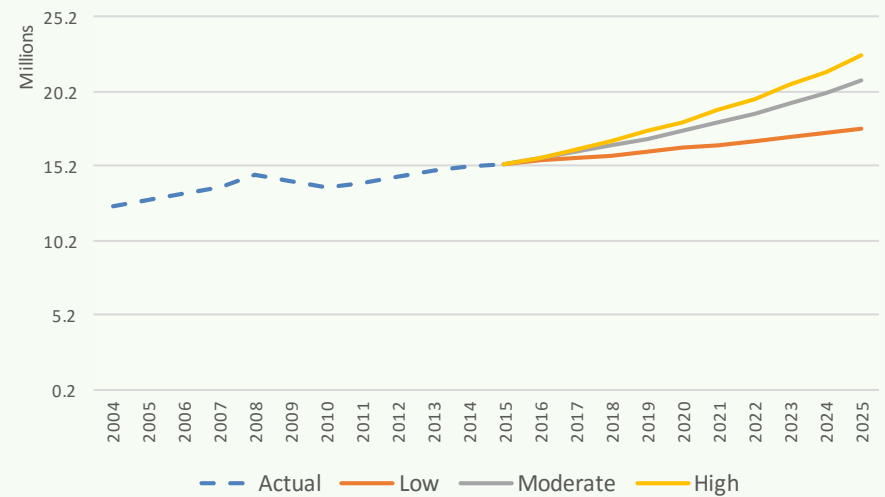
Output & Employment (2015-2025)

Fig 4.1: Real GDP Trends (2004-2025, R Bil)



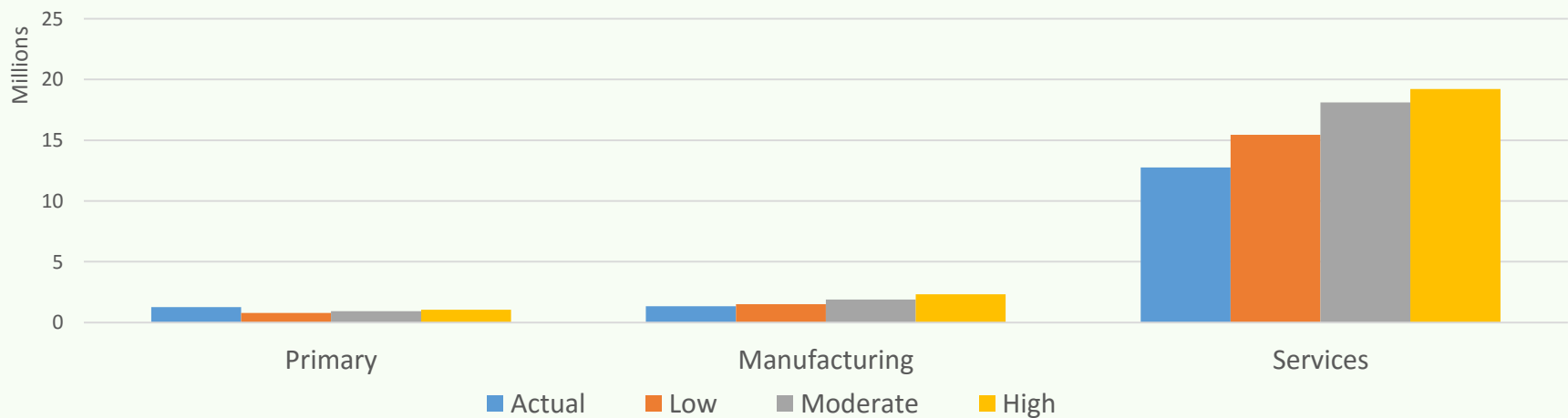
Source: LM-EM Model (www.adrs-global.com)

Fig 4.2: Trends in Employment (2004-2025, levels)



Source: LM-EM Model (www.adrs-global.com)

Aggregate Sector Employment (2015 & 2025, levels)



Source: LM-EM Model (www.adrs-global.com)

Table 4.2: Total Output by Sector (2015 & 2025)					Table 4.3: Total Employment by Sector (2015 & 2025)				
Sectors	Sectoral Shares of Output (%)				Sectors	Sectoral Shares of Employment (%)			
	2015	2025				2015	2025		
		Low	Moderate	High			Low	Moderate	High
Total Output (2010 price, R millions)	2,742,728	3,350,526	3,949,715	4,312,564	Total Employment	15,370,261	17,748,991	20,932,626	22,607,461
Agriculture, Forestry and Fishing	2.73	3.86	3.41	3.08	Agriculture, Forestry and Fishing	5.10	2.38	2.42	2.46
Coal Mining	1.70	1.05	1.29	1.76	Coal Mining	0.57	0.47	0.54	0.66
Gold, uranium and ore mining	0.87	0.33	0.32	0.41	Gold, uranium and ore mining	0.74	0.72	0.65	0.67
Other mining	5.26	2.78	2.43	2.39	Other mining	1.87	0.92	0.88	0.88
Food	1.95	2.15	2.20	2.15	Food	1.15	0.84	0.84	0.82
Beverage	0.75	0.55	0.53	0.63	Beverage	0.45	0.50	0.45	0.46
Tobacco	0.10	0.05	0.07	0.19	Tobacco	0.02	0.02	0.02	0.03
Textiles	0.11	0.12	0.15	0.32	Textiles	0.29	0.22	0.27	0.39
Wearing Apparel	0.23	0.41	0.46	0.69	Wearing Apparel	0.50	0.61	0.69	0.94
Leather and Leather products	0.05	0.03	0.10	0.04	Leather and Leather products	0.03	0.02	0.03	0.02
Footwear	0.05	0.04	0.08	0.21	Footwear	0.07	0.05	0.09	0.16
Wood and wood products	0.31	0.38	0.40	0.55	Wood and wood products	0.37	0.32	0.35	0.47
Paper and paper products	0.38	0.32	0.33	0.48	Paper and paper products	0.25	0.12	0.10	0.12
Printing, publishing and recorded media	0.48	0.40	0.36	0.35	Printing, publishing and recorded media	0.35	0.30	0.27	0.27
Coke & refined petroleum products	1.39	1.84	1.63	1.69	Coke & refined petroleum products	0.18	0.29	0.27	0.30
Basic chemicals	0.58	0.71	0.78	1.17	Basic chemicals	0.16	0.14	0.16	0.23
Other chemicals & man made fibres	0.98	1.03	1.15	1.24	Other chemicals & man made fibres	0.36	0.48	0.52	0.57
Rubber products	0.12	0.12	0.14	0.30	Rubber products	0.07	0.05	0.06	0.10
Plastic products	0.39	0.42	0.48	0.70	Plastic products	0.26	0.14	0.16	0.20
Glass and glass products	0.09	0.09	0.12	0.29	Glass and glass products	0.06	0.05	0.05	0.05
Non-metalic minerals	0.53	0.56	0.53	0.68	Non-metalic minerals	0.39	0.31	0.37	0.39
Basic iron & steel	0.79	1.07	1.17	1.40	Basic iron & steel	0.23	0.40	0.44	0.50
Basic non-ferrous metals	0.39	0.40	0.44	0.65	Basic non-ferrous metals	0.14	0.17	0.20	0.29
Metal products excl.machinery	0.73	0.56	0.56	0.57	Metal products excl.machinery	0.94	0.44	0.45	0.46
Machinery and equipment	0.72	0.80	0.74	0.82	Machinery and equipment	0.78	0.95	0.97	1.01
Electrical equipment	0.35	0.61	0.60	0.74	Electrical equipment	0.29	0.51	0.50	0.55
Tv, radio & communication equipment	0.15	0.27	0.31	0.57	Tv, radio & communication equipment	0.04	0.06	0.07	0.11
Professional & scientific equipment	0.05	0.02	0.05	0.18	Professional & scientific equipment	0.07	0.04	0.05	0.07
Motor vehicles, parts & accessories	0.93	1.42	1.46	1.62	Motor vehicles, parts & accessories	0.58	0.70	0.70	0.73
Other transport equipment	0.16	0.19	0.23	0.40	Other transport equipment	0.09	0.07	0.08	0.11
Furniture	0.14	0.13	0.15	0.30	Furniture	0.21	0.15	0.19	0.31
Other industries	0.89	1.24	1.39	1.25	Other industries	0.40	0.58	0.62	0.63
Electricity, Gas and water	2.55	3.41	3.73	4.18	Electricity, Gas and water	0.42	0.37	0.43	0.47
Building construction and engineering	3.61	3.90	4.86	4.69	Building construction and engineering	7.77	8.23	10.26	10.71
Wholesale, retail trade, catering & acc.	14.41	13.21	14.40	13.25	Wholesale, retail trade, catering & acc.	24.22	28.35	30.76	31.01
Transport, storage, and communication	9.52	10.34	10.98	10.68	Transport, storage, and communication	5.40	5.65	5.73	5.72
Fincl srv, insurance & real estate	21.99	22.28	19.81	18.37	Fincl srv, insurance & real estate	15.09	15.43	14.65	14.29
Community, social & personal services	23.59	22.89	22.17	21.02	Community, social & personal services	30.07	28.95	24.67	22.84
Other services	3.45	3.82	4.87	4.85	Other services	2.80	2.89	2.58	2.38
Households	2.60	2.59	3.32	3.36	Households	13.40	12.80	10.86	10.05
General government	17.54	16.48	13.98	12.81	General government	13.87	13.25	11.24	10.40
Total economy	100.00	100.00	100.00	100.00	Total economy	100.00	100.00	100.00	100.00
Total mining	10.56	8.02	7.45	7.63	Total mining	8.28	4.50	4.48	4.67
Total manufacturing	13.77	15.95	16.61	20.18	Total manufacturing	8.74	8.52	9.01	10.30
Total services	75.67	76.03	75.94	72.19	Total services	82.98	86.98	86.51	85.03
Source: LM-EM Model (www.adrs-global.com)					Source: LM-EM Model (www.adrs-global.com)				

SETA Employment, 2015-2025, Moderate Scenario

Table 4.4: Projection of SETA Employment for Moderate Scenario (2015-2025, Thousand)

SETAs	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
FASSET	315	322	330	338	347	356	365	375	386	396	408
BankSETA	256	262	268	275	283	291	299	308	318	328	339
CHIETA	139	144	150	157	167	176	188	199	215	232	250
FP&MSETA	508	507	508	513	520	530	542	560	579	606	636
CETA	1,449	1,469	1,528	1,600	1,684	1,774	1,874	1,980	2,100	2,245	2,403
ETDP	1,491	1,531	1,565	1,594	1,619	1,640	1,656	1,666	1,673	1,673	1,667
EWSETA	196	201	209	218	229	240	253	266	280	298	317
FOODBEV	184	186	189	191	194	196	199	202	205	207	211
HWSETA	1,572	1,614	1,652	1,687	1,719	1,748	1,773	1,795	1,815	1,830	1,841
INSETA	91	93	95	98	100	103	106	109	113	116	120
LGSETA	759	779	797	813	826	838	848	855	860	862	862
MICT/ICTSETA	323	331	340	349	359	369	380	391	403	416	430
MQA	557	551	560	545	548	546	541	534	539	552	570
MERSETA	1,088	1,105	1,136	1,176	1,224	1,277	1,340	1,410	1,495	1,595	1,706
SASSETA	352	360	369	376	384	390	397	403	408	412	416
AGRISETA	1170	1164	1153	1145	1138	1134	1133	1135	1150	1165	1184
PSETA	110	112	115	117	119	120	122	122	123	123	122
SERVICES	1,042	1,068	1,094	1,121	1,148	1,176	1,204	1,233	1,263	1,293	1,324
CATHSSETA	1,352	1,391	1,445	1,504	1,568	1,637	1,710	1,789	1,878	1,981	2,092
TETA	175	188	203	219	236	255	275	297	321	348	377
W&RSETA	1,941	2,002	2,098	2,206	2,325	2,454	2,595	2,748	2,922	3,130	3,357
Total	15,370	15,681	16,103	16,542	17,037	17,550	18,098	18,678	19,344	20,109	20,933

SETA: Change in Employment, 2015-2025

Fig 4.7: Change in Employment by SETA (2015-2025, Levels)



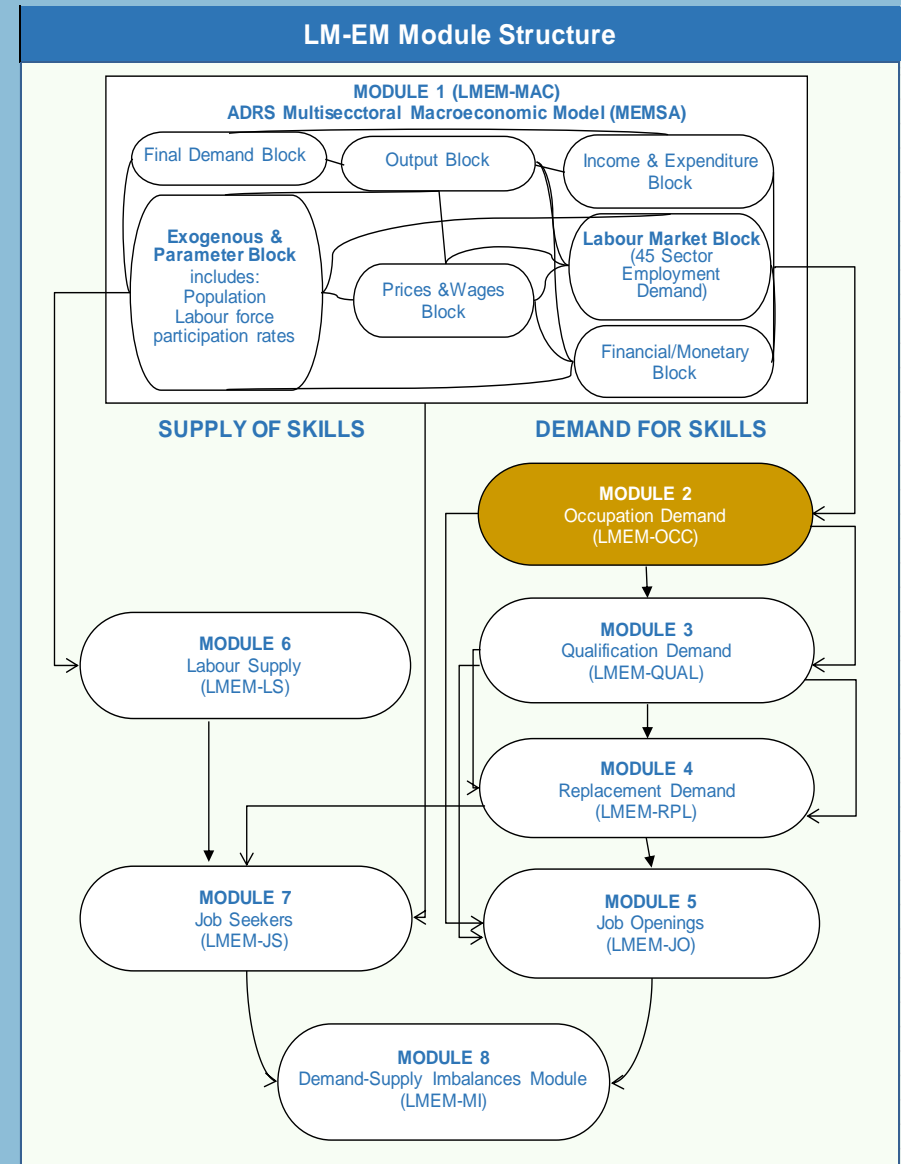
Occupation Demand Module of LM-EM (LMEM-OCC)

Aim:

- To capture the occupational structure within economic sectors
- To capture occupational composition of new job opportunities due to the expansion of the economy (i.e., expansion demand).

Outputs:

- Produce forecasts of for occupations at national level
- Produce occupational projections of employment under SETAs



Total Employment by Occupation: Actual & Projections

Table 6.1: Employment by Occupation (2008-2014)

Main Occupation Grouped	(Thousand)				(Shares, %)			
	2008	2010	2012	2014	2008	2010	2012	2014
Manager	1,166	1,184	1,152	1,337	7.9	8.5	7.9	8.7
Professional	807	802	861	654	5.5	5.8	5.9	4.3
Technician	1,615	1,559	1,609	1,467	10.9	11.2	11.1	9.6
Clerk	1,523	1,502	1,546	1,750	10.3	10.8	10.6	11.4
Sales and Services	1,828	2,000	2,123	2,448	12.4	14.4	14.6	16.0
Skilled Agriculture	115	74	63	94	0.8	0.5	0.4	0.6
Craft and Related Trade	2,034	1,659	1,773	1,957	13.8	11.9	12.2	12.8
Plant and Machine Operator	1,313	1,205	1,222	1,315	8.9	8.7	8.4	8.6
Elementary	3,269	2,964	3,216	3,356	22.1	21.3	22.1	21.9
Domestic Worker	1,097	947	958	943	7.4	6.8	6.6	6.2
Total	14,768	13,898	14,524	15,320	100	100	100	100

Source: Statistics South Africa, Quarterly Labour Force Survey, Quarterly for all years.

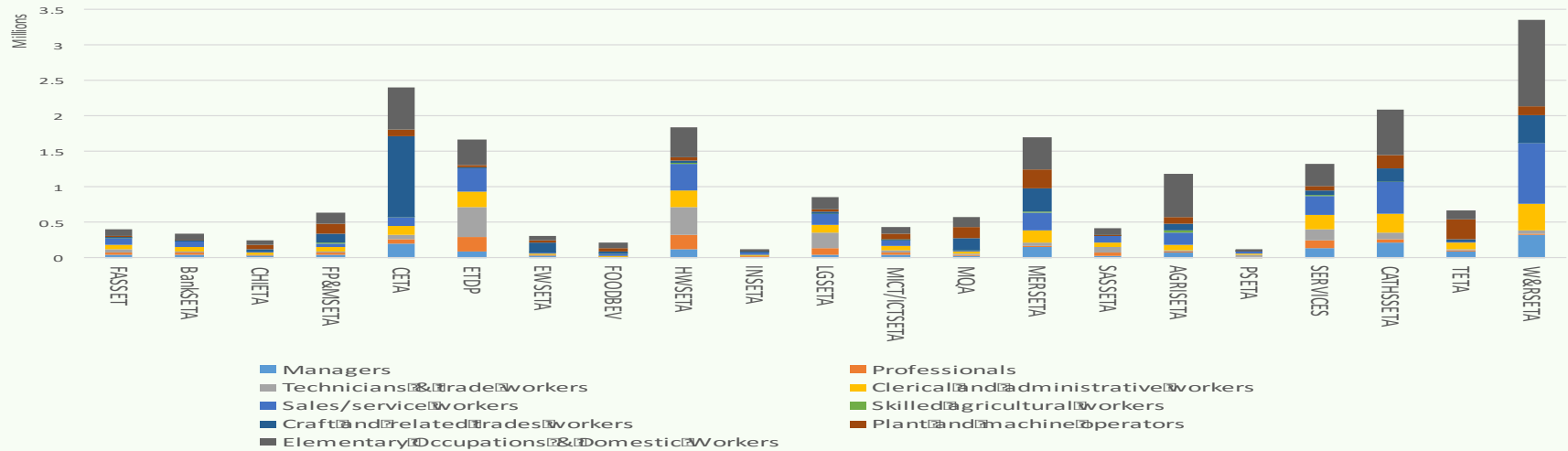
Table 6.2: Total Employment by Occupation (2015-2025)

Occupations	(Thousands)				Compound Average Growth Rate			Shares (%)		
	2015	2025			2015-2025			2025		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Manager	1,263	1,536	1,827	1,972	3.32	6.35	7.72	8.65	8.73	8.72
Professional	813	936	995	1,027	2.39	3.43	3.97	5.28	4.75	4.54
Technician	1,456	1,655	1,731	1,770	2.15	2.92	3.31	9.32	8.27	7.83
Clerk	1,705	2,031	2,329	2,481	2.95	5.33	6.45	11.44	11.13	10.98
Sales and Services	2,529	3,060	3,523	3,723	3.23	5.68	6.66	17.24	16.83	16.47
Skilled Agriculture	86	57	67	73	-6.69	-4.19	-2.65	0.32	0.32	0.32
Craft and Related Trade	1,856	2,170	2,885	3,274	2.64	7.63	9.92	12.23	13.78	14.48
Plant and Machine Operator	1,312	1,461	1,774	2,018	1.80	5.15	7.43	8.23	8.47	8.93
Elementary and Domestic Worker	4,350	4,844	5,803	6,270	1.81	4.92	6.28	27.29	27.72	27.73
Total	15,370	17,749	20,933	22,607	2.43	5.28	6.64	100.00	100.00	100.00

Source: I-M-EM (www.adrs-global.com)

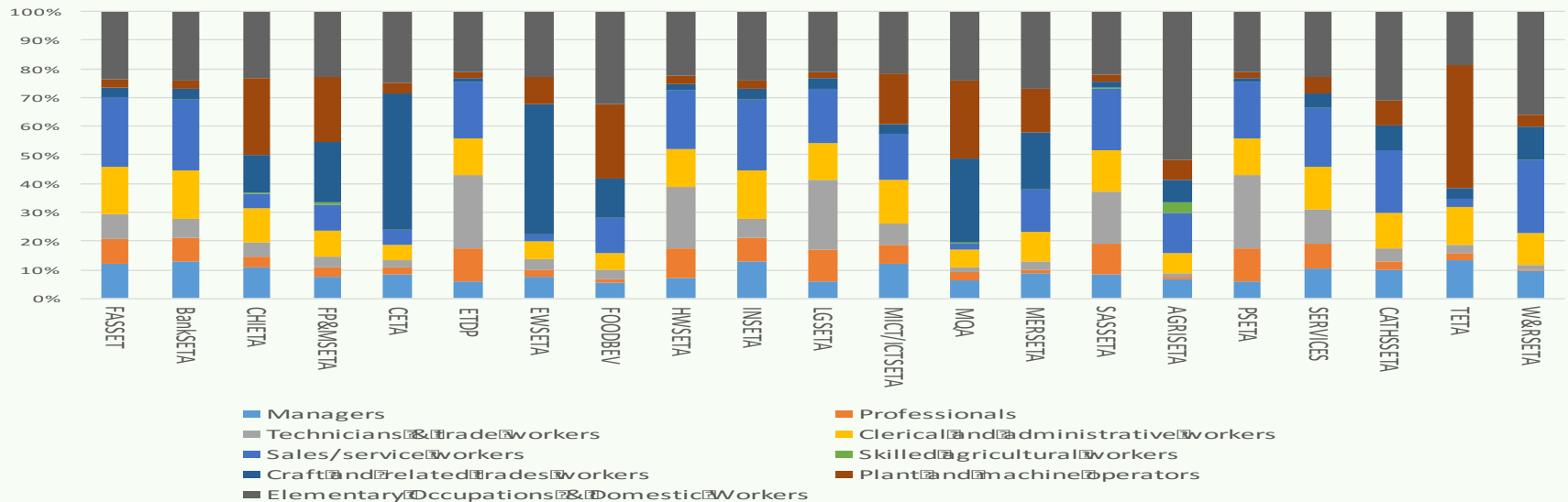
SETA Employment by Occupation, 2025 (Moderate Scenario)

Fig 6.2: SETA Employment by Occupation (2025, Moderate Scenario, Levels)



Source: ILM-EM Model (www.adrs-global.com)

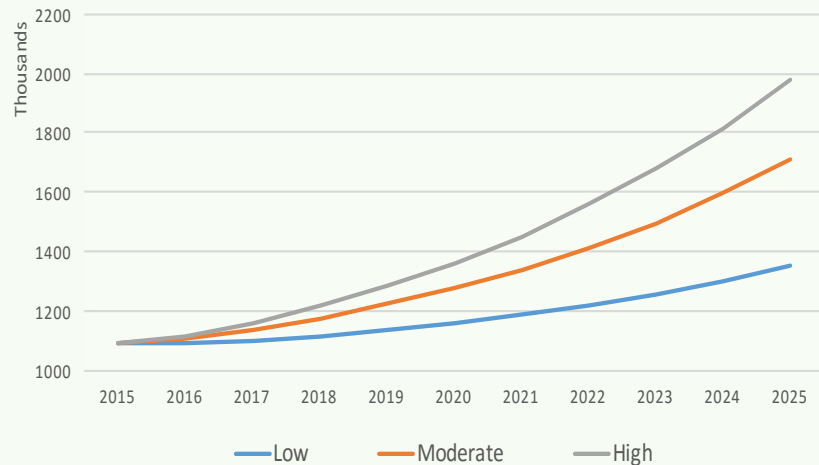
Fig 6.3: Occupational Shares of SETA Employment (2025, Moderate Scenario)



Source: ILM-EM Model (www.adrs-global.com)

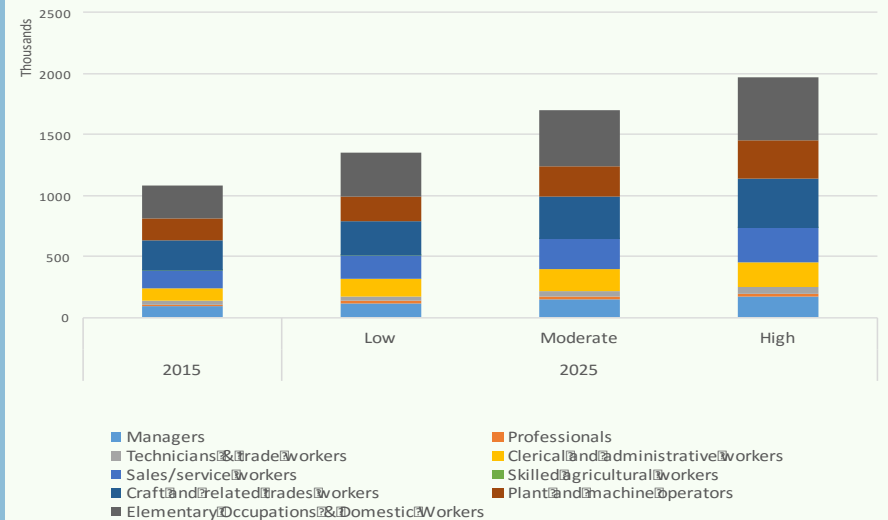
MERSETA Employment (2015-2025)

Fig 6.4: MERSETA employment trends (2015-2025, levels)



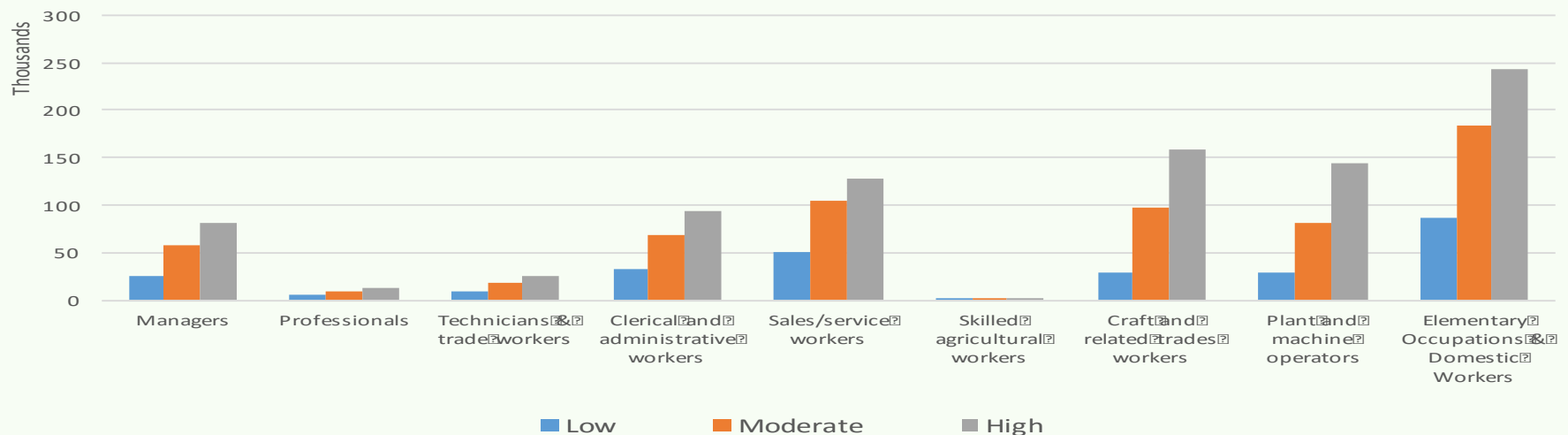
Source: M-EM Model (www.adrs-global.com)

Fig 6.5: MERSETA Employment by Occupation (2015 & 2025, levels)



Source: M-EM Model (www.adrs-global.com)

Fig 6.6: Change in MERSETA employment by Occupation (2015 & 2025, levels)



Source: M-EM Model (www.adrs-global.com)

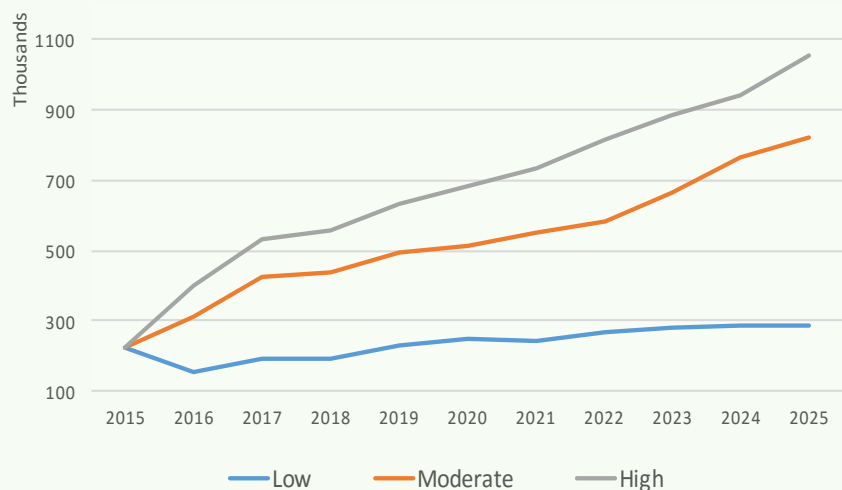
Expansion Demand Employment by Occupation

Table 6.3: Expansion Demand by Occupation (2015-2025, Levels & Shares)

Occupations	Total for 2015 to 2025			Share (%)		
	Low	Moderate	High	Low	Moderate	High
Manager	266,942	555,505	700,103	10.2	9.6	9.4
Professional	129,640	187,982	219,242	5.0	3.2	2.9
Technician	230,655	306,454	346,088	8.9	5.3	4.6
Clerk	358,008	656,127	808,471	13.7	11.3	10.8
Sales and Services	606,878	1,071,373	1,271,330	23.3	18.5	17.0
Skilled Agriculture	-34,202	-24,574	-17,976	-1.3	-0.4	-0.2
Craft and Related Trade	325,273	1,040,062	1,428,952	12.5	18.0	19.1
Plant and Machine Operator	154,690	467,338	711,188	5.9	8.1	9.5
Elementary and Domestic Workers	566,756	1,528,012	1,995,713	21.8	26.4	26.7
Total	2,604,640	5,788,279	7,463,111	100.0	100.0	100.0

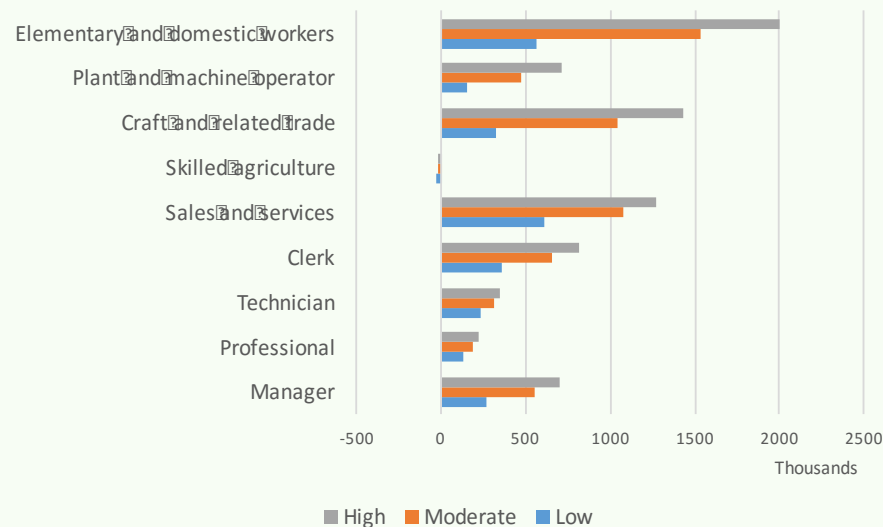
Source: Linked Macro-Education Model (LM-EM) (www.adrs-global.com)

Fig 6.7: Trends in Total Expansion Demand (2015-2025)



Source: LM-EM Model (www.adrs-global.com)

Fig 6.8: Expansion Demand by Occupation (2015-2025)



Source: LM-EM Model (www.adrs-global.com)

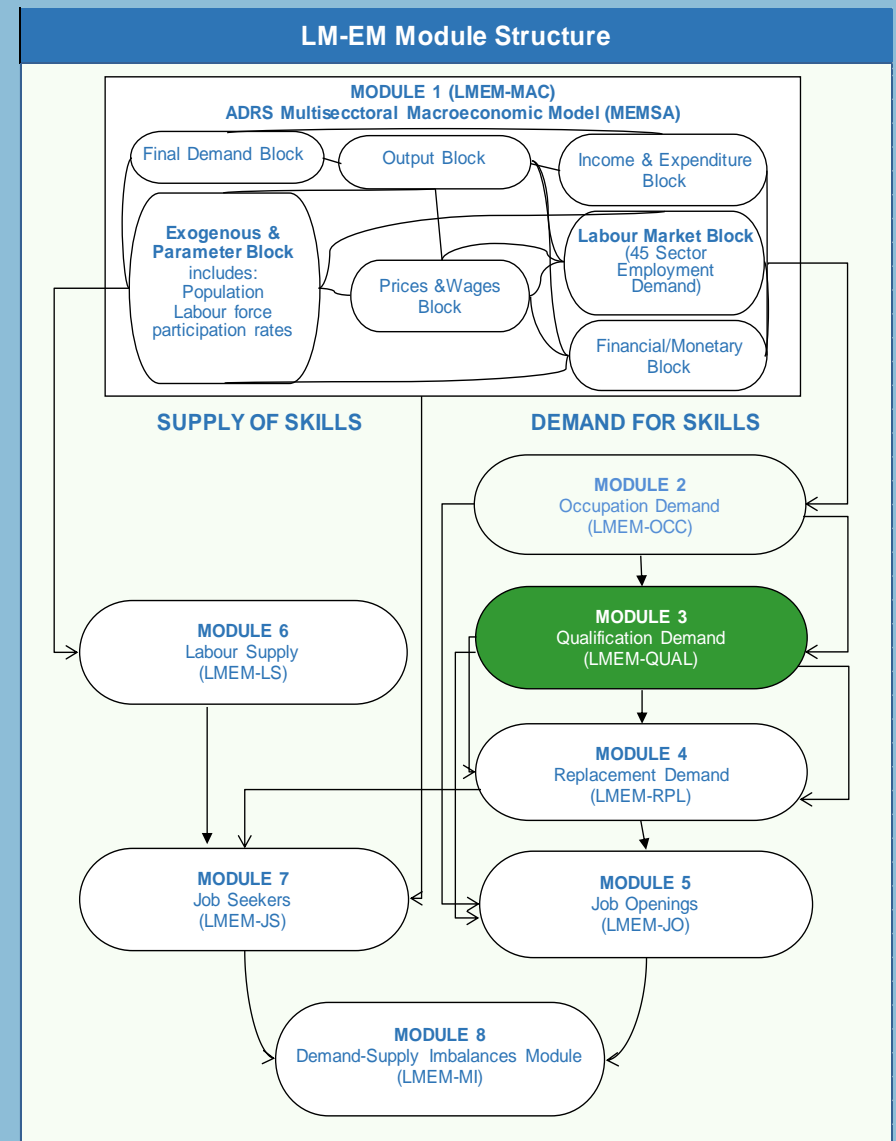
Qualification Demand Module of LM-EM (LMEM-QUAL)

Aim:

- ❑ To capture the educational qualification structure within occupations
- ❑ To capture qualification composition of new job opportunities due to the expansion of the economy (i.e., expansion demand).

Outputs:

- ❑ Produces forecasts of qualifications at national level
- ❑ Produces projections of qualification of employed under SETAs



Total Employment by Qualification: Actual & Projections

Table 7.1: Employment by Educational Qualification (2008-2014)

Main Education Groups	(Thousand)				(Shares, %)			
	2008	2010	2012	2014	2008	2010	2012	2014
No schooling	613	421	382	386	4.1	3.0	2.6	2.5
Less than primary completed	1,508	1,135	1,129	1,092	10.1	8.1	7.7	7.0
Primary completed	761	665	639	603	5.1	4.7	4.4	3.9
Secondary not completed	5,004	4,619	4,978	5,204	33.5	32.9	34.0	33.6
Secondary completed	4,187	4,261	4,525	4,887	28.1	30.4	30.9	31.5
Tertiary	2,662	2,748	2,857	3,164	17.8	19.6	19.5	20.4
Other	185	187	144	171	1.2	1.3	1.0	1.1
Total	14,919	14,035	14,654	15,507	100	100	100	100

Source: Statistics South Africa, Quarterly Labour Force Survey, Quarter 4 for all years.

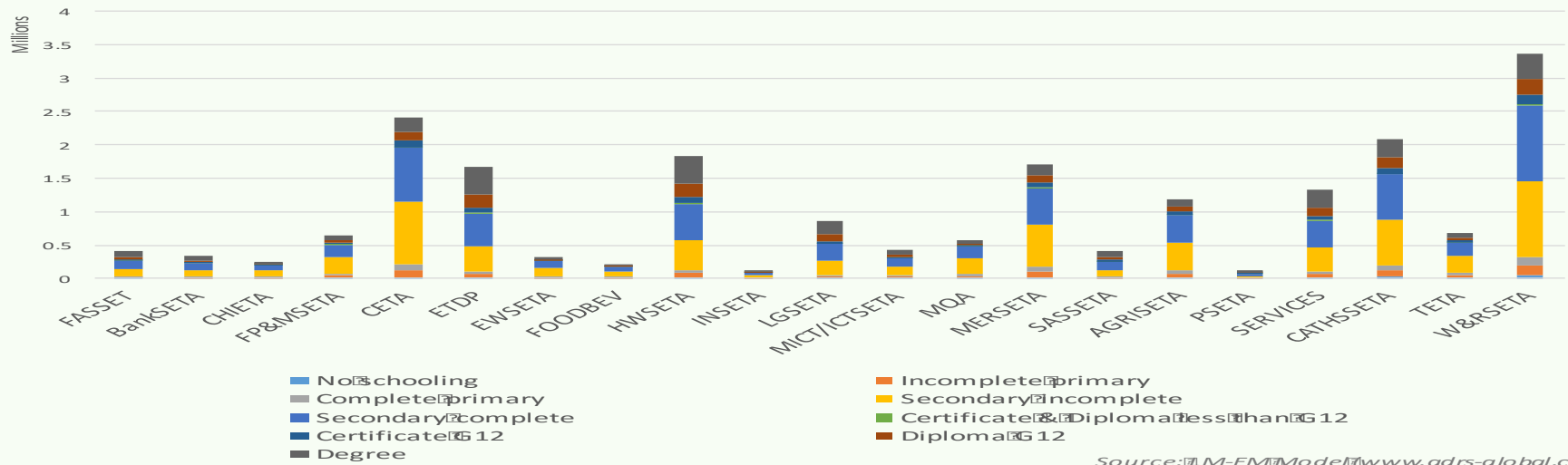
Table 7.2: Total Employment by Qualification (2015-2025)

Qualifications	(Thousands)				Compound Average Growth Rate (%)			Shares (%)		
	2015	2025			2015-2025			2025		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
No schooling	408	206	244	265	-6.61	-5.00	-4.24	1.16	1.17	1.17
Incomplete primary	1,194	741	888	970	-4.65	-2.91	-2.05	4.18	4.24	4.29
Complete primary	646	606	729	798	-0.64	1.22	2.13	3.41	3.48	3.53
Secondary incomplete	5,148	5,539	6,690	7,315	0.73	2.65	3.58	31.21	31.96	32.36
Secondary complete	4,796	5,604	6,653	7,194	1.57	3.33	4.14	31.57	31.78	31.82
Certificate & Diploma less than G12	95	90	105	113	-0.55	1.02	1.75	0.50	0.50	0.50
Certificate G12	390	800	936	1,005	7.46	9.16	9.94	4.51	4.47	4.45
Diploma G12	1,039	1,466	1,666	1,766	3.50	4.84	5.44	8.26	7.96	7.81
Degree	1,654	2,697	3,021	3,182	5.01	6.21	6.76	15.19	14.43	14.07
Total	15,370	17,749	20,933	22,607	1.45	3.14	3.93	100.00	100.00	100.00

Source: LM-EM (www.adrs-global.com)

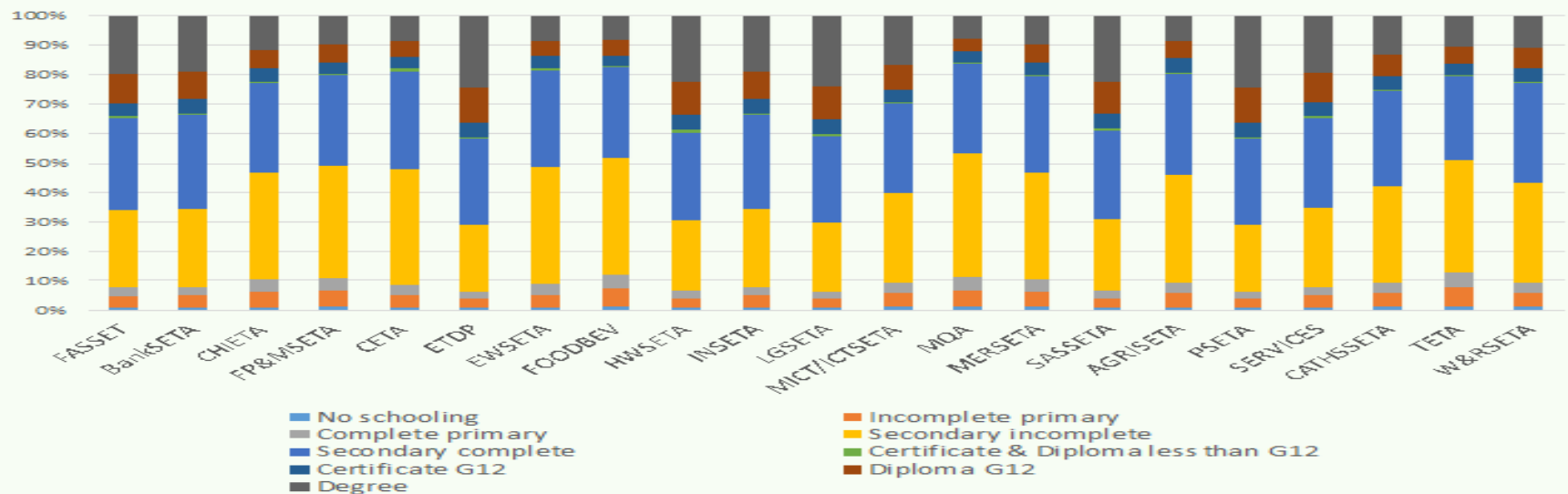
SETA Employment by Qualification, 2025 (Moderate Scenario)

Fig 7.2: SETA Employment by Qualification (2025, Moderate Scenario, Levels)



Source: LM-EM Model (www.adrs-global.com)

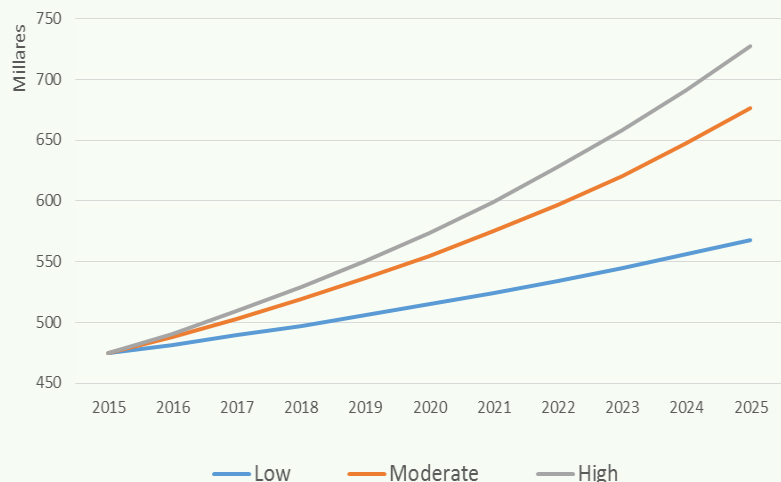
Fig 7.3: Qualification Shares of SETA Employment (2025, Moderate scenario)



Source: LM-EM Model (www.adrs-global.com)

TETA Employment (2015-2025)

TETA Employment Trends (2015-2025, levels)



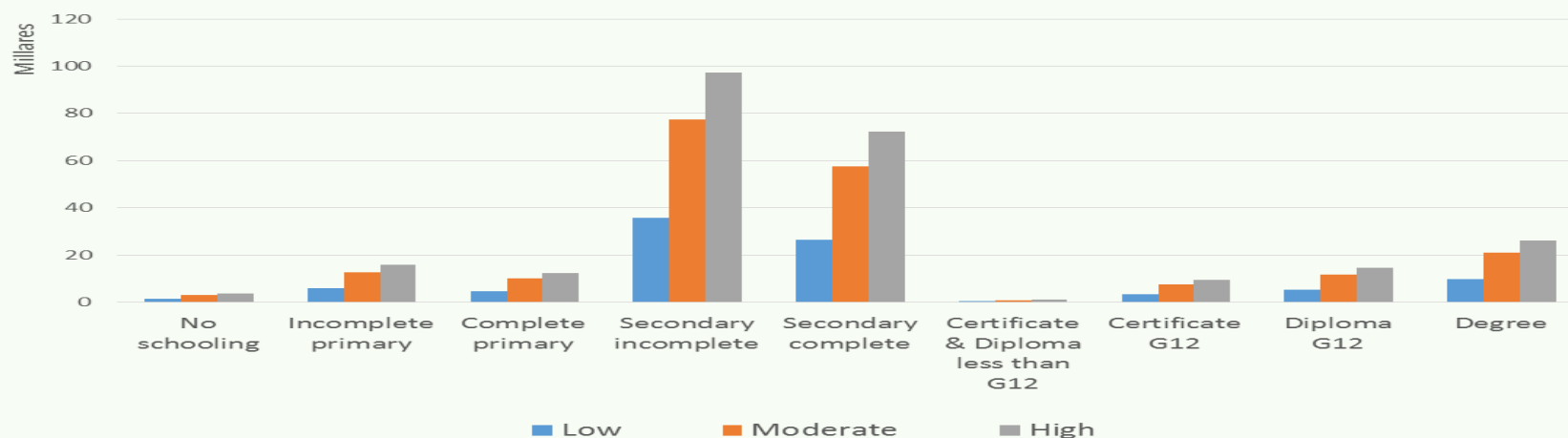
Source: LM-EM Model (www.adrs-global.com)

TETA Employment by Qualification

Qualifications	2015	2025		
		Low	Moderate	High
No schooling	6,936	8,322	9,931	10,688
Incomplete primary	29,385	35,272	42,119	45,341
Complete primary	23,045	27,641	33,007	35,533
Secondary incomplete	180,783	216,430	258,335	278,066
Secondary complete	136,340	162,850	194,024	208,703
Certificate & Diploma less than G12	2,001	2,389	2,843	3,056
Certificate G12	18,160	21,666	25,781	27,719
Diploma G12	27,706	33,117	39,282	42,180
Degree	50,322	60,230	71,363	76,593
Total	474,679	567,919	676,684	727,879

Source: LM-EM (www.adrs-global.com)

Change in TETA Employment by Qualification (2015-2025, levels)



Source: LM-EM Model (www.adrs-global.com)

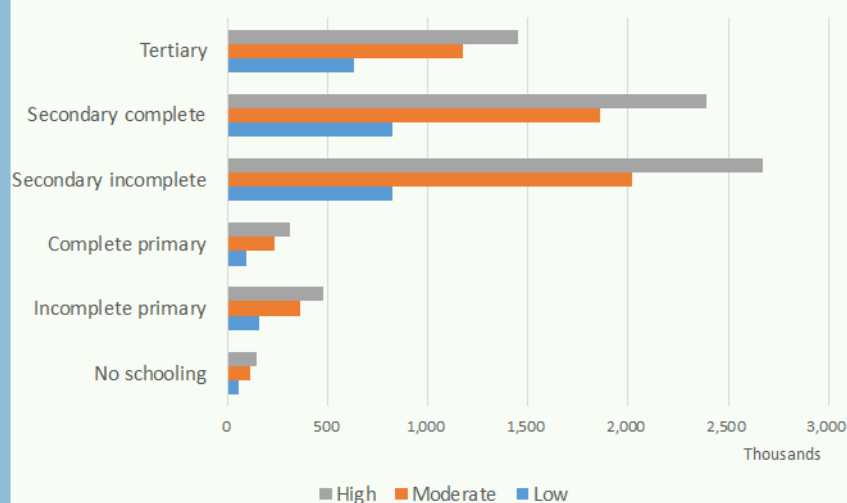
Expansion Demand Employment by Qualification

Table 7.3: Expansion Demand by Qualification (2015-2025, levels & shares)

Qualifications	Total for 2015 to 2025			Average Share (2015-2025, %)		
	Low	Moderate	High	Low	Moderate	High
No schooling	55,674	116,790	149,981	2.1	2.0	2.0
Incomplete primary	159,785	365,385	480,634	6.1	6.3	6.4
Complete primary	99,097	237,280	313,836	3.8	4.1	4.2
Secondary incomplete	813,201	1,997,303	2,638,666	31.2	34.5	35.4
Secondary complete	831,774	1,860,517	2,389,724	31.9	32.1	32.0
Certificate & Diploma less than G12	15,104	31,392	39,819	0.6	0.5	0.5
Certificate G12	85,202	187,530	238,550	3.3	3.2	3.2
Diploma G12	205,144	383,371	471,018	7.9	6.6	6.3
Degree	339,658	608,711	740,874	13.0	10.5	9.9
Total	2,604,640	5,788,279	7,463,111	100.0	100.0	100.0

Source: Linked Macro-Education Model (LM-EM) (www.adrs-global.com)

Fig 7.6: Expansion Demand by Qualification (2015-2025)



Source: LM-EM Model (www.adrs-global.com)

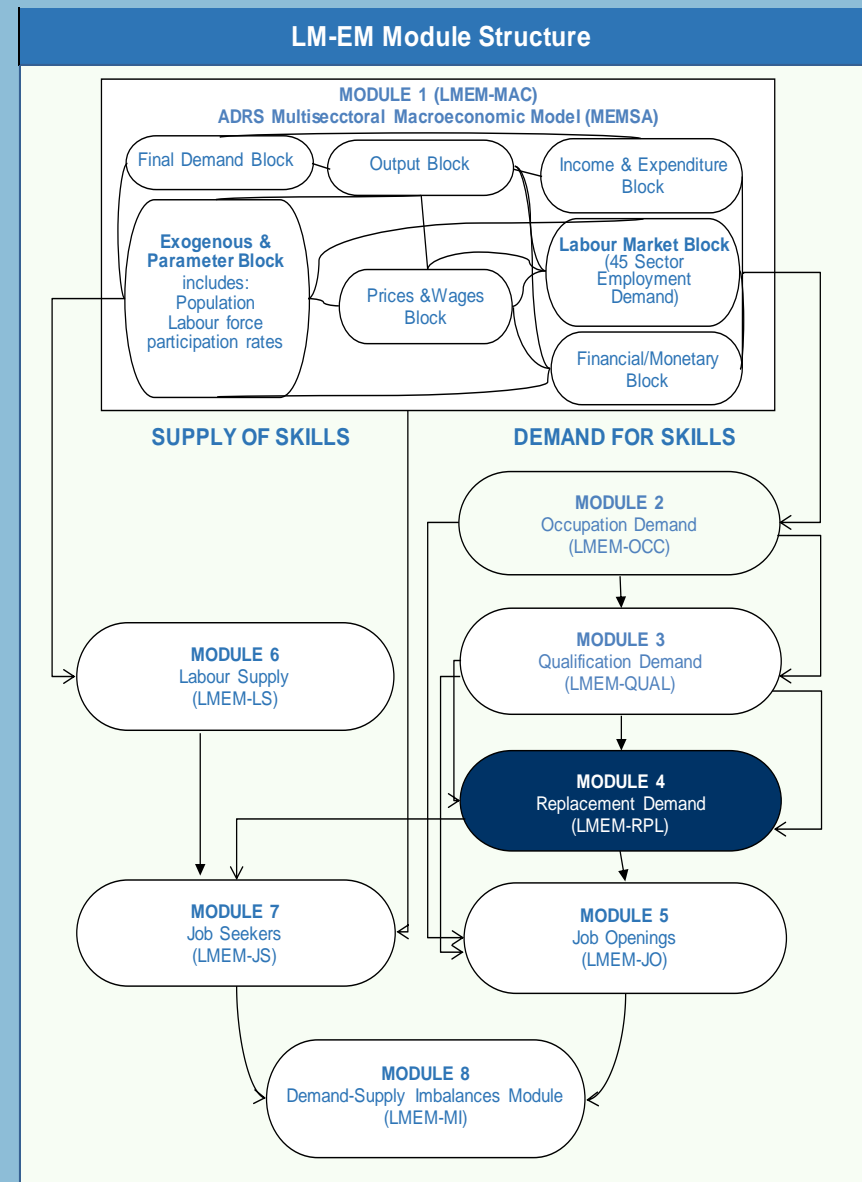
Replacement Demand Module of LM-EM (LMEM-RPL)

Aim:

- To provide projections of the number of employees in each occupation that will be replaced due to labour turnover related to retirement, migration, mortality or through career changes

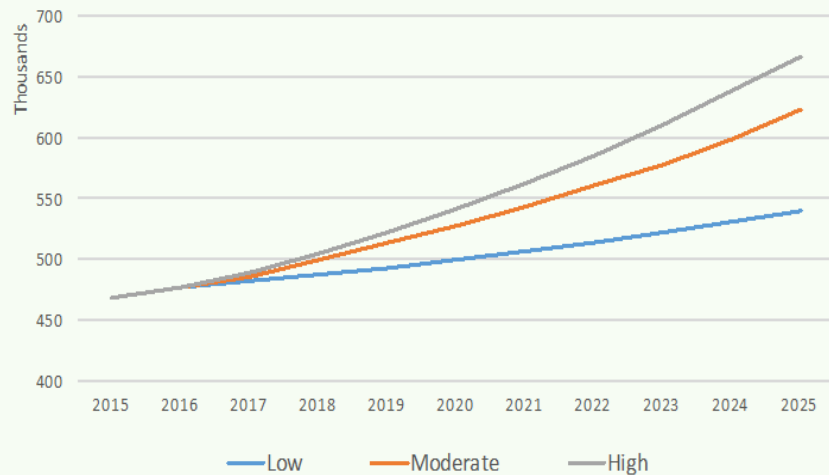
Outputs:

- Generates projections of the number of vacancies that are expected under a given economic scenario by occupation and qualification.



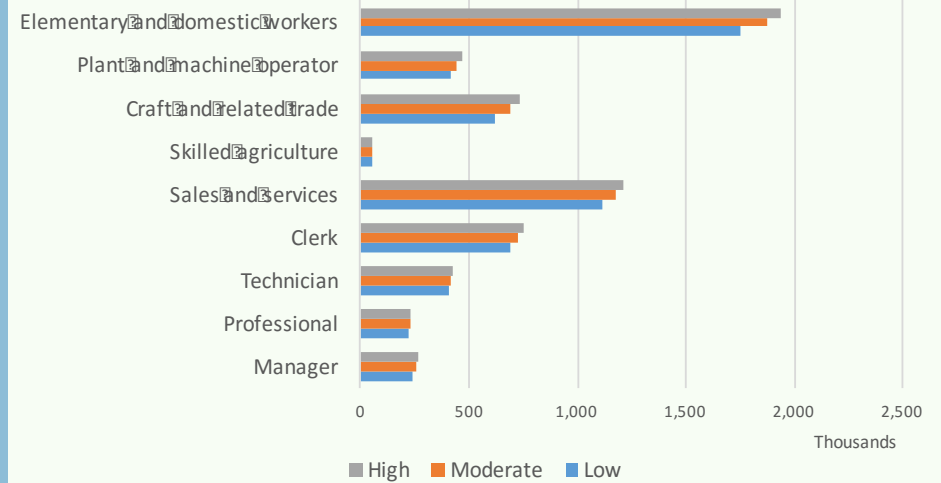
Replacement Demand by Occupation (2015-2025)

Fig 8.1: Trends in Total Replacement Demand (2015-2025)



Source: LM-EM Model (www.adrs-global.com)

Fig 8.2: Replacement Demand by Occupation (2015-2025)



Source: LM-EM Model (www.adrs-global.com)

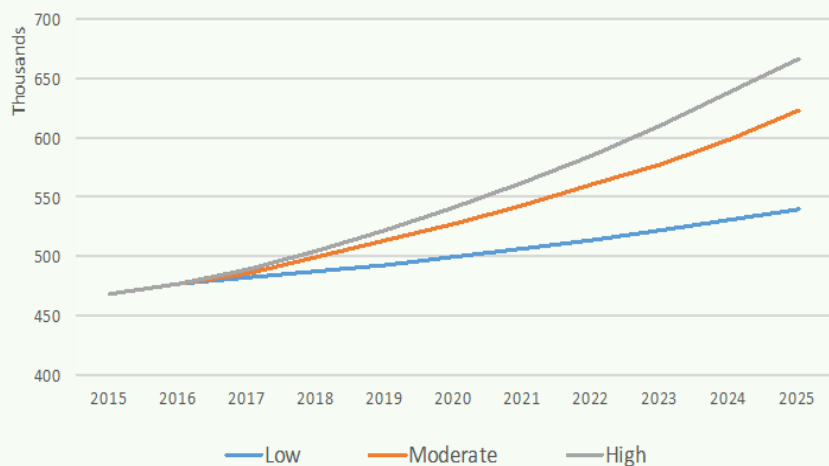
Table 8.2: Replacement Demand by Occupation (2015-2025, levels & shares)

Occupations	Total for 2015 to 2025			Share (%)		
	Low	Moderate	High	Low	Moderate	High
Manager	239,280	255,541	264,110	4.3	4.4	4.4
Professional	224,302	229,284	231,993	4.1	3.9	3.8
Technician	411,012	417,572	421,065	7.4	7.1	6.9
Clerk	692,799	729,159	748,568	12.6	12.4	12.3
Sales and services	1,117,194	1,177,916	1,206,814	20.2	20.1	19.9
Skilled agriculture	49,876	52,751	54,741	0.9	0.9	0.9
Craft and related trade	619,418	693,465	735,208	11.2	11.8	12.1
Plant and machine operator	415,462	445,865	468,619	7.5	7.6	7.7
Elementary and domestic workers	1,749,589	1,872,316	1,937,175	31.7	31.9	31.9
Total	5,518,932	5,873,869	6,068,293	100.0	100.0	100.0

Source: Linked Macro-Education Model (LM-EM) (www.adrs-global.com)

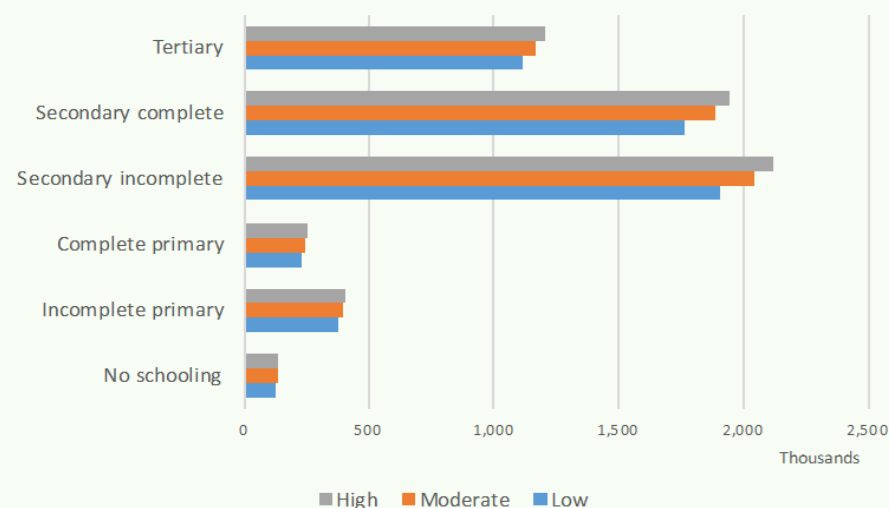
Replacement Demand by Occupation (2015-2025)

Fig 8.1: Trends in Total Replacement Demand (2015-2025)



Source: LM-EM Model (www.adrs-global.com)

Fig 8.3: Replacement Demand by Qualification (2015-2025)



Source: LM-EM Model (www.adrs-global.com)

Table 8.3: Replacement Demand by Qualification (2015-2025, levels & shares)

Qualifications	Total for 2015 to 2025			Average Share (2015-2025, %)		
	Low	Moderate	High	Low	Moderate	High
No schooling	124,341	130,799	134,312	2.3	2.2	2.2
Incomplete primary	372,488	394,275	406,509	6.7	6.7	6.7
Complete primary	230,649	246,136	254,859	4.2	4.2	4.2
Secondary incomplete	1,912,231	2,048,197	2,124,170	34.6	34.9	35.0
Secondary complete	1,765,400	1,882,724	1,946,233	32.0	32.1	32.1
Tertiary	1,113,816	1,171,729	1,202,220	20.2	19.9	19.8
Total	5,518,925	5,873,860	6,068,303	100.0	100.0	100.0
Qualifications	Total for 2015 to 2025			Average Share (2015-2025, %)		
	Low	Moderate	High	Low	Moderate	High
Low Skills	2,609,110	2,787,048	2,886,534	47.3	47.4	47.6
Medium Skills	1,795,999	1,915,083	1,979,549	32.5	32.6	32.6
High Skills	1,113,816	1,171,729	1,202,220	20.2	19.9	19.8
Total	5,518,925	5,873,860	6,068,303	100.0	100.0	100.0

Source: Linked Macro-Education Model (LM-EM) (www.adrs-global.com)

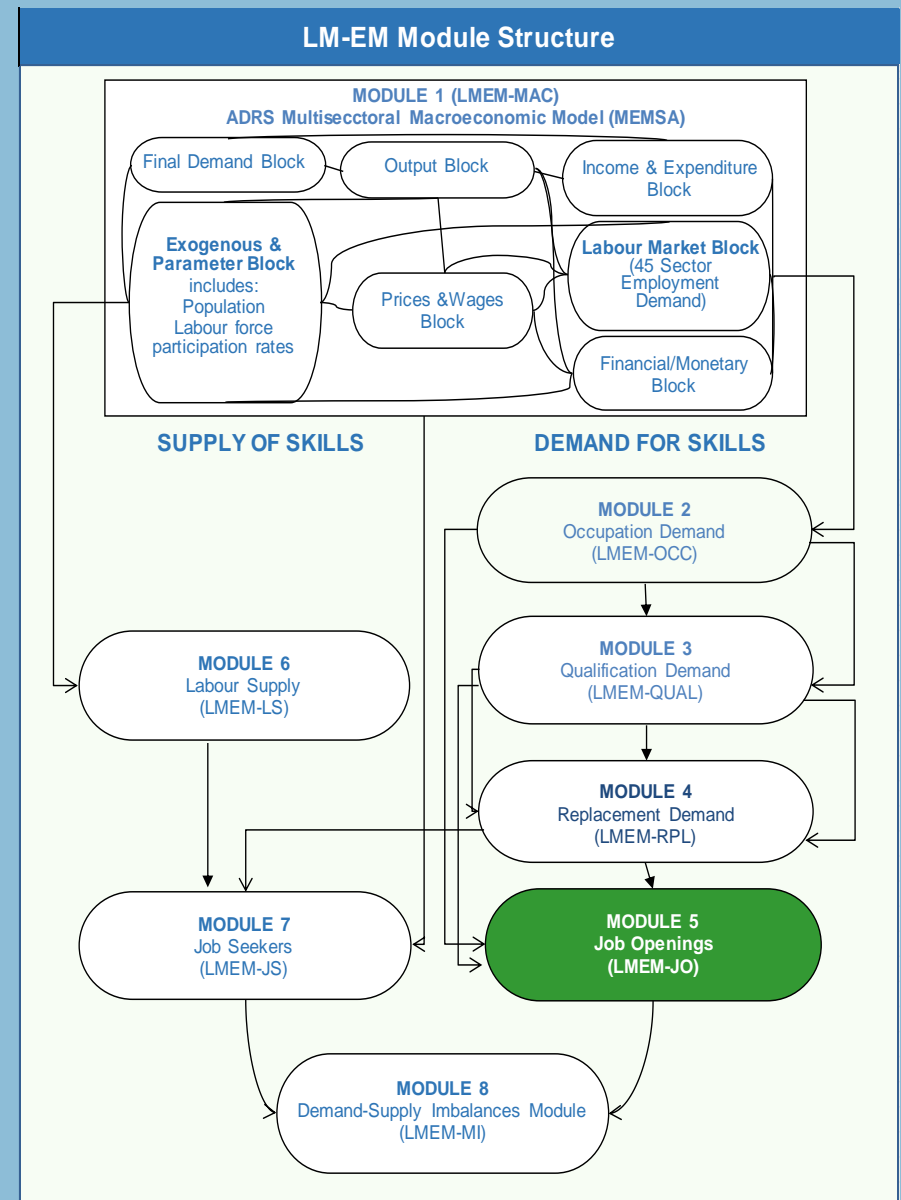
Job Openings Module of LM-EM (LMEM-JO)

Aim:

- To provide an aggregate view of total job openings in the economy,

Outputs:

- Annual projections of total job openings by occupation and qualification.



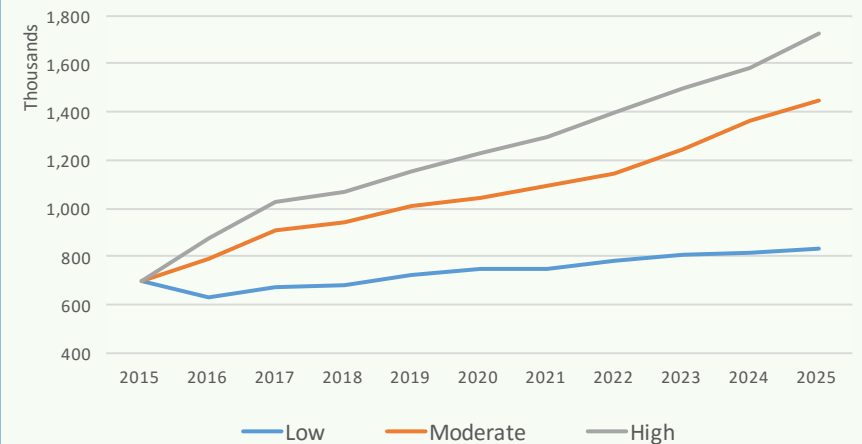
Trends in Job Openings (2015-2025)

Table 9.1: Components of Job Openings (Three Scenarios)

Job Openings		Total JO (2015-2025)	Average Annual	CAGR (%)	% of JO
Low	Expansion Demand	2,604,640	236,785	2.47	32.1
	Replacement Demand	5,518,932	501,721	1.43	67.9
	Total Job Openings	8,123,572	738,506	1.78	100.0
Moderate	Expansion Demand	5,788,279	526,207	13.81	49.6
	Replacement Demand	5,873,869	533,988	2.89	50.4
	Total Job Openings	11,662,148	1,060,195	7.62	100.0
High	Expansion Demand	7,463,111	678,464	16.68	55.2
	Replacement Demand	6,068,293	551,663	3.60	44.8
	Total Job Openings	13,531,404	1,230,127	9.52	100.0

Source: LM-EM (www.adrs-global.com)

Fig 9.1: Trends in Total Job Openings (2015-2025)



Source: LM-EM Model (www.adrs-global.com)

ADRS

Applied Development
Research Solutions

Job Openings by Qualification & Occupation (2015-2025)

Composition of Job Openings: Expansion and Replacement Demand by Qualification (2015-2025)

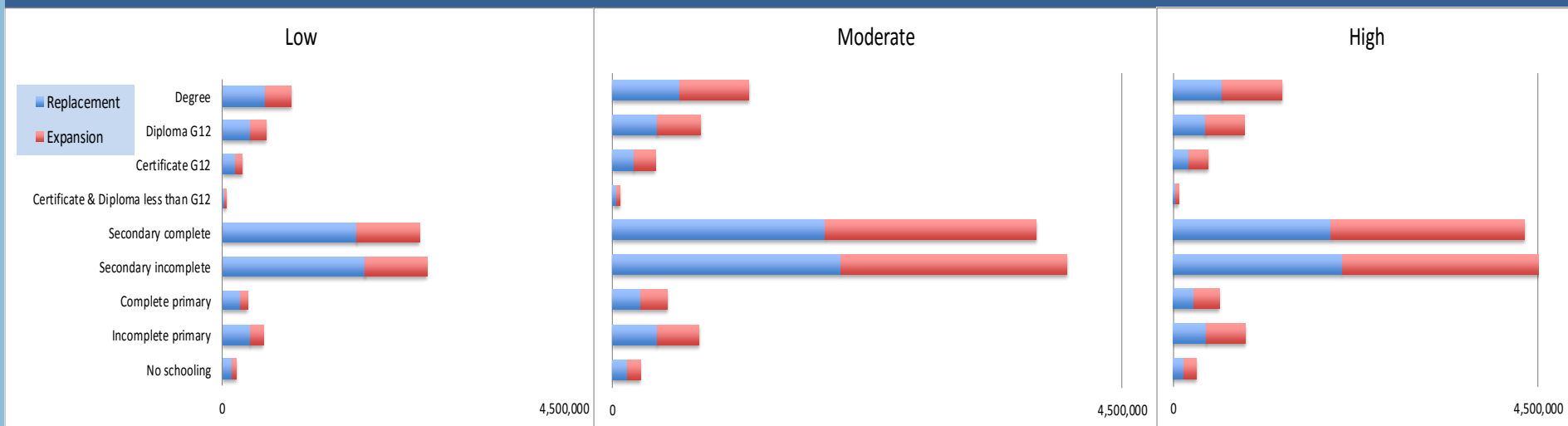
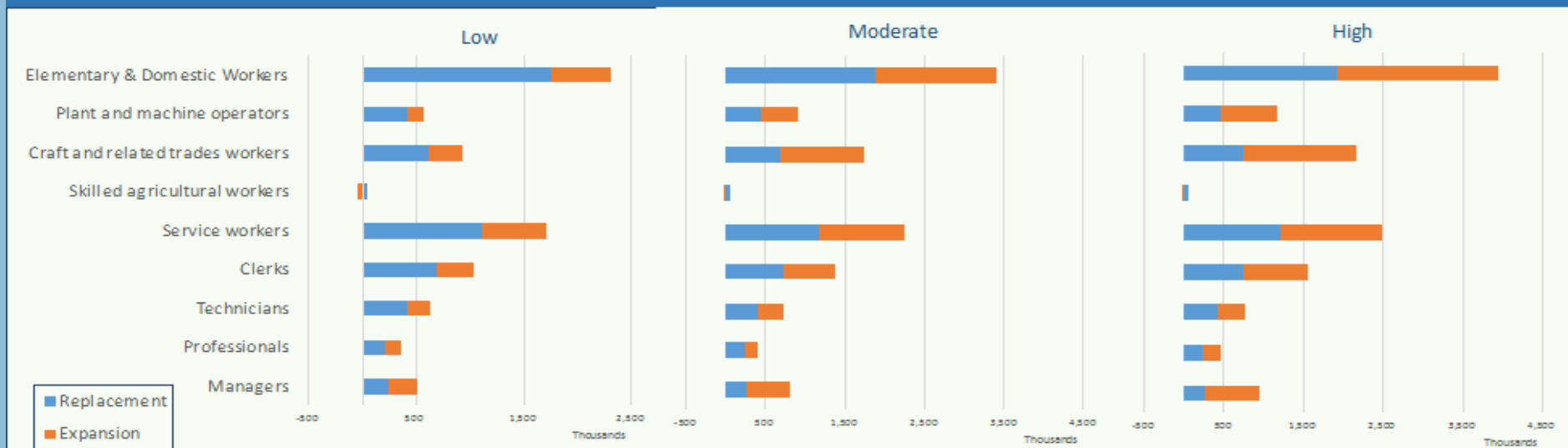
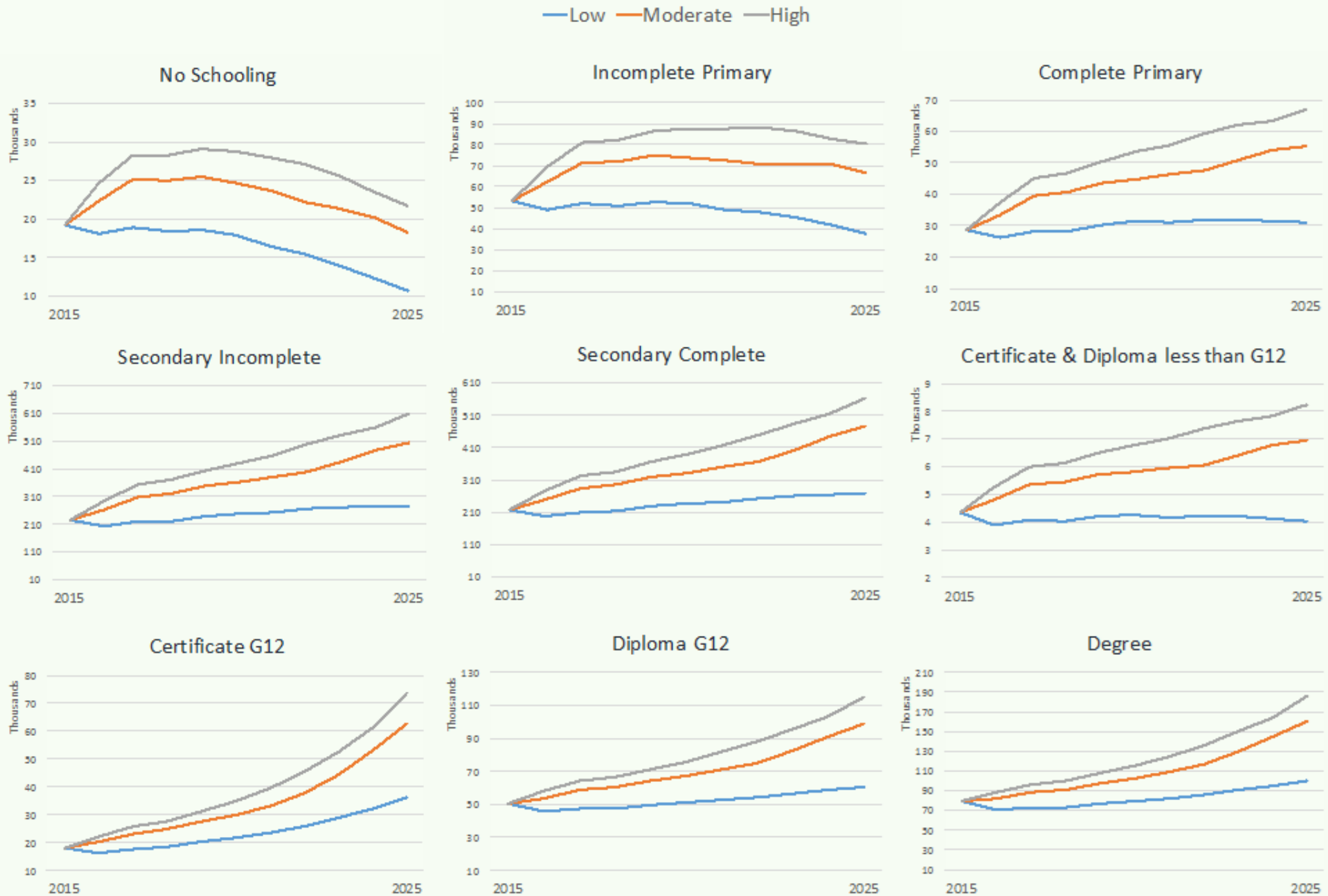


Fig 9.3: Composition of Job Openings: Expansion and Replacement Demand by Occupation (2015-2025)



Source: Linked Macro-Education Model (LM-EM) (www.adrs-global.com)

Fig 9.4: Job Openings by Qualification, 2015-2025



Labour Supply Module of LM-EM (LMEM-LS)

Aim:

- To produce annual projections of the labour force by qualification and occupation, using expanded definition of unemployed

Outputs:

- Produces annual projections of the labour force for 10 educational qualifications and by 9 occupation groups

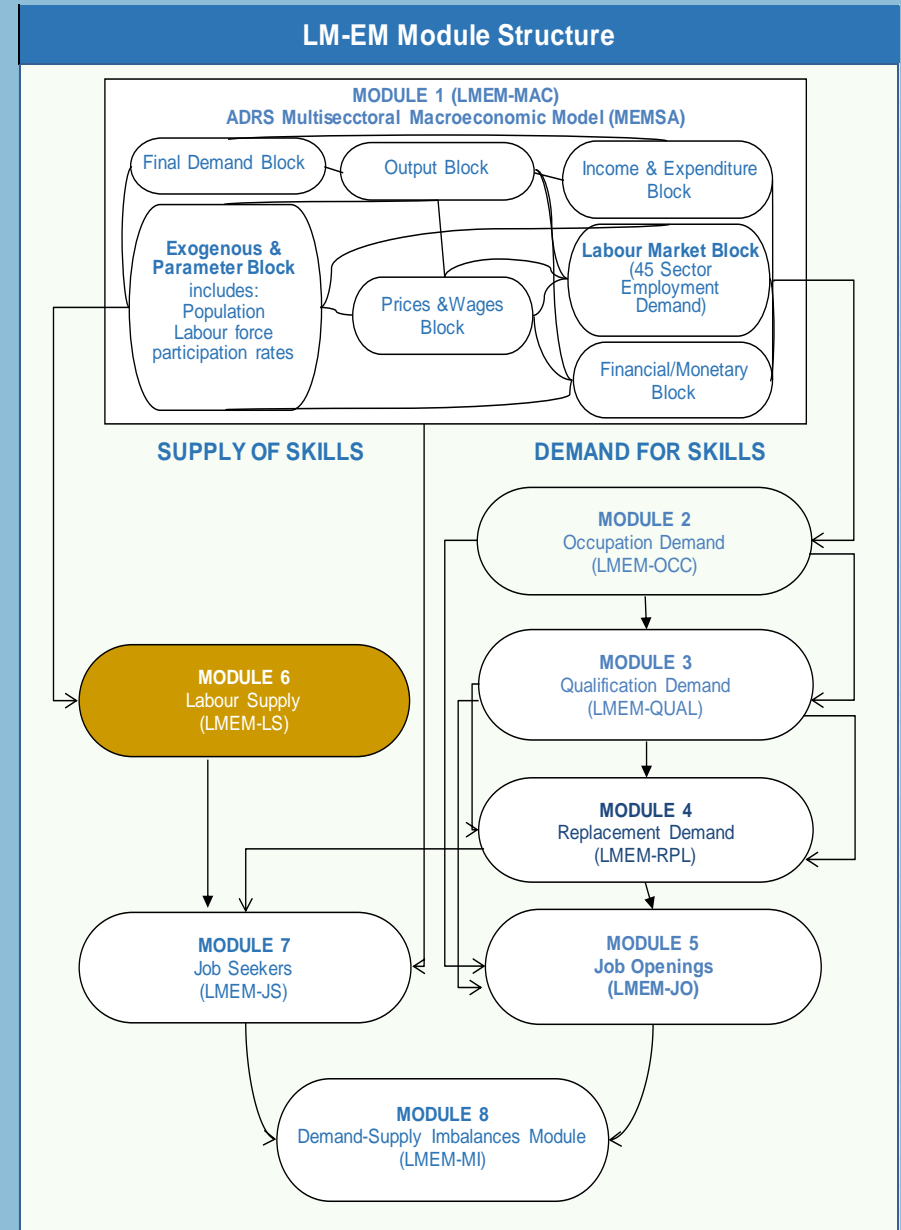


Fig 10.1: Labour Force (2015 -2025)

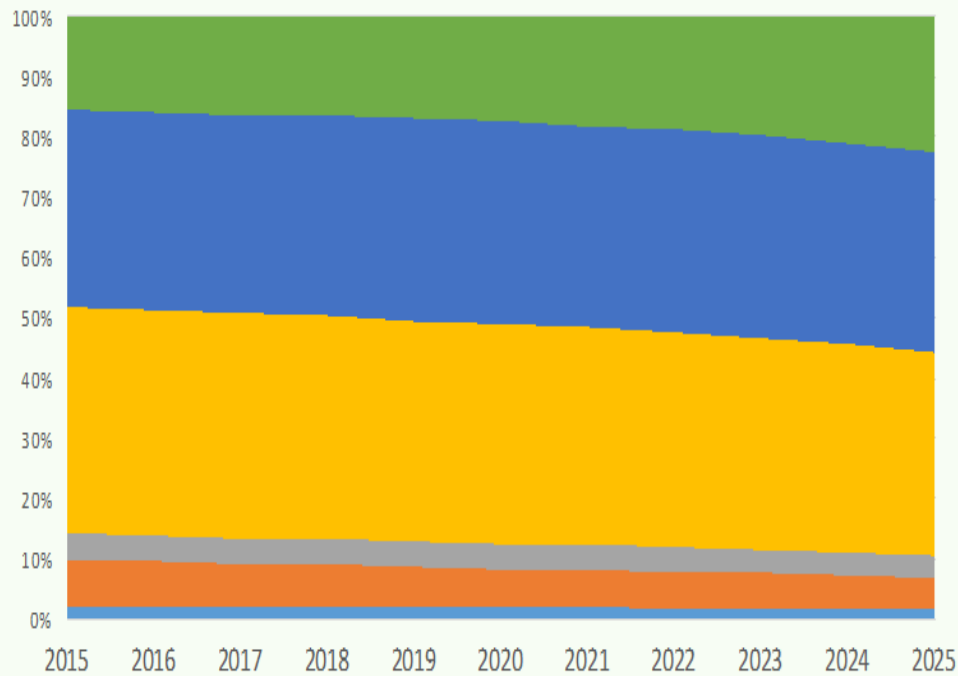
Expanded Definition



Source: LM-EM Model (www.adrs-global.com)

Labour Force by Qualification, 2015-2025

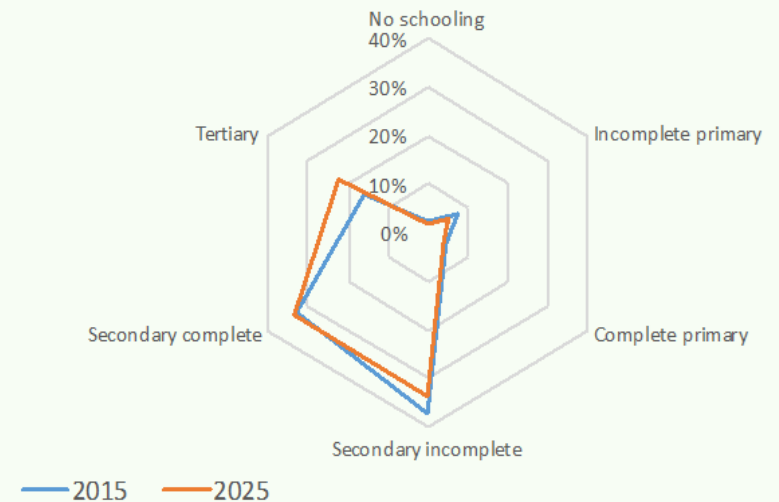
Fig 10.2: Trend in Qualification Shares of Labour Force (2015-2025)



- No Schooling
- Complete Primary
- Secondary Complete
- Incomplete Primary
- Secondary Incomplete
- Tertiary

Source: LM-EM Model (www.adrs-global.com)

Fig 10.3: Labour Force Qualifications (2015 & 2025)



Source: LM-EM Model (www.adrs-global.com)

ADRS

Applied Development
Research Solutions

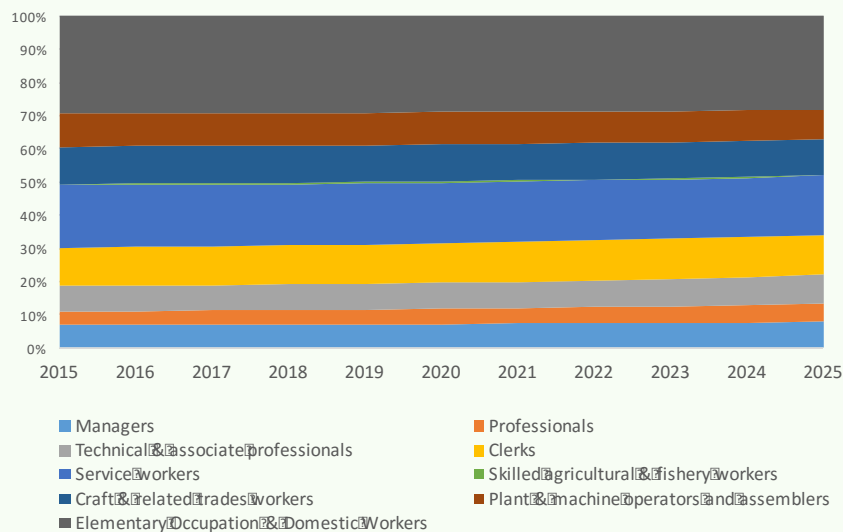
Labour Force by Occupation, 2015-2025

Table 10.3: Labour Force by Occupation 2015-2025 (Millions, Expanded Definition of Unemployed)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Managers	1.67	1.71	1.76	1.80	1.85	1.90	1.96	2.02	2.08	2.16	2.24
Professionals	1.03	1.06	1.09	1.13	1.17	1.21	1.26	1.31	1.37	1.44	1.52
Technicians	1.83	1.88	1.92	1.97	2.03	2.08	2.15	2.22	2.29	2.38	2.48
Clerks	2.85	2.90	2.96	3.02	3.08	3.13	3.19	3.25	3.31	3.37	3.43
Service workers	4.56	4.63	4.68	4.74	4.79	4.84	4.88	4.92	4.96	4.99	5.00
Skilled agricultural workers	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Craft & trades workers	2.76	2.80	2.84	2.87	2.91	2.93	2.96	2.98	2.99	2.99	2.99
Plant & machine operators	2.48	2.51	2.53	2.55	2.57	2.58	2.58	2.58	2.58	2.56	2.53
Elementary & domestic workers	7.13	7.25	7.36	7.47	7.57	7.66	7.75	7.83	7.90	7.95	7.99
Total	24.41	24.83	25.25	25.66	26.05	26.44	26.82	27.20	27.58	27.94	28.29

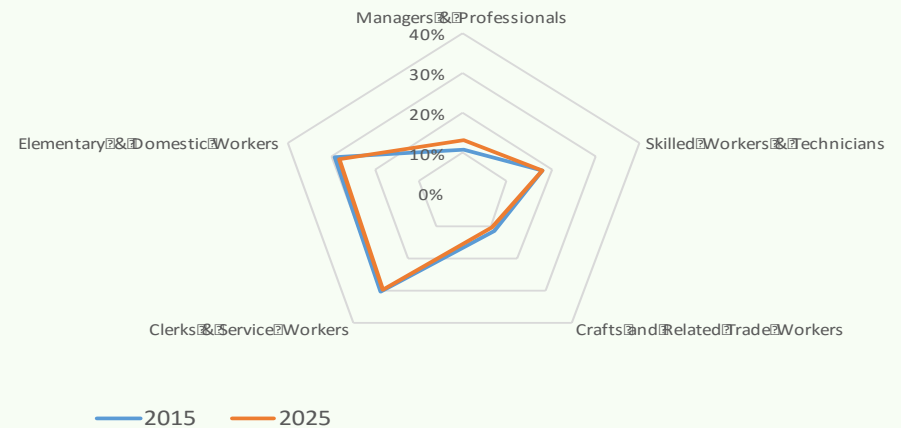
Source: LM-EM Model (www.adrs-global.com)

Fig 10.4: Trends in Occupation Shares of Labour Force (2015-2025)



Source: LM-EM Model (www.adrs-global.com)

Fig 10.6: Occupation Composition of Labour Force (2015 & 2025)



Source: LM-EM Model (www.adrs-global.com)

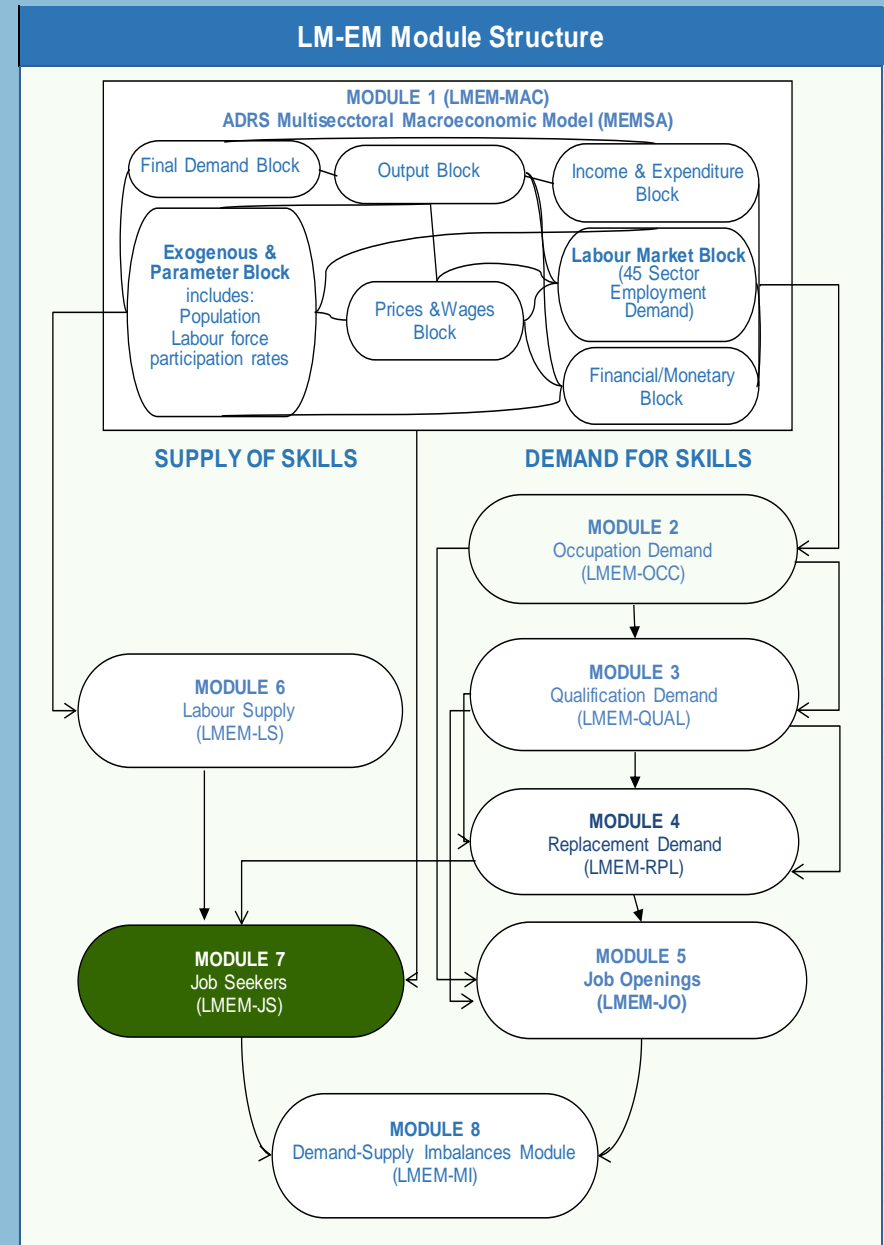
Job Seekers Module of LM-EM (LMEM-JS)

Aim:

- To produce annual projections of the size of job seekers in the economy and its breakdown by qualification of unemployed and their occupational preference.

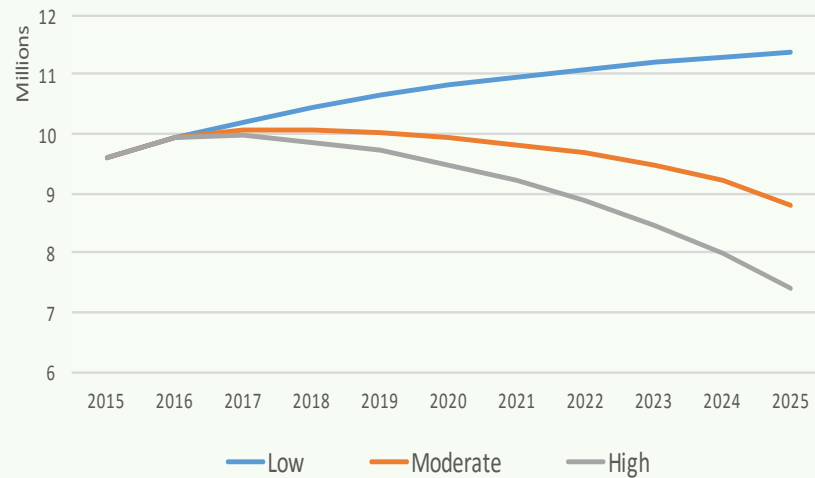
Outputs:

- Produces annual projections of job seekers by 10 educational qualifications and 9 occupation groups



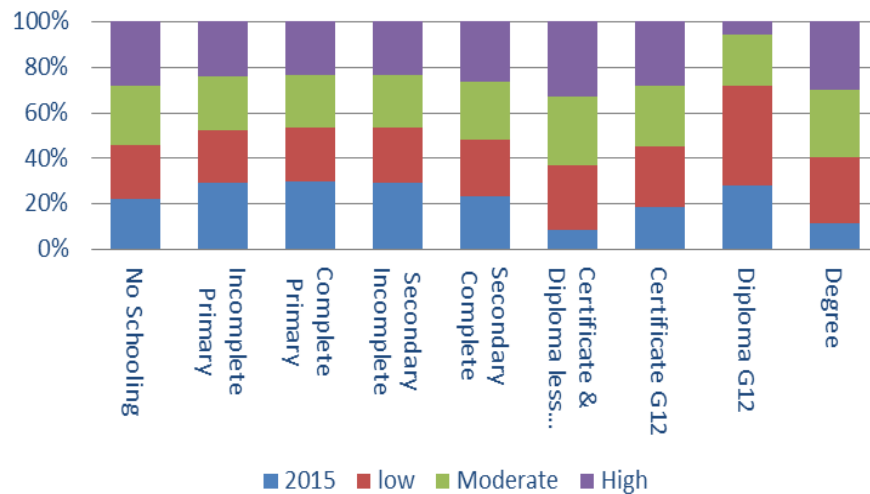
Job Seekers, 2015-2025

Fig 1.1: Trends in Job Seekers (2015-2025)

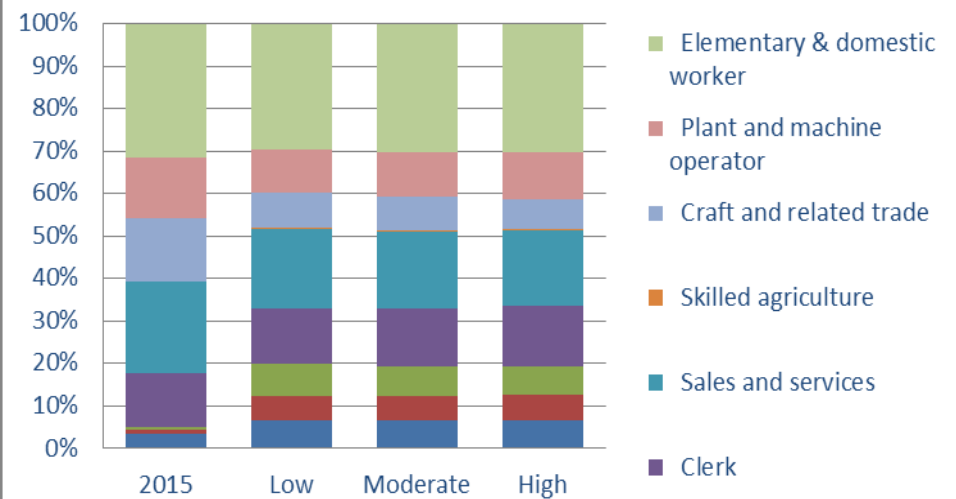


Source: ILM-EM Model (www.adrs-global.com)

Job Seekers by Qualification, 2015 and 2025



Job Seekers by Occupation 2015 & 2025



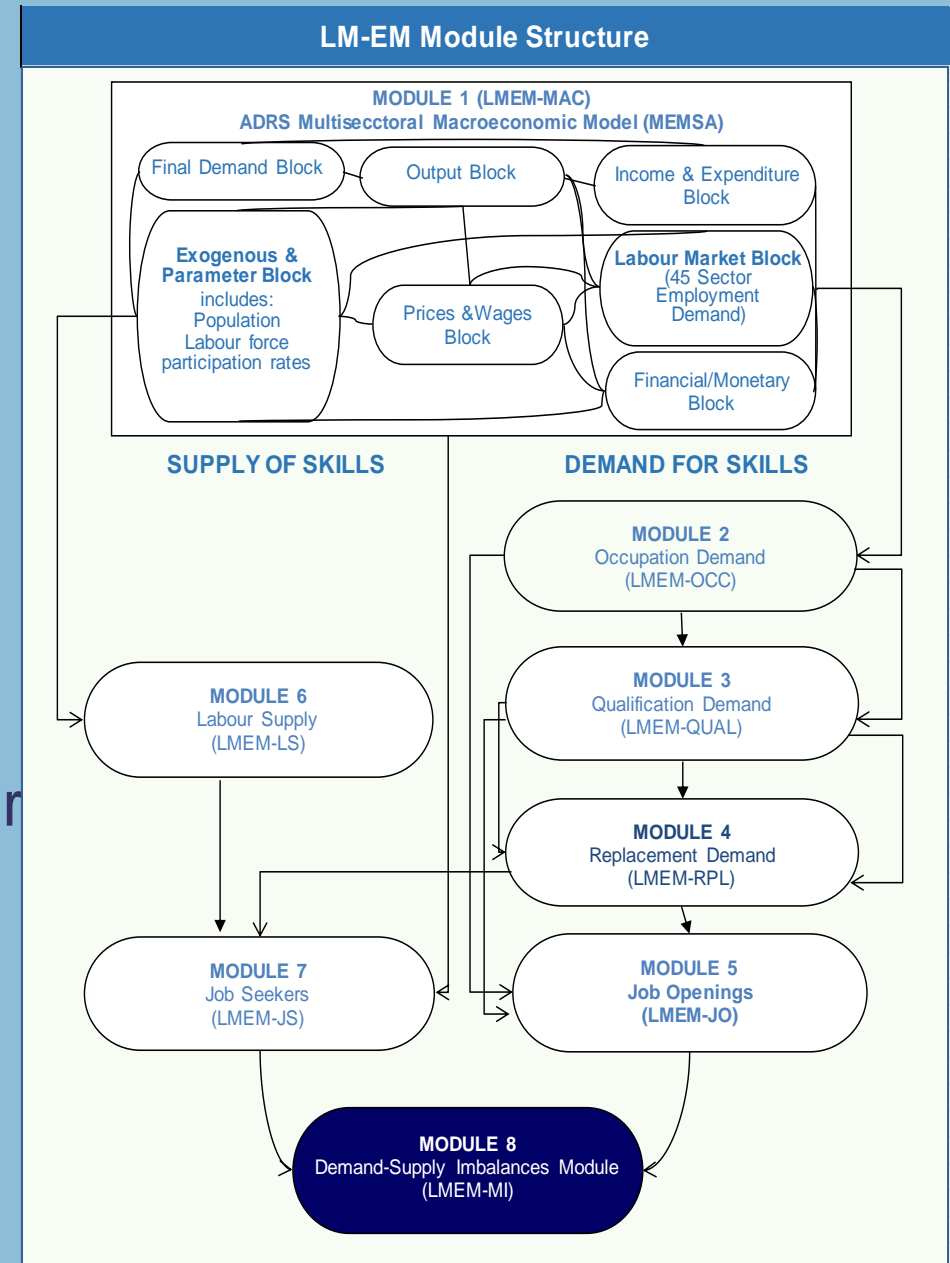
Labour Market Imbalances Module of LM-EM (LMEM-IMB)

Aim:

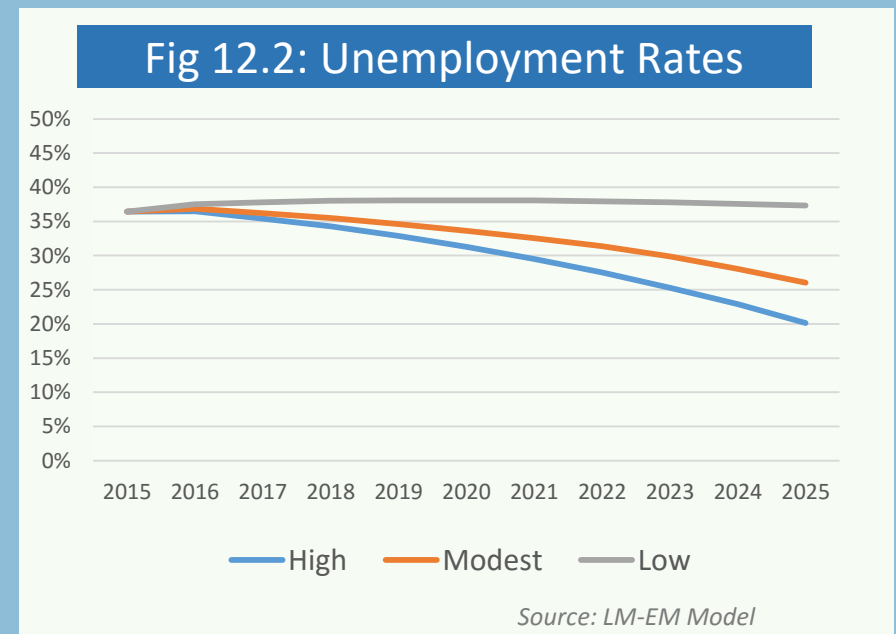
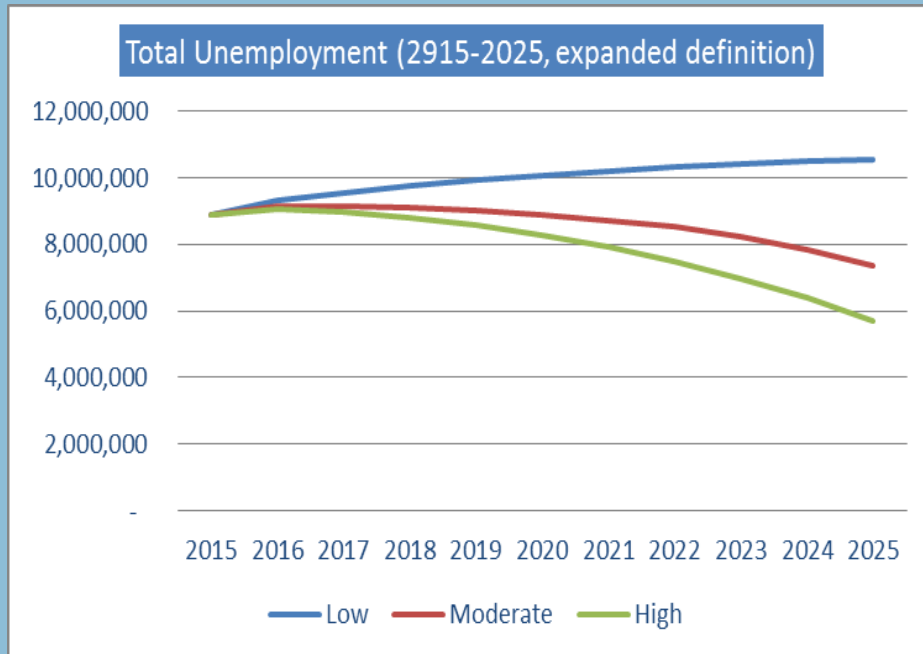
- To estimate the extent of labour market imbalances, skills gap, and unemployment rates over time.

Outputs:

- Projections of indicators of labour market (im)balances by educational qualification and occupation

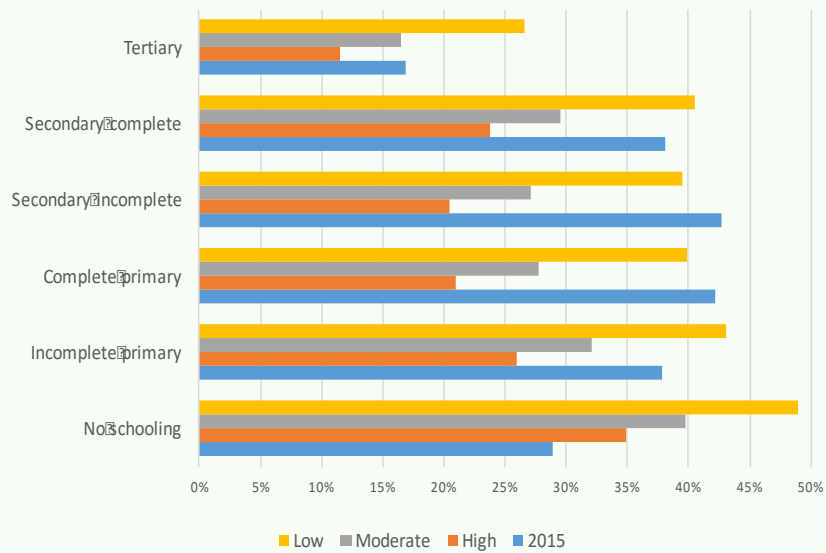


Unemployment & Unemployment Rates, 2015-2025



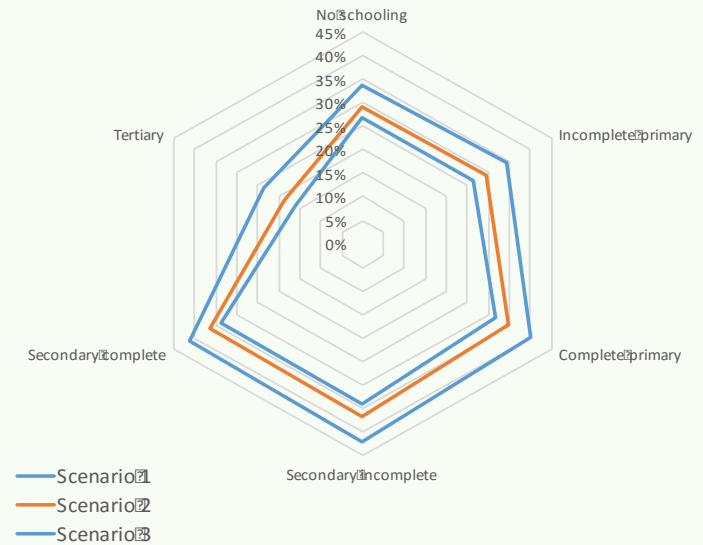
Skills Gap, 2015-2025

Fig 12.5: Unemployment Rate by Qualification (2015 & 2025)



Source: ILM-EM Model (www.adrs-global.com)

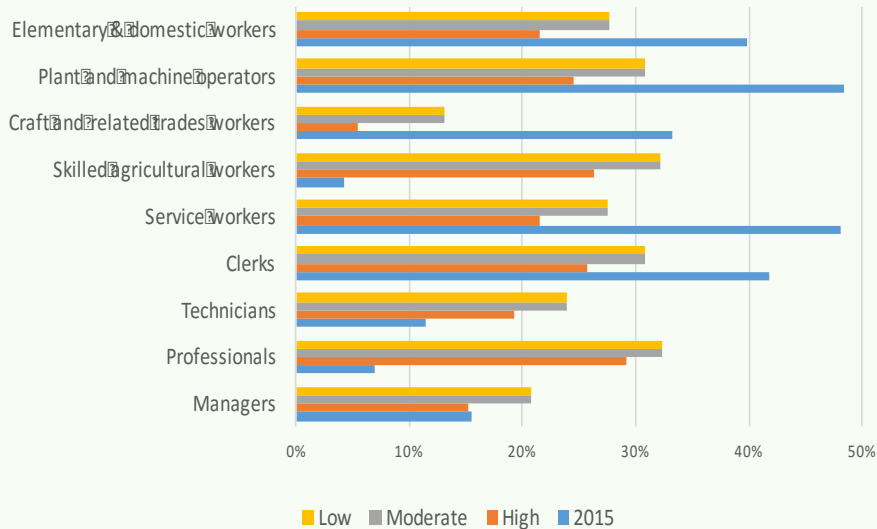
Fig 12.6: Rate of Unemployment by Qualification (%)



Source: ILM-EM Model (www.adrs-global.com)

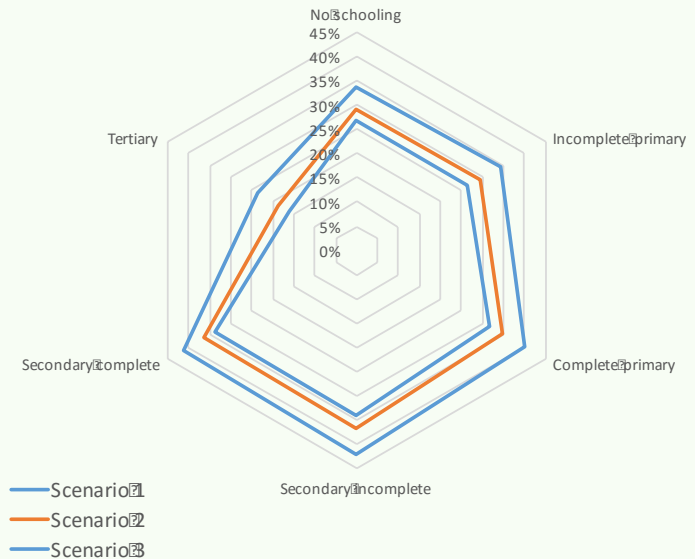
Unemployment Rate by Occupation, 2015-2025

Fig 12.9: Unemployment Rate by Occupation (2015 & 2025)



Source: I-M-EM Model (www.adrs-global.com)

Fig 12.6: Rate of Unemployment by Qualification (%)



Source: I-M-EM Model (www.adrs-global.com)

LM-EM: A Skills Forecasting & Planning Tool

LM-EM provides **insight** on the working of the economy:

The macroeconomic basis of LM-EM provides you with insight on the working of the economy and its direct and indirect connections to the education sector.

LM-EM provides **foresight** into future:

Through its comprehensive and consistent forecasts of economic indicators, demand for occupations, and demand and supply of educational qualifications, it provides foresight into future.

LM-EM as a tool for **decision making**:

Overall, LM-EM projections of important economic and skills demand and supply indicators offer the necessary intelligence for detailed and systematic decision making.

ADRS

Applied Development
Research Solutions

LM-EM: A Skills Forecasting & Planning Tool

“What is needed is knowledge and planning instruments for the system and research-based intelligence for strategic decision-making for the post school system.”

- Dr. Nzimande

Minister of Higher Education and Training

ADRS

Applied Development
Research Solutions