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Mining Sector Wages in South Africa

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1. BACKGROUND AND CONTEXT

The importance of the South African mining sector cannot be overemphasised. In the world, South Africa is the top producer of platinum group metals (PGMs) and chrome ore. It is also ranked among the world's top three producers of manganese ore and titanium (Department of Mineral Resources [DMR], 2012). The mining sector has mineral reserves estimated at approximately USD2.5trillion (Citigroup Global Markets, 2010), its output accounts for 5% of the country's gross domestic product (GDP), directly employs about 500 000 workers (with 500 000 more workers being indirectly involved in mining-related activities), and in 2011 exports from the sector accounted for 39% of the country's export earnings (Leon, 2012; DMR, 2012). Mining companies also pay significant amounts to government through taxes and royalties.[1] In 2011 the sector contributed about ZAR21 billion in taxes to the government, accounting for about 15% of the corporate tax paid in 2011 (DMR, 2012; Republic of South Africa, 2012). At the same time, it employed about 3% of the country's economically active population (DMR, 2012). Moreover, during the period 2002–2011, almost 100 000 new jobs were created in the sector (DMR, 2012).[2]

The above shows that events in the mining sector have ripple effects on the whole economy. Of late, the sector has been plagued by a myriad of problems ranging from declining mineral prices to policy uncertainty. For example, the fierce and lengthy debate around nationalisation contributed to policy uncertainty in the country. The African National Congress' (ANC) 2012 Mangaung conference clarified a number of issues concerning nationalisation of mines as it emerged that nationalisation was not government policy. The Fraser Institute's Policy Potential Index (PPI) shows that South Africa droppen from 28 (out of 48) in 2003 to 67 (out of 79) jurisdictions in 2011.[3] The 2012 downgrades by credit rating agencies Standard and Poors, and Moody's, as well as the weakening of the South African Rand, are partly attributable to challenges facing the mining sector. Furthermore, the 2012 wildcat strikes that started in Marikana at Lonmin Mine significantly affected the sector's stability as well as the country's position as a foreign direct investment destination. The Marikana incident also resulted in a number of questions being raised about the efficacy of the wage determination processes in the South African mining sector.[4]

The role of major trade unions such as the National Union of Mineworkers (NUM) and the United Association of South Africa (UASA), as well as trade union federations such as the Congress of South African Trade Unions (COSATU), is also being questioned, especially given the emergence of splinter trade union groups. The resolution of the Marikana crisis which saw workers receiving salary increases of as much as 22% may further encourage their counterparts in other sectors of the economy who, disgruntled with the union-wage premia, may want to cut out unions and negotiate their own wage increases.

In light of the above, the main objective of this paper is to investigate wage determination in South Africa's mining sector with a view to better understand the current unrests in the sector. This is important given

1 For example, in 2011, Anglo American contributed USD2.5 billion in taxes and Impala Platinum paid ZAR1.9 billion in taxes and royalties (*Financial Mail*, October 12–17 2012).

2 This is an absolute increase and not a relative increase.

3 The PPI is a composite index measuring the impact of government policies on country attractiveness. It ranges from 0 (for the least attractive jurisdiction) to 100 (for the most attractive jurisdiction). See *Fraser Institute Annual Report* (2012) for more details.

4 The wage protests at Marikana saw 44 people being killed and 78 injured.

that this wave of strikes is not the first to hit South African mines; in 2007 there was an industry-wide miners' strike during which the miners made it clear they were not happy with their remunerations and working conditions at the country's mines.

1.1 Objective

The objective of this study is to investigate wage determination issues in the mining sector that have led to episodes of recurring violent strike action.

1.2 Scope

This study aims to investigate the following:

- How are mining wages determined?
- What is the percentage of wages in relation to a mining company's total costs?
- How do mine workers' wages compare to the rest of the economy?
- What are the pay differentials between different occupations within the mining sector?
- What are the skills/qualification levels of employees in the mining sector (workers, management and executives)?
- How do South Africa's average wage rates per mining occupation differ from those in other mining-driven economies?

1.3 Methodology

The study uses secondary data to investigate the determination of wages in the mining sector. Data on a sample of firms operating in the South African mining sector was collected and used to assess their cost structures, particularly the proportion of wages to the firm's total costs of production. Worker productivity data was also used to assess the extent to which change in productivity was driving the change in wages. Data on remuneration and skills levels of workers in different sectors was collected to assess sectoral wage differentials as well as skills levels. To better understand wage determination in the South African mining sector we reviewed literature on a number of issues related to wage determinations. These included industrial relations, labour laws and collective bargaining (centralised and non-centralised). This review helped in tracking the evolution of South Africa's collective bargaining process. We used data from the following sources to conduct the study:

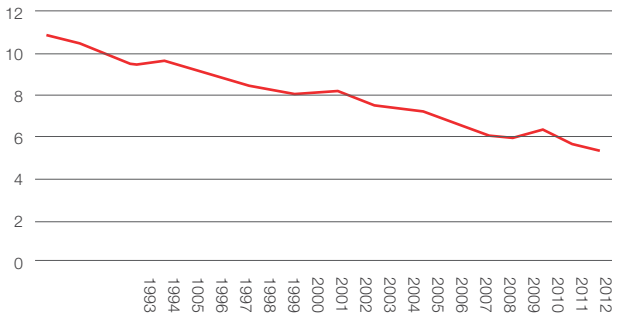
- Government of South Africa (especially the DMR) (e.g., contribution of mining sector to the South African economy, etc.);
- Financial Statements of the JSE-listed mining firms (e.g., wages and other costs of production in mining sector);
- Statistics South Africa (StatsSA) – October Household Surveys (1997 and 1999) (e.g., labour market indicators: education, wages, occupations, industries);
- StatsSA – Labour Force Surveys (2001–2007) (e.g., labour market indicators: education, wages, occupations, industries);
- StatsSA – Quarterly Labour Force Survey (2010) (e.g., labour market indicators: education, wages, industries, occupations);
- StatsSA Online Database (e.g. mining gross added value [GVA] as a percentage of GDP, employment figures);
- StatsSA – Mineral Accounts for South Africa: 1980–2007 (e.g., mineral production in South Africa, employee compensation);
- Reserve Bank of South Africa (e.g., macro-economic indicators such as GDP, export revenues, contribution of mining sector to the South African economy, etc.);
- DMR (e.g., contribution of mining sector to the South African economy, etc.); and
- the Chamber of Mines, South Africa (e.g., contribution of mining sector to the South African economy, etc.).

1.4 The Changing Contribution of the South African Mining Sector

We analyse the contribution of the South African mining sector to the economy using the following indicators:

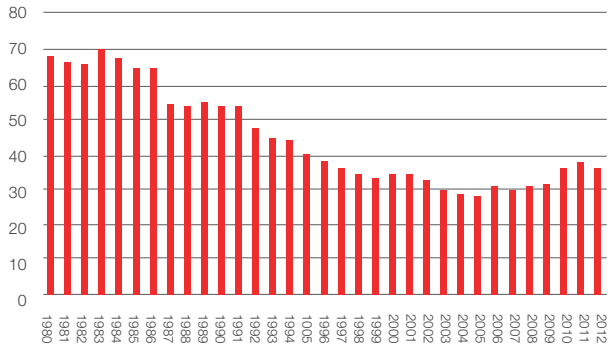
1. GVA as a percentage of GDP;
2. mining export earnings as a percentage of total South African export earnings;
3. direct employment in the mining sector as a percentage of the total employment; and
4. general trends in output of main minerals.

Figure 1: Mining gross value added as a % of GDP: South Africa (1993–2012)



Source: Stats SA

Figure 2: South Africa mining sector export earnings (as a % of total export earnings)



Source: Quantec Online Database

It is noteworthy that the sectoral contributions suggested by the above indicators are by and large minimal as they do not account for the indirect contributions of the sector. For example, some of the mining sector's output is processed in the manufacturing sector, thereby creating jobs in this sector. Hence there are spill-over effects from the mining sector that are not captured as such, understating the sector's contribution.

Figure 1 reveals that the contribution of the mining sector to the country's economic activity, as measured by the ratio of mining sector GVA to the country's total GDP, has gradually declined. For example, in 1993 the sector contributed almost 11% to the country's GDP but by 2012 the contribution had gone down to about 5%. This is partly due to a general decline in the sector's mineral output (see Tables 2a-c which show the general decline in production of a number of South Africa's major minerals). The general instability in the sector linked to labour unrest and policy uncertainty, especially around nationalisation of the sector, msy also explain part of the decline.

The same pattern is discernible from other indicators of the mining sector's importance e.g. sectoral export earnings and employment. In the early 1980s the mining sector contributed more than 60% to the country's total earnings (between 1980 and 1990 the sector contributed an annual average of 62.16% to the country export earnings). By the end of the 1980s and early 1990s the sector's contribution to export earnings had declined to around 50%. The downward trend continued such that for the period 1991–2000 the annual average contribution was around 41%. By 2010 this had dropped to 36%. As such, the annual average contribution for the period 2001–2010 was 31.38%.[5]

The weakening contribution of the mining sector is also evident in employment figures. Data from StatsSA and DMR (2012) show a steady decline in the sector's contribution to total employment in the country. In 2000 it contributed 4.5% of the country's jobs, this decreased to 4.3% and 3.9% in 2005 and 2010, respectively. The decline could be due to the country's employment growth outpacing that of the mining sector. The total number of employees in South Africa increased from 9.329 million in 2000 to 13.645 million in 2012, showing a 46.3% increase. Concomitantly, the number of mining sector employees increased from 421 000 to 513 000, a 22.9% increase. It must however be noted that the figures used here are capturing direct employment creation. When indirect employment creation is considered it may amplify this contribution.

5 It must be noted that export earnings also fluctuate with the exchange rate, but since we are weighting using the total export earnings we correct for this.

Table 1: Employment in the mining and quarrying sector: South Africa (2000–2012)

Year	No. of employees in the formal mining sector ('000)	Total employees in South Africa ('000)	% of mining employees (using direct employment only)
2000	421	9 329	4.51
2001	397	9 353	4.24
2002	416	9 644	4.31
2003	436	9 764	4.47
2004	449	9 976	4.50
2005	444	10 271	4.32
2006	456	10 797	4.22
2007	495	11 199	4.42
2008	519	13 655	3.80
2009	492	12 885	3.82
2010	499	12 975	3.85
2011	513	13 318	3.85
Average 2000–2011	461	11 097	4.19

Source: StatsSA (2009) Labour Force Survey: Historical Revision September Series; StatsSA Online Database; DMR (2012).

Tables 2a-2c show changes in mineral production. This is important as another factor explaining the decline in the mining sector's role is the downward trend in output. The production of a number of minerals declined significantly during the period 1990–2010. Examples of such minerals include gold, copper, silver and uranium oxide. For example, in 1990 the country produced 605 000 kg of gold but by 2000 this had declined to 430 800 kg; a 2.6% annual average decline in gold production. The decline continued in the 2000s. During the period 2001–2010 gold production declined from 430 800 kg (in 2000) to 188 700 kg in 2010; a decline of more than 50% (or an annual average decline of more than 5%). This is despite the commodity price boom witnessed during the period 2000–2010. It is interesting to note that there has been a monotonic decline in gold production. It fell by just over 9% between 2003 and 2004, followed by just over 12% between 2004 and 2005, and just over 15% between 2007 and 2008. Copper production followed a similar pattern, with production falling from 193.6 kt[6] (in 1991) to 83.6 kt (in 2010). In the period 1991–2010 copper production plummeted by more than 56% (an annual average decline of almost 3%). A similar trend was observed for silver, with production falling from 161 400 kg of silver (in 1990) to 79 300 kg (in 2010). Uranium oxide also fell significantly from more than 3 million kg in 1989 to about 682 300 kg in 2010 (a decline of more than 80% or an annual average decline of 3.6%).

It should be noted that during the same period one important sub-sector of the mining sector, the asbestos production sector, stopped production completely. This is due to the ban on the production of asbestos which saw a number of firms involved directly and indirectly in the production of asbestos being forced to close or focus on other sectors. The asbestos sector used to contribute as much as 5% to the mining sector's export earnings. During the same period the production of minerals such as platinum, iron ore, cobalt and manganese increased. While the overall annual increase in these minerals was about 3.62% the overall annual decrease was about 5%, implying that the increase was not enough to reverse the downward trend in the economic contribution of the sector.

The decline in the mining sector's contribution is attributed to a number of factors including mining closure, poor ore grades and high depth of mining as well as decreasing tonnage – most of which contributed to high extraction costs (Baartjes and Gounden, 2012). These factors can be grouped into two main groups: geological factors and external factors. Geological factors include poor ore grade and decreasing tonnage (related to ageing mines). There are not many new mines being discovered/opened in South Africa, many of them are old mines and the tonnage tends to decline over the life of the mine. The other factor is the changing depth of mining – with time as the extraction of deposits continues and as the deposits deplete gradually, mines are forced to mine at deeper levels which results in high extractive costs (Baartjes and Gounden, 2012; Mantashe, 2008). External factors include changes in the minerals markets and legislation issues related to compliance. A general decrease in commodity prices can reduce the viability of mining projects, resulting in closure. Closure may also be due to legislation. For example, legislation (related to licensing, environmental or safety requirements), may make it difficult for new mining firms to enter the market implying that the

6 1 kt = 1000 metric tonnes.

Table 2a: Production of main minerals in South Africa (1989–2010)

Year	Gold production ('000 kg)	Growth rate in gold production (%)	Copper production (kt)	Growth rate (%)	Silver production ('000 kg)	Growth rate (%)
1989	607.7	..	191.6	..	181.7	..
1990	605.1	-0.42	188.4	-1.70	161.4	-11.18
1991	601.0	-0.67	193.6	2.79	171.6	6.31
1992	613.0	2.00	176.1	-9.07	182.7	6.51
1993	619.3	1.03	166.3	-5.52	192.4	5.31
1994	580.2	-6.32	160.1	-3.73	197.8	2.78
1995	523.8	-9.72	161.6	0.90	174.3	-11.86
1996	498.3	-4.88	152.1	-5.89	168.7	-3.23
1997	490.6	-1.53	153.1	0.65	155.1	-8.05
1998	465.1	-5.20	164.4	7.41	160.8	3.68
1999	451.2	-3.00	144.3	-12.25	152.0	-5.51
2000	430.8	-4.51	137.1	-4.97	144.5	-4.91
2001	395.0	-8.31	141.9	3.48	109.7	-24.06
2002	398.5	0.89	129.5	-8.75	113.1	3.11
2003	373.2	-6.34	120.9	-6.59	87.5	-22.70
2004	337.2	-9.65	102.6	-15.18	70.9	-18.92
2005	294.7	-12.62	103.9	1.25	87.9	23.92
2006	272.1	-7.66	109.6	5.52	86.9	-1.08
2007	252.6	-7.17	117.1	6.82	69.8	-19.68
2008	212.6	-15.85	97.2	-16.98	75.2	7.71
2009	197.6	-7.03	92.9	-4.43	77.8	3.43
2010	188.7	-4.52	83.6	-9.95	79.3	1.97

Source: Minerals Statistic Tables (DMR).

Table 2b: Production of main minerals in South Africa (1989–2010)

Year	Platinum production ('000 kg)	Growth rate platinum production	Uranium oxide production ('000 kg)	Growth rate uranium production	Cobalt production ('000 kg)	Growth rate cobalt production	Iron ore production (kt)	Growth rate iron ore production	Manganese ore production (kt)	Growth rate in manganese production
1989	133.684		3456.0		199		29958.3		4 884	
1990	141.913	6.16	2874.6	-16.82	249	25.38	30346.7	1.30	4 402	-9.87
1991	142.861	0.67	2025.1	-29.55	209	-16.40	27037.0	-10.91	3 146	-28.53
1992	152.891	7.02	1970.7	-2.69	234	12.39	25171.2	-6.90	2 464	-21.69
1993	176.167	15.22	2007.7	1.88	172	-26.76	27169.0	7.94	2 507	1.75
1994	183.926	4.40	1990.6	-0.85	246	43.48	30487.6	12.21	2 851	13.74
1995	183.097	-0.45	1701.9	-14.50	190	-22.91	31943.9	4.78	3 199	12.18
1996	188.636	3.03	1706.0	0.24	247	30.19	30828.5	-3.49	3 240	1.30
1997	196.605	4.22	1323.9	-22.40	318	28.57	33223.6	7.77	3 121	-3.69
1998	199.953	1.70	1138.3	-14.02	296	-6.74	32964.4	-0.78	3 044	-2.45
1999	216.478	8.26	1092.6	-4.01	306	3.18	29506.7	-10.49	3 122	2.56
2000	206.77	-4.48	1015.0	-7.11	397	29.84	33707.4	14.24	3 635	16.45
2001	229.546	11.02	1065.0	4.93	373	-6.00	34757.2	3.11	3 274	-9.94
2002	236.641	3.09	998.0	-6.29	352	-5.70	36484.0	4.97	3 358	2.57
2003	265.402	12.15	893.9	-10.43	271	-22.90	38085.9	4.39	3 547	5.60
2004	276.4	4.14	887.3	-0.74	309	13.84	39322.1	3.25	4 282	20.74
2005	302.979	9.62	795.3	-10.36	268	-13.26	39542.1	0.56	4 612	7.70
2006	309.348	2.10	639.2	-19.62	267	-0.41	41371.9	4.63	5 213	13.05
2007	304.031	-1.72	618.7	-3.22	293	9.97	42083.1	1.72	5 996	15.01
2008	275.767	-9.30	654.3	5.77	244	-16.72	48982.5	16.39	6 807	13.53
2009	271.393	-1.59	629.0	-3.87	238	-2.70	55313.1	12.92	4 579	-32.73
2010	287.304	5.86	682.3	8.48	840	253.34	58709.3	6.14	7 172	56.63

Source: Minerals Statistic Tables (DMR).

Table 2c: Production of main minerals in South Africa (1989–2010)

Year	Nickel Production (kt)	Growth rate	Zinc (Metal in Concentrate) Production (kt)	Growth rate	Coal production (kt)	Growth rate
1989	28.054		77		177764.4	
1990	28.188	0.48	75	-3.29	174973.6	-1.57
1991	26.885	-4.62	64	-13.86	178464.4	2
1992	27.621	2.74	72	11.65	177370	-0.61
1993	29.868	8.14	77	7.18	183962.5	3.72
1994	30.751	2.96	76	-0.95	196454.5	6.79
1995	29.803	-3.08	71	-6.87	205639.1	4.68
1996	33.861	13.62	77	8.06	204995.9	-0.31
1997	34.849	2.92	71	-7.54	219266.8	6.96
1998	36.679	5.25	70	-2.02	223783.8	2.06
1999	36.202	-1.3	70	0.15	222270.8	-0.68
2000	36.616	1.14	63	-10.08	224906.7	1.19
2001	36.443	-0.47	61	-2.36	223494.7	-0.63
2002	37.286	2.31	64	4.82	220269.6	-1.44
2003	40.842	9.54	41	-35.74	237872.1	7.99
2004	39.85	-2.43	32	-22.4	243371.5	2.31
2005	42.392	6.38	32	0.35	244988.2	0.66
2006	41.757	-1.5	34	7.26	244832.4	-0.06
2007	37.163	-11	31	-10.41	247666.4	1.16
2008	31.675	-14.77	29	-6.02	252699.1	2.03
2009	34.605	9.25	28	-2.91	250538.1	-0.86
2010	39.96	15.47	36	28.35	254521.9	1.59

Source: Minerals Statistic Tables (Department of Mineral Resources)

rate of exit may exceed the rate of entrance, with new firms not adequately replacing the existing firms. Legislation can also result in the closure of already existing firms, e.g. the case of asbestos.

Unpredictability of government policy has also been touted as a reason for the decline of the sector (*The Economist*, 2012). The instability in the sector is also driven by labour force unrest.

2. LITERATURE REVIEW

2.1 A Brief Review of Wage Determination Models

Since wages in the mining sector are largely determined by collective bargaining, this section provides a brief review of models of trade union behaviour. There are many models of trade union behavior in wage bargaining such as the monopoly union model by Dunlop (1944) which proposes that a union exploits monopoly power in its labour market; the right to manage model by Leontief (1946) where a union and a firm bargain over wages; and the efficient bargaining model by McDonald and Solow (1981) where a trade union and a firm simultaneously bargain over wages and employment. Union power within a bargaining unit, i.e. the fraction of workers covered by collective bargaining and the degree of centralisation of bargaining are some of the factors that can have an influence on the wage outcome. In general, the trade union tries to maximise a utility function which has wages and unemployment benefits:

$$V(w, L) = \frac{L}{N} u(w) + \left[1 - \frac{L}{N} \right] u(B) \qquad (1)$$

N is the fixed number of union members, L is the number of unemployed union members, w is the real wage, B is the value of unemployment benefits and $u(.)$ is the indirect utility function.

The firm tries to maximise a profit function which entails having as low wage payment as possible to maximise profit. Profits are therefore maximised by the choice of L.The profit function is therefore stated as:

$$\pi (w, L) = AF (L, K) - wL \qquad (2)$$

$A (L, K)$ are factors of standard production function as labour, and capital.

The budget constraints faced by a trade union or a firm vary from model to model, for example, under monopoly union the trade union tries to maximise wages subject to the budget constraint which is denoted by the firm's labour demand. The focus will therefore be on trying to maximise the wage that the firm can grant. This means that if $(L=N)$ from equation (1) the objective function simplifies to $V(w, L)=u(w)$. Thus the trade union will set the highest possible wage.

The right to manage model tries to depict that both the union and the firm have the right to bargain over wages. The firm, however, is assumed to have a free choice of employment, hence the term 'right to manage'. The increase in bargaining power by the union might force firms to downsize and lead to higher unemployment. This shows that the outcome of this model might be inefficient; it might lead to unnecessary involuntary unemployment. What determines the winner in the power struggle between a union and its employer is the ability of both sides to halt production, for example, the firm may fire workers while workers may go on strike. This was the situation at Marikana – workers went on strike in the hope of forcing the firm to increase wages, while the firm tried to threaten the workers.

Finally the efficient bargaining model by McDonald and Solow (1981) opines that the union and the firm simultaneously bargain over wages and employment, which makes it an efficient outcome. The notion is that both the firm and the union will reach an equilibrium where no one is made worse off. Bargaining may not only be over wages but could include employment conditions or hours of work. such bargaining has taken place in the mining sector in South Africa where miners have not only complained about wages but also about other employment conditions such as social and housing

amenities. To some extent, the reviewed models underpin centralised collective bargaining in the South African mining sector.

The central hypothesis of these models of trade union behaviour is that unions aim (i) to maximise the wages of their members and (ii) to increase the number of union members. The trade unions for mine workers in South Africa are forceful due to high membership, and calls for high wages as explained below. Other theories of wage determination are briefly mentioned below, including: market theory of wage determination, and efficiency wage models. For a detailed discussion of on efficiency wage models such as the shirking model, labour turnover model, adverse selection model, sociological model and union threat model, see Katz (1986).

2.2 Wage Determination in South African Mining Sector

In South Africa, wages are determined by several factors including: labour supply and labour demand; prices of minerals; institutional factors such as minimum wages; bargaining councils and union pressure; and past racial discrimination considerations. The wage setting landscape has evolved in line with the country's political events – the transition from apartheid into the post-apartheid era.

Collective bargaining, both centralised and non-centralised, plays an important role in the determination of wages in the mining sector. The Chamber of Mines plays a central role in the centralised bargaining process. It negotiates with workers' representatives, especially in the coal and gold sectors. Bargaining councils consisting of trade unions and employer organisations are the fundamental institutions engaged in the legislative system of collective bargaining and wage determination (Bhorat *et al*., 2007). This setting is in the context of bargaining models (Layard *et al*. 1991), in which unions and employers negotiate how the revenues from production are to be shared. This involves a trade-off between the gains from a higher wage for the employees and the associated profit decrease for the employer. The Labour Relations Act (LRA) of 1995 legalised the framework for collective bargaining in South Africa. It was based on the premise of self-regulation associated with the development of robust tripartite institutions comprising the government, strong unions and employer organisations (Grawitzky, 2011).

This bargaining process can be partially said to represent the efficiency-wage hypothesis, in which wages are instead determined unilaterally by employers, who weigh the disadvantages from higher wages due to the increase of the wage bill against the benefits in the form of more effort from the employees or reduced turn-over of labour. The models of trade union behaviour underpin the case of the South African mining sector. The NUM (the main union which represents workers in the sectoral bargaining process) was formed in 1982, and represents approximately 300 000 workers in the industry. Its membership constitutes approximately 60% of the workforce (COSATU, 2012). In 2009, the bargaining councils signed a two-year wage deal which included a 10.5% increase for the lowest grade; this increased the minimum monthly wage for underground miners to ZAR3 646. A second part of the deal stipulated a further 10% increase to ZAR4 000 in the following year. Workers in categories 4–8 received a 10% increment, while miners and artisans received 9%. In 2010, they aimed for a minimum of ZAR4 000 for the lowest paid workers. Other workers received 7.5% as based on the Consumer Price Index plus 1 and a guaranteed minimum of 7.5% (Grawitzky, 2011). The weakness of this bargaining system is that it does not include the platinum and diamond sectors but coal and gold only. Furthermore, NUM is being challenged by a new workers' union – the Association of Mineworkers and Construction Union (AMCU).

The fact that mining and manufacturing sectors are traditionally union hubs (Ntuli and Kwenda, 2012), indicates that unionisation plays a crucial role in the mining sector's wage determination process. Unions create a divide in the labour market between insiders (employed) and outsiders (unemployed), with their interest largely vested in insiders (Altman, 2006). It has been established that, although overall wage growth was relatively stagnant in the 1980s, trade union movement was successful in substantially raising wages in certain industries, particularly in

mining and manufacturing (Fallon and Lucas, 1998). Trade unions in South Africa have been advocating for the closure of racial wage inequality which is the largest in the world (Schultz and Mwabu, 1997), with African and white workers receiving a wage that differs by a factor of five (Mwabu and Schultz, 1995). Existing studies on South African union wage effects found that unions compress the distribution of wages and reduce inequality among unionised African and white men (Moll, 1993; Ntuli and Kwenda, 2012). This, however, is not in the setting of the monopoly-union framework, where wages are assumed to be set unilaterally by unions that trade off the benefits from a real wage increase for employed union members against the associated loss of employment. Instead, the unions try to negotiate with the employers. However, in recent years, the impact of unions in wage setting has been declining as witnessed by the 2012 Marikana disaster. Workers disobeyed the union directive and viewed NUM and other unions as stooges for the employers and hence, their rejection of the unions. This has led to the breakdown of the collective bargaining system that has operated effectively since the mid-1980s.

Furthermore, economic factors such as the increase in minerals prices and cost of living have influenced wage setting in the mining sector. The mineral price boom in the 1970s, for example, led to the rapid annual growth in real wages in mining (10.8%), manufacturing (2.5%) and agriculture (2.6%) (Altman, 2006). According to Mazumdar and Van Seventer, (2002), the tradable sector divided the increase in output almost equally between real wage growth and employment increase. However, this trend changed in the 1980s when wages were no longer increasing. The context here lies in the market theory of wage determination where forces of demand and supply dictate wage setting. The determinants from the supply side include the numbers of workers available and the skills that they have, these are weighed against labour demand.

As pointed out earlier in this paper, past racial discrimination also contributes to wage determination in the mining sector. Pre-1994, wages favoured whites over blacks (Africans). Whites were rewarded higher wages mainly due to racial discrimination and union representation. Apartheid created conditions necessary for both pre- and post-labour market discrimination through biases in education and training, and job reservations. This created a situation where whites earned more than Africans. Woolard and Woolard (2005) confirmed that the wage gap between most skilled white and African workers was increasing or not changing at all over the period 1995–2003. However, these disparities led Africans to demand higher wages in order to correct this historical discrepancy. In this context, Africans workers in particular are demanding an increase in wages in the mining sector. Existing studies show that in the 1990s there have been rising wages for lowly-skilled African workers and relatively stagnant wages for highly-skilled workers (Hofmeyr, 1990; Fallon, 1992). According to Altman (2006), these wage increases for lowly-skilled blacks were generally understood to be a correction of past racial discrimination, after years of exploitation. This, however, has been seen to have a negative impact on competitiveness and employment.

Minimum wage regulation also plays a key role in wage determination in the mining sector. Currently the minimum wage is at ZAR 4000 (Taal *et al*., 2012). According to Labour Research Services (LRS) (2011), the mining industry pays the third highest minimum wage after transport and communication, and manufacturing. However, all these sectors pay below the minimum wage. These low wages are a result of outsourcing work which maintains very low wages even within an industry with high levels of union organisation and dominated by large companies (LRS, 2011). This shows that wage setting in the mining sector is not dictated by efficiency wage models like the turnover model (Stiglitz, 1974) or the fair wage model (Akerlof, 1982) where companies pay above the market wage to reduce quits and pressure them to exert more effort.

Sectoral conditions also play a role in wage determination in South Africa. The Minister of Labour can make a sectoral wage determination in a specific area (Bhorat *et al*., 2007). This occurs when there is limited bargaining and union organisation, and are promulgated by the Department of Labour following recommendations by the Employment

Conditions Commission (ECC). The sectoral determination will therefore set minimum terms and conditions of employment including minimum wages. The wage determination on sectoral grounds is determined taking into account several criteria such as cost of living, wage differentials and equity, and alleviation of poverty. It tries to protect vulnerable workers who normally are not represented and do not have high bargaining power.

2.3 Industrial Relations in South Africa

South Africa has an advanced industrial relations system (IRLS) as compared to the rest of southern Africa (Fashoyin, 1998). However, during the pre-democratic transition period, the IRLS was highly polarised and therefore characterised by adversarialism. The Industrial Conciliation Act (1924) was aimed at establishing a system of collective bargaining (Bhorat *et al*., 2007). Its weakness was an exclusion of Africans from the definition of an employee. This resulted in development of a dual system in industrial relations defined by race. It shows that during apartheid majority of the population was denied fundamental human rights, including the right to freely organise and bargain collectively. The labour market become highly segregated along race, occupation and gender lines, such that this affected wages and employment conditions (Standing *et al*., 1996). This system of adversarial industrial relations was changed after the democratic transition with the enactment of the Labour Relations Act of 1995, which enabled extensive reform of industrial relation policies and practices. The Act empowers the central bargaining process which characterises the mining sector. Despite this enabling legal framework, the historical imbalance background created a situation where decentralised bargaining at the plant level is carried out with workers' suspicion of the employers. This results in conflict in the negotiation process, as occurred during the period of the mining strikes.

The post-apartheid South African government put in place institutions to oversee industrial relations and to foster amicable relations. The two key institutions in South Africa's industrial relations are the Commission for Conciliation, Mediation and Arbitration (CCMA) and the National Economic Development and Labour Council (NEDLAC). These institutions are important in encouraging dialogue and solving work-related problems in the economy. The CCMA is a dispute settlement body established from the Labour Relations Act (1995). It replaced the Conciliation Boards and the Industrial Court which lacked credibility with its stakeholders; this resulted in low rates of dispute settlement (Budlender, 2009). The CCMA was created in an attempt to have an efficient board responsible for dispute resolution. The CCMA has set a settling target of 70% of cases referred to it by 2015 (CCMA 2011/2012 Annual Report). Due to its efficiency and proactive stance, it has managed to settle about 70% of the cases it received in 2011/2012 (Benjamin, 2013). Its functions include the following: conciliating workplace disputes, arbitrating on disputes, facilitating the establishment of workplace forums and statutory councils, publishing and compiling information and statistics about its activities, and consideration of applications for accreditation and subsidy from bargaining councils and private agencies.

NEDLAC was established through the promulgation of the National Economic Development Labour Council Act of 1994. The Act emerged as a result of the merger of the National Economic Forum (NEF) and the National Manpower Commission (NMC) which were in existence prior to democratic transition. NEDLAC has stakeholders ranging from government, labour and business, and aims to promote social dialogue to address the economic development challenges facing the country. The body strives to promote the goals of economic growth, concluding agreements on matters pertaining to social and economic policy, encouraging and promoting the formulation of co-ordinated policy on social and economic matters, and consideration of socio-economic disputes.

2.4 Labour Laws in South Africa

South African labour relations are governed by acts of parliament which cover all sectors of the economy, mining included. These include the Compensation for Occupational Injuries and Diseases Act (1993) which seeks to ensure compensation for workers who are injured on the

job; the Occupational Health and Safety Act (1993) which aims to provide a safe working environment for all workers; the Labour Relations Act (LRA) (1995) which provides a framework for collective bargaining; the Basic Condition of Employment Act (1997) which sets minimum conditions of employment; the Employment Equity Act (1998) which outlaws discrimination in the workplace; the Skills Development Act (1998) which ensures adequate training of the country's workforce; the Skills Development Levies Act (1999) which provides the legal framework on how employers must contribute to the National Skills Fund; and the Unemployment Insurance Act (2001) which defines an unemployment insurance fund to which employers and employees contribute.

It is notable that these laws aim to empower and protect workers from multi-dimensional facets of unfair labour practices which were entrenched in the apartheid system. Workers in the mining sector now enjoy trade union rights and improved working conditions through legalised collective bargaining *among others*. Despite such improvements, there still remain some areas of weakness within the labour laws. For example, there is no provision for national minimum wages to be set. The labour laws established a liberal system in which the determination of wages is left to a collective bargaining process. The failure to reach a concrete agreement through the collective bargaining process during the recent Marikana crisis is also an indication of some of the faults of the current labour laws.

2.5 Centralised and Non-centralised Collective Bargaining in South Africa

As stated earlier, both centralised and non-centralised bargaining take place in South Africa. The South African Constitution (1996) protects fundamental collective bargaining rights, and the entire LRA (1995) is based on promoting and supporting collective bargaining, while section1(d) provides for the promotion of orderly collective bargaining at sectoral level in centralised bargaining forums, that is bargaining councils (Holtzhausen, 2012). Collective bargaining is a process whereby employees and their representatives, and employers and their representatives, negotiate in order to achieve some balance between the fulfilment of the needs and the objectives set for each party (Holtzhausen, 2012).

Centralised bargaining can be defined as labour related negotiations that take place at macro level (industry-wide, multi-employer bargaining). Collective bargaining remains voluntary; unlike in the old LRA where bargaining was not optional. The LRA does not enforce collective bargaining but promotes it, specifically the establishment of centralised collective bargaining structures and the extension of agreements to non-parties through the bargaining council system. According to the Presidential Commission to Investigate Labour Market Policy (1996), the role of these bargaining councils is to create a stable framework for the setting of standards relating to minimum wages and conditions through distributive bargaining, to promote industrial relations stability, to participate in the development of industrial policy and policies relating to skill enhancement, enhance productivity and tackle poverty and inequality. Godfrey *et al*. (2006) notes that bargaining councils have been the foundation and are central to collective bargaining and the industrial relations systems of South Africa for over 80 years. Godfrey (2006) and Bhorat *et al*. (2009) note that in 2006, the LRA and the Basic Conditions of Employment Act (BCEA) cover approximately 9.5 million employees in the country. Of these, 25% are covered by bargaining council agreements (approximately 2.36 million employees), 36% are covered by sectoral determinations and the remaining 39% are covered only by the BCEA.

Non-centralised collective bargaining is collective bargaining at the micro level (enterprise or workplace or individual bargaining) rather than at the macro-level (industry-wide, multi-employer bargaining). World over, collective bargaining is now being discouraged. Companies that are exposed to worldwide competitive pressures see decentralised collective bargaining as enhancing their ability to adjust to changing labour and product market needs (Wild, 2004).

The essential characteristic of collective bargaining is joint regulation (Flanders, 1975). Collective bargaining is thus founded on the theory of joint

regulation, allowing employees (through their representatives) to open up discussions on issues of concern to them, and to respond to matters raised by management. In the South African mining sector, centralised bargaining is done by Chamber of mines for gold and coal, while non-centralised bargaining for platinum and diamonds is conducted at company level. Godfrey *et al.* (2010) state that the broad trend towards decentralising collective bargaining impacts notably on collective bargaining coverage, an element further affected by the decline in union membership. When no provision is made for extending collective agreements, coverage is effectively limited to party employers and employees.

Non-statutory centralised bargaining started in 1915 when the Chamber of Mines was first mandated by its members to negotiate with trade unions (Shane *et al.*, 2007). There are currently three unions – NUM, AMCU and UASA – in the mining sector (Mantashe, 2008). The main union is NUM while AMCU is emerging. The Chamber of Mines is the employers' organisation which bargains on behalf of its gold and coal mining members with the relevant unions, dominated by NUM. It has been estimated that the centralised bargaining agreement covered about 69% of employees in the gold mining industry while only 36% are coverage in the coal mining industry (Bhorat *et al*., 2007). The last wage negotiations took place in 2011 and the next is expected in 2013. The agreements cover all recognition units: category 3 to 8 employees, miners and artisans and officials, and the three unions in the mining industry. In 2005, the bargaining processes of all recognised unions became unified. However, in this bargaining process not all issues are dealt with at centralised level, rather a two-tier agreement was concluded in 1996 which stipulates that the bargaining on basic wages and conditions of employment would take place at the Chamber while bargaining on organisational, operational and workplace issues would take place at mine or company level.

Though the majority of platinum producers (Anglo American Platinum Corporation, Impala Platinum and Lonmin Platinum) are members of Chamber, they have not been part of collective bargaining conducted by the Chamber; rather, wage negotiations are company-specific agreements (Godfrey, 2007). The platinum members have their own extensive collective bargaining. This is the same as in the diamond sector (De Beers Consolidated Mines, the Trans Hex Group and the Namakwa Diamond Company) where the Chamber has not conducted collective bargaining on behalf of its diamond members. However, the Chamber has specific arrangements with these two sectors. The diamond sector has the South Africa Diamond Producers' Organisation which is a member of the Chamber. For platinum, negotiations are conducted at company level, pointing to the fact that wages and conditions are not uniform across the mineral commodities as these wages might be different from those set by the bargaining process in the coal and gold sectors. The Chamber has facilitated numerous agreements so far which are not only limited to wages but to various socio-economic and transformation issues, some of which include agreements on health, women in mining and training.

2.6 Has the Collective Bargaining in South Africa Evolved Over Time (Pre- and Post-apartheid Periods)?

The centralised bargaining process in South Africa has gone through considerable changes dictated by changes in the country's political landscape and what is happening in the global arena. The first law to provide the legal framework for collective bargaining process, though on discriminatory grounds, was the Industrial Conciliation Act of 1924.[7] The Act excluded Africans from representation on industrial councils (Bhorat *et al*., 2007). This was buttressed by apartheid policies which discriminated against Africans in the bargaining process, such as the Native Labour Act and the Black Relations Act (Bhorat *et al*., 2007). It was only in 1981 when the Industrial Conciliation Act was amended to the Labour Relations Act that this dual system of industrial relations ended (discrimination on the basis of race). This Act was later replaced by the LRA of 1995 which provided

7 It made provision of industrial councils as the core centralised collective bargaining institution. The name was then changed to bargaining councils in 1995. Black unions were initially allowed in 1979.

the legal framework for bargaining process regardless of race. The old LRA stipulated that it was a duty to bargain while a key feature of the current LRA is the promotion of voluntary orderly collective bargaining, particularly at sectoral level (Du Toit *et al.*, 2003). These laws recognised trade unions' role and this promoted union growth. Importantly, these legislative changes increased union activity in the bargaining process. The LRA contains provisions that regulate the organisational rights for trade unions, allow for the right to strike and regulate the collective bargaining process (Bhorat *et al*., 2007).

Probably the biggest change, specifically to mining, was brought about by recognition of NUM in 1983, and subsequent collective bargaining with the union as well as with other trade unions. As indicated in the literature, South Africa's collective bargaining originated from the inequality between the employer and the employee (Godfrey *et al*., 2010). In an attempt to equalise this power imbalance, employees negotiate collectively through representatives, rather than individually and on their own behalf. This was the issue in South Africa as the establishment of centralised bargaining was seen as a strategy to institutionalise union power to break down old paternalistic structures of the pre-democratic period. These paternalistic structures were the wage boards,[8] which unilaterally determined minimum wages for different sectors. The idea of these wage boards was to deter wage competition between sectors. This was effectively a monopoly created by mining employers where they used centralised control of recruitment to determine the price of labour (COSATU, 2012). This was, however, changed by the new LRA, which points to the fact that there were major changes in bargaining process pre- and post-apartheid period. The evolution of collective bargaining is centered as mention above on the LRA of 1995 which extended full collective bargaining rights to the majority of workers. This also led to 'industrial councils' being renamed 'bargaining councils'. Though the Act allows a voluntary approach to bargaining, the major pillar was its ability to strengthen trade union organisational rights at the work place. It is, however, crucial to point out that although centralised collective bargaining has been taking place for decades in the mining sector, a national bargaining council for the sector has not been set up (Godfrey *et al.*, 2010). Centralised bargaining has been selective across mining sectors (for example, the gold and platinum sectors). This selectivity might contribute to inter-mine strife as workers' conditions of employment differ between mines.

The current global trend points to the shift from centralised to decentralised bargaining process. Finnemore (2009) explain that in the US and the UK, pluralism (centralised collective bargaining) and its proneness to strikes are increasingly questioned, with collective bargaining alleged as being too disruptive and the accompanied industrial action seen as too costly for any country that competes globally. This is the evolution that is happening currently to collective bargaining worldwide, South Africa included. The trend is that determining conditions of service at organisational level is progressively becoming widespread, and that international businesses are more likely to impose universal patterns of employment relations across their global operations, and that the outcome of such forces are organisational-based employment systems (Ferner and Hyman, 1998). This is mainly driven by globalisation. According to Wild (2004), the changing world of work has added to a steady move away from wage determination through collective bargaining to the individual contract. Godfrey *et al.* (2010) state that the broad trend towards decentralising collective bargaining impacts notably on collective bargaining coverage, an element further affected by the decline in union membership.

Despite that shift, centralised collective bargaining is said to generate some externality advantages such as the possibility of a lower aggregate real wage and hence, according to a standard negatively sloped labour-demand schedule, higher employment. This is because the inter-union and inter-employer co-operation implies that the effects of wage increases in one part of the economy will be felt in other sectors. The other advantage of centralised bargaining is that it provides a mechanism of handling information on the aggregate economic

8 The Wage Act which was introduced in 1925 as companion to the Industrial Conciliation Act, is the Act that established the wage boards.

development and therefore of co-ordinating the behaviour of various wage setters (Bhaskar, 1990; Calmfors, 1993). This advantage was, however, not tapped in the mining sector in South Africa, particularly at Marikana. The situation at the mines was made worse by circumventing recognised unions and increasing wages to selected grades of workers outside of collective bargaining arrangement (Cillie, 2012), which violates the advantage of co-ordination. According to COSATU (2012), though the centralised bargaining is a historical achievement, the current voluntary form has not been able to address workers' demands. This shows that this approach has in some way fuelled the strikes in the mining sector and particularly the Marikana disaster.

2.7 Weakness of the Wage Determination Process in South Africa

The main weakness of the wage determination process in the mining sector is to a larger extent attributed to the migrant labour system which has largely remained unaltered in the post-apartheid era despite being criticised (Lye, 1984; Harrington *et al*., 2004). The persistence of this system builds poorly paid workers, who have largely been neglected in terms of social and housing amenities. These migrant workers were recruited from over 20 territories with main providers being Lesotho, the former Transkei within South Africa and Mozambique (Harrington *et al*., 2004). It was built along the principles of racial segregation, control and exploitation of Africans. The migrant workers' demands were neglected since the pre-reform era, largely due to the fact that these workers were vulnerable as they were sometimes foreigners who could easily be fired and rehired due to their social and political status. Despite this neglect and the fact that NUM didn't create particular structures for migrant miners, it championed for an improvement of the working conditions of migrant workers. For instance, it campaigned against the obligation to renew contracts of migrant miners on an annual basis, and it succeeded in de-racialising the hostel system by removing the language criterion in the allocation of hostel rooms.

Furthermore, the migrant labour system led to the development of 'second families' in which migrant workers establish local households with second wives or girlfriends in the shanties around the mines. This has been encouraged by the abolition of the single-sex hostels and paid-for by 'living-out allowances'– a cash allowance to 'live out', that is to exit the migrant hostel system. Families become a drain on employee salaries and frequently force migrant miners into the unsustainable agreements with loan sharks which use garnishee orders on miner salaries, a feature well highlighted in the strike action, especially at the platinum mines where indebtedness was considered an element of the salary discontent (COSATU Media Monitor, 2012). This socio-economic condition of mine workers supporting a second family on or near the mine while at the same time needing to visit his rural home has become so expensive that it has led to demands for higher wages.

What exacerbates mistreatment of migrant workers has been the dominance of a handful of powerful, centralised mining groups which began to out-source non-production and production functions to a growing number of sub-contracting companies[9] (Department of Labour, 2007). The use of these sub-contracting workers has been highest in the platinum sector (Buhlungu and Bezuidenhout, 2008), pointing to the possibility why Marikana disaster occurred in that sector. For example, in 2005, 54 667 of a total of 96 734 employees in the platinum group metals were outsourced, while in gold sector only 23 373 of of 133 569 male employees were outsourced (Buhlungu and Bezuidenhout, 2008). These companies tend to hire more vulnerable migrant workers particularly from Mozambique and Lesotho, and the trend of sub-contracting has had a marked impact on trade union strength[10] in the mining industry and led to a marked deterioration in wages, working conditions and

9 Cronin (2012) reports that between one-third and a half of the workforce on the platinum mines is sub-contracted labour. This he labelled as the perpetuation of the migrant labour system in a new and often harsher form. Godfrey and Theron (2004) assert that this sub-contracting in the mining sector appears to have stabilised at about 10% of the workforce.

10 It shows therefore shows that union power has been weakened since sub-contracted workers are not union members; they are hired on contract basis without any benefits.

underground safety (Crush *et al*., 2001). This extensive outsourcing in the platinum mines resulted in workers employed through labour brokers being paid much less than permanent workers. These sub-contracted workers do not receive benefits such as healthcare and housing. At AngloPlatinum over 41% of its workforce is employed through labour brokers; about 30% at Marikana (The Bench Marks Foundation, 2012). These labour brokers (sub-contractors) are used by big mining corporations in a bid to circumvent aspects of the labour law, rendering union representation ineffective. Crush *et al*. (2001) maintain that there has generally been an increase in the percentage of foreign labourers in South Africa mining workforce from 47% in 1990 to 57% by 2000 and that the percentage has been increasing post-2000. The failure to reverse the effects of this migrant labour system is the root cause of the many strikes that have occurred in the mining industry. According to Buhlungu and Bezuidenhout (2008), the sub-contracted workers compete with permanent workers which creates conflicts as they take jobs of permanent employees, and are paid less as they are not allowed to join unions.

Since 2005, South Africa has experienced more strikes days per capita than any other country (Alexander, 2012). This may indicate that the wage determination process in South Africa, particularly one governed by a collective bargain process, has some weaknesses. According to COSATU (2012), collective bargaining has failed to meet its objectives and a substantially restructured collective bargaining architecture is required. The current bargaining process is purely voluntary. Minimum wages in the mining sector are set outside bargaining councils; they are set at either the sector or company level which makes them neither comprehensive nor uniform. This lack of uniformity across gold, diamond and platinum mines creates tension. There is therefore discrepancy between wages that are covered by sectoral determinants with the ones covered by collective agreements.

It is noteworthy that trade union membership and power has been declining not only in South Africa but globally (Vettori, 2006). This is evident in the mining sector where NUM membership is declining. The reason for this decline is attributed to globalisation that increases the inequality in power between transnational employers and employees, and undermines unions' ability to organise employees (Godfrey *et al*., 2010; Ferner and Hyman, 1998). This decline in union power is also seen as a weakness of the wage determination process in South Africa, which leads workers to demonstrate without union approval as experienced in the platinum sector. Globalisation affects union power in that wages are no longer determined locally or nationally but internationally by these multinational companies. The mulitinational companies will therefore negotiate wages bearing in mind what they pay in other countries e.g. AgloGold Ashanti will take into account wages in various countries of their operation. This trend seems to affect the traditional union hubs like mining.

Specifically, focusing on the mining sector, the division between NUM and AMCU points to the fact that there may have been a labour leadership vacuum in the platinum sector. The mass resignation from NUM at three of the major platinum producers (Impala, Lonmin and Angloplats) indicates that workers think that the trade union was not on their side (Alexander *et al*., 2012). The strike at Marikana was also caused by Lonmin's refusal to negotiate with workers sighting its collective bargaining agreement with NUM. JP Morgan investment firm reported that NUM has become too close with mine's management (Molatilwa, 2012). This seems to be a similar case to the transport sector. It shows that the mandate of trade unions as the central wage negotiator in the wage determination process in South Africa has weakened.

The major pointer to the weakness of the wage determination process in the South African mining industry is the 'Marikana Massacre' which raises the following questions: Has peaceful wage determination failed in South Africa? Is the role of trade unions in wage negotiation failing in South Africa? COSATU, the ANC and the South Africa Communist Party (SACP) are party to the Tripartite Alliance (Collins, 2004). This, to some extent, has compromised COSATU's representative ability (Misra, 2008). The breakaway of unions from COSATU shows the lack of confidence unions and

workers have in COSATU. The clear example in the mining sector is the creation of AMCU in 2001 after dissatisfaction towards NUM which is the main member of COSATU. This points to the issue that the entire wage determination process in the mining sector has been compromised.

The Tripartite Alliance is a powerful entity. However, questions need to be asked about the extent to which it adequately represents the truly poor and vulnerable in South Africa. Some have argued that COSATU and the SACP have largely come to represent a 'working class aristocracy' and are too involved in ANC elite power politics to adequately work in the interest of the poor. As a result, violent public protests over poor service delivery have been increasing substantially over the past three years. For example in the Marikana protest instead of the trade union protecting the striking workers, it is reported that the NUM's general-secretary appealed for the deployment of the Special Task Force or of the South African Defense Force to the Marikana area (Alexander *et al*., 2012). This indicated that the trade union which is supposed to support workers in airing their views to their employers has become insensitive to the plight of workers. Moreover, the strong ties between COSATU and ANC which often result in labour leaders graduating into key positions in government and big business, lead workers to believe that labour movements are used as bargaining tools to gain positions in the ANC (Twala and Kompi, 2012).

The intra-industry separation in wage negotiation in the mining sector is also a weakness of the wage determination process. For example, there is industry-wide bargaining for gold and coal while negotiations in the platinum are company-based. This creates division in union representation of workers as the union with majority of workers will claim representation of all workers. This, according to Alexander *et al*. (2012), compromises the capacity of small unions to be responsive to their members' concerns. This may force some workers to demand to talk to employers directly with negative effects on the central bargaining system.

The increase of wages for workers in one plant may also lead their counterparts in other plants to demand the same, a case in point being the award of wage increases in February 2012 by Impala (a response to wildcat strike) before the Marikana disaster. This has been seen as sanctioning unofficial strikes elsewhere – a challenge to existing bargaining process in the mining industry (South Africa Labour Bulletin, 2012). This shows that there is a need to curtail the extension of within-industry bargaining agreements to non-parties.

There is also a view that platinum companies have created unique problems for themselves by opposing centralised, industry-wide bargaining. According to COSATU (2012), there is a lack of federation-wide collective bargaining strategies to reconfigure wage structure and legislated mandatory centralised bargaining. The other weakness is that South Africa is faced with high unemployment and poverty which makes employers ignore the collective bargaining demands. This mainly stems from lack of large-scale state interventions in the wage structure in South Africa (such as decisive state intervention through statutory minimum wage) (COSATU, 2012).

3. WAGES IN THE SOUTH AFRICAN MINING SECTOR

This section has two sub-sections. Section 3.1 looks at the costs of production for the firms in the mining sector, with a view to better understand the significance of labour costs in the firms' total cost of production. Section 3.2 provides a descriptive comparative analysis of the mining sector wages versus wages in other sectors. It also looks at education levels of workers in the mining sector and compares them to those of workers in other sectors of the economy.

3.1. Worker remuneration as a percentage of total company costs

In this section we assess the significance of labour costs in the production costs of mining companies. We look at the remuneration of the management as well as that of the general workers. We collected data on 19 JSE-listed companies (see Table A1) involved in the mining sector and calculated their total wage bill as a proportion of the companies' total cost. Table 3 shows the results. We find that for the period 2000–2012 there was a general increase in the wage bill as a percentage of total cost. In 2000 the wage bill:total cost ratio was 12.94% and gradually increased to 20.22% in 2001. The increase continued until when it reached a peak of 41.48% in 2007. After that it then began to decline gradually and reached 23.30% in 2012. For the period 2000–2012 wages accounted for an annual average of about 28% of the total cost for the firms in the sector. This suggests that wages account for a significant proportion of the mining sector production cost. Such increases in labour cost and the attendant labour unrest may have contributed to the decline in employment in the sector.

Table 3: Wages as a percentage of total costs in the mining sector[11]

Year	Wages as a % of total cost in the mining sector
2000	12.94
2001	20.22
2002	21.42
2003	28.39
2004	21.38
2005	29.34
2006	25.64
2007	41.48
2008	36.62
2009	32.97
2010	33.31
2011	34.62
2012	23.30
Average 2000–2012	27.82

Source: Annual reports from listed mining firms as retrieved from the Osiris Online Database.

In order to develop a better understanding of the cost structure faced by the firms in the mining sector we also looked at the production cost for the firms in the main minerals, gold, platinum group metals (PGM) and coal sectors. We noted that the proportion of wages to total cost is highest in the gold sector followed by the PGM sector and then the coal sector (see Table 4).

One contentious issue in the South African discourse is that of inequality as evidenced by the disparity between management remuneration and that of general workers. We examined the remuneration of management working in the mining sector and minimum wages in the sector. Due to

11 The figures were calculated based on 19 listed mining firms as detailed in Table A1 in the Appendix.

Table 4: Worker remuneration as a % of total cost by sector in South Africa (2000–2007)

Year	Gold sector	PGM sector	Coal sector
2000	37.22	18.46	23.29
2001	38.43	17.58	21.64
2002	31.48	23.21	17.66
2003	47.03	27.82	21.91
2004	53.00	29.61	22.68
2005	50.8	31.27	22.18
2006	40.86	27.17	21.88
2007	41.77	31.6	24.12
Average 2000–2007	42.57	25.84	21.92

Source: StatsSA (2010): Mineral Accounts for South Africa: 1980–2007

Table 5: CEO average remuneration for selected mining companies in 2011 (ZAR)

Company	Remuneration p.a.
BHP Billiton	37 747 524
Goldfields	32 698 609
Anglo American	28 197 674
Anglo Ashanti	27 836 000
Lonmin	16 707 711
Anglo Platinum	12 562 379
Impala Platinum	11 448 000
African Rainbow Minerals	10 161 000
Transhex	4 292 000
Average remuneration	**20 183 433**

Source: LRS (2012)

data limitations we use the median minimum wage in the sector as a proxy for the general workers' wage. According to the Labour Research Services (LRS) Fees Survey, in 2011 the average remuneration for a mining sector CEO was just over R20 million (LRS, 2012) (see Table 5). The CEO for BHP Billiton, at R37.7 million, earned the highest annual remuneration and Transhex's CEO earned the lowest at R4.3 million. The average CEO remuneration of R20.2 million is 420 times that of the South African minimum wage and 355 times that of the mining sector median minimum wage.[12] Of course, without data on productivity at different occupational levels, we cannot say much concerning the differences in remuneration. Indeed, the CEOs and the general workers are in different labour market segments and do not necessarily compete for the same jobs, but such glaring disparities are bound to result in labour unrests especially when the management fails to genuinely consider the demands for a living wage and decent working conditions by the general workers, most of whom earn salaries close to the minimum wage. (For more details on average remuneration by skill level, see Section 3.2.)

The fact that South Africa does not have a coherent income policy does not help the matter. In the tripartite alliance between workers, government and employers there does not seem to be a genuine concern for the general worker, who must strike annually if he or she is to be heard. The workers on the ground do not see the leaders (be they in the trade unions, in government or CEOs), making sacrifices in the form of reduced salaries to express their solidarity with the workers. It has also been reported that some of the trade union leaders have an arrangement with the employers that ensures that part of their salaries are paid by the employers (instead of being paid by the unions themselves). This can only fuel the view that the trade union leaders serve their own interests and do not necessarily serve union members. Indeed, they too may be perceived, by the general trade union membership as being as bottom-line-minded as the CEOs of the private mining firms. Such a scenario may result in workers' trade unions being perceived as toothless, encouraging the workers to negotiate for their own salary increases. The danger with this scenario is that it is unorganised and may be costly to the economy, the firms and even to the striking workers themselves. The Marikana massacre, for example, resulted in the deaths of more than 30 workers, loss of jobs, a huge salary increase and tarnished the image of South Africa as a foreign investment destination. Hence, no group of the tripartite alliance (workers, government and employers) was left unscathed.

Monthly minimum wages vary across sectors, occupation, years of experience and geographical location (urban or rural). We selected the median

12 We multiplied the monthly median minimum wage by 12 to get the annual minimum wage and then divided it into the CEO's annual salary.

Table 6: Compensation of employees as a % of total compensation to all employees by sector (2002–2012)

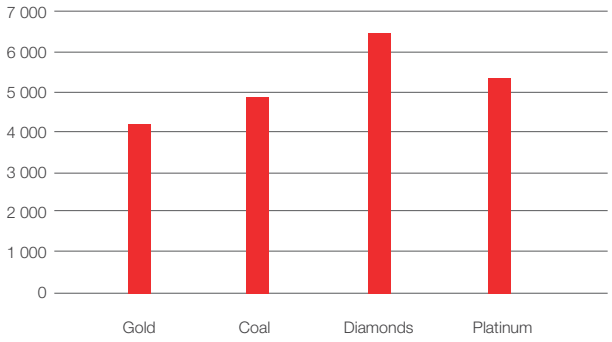
Sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average 2002-2012
Agriculture	2.76	2.32	2.03	1.74	1.65	1.66	1.67	1.66	1.55	1.49	1.48	1.82
Mining and quarrying	6.51	6.08	5.95	5.85	6.22	6.46	6.90	6.80	6.82	6.83	6.99	6.49
Manufacturing	18.80	18.17	17.67	17.27	17.19	17.30	17.53	16.97	16.70	16.32	16.35	17.30
Electricity, gas and water	1.87	1.85	1.76	1.76	1.76	1.72	1.79	1.82	1.79	1.79	1.85	1.80
Construction	2.60	2.66	2.68	2.78	2.81	3.38	3.51	3.63	3.42	3.38	3.44	3.12
Wholesale, retail and motor trade	12.66	12.80	13.00	13.00	12.96	12.32	12.18	11.90	11.84	12.00	11.79	12.40
Transport, storage and communication	7.12	7.22	7.23	7.23	6.95	6.57	6.19	5.95	5.89	5.98	5.90	6.57
Finance	13.78	14.44	15.22	16.16	16.55	16.98	16.90	15.84	15.95	16.08	16.15	15.82
General government	25.72	26.09	26.11	26.00	25.72	25.52	25.46	27.61	28.50	28.66	28.75	26.74
Personal service	8.18	8.37	8.36	8.22	8.19	8.09	7.88	7.81	7.54	7.48	7.30	7.95
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: StatsSA GDP Q4 2012: Statistical Release P0441. February 2013.

minimum wage for each sector and made an intra-sectoral comparison. The median minimum wage is the minimum wage in the middle when all minimum wages are sorted in ascending order. There are therefore a number of people who may earn less than the median minimum wage. The median minimum wages in the main mining sub-sectors are as shown in Figure 3. The diamond sub-sector, at ZAR6 540, had the highest monthly minimum wage, followed by the PGM sub-sector at ZAR5 360 per month. At ZAR4 222, the gold sector had the lowest minimum monthly wage. The sectoral differences in the median wages could be due to a number of factors, including the prices of the minerals, management structure and collective bargaining.

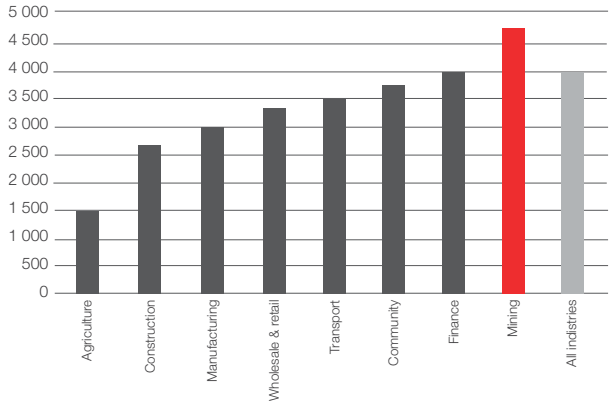
To better understand the issue of minimum wages, we also conducted a sectoral comparison of the median minimum wages and found that most sectors have minimum wages below the all-industries average of ZAR4 000. For example, the agricultural sector minimum wage is less than half of the national median. Figure 4 shows the median minimum wages across sectors. We find that the mining sector had the highest minimum wage, at ZAR4 743. It is therefore important to disaggregate the data to further investigate the distribution of the minimum wage especially for those groups with minimum wages way below the mining median of ZAR 4 743. It must be noted that the median wage for all sectors is actually smaller than the mining median.

Figure 3: Monthly median minimum wages in mining by commodity group in 2012 (ZAR)



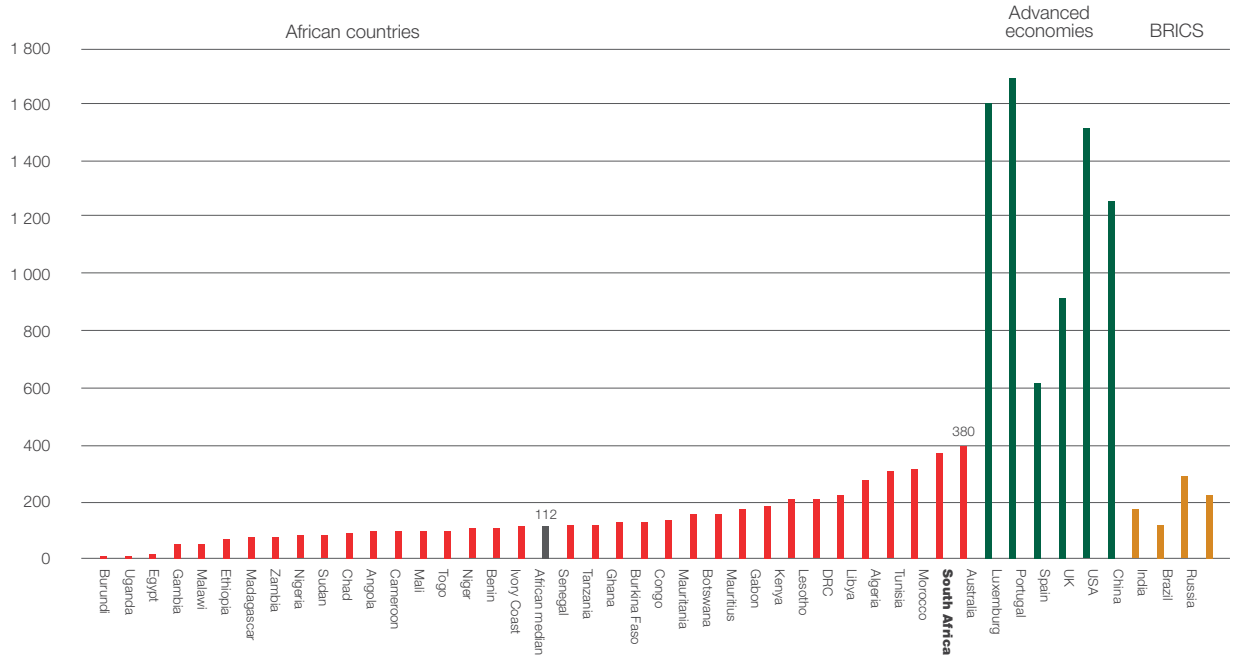
Source: LRS (2012).

Figure 4: South African median minimum wage across sectors in 2012 (ZAR)



Source: LRS (2012).

Figure 5: Minimum wage comparisons across African, emerging and developed economies in 2009 (PPP USD)



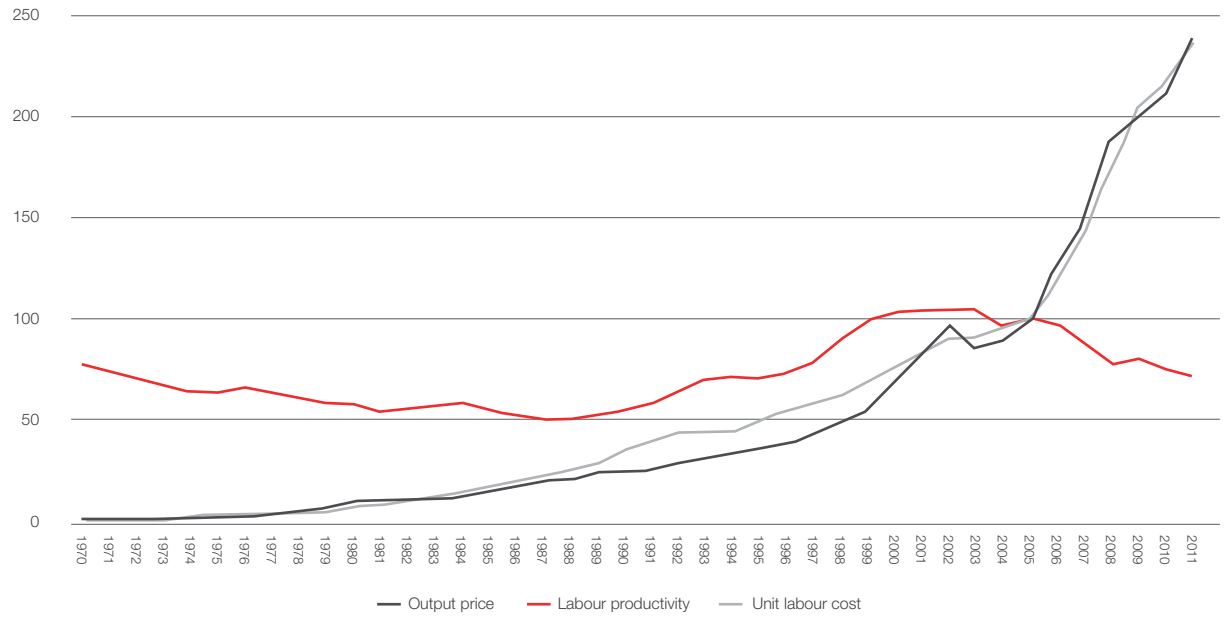
Source: ILO (2010/2011) Global Wage Report

In Figure 5 we compare the minimum wage figures across African countries, advanced economies and the BRICS group of countries. We find that South Africa's minimum wage at PPP USD 390 is the highest among African countries. The South African minimum wage is almost 3.5 times that of the African median. South Africa also does much better than its BRICS counterparts. However, the country fares poorly when compared to advanced economies like Australia, the UK and the US. This can make South African products more competitive vis-à-vis its major trading patners like the US, UK and Australia or the European Union in general.

We also collected data on worker productivity, their wages as well as the average price of the mining output for the period 1970–2011.The worker productivity changes were calculated using a productivity index.[13] The indices for output price and unit labour cost were also used to analyse the changes in the two variables over time. For all the indices 2005 was used as the base year. We compared the output price, labour and labour productivity indices to assess if there is a close relationship between labour productivity and labour unit cost for the firms. Figure 6 shows that labour productivity gradually declined during the period 1970–1988 and then started to increase from 1989 to 2001 before declining again. It also shows that even though labour productivity was declining during the period 1970–1989, labour costs were increasing. Even though there was some co-movement between labour productivity and labour cost during the period 1988–2001, beyond that there was no close link between the two as labour costs continued to increase even though productivity was falling. The output price has however been on an upward trend for the period 1970–2011. There is a close relationship between output price and labour costs. It must be noted that the close relationship between labour cost and output prices is maintained even when labour productivity is declining as discernible from the graph, particularly after 2005. This shows that the mining sector workers may have managed to demand higher wages even though labour productivity may have been going down. This may have reduced profitability in the sector and partially explain the drop in the growth rate of employment in the sector. After 2005, the divergence between

13 The index is calculated using average worker productivity using 2005 as the base year.

Figure 6: Trends in average labour unit cost, labour productivity and output price (Index 2005 = 100)



Source: Quantec Online Database

labour productivity and labour cost increased at an alarming rate compared to the previous period, holding everything else constant. This may have reduced the profitability in the mining sector.

3.2 Mining Wages in South Africa: A Sectoral Comparison

The analysis in this section is three-fold. First, we carry out a descriptive comparative analysis of median wages in the mining industry with those from other industries over the period 1997–2010. Second, we examine intra-occupational wage differentials for the mining sector using occupational median wages. Third, we investigate education levels for workers in the mining sector by occupation. The study utilises data from October Household surveys (OHS) for 1997, 1999 and September waves of the Labour Force surveys (LFS) for 2001, 2003, 2005 and 2007, produced by Statistics South Africa. Due to lack of a comparable wage series from 2007 to-date, we utilise the third quarter of the Quarterly Labour Force survey for 2010, for a more recent wage analysis. The surveys provide labour market information for working age individuals residing in 30 000 households across the country's nine provinces. For this analysis only formal sector wage employees aged from 15 to 65 years were considered. Branson's cross entropy weights are used to weight the data so that the analyses are representative of the South African population.

How do mining sector wages compare to the rest of the economy?

To address this question we compare real gross monthly median wages for the period 1997–2007, converted to 1997 values, and current wages for 2010,[14] across occupations and industries. Table A2a shows the taxonomy of occupations and industries used in the analysis. The occupations are categorised on the basis of the International Standard Classification of Occupations (ISCO) and the South African Standard Classification of Occupations (SASCO). For wages, we utilise midpoints of income bands for workers who did not report their actual incomes, but only indicated their income bands. Also consumer price indices are used to convert monthly wages into real wages, using 1997 prices.

14 As 2010 data is not directly comparable to the data from the 1997–2007 period, we used nominal figures for the 2010 data to obtain a static picture for that particular year.

Figure 7: Monthly median wages by industry 1997-2005 (Rand at 1997 prices)

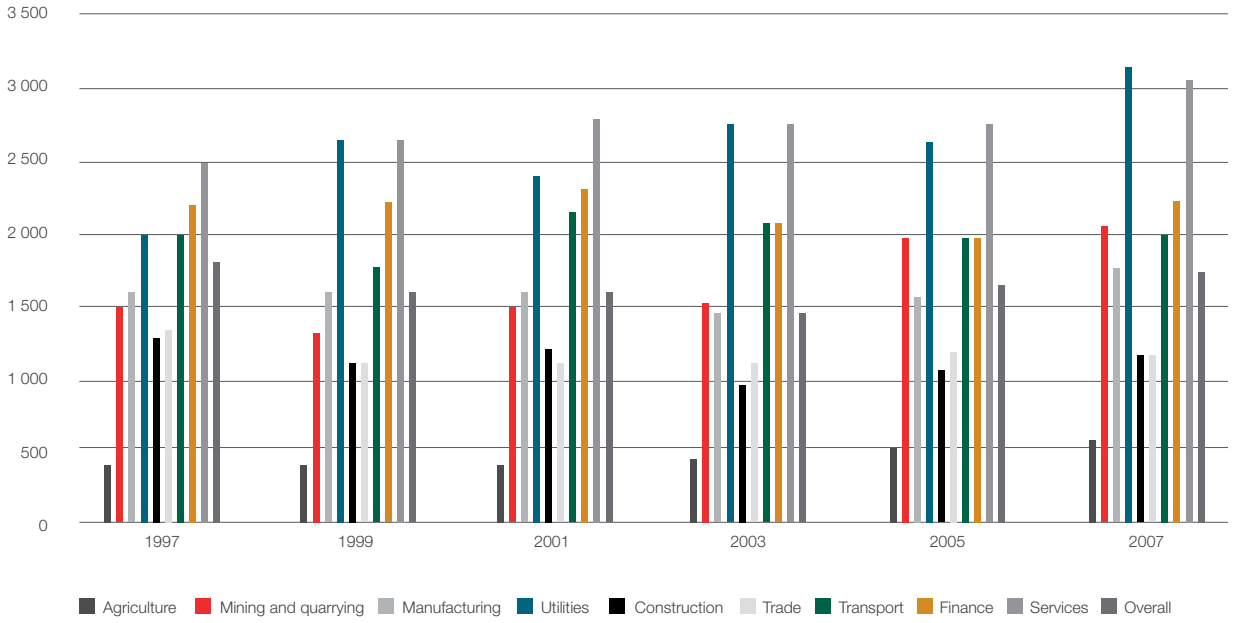
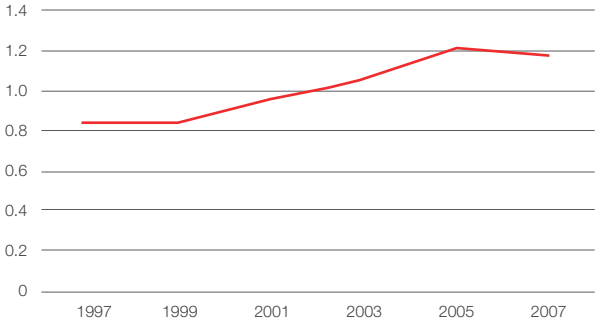


Figure 7 shows median gross real monthly wages for formal sector employees by industry of employment for the period 1997–2007 (see Table A2 in the Appendix for statistics). According to Figure 7, from 1997–2007, the median wage for mining was below those for electricity, gas and water supply; community, social and personal services; transport, storage and communication; financial intermediation, insurance, real estate and business services; and the reverse was the case for agriculture, fishing and forestry; wholesale and retail trade; construction, and manufacturing (from 2003). This places the mining sector at the middle of the industrial wage distribution. Furthermore, an analysis of changes in the median wages from 1997–2007 suggests the following order of growth in the industrial median wage:

- electricity, gas and water supply grew by 58%;
- agriculture, fishing and forestry grew by 43.7% although from a lower base;
- mining grew by 37%;
- manufacturing grew by 9.9%;
- community, social and personal services grew by 23.4%;
- financial intermediation, insurance, real estate and business services grew by 1.5%;
- transport, storage and communication regressed by 0.1%;
- construction regressed by 8.2%; and
- wholesale and retail trade regressed by 12.3%.

This implies that wage growth in the mining sector ranks third out of the nine industries. This position is also supported by Figure 8 which shows an evolution of the ratio of the median wage for the mining sector relative to the median wage for all

Figure 8: Mining to overall median wage ratio 1997–2007



Note: This trend is similar to the case where divide median wages for mining with those from other sectors excluding mining.

sectors combined, from 1997–2007. The emerging picture is that the relative median wage for mining has been improving over time. It was below the overall median wage in the 1990s, and grew to surpass the latter from 2003–2007. To some extent, this could have been motivated by a contemporaneous increase in real Rand price of mining sector commodities (PwC, 2012), assuming some of the revenues were shared with employees.

Tables A2 and Figures A1 in the Appendix show median gross real monthly wages by occupation and industry. They reveal that in 1997 and 1999, real gross median monthly wages for mining workers in elementary occupations surpassed those of their counterparts in other industries except for electricity, gas and water supply, and transport, storage and communication. The situation improved in 2001 as mining workers earned more than those in transport, storage and communication. In 2003 and 2005 mining workers were at par with those from community, social and personal services but earned more than the other sectors. A further improvement was registered in 2007 and 2010 as mining workers earned more than their counterparts in all other industries.

Plant and machine operators in the mining sector's median wages are above median wages for the occupation in general. In 1997 and 1999, their wages were below those for comparable workers in other industries, except for agriculture, fishing and forestry. Their position improved over time; for instance, in 2003, their wages were only below those of electricity, gas and water supply, and community, social and personal services. In 2007, their wages were only below those from the electricity, gas and water supply, and they were at the top of all industries in 2010. Even though these mining workers have relatively high median wages *at face value*, it is not clear whether the 'wage premium' realistically compensates them for their arduous work and exposure to risk. This calls for a comprehensive analysis of whether mine workers are reasonably compensated for their undesirable job characteristics against the backdrop of the theory of compensating wage differentials.

Mine workers in craft and related trades have higher real gross median monthly wages than their colleagues in other industries. In 1997–2003 their wages exceeded those of similar workers in agriculture, fishing and forestry; manufacturing; wholesale and retail trade; construction; and finance (in 2003). In 2005, their median wages were above those of other industries, with the exception of transport, storage and communication. A further advancement in mine workers' position occurred in 2007 and 2010 where their median wages exceeded those of counterparts in other industries. Taken together, this shows that wages for the majority of workers in the mining sector – elementary; plant and machine operators; and craft and related trades – are higher than earnings for their colleagues in other industries. This implies that the unrest in the mining sector is mainly an intra-industry story as we do not see the same unrest in other industries with lower median wages. A possible explanatory factor is the perpetuation of mine workers' increasing cost of living as defined by the migrant labour system discussed earlier; this may be inadequately financed by their 'wage premium' over similar workers in other industries.

In 1997–1999, the real gross median monthly wages for mine workers in service, and shop and market sales were greater than those for their co-workers in agriculture, fishing and forestry, and construction; similar to the wholesale and retail trade sector; and below the remaining industries. During this period the mine workers' median wages were less than the median for the entire occupation. Workers' position improved, however, over time; in 2007 their median wages exceeded those of comparable workers in agriculture, fishing and forestry; construction; wholesale and retail trade; and finance.

The earnings position of clerks in the mining sector has also improved over time, relative to other industries. In 1997–2003, their median wages were below those of similar workers in other industries barring agriculture, fishing and forestry; wholesale and retail trade sectors; and construction (in 1999). The situation was reversed in 2005 as these mine workers had higher median wages than their colleagues in other industries. However, in 2007 and 2010, their median wages were surpassed by those in electricity, gas and water supply; and transport (2007 only).

Table 7: Median wages by industry and race, 1997, 2001 and 2007 (Rand, at 1997 prices)

	1997					2001					2007				
	African	Coloured	Indian	White	A/Y	African	Coloured	Indian	White	A/Y	African	Coloured	Indian	White	A/Y
Agriculture	350	400	2 125	3 000	0.117	359	511	1 996	2 795	0.129	529	611	2 350	3 232	0.164
Mining and quarrying	1 330	2 000	4 500	4 200	0.317	1 437	1 996	3 194	5 589	0.257	1 821	2 409	4 701	7 051	0.258
Manufacturing	1 300	1 520	2 000	4 501	0.289	1 198	1 597	1 757	4 791	0.250	1 234	1 763	2 350	5 582	0.221
Electricity, gas and water supply	1 700	1 800	3 000	5 200	0.327	1 597	2 276	2 395	5 589	0.286	2 938	4 113	7 638	4 407	0.667
Construction	1 200	1 400	3 000	4 000	0.300	958	1 278	2 795	3 194	0.300	940	1 528	2 350	5 582	0.168
Wholesale and retail trade	1 200	1 300	2 000	3 000	0.400	958	1 198	2 395	2 795	0.343	999	1 528	2 350	3 085	0.324
Transport, storage and communication	1 500	2 000	3 000	4 000	0.375	1 437	3 194	2 874	4 192	0.343	1 645	5 582	3 525	4 113	0.400
Financial intermediation, insurance, real-estate and business services	1 368	2 000	3 000	4 000	0.342	1 198	1 996	3 194	4 192	0.286	1 175	2 350	4 113	4 701	0.250
Community, social and personal services	2 000	2 280	3 000	3 501	0.571	2 395	2 395	3 194	4 019	0.596	2 820	3 085	3 819	4 113	0.686
All	1 400	1 428	2 500	4 000	0.350	1 278	1 533	2 395	3 992	0.32	1 293	2 938	2 938	4 113	0.314
N	10 338	3 711	750	2 521		10 085	2 680	580	2 202		10 810	3 271	511	1 583	

A/Y is the ratio of median wages of Africans to median wages of whites.
Source: Own calculations based on OHS 1997and LFSs 2001:2 & 2007:2.

Table A2 shows that median wages for technical and associate professionals in mining are usually above the average for the occupation. However, these occupational wages are sometimes below those of comparable workers in electricity, gas and water supply; construction; transport, storage and communication; and financial intermediation, insurance, real estate and business services; and above those of remaining industries.

Professionals in the mining sector had higher median wages than the occupational median wage. In 1997 and 1999, their median wages were less than those offered by electricity, gas and water supply; transport; and financial intermediation, insurance, real estate and business services. This changed between 2001 and 2005, as these mine workers had the highest median wages for the occupation. Nonetheless, the pattern for 2007–2010 is not robust.

The case for legislators, senior officials and managers shows that those in the mining sector consistently earn less than their counterparts in electricity, gas and water supply. However, their situation improved from 1997–2010. In 1997, their median wages were below those of other sectors, apart from agriculture, fishing and forestry. This changed in 2010 as these mine workers were earning more than other industries with the exception of electricity, gas and water supply; and community, social and personal services.

Median wages by industry and race

Table 7 shows median real gross monthly wages of employees by industry and race, for 1997, 2001 and 2007. As a whole, the statistics generally show that all industries maintain the racial wage hierarchy in the South African labour market; this places white workers first followed by Indians, coloureds and Africans, respectively. Hence, the legacy of apartheid policies is still widely preserved by all industries. We further analyse the racial wage inequality between top and least paid workers, using ratios of median wages for Africans and whites (see columns labelled A/Y). The findings show that, in 1997, the African:white median wage ratio in the mining sector is ranked fourth out of the nine industries, in ascending order. This implies that the mining sector is the fourth most unequal when it comes to African–white wage differentials. The most unequal sector is agriculture, fishing and forestry followed by either

construction or manufacturing. In 2001, the mining sector was the third most unequal sector and in 2007 it was the fifth most unequal sector. The finding for 2010 implies that the higher median wages in the mining sector are in pursuit of racial wage equality.

Median wages by education and industry

According to the theory of human capital, wages are positively correlated with education. Hence, Tables A3a and A3b in the Appendix present real gross median monthly wages of employees by education and race, for 1997, 2001, 2007 and 2010. The statistics show that all South African industries compensate workers for higher levels of education. Throughout the period 1997–2001, median wages increased with levels of education i.e. no schooling, primary (grades 1–7), incomplete secondary (forms 1–4), matric (form 5), certificate/diploma and degree (in ascending order). That university graduates earn more than other workers could be linked to the skill bias of the South African labour market, in favour of graduates. Tables A3a and A3b reveal that, in most cases, mine workers across all education levels and time periods had higher median wages than overall median wages for their education levels. For instance, the case for mining workers with certificates/diplomas shows that their real gross monthly median wages in 1997, 2001, 2007 and 2010 were ZAR3 000, ZAR5 110, ZAR5 582 and ZAR12 200,[15] respectively while the corresponding median wages for all workers with certificates/ diplomas were ZAR3 300, ZAR3 593, ZAR4 113 and ZAR9 300. This picture is supported by a comparison of mining wages with those of a similar industry such as manufacturing. For instance, in 1997 mining had higher median wages for education levels below matric than manufacturing, while the opposite applies to higher levels of education. This changed in the 2000s as mining had relatively higher median wages across education levels.

Intra-occupational in wage differentials for the mining sector

Column 2 in Table A2a shows median wages for workers in the mining sector by occupation for 1997–2007 (at 1997 prices), and Table A2b for 2010 (at 2010 prices). These statistics suggest the following occupational wage hierarchy in the mining sector:

- professionals;
- legislators senior officials and managers;
- technical and associate professionals;
- clerks;
- craft and related trades;
- plant and machine operators;
- service workers and shop and market sales workers/ elementary occupations;
- skilled agriculture and fishery workers.

This hierarchy is partly based on the requisite skills for the job, with jobs for highly-skilled workers paying more than those of their less-skilled counterparts. While the real median wage for the mining sector as a whole is shown to have increased by 37% from 1997 to 2001 i.e. ZAR1 500 to ZAR2 056, median wages for different occupations have not changed at the same pace. For instance, median wages for legislators, senior officials and managers increased from ZAR2 000 to ZAR6 463 from 1997–2001, concurrently those for plant and machine operators only increased from ZAR1 250 to ZAR1 821. This represents the skills bias of the South African labour market in favour of highly-skilled workers. Nonetheless, changes in occupational median wages do not display a smooth upward trend from one period to the next; the overall picture shows that they have increased from 1997–2007.

Table 8 shows occupational wage inequality in the mining sector. The figures are ratios of median wages of the corresponding occupation to the median wage of legislators, senior officials and managers. Apart from 1999 and 2007, professionals earned more than legislators, senior officials and managers. Technical and associate professionals and clerks' wages were about 33–71% and 22–45% of legislators, senior officials and managers' wages respectively, except for 1997. Workers in craft and related trades earned about 24–35% of legislators, senior officials and managers' wages, not including 1997. Service workers and shop and market sales workers, those in elementary occupations, and plant and machine operators received about 13–28% of legislators senior officials and managers' wages,

15 Figures for 2010 are at current prices.

Table 8: Intra-occupational wage differentials for the mining sector (1997–2007)

	1997	1999	2001	2003	2005	2007
Legislators, senior officials and managers	1.00	1.00	1.00	1.00	1.00	1.00
Professionals	2.00	0.93	1.13	1.38	1.15	0.55
Technical and associate professionals	1.50	0.71	0.33	0.61	0.35	0.55
Clerks	1.00	0.36	0.22	0.35	0.30	0.45
Service workers, and shop and market sale workers	0.60	0.19	0.13	0.18	0.12	0.27
Skilled agricultural and fishery workers	0.80	0.11	0.07	0.09	...	0.16
Craft and related trades workers	0.75	0.24	0.17	0.28	0.16	0.35
Plant and machine operators and assemblers	0.63	0.21	0.15	0.21	0.14	0.28
Elementary occupations	0.63	0.18	0.13	0.20	0,10	0.27

For each occupation the figures show the ratio of the occupation's median wage to the median wage for legislators, senior officials and managers.
Source: Own calculations based on OHSs 1997, 1999 and LFSs 2001:2, 2003:2, 2005:2 & 2007:2.

with the exception of 1997. The wage ratios for 1997 are outside the given ranges as the year is characterised by relatively less inequality in the distribution of wages. In 1997, the lowest paid workers earned around 60% of legislators, senior officials and managers' wages i.e. service workers and shop and market sales workers, workers in elementary occupations, and plant and machine operators. Similarly, technical and associate professionals, and professionals earned more, while clerks had similar wages to legislators, senior officials and managers. However, inequality in the distribution of wages increased over time. For instance, in 2001 and 2007 wages of service workers and shop and market sales workers; workers in elementary occupations; and plant and machine operators were about 13% and 27% of legislators, senior officials and managers' wages, respectively. However, the penalty of relative wage inequality seems to have increased by a larger magnitude for highly-skilled occupations such as professionals, technical and associate professionals and clerks than for their lowly-skilled counterparts. Nonetheless, this within sector wage inequality could partly contributed to general unhappiness in the mining sector.

Education levels for workers in the mining sector

This section discusses education levels for workers in the mining sector by occupation, using data for 1997, 2001, 2007 and 2010. The discussion follows statistics presented in Tables A4 and Figure A2 in the Appendix. The statistics show that most mining workers are in blue collar jobs – craft and related trades, plant and machine operations, and elementary occupations. Most blue collar workers attained education levels that are below matric i.e. no-schooling, primary, and incomplete-secondary levels. The average ratios of those who attained less than matric level were 85.4%, 87.1%, 74.3%, 54.8, in 1997, 2001, 2007 and 2010, respectively. In 1997, on average, 6.9% of blue collar workers had no schooling, 35.8% had primary, 42.7% had incomplete secondary, 9.7% had matric, and 4.9% had post-matric (i.e. certificate/diploma or degree) education. In 2007, the proportions of blue collar employees in the no schooling, primary and incomplete secondary categories were less than those of their 1997 counterparts by 1.5, 6.1 and 3.5%. The reverse is the case for matriculants as their proportion increased by 11.1%, this proportion further increased by 13.3% in 2010. It is also notable that the percentage of blue collar workers who attained a certificate/diploma was 7.5% in 2010; an increase from 2% in 1997. This trend in education levels of blue collar workers in the mining sector is qualitatively similar to that of their colleagues in other sectors. For instance, the percentages of those in other sectors with less than matric were 83.1%, 71.1% and 66.7% in 1997, 2007 and 2010, respectively. In 2010, the relatively lower percentage of mining sector employees in this category is largely attributable to a higher proportion of matriculants than in other sectors i.e. on average 34% versus 28.6%; as the proportion of workers with post-matric education is generally low for blue-collar workers.

Most mine workers in clerical positions either have an incomplete secondary education or a matric qualification. The ratios of clerical workers at these

education levels were 93.7%, 76.1%, 68.8% and 68.3% in 1997, 2001, 2007 and 2010, respectively. The decrease in the proportion of clerks with these qualifications is partly attributable to an increase in individuals who attained a certificate/diploma. This was 8.4% in 2001, 18.8% in 2007 and 27.8% in 2010. Nonetheless, a negligible number of clerks have degrees.

Similar to clerks, most technical and associate professionals possess incomplete secondary or matric qualifications. That is, 72%, 63.8%, 74.4% and 67% in 1997, 2001, 2007 and 2010, correspondingly. However, the proportion of matriculants in these occupations has been increasing over time (by 11.6% from 1997–2007), while that of incomplete secondary graduates has been decreasing (by 8.8% from 1997–2007). Concomitantly, the fraction of those with certificates/diplomas increased from 13.6% in 1997 to 18.3% in 2007. The trend also extends to university graduates as their fraction also increased albeit from a low base – 6.1% in 1997, 8.4% in 2001 and 11.7% in 2010. Thus the qualification level of clerks has been increasing overtime.

Compared with clerical and technical and associate professionals, a relatively higher number of professionals in the mining sector have tertiary education. Although the statistics in Tables 6 and 8 do not exhibit a monotonic trend, they demonstrate that the fraction of tertiary graduates in these occupations has been increasing over time. For instance this was 33.5%, 76.5%, 39% and 69.9% in 1997, 2001, 2007 and 2010, respectively. The increase in tertiary graduates from 1997–2001 from 25% in 1997 to 59.6% in 2001, may be due to a large drop in the number of professionals in 2001 which could be linked to retrenchments of less educated workers. On the contrary, the fraction of matriculants in these jobs has been declining, from 24.1% in 1997, 16.3% in 2007 and 15.4% in 2010.

As for legislators, senior officials and managers, in 1997 a larger ratio of mine workers in these occupations had incomplete secondary or matric levels of education. The ratio of workers in these echelons has been declining over time as more workers are attaining tertiary education. In 1997, 6.7% of them had a post-matric education and this increased to 58.7% in 2007 and 64.9% in 2010. It is noteworthy that the percentage of university graduates increased from 3.8% in 1997, to 26.5% in 2007 and 53.8% in 2010.

In general, although there is still a large proportion of mine workers with an incomplete secondary education, there has been an improvement in educational attainment of the mining workforce over time. However, the education levels of the workforce differ across occupations depending on the skill requirement of the profession. As such, employers in the mining sector seem to recruit relatively highly skilled workers for legislators, senior officials and managers, and for professionals and technical and associate professionals; skilled workers for clerical positions; and lowly skilled workers for blue-collar jobs. These differences in the skills levels of the workforce partly explain wage inequalities, and general unhappiness in the sector as the majority of the workers are poorly educated; and the skill differential seems to outweigh the lowly skilled workers' compensation for exposure to risk, if any.

4. CONCLUSION

The recent unrest in the mining sector, as evidenced by the 2007 strikes and the Marikana Massacre of 2012, coupled with the sector's increasingly diminishing contribution to the country's economy suggests that the mining sector is in dire straits. This calls for a tripartite-led multi-pronged approach to rescue this critical sector of the economy. This paper assessed mining wage determination as well as the sector's performance in recent times. A number of findings emanate from the investigation.

First, there is a general decline in the mining sector's contribution to the South African economy, as evidenced by a decrease in production, export earnings and employment. This is largely driven by a massive decline in the production of gold, copper and silver as well as the ban on the production of asbestos. Though other minerals, like the platinum metal group, saw a huge increase in their production, this was not sufficient to reverse the decline in the sector's contribution. Policy uncertainty, particularly concerning the nationalisation of mines, may also have contributed to the lethargic performance of the sector.

Second, workers in the mining sector seem to have lost confidence in the main trade union, NUM, which would ordinarily champion their cause. As a result, AMCU, a relatively new labour union in the sector, attempted to fill the gap and was joined by a significant number of the workers. But the union was not recognised by the mining companies. This created tension between the two unions. Instead of negotiations being conducted through unions as was the practice, at Lomnin workers initiated their own negotiations. This caused instability in the sector, resulting in more than 30 people dying in what has come to be known as the Marikana Massacre. Instances of conflicts of interest have also been reported, with trade union bosses' salaries allegedly being paid by the mining companies. Unions are also considered not to have pushed hard enough to ensure the eradication of the migrant labour system; with additional costs on the workers' incomes.

Third, compared to other economic sectors, the mining sector pays relatively more. For example, in 2012 the mining sector median minimum wage was ZAR4 743 while the median for the all industries was ZAR4 000. We also found that the South African average minimum wage was higher than that of African countries as well as that of the BRICS group of countries. The median or mean of the wages may not be a perfect measure. Further studies should look at the distribution of income in the mining sector and assess the living conditions of the workers with a view to better understand the extent of poverty and inequality in the sector. This is especially important given that CEOs in the sector earn incomes that are more than 300 times that of most mine workers. Even though the mining sector may be paying more than other economic sectors, it is important to consider the conditions of work in mining which are risky, dangerous and highly strenuous. Workers may demand higher remuneration as compensation for working under such conditions. We also do not find a close match between worker productivity and remuneration in the sector, with worker remuneration being largely driven by average output prices in the sector rather than productivity.

The mining sector, like any other sector, seems to reward people with higher levels of education. The majority of people in the mining sector have low education levels. Most in the sector have less than matric levels of education (most of these are blacks) and those in white collar jobs are mostly whites. As a result, black mine workers tend to earn less than

their educated counterparts – perpetuating the problem of inequality in the sector, something which is ubiquitous across the country. Given South Africa's historical background, it is not surprising that a majority of those with lower levels of education are black Africans. They thus have low incomes and most of them earn incomes much closer to the mining median minimum wage.

Given the above problems, there is need to create a conducive environment in the mining sector for the effective operation of the mining companies. At the same time, there is need to reduce the obvious wage inequalities in the sector. Productivity must also be stimulated and rewarded. Consideration should be given to awarding workers a stake in the mining companies they work for, as this could help in synchronising their interests with those of the mining firms.

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6. APPENDIX: FIGURES AND TABLES

Table A1: Listed Mining Companies in South Africa

1	Wesizwe Platinum Limited
2	Anglo American Platinum Limited
3	Assore Limited
4	Chrometco Limited
5	Exxaro Resources Limited
6	Impala Platinum Holdings Limited
7	Miranda Mineral Holdings Limited
8	Omnia Holdings Limited
9	Wesizwe Platinum Limited
10	Kumba Iron Ore Limited
11	Afrimat Limited
12	Keaton Energy Holdings Limited
13	Sacoil Holdings Limited
14	Platfields Limited
15	Palabora Mining Company Limited
16	South African Coal Mining Holdings Limited
17	Sentula Mining Limited
18	Trans Hex Group Ltd
19	Pamodzi Gold Limited

Table A2a: Median wages by occupation and industry, 1997–2007 (ZAR at 1997 prices)

		Agriculture, fishing and forestry	Mining and quarrying	Manufacturing	Electricity, gas and water supply	Construction	Wholesale and retail trade	Transport, storage and communication	Financial intermediation, insurance, real-estate and business services	Community, social and personal services	All	All except mining
1997	Legislators, senior officials and managers	1500	2000	4000	5200	3000	3000	4600	5500	3500	3500	4000
	Professionals	3000	4000	4000	7500	5250	4000	5000	5250	3200	3500	3500
	Technical and associate professionals	1700	3000	3000	4501	3500	2800	3000	3000	2900	3000	3000
	Clerks	1500	2000	2000	2500	2500	1500	2800	2500	2100	2000	2000
	Service workers, and shop and market sales workers	750	1200	1500	2500	1000	1200	2500	1250	2000	1500	1500
	Skilled agricultural and fishery workers	400	1600	1200	1000	.....	650	680	750	1200	600	501
	Craft and related trades workers	450	1501	1400	2000	1250	1300	2400	2000	1500	1500	1424
	Plant and machine operators and assemblers	400	1250	1500	2000	1900	1250	1600	1840	1800	1400	1400
	Elementary occupations	350	1250	1250	1500	1000	1000	1500	1200	1250	1000	1000
	All	400	1500	1604	2000	1280	1340	2000	2200	2500	1800	1800
1999	Legislators, senior officials and managers	2667	6222	5333	8444	3556	3556	4667	6222	4667	4667	4667
	Professionals	8444	5778	8444	6400	4667	4667	7556	6222	4000	4667	4667
	Technical and associate professionals	3556	4444	2667	4667	4667	1778	4444	3556	3111	3200	3190
	Clerks	1111	2222	2667	3111	1778	1111	2667	2667	2667	1778	1778
	Service workers, and shop and market sales workers	533	1156	1156	1778	1422	1111	1778	1111	2020	1298	1333
	Skilled agricultural and fishery workers	427	711	444	1333	1244	551	1111	667	1422	569	551
	Craft and related trades workers	533	1467	1244	2133	1067	1333	1911	1778	1778	1316	1244
	Plant and machine operators and assemblers	444	1333	1422	1511	1422	1422	1778	1511	1778	1253	1244
	Elementary occupations	356	1111	1111	1422	889	711	1422	1067	1156	667	667
	All	400	1333	1600	2667	1111	1111	1778	2222	2667	1600	1622
2001	Legislators, senior officials and managers	3194	9582	6388	5589	7585	3992	7585	7585	5589	5589	5589
	Professionals	3633	10779	7585	6787	5988	4192	4791	7186	4392	4791	4791
	Technical and associate professionals	1118	3194	2795	4791	3673	2795	4192	3593	3194	3194	3194
	Clerks	1437	2062	2395	2395	2795	1341	2395	2475	2395	2395	2395
	Service workers, and shop and market sales workers	559	1198	1198	1597	1597	958	1916	1198	2395	1198	1198
	Skilled agricultural and fishery workers	958	719	1437	1836	....	559	200	998	1198	998	998
	Craft and related trades workers	439	1597	1597	2395	1038	1437	2795	1597	1597	1437	1437
	Plant and machine operators and assemblers	463	1437	1405	1599	1437	998	1597	1597	1597	1278	1278
	Elementary occupations	383	1278	958	1437	958	735	1198	878	1278	712	639
	All	399	1517	1597	2395	1198	1118	2156	2316	2795	1596	1597
2003	Legislators, senior officials and managers	3628	6772	6565	13821	4837	3628	6565	6565	6565	6219	6219
	Professionals	4837	9329	6565	8292	4837	8292	4837	6565	4837	4837	4837
	Technical and associate professionals	553	4146	3455	6565	3628	2626	2764	3662	3628	3628	3628
	Clerks	1728	2350	2419	3455	2764	1244	2764	2764	2764	2073	2073
	Service workers, and shop and market sales workers	553	1244	1313	4146	1980	898	1728	1106	2687	1244	1244
	Skilled agricultural and fishery workers	553	622	1382	…	…	1382	691	864	304	622	622
	Craft and related trades workers	553	1866	1382	2419	967	1244	3455	1382	2073	1382	1360
	Plant and machine operators and assemblers	539	1437	1382	2073	1244	1106	1382	1382	2073	1382	1368
	Elementary occupations	449	1382	967	1244	829	691	1175	829	1382	691	656
	All	449	1520	1451	2764	967	1106	2073	2073	2764	1451	1415

Table A2a continued: Median wages by occupation and industry, 1997–2007 (ZAR at 1997 prices)

		Agriculture, fishing and forestry	Mining and quarrying	Manufacturing	Electricity, gas and water supply	Construction	Wholesale and retail trade	Transport, storage and communication	Financial intermediation, insurance, real-estate and business services	Community, social and personal services	All	All except mining
2005	Legislators, senior officials and managers	3461	13185	6263	19778	6263	3461	6263	6263	6725	6263	5933
	Professionals	1055	15163	8790	8900	4615	8900	8900	6263	4615	5274	5274
	Technical and associate professionals	989	4615	3461	3296	1648	1978	4615	3956	3461	3461	3461
	Clerks	1319	3956	2637	2637	1319	1319	3033	2637	2637	2505	2439
	Service workers, and shop and market sales workers	429	1582	1319	3296	857	989	1648	1055	1978	1166	1166
	Skilled agricultural and fishery workers	712	…	461	…	923	1648	…	1187	1978	923	923
	Craft and related trades workers	704	2110	1319	1978	1055	1319	2637	1978	1978	1319	1319
	Plant and machine operators and assemblers	538	1846	1530	2637	1582	1319	1319	1978	1978	1530	1319
	Elementary occupations	518	1319	1187	857	791	791	791	791	1319	791	791
	All	527	1978	1582	2637	1055	1187	1978	1978	2775	1648	1582
2007	Legislators, senior officials and managers	3085	6463	7932	9401	5582	3819	5876	7345	7051	5582	5582
	Professionals	3085	3525	4113	5582	5582	1645	8814	6463	4928	4701	4701
	Technical and associate professionals	1410	3525	2644	7932	1763	2350	4113	3525	3525	3525	3525
	Clerks	1528	2938	2056	4113	2350	1175	4113	2350	2820	2350	2327
	Service workers, and shop and market sales workers	793	1763	1293	1763	1058	1175	1763	1105	2350	1175	1175
	Skilled agricultural and fishery workers	588	1058	758	…	206	646	…	1469	2056	705	705
	Craft and related trades workers	705	2233	1469	2056	1175	1175	3525	1763	2056	1469	1410
	Plant and machine operators and assemblers	588	1821	1598	2350	1763	1234	1469	1528	1763	1528	1469
	Elementary occupations	529	1763	1175	999	881	823	940	881	1410	823	823
	All	575	2056	1763	3164	1175	1175	1998	2233	3085	1762	1762

Source: Own calculations based on OHSs 1997, 1999 and LFS 2001:2. The figures for 'All' and 'All except mining' are similar in some cases as we are using midpoints of income bands for individuals who did not avail their actual wages.

Table A2b: Median wages by occupation and industry, 2010 (ZAR at current prices)

		Agriculture, fishing and forestry	Mining and quarrying	Manufacturing	Electricity, gas and water supply	Construction	Wholesale and retail trade	Transport, storage and communication	Financial intermediation, insurance, real-estate and business services	Community, social and personal services	All	All except mining
2010	Legislators, senior officials and managers	9000	12500	11000	11500	15000	9600	11000	11000	14800	11500	11000
	Professionals	4500	10000	14000	20000	10000	10000	9500	10000	11900	11000	11000
	Technical and associate professionals	5000	9000	6000	6500	7000	4500	9000	7500	9000	8000	8000
	Clerks	2900	6453	5000	9000	3300	2816	5800	6000	6300	4800	4766
	Service workers, and shop and market sales workers	1300	4800	3000	4000	2500	2400	5000	2300	4000	2535	2500
	Skilled agricultural and fishery workers	1500	…	16000	….	….	15000	…	5700	16700	2200	2200
	Craft and related trades workers	1500	9000	3000	4500	2600	3059	6000	4463	3500	3033	3000
	Plant and machine operators and assemblers	1500	4600	3000	2500	3000	2800	3466	3400	3600	3100	3000
	Elementary occupations	1230	3600	2080	1516	1600	1800	2166	1900	2500	1700	1625
	All	1300	5000	3466	5900	2600	2700	4550	4000	6500	3500	3500

Source: Own calculations based on OHSs 1997, 1999 and LFS 2001:2. The figures for 'All' and 'All except mining' are similar in some cases as we are using midpoints of income bands for individuals who did not avail their actual wages.

Figure A1a: Median wages by Occupation and Industry 1997 (Rand, at 1997 prices)

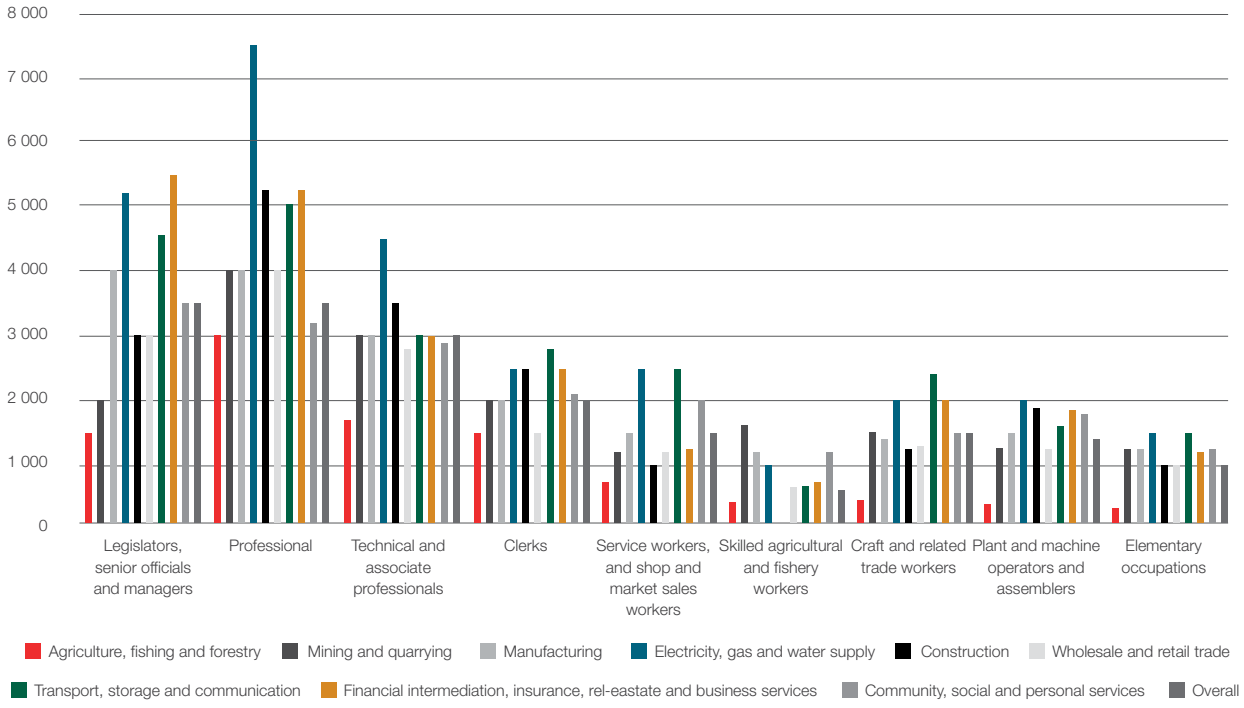

Figure A1b: Median wages by Occupation and Industry 1999 (Rand, at 1997 prices)

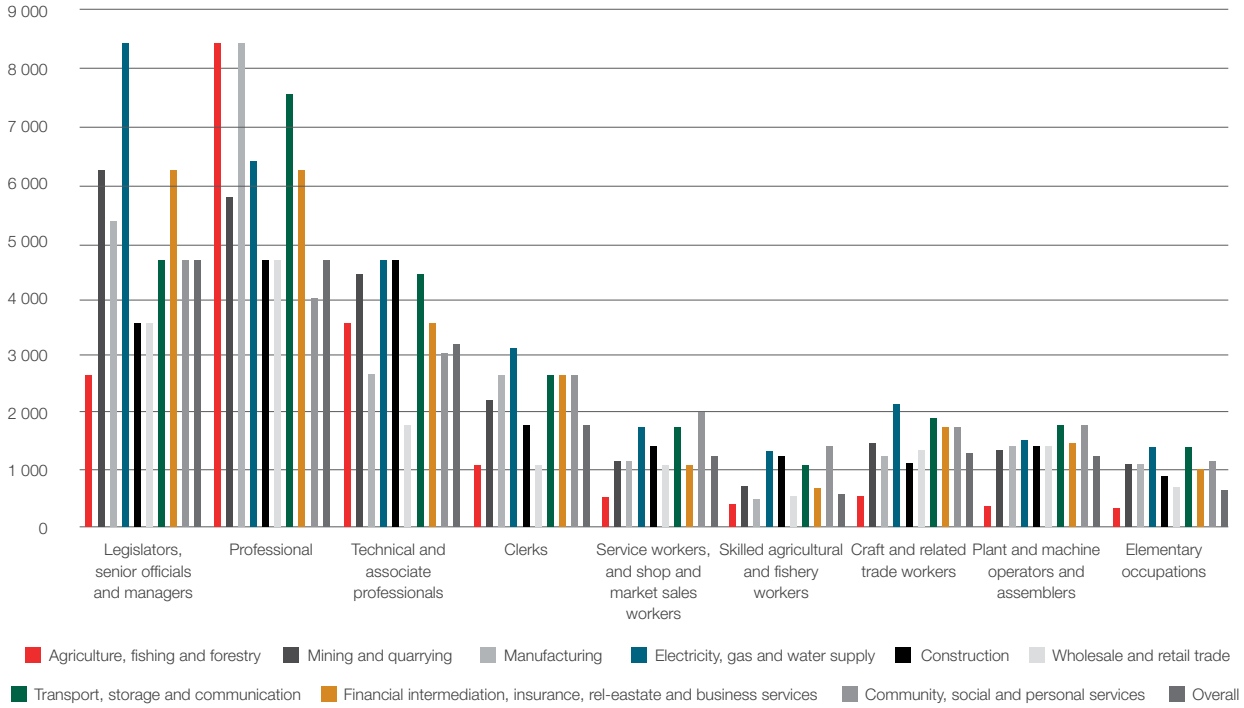

Figure A1c: Median wages by Occupation and Industry 2001 (Rand, at 1997 prices)

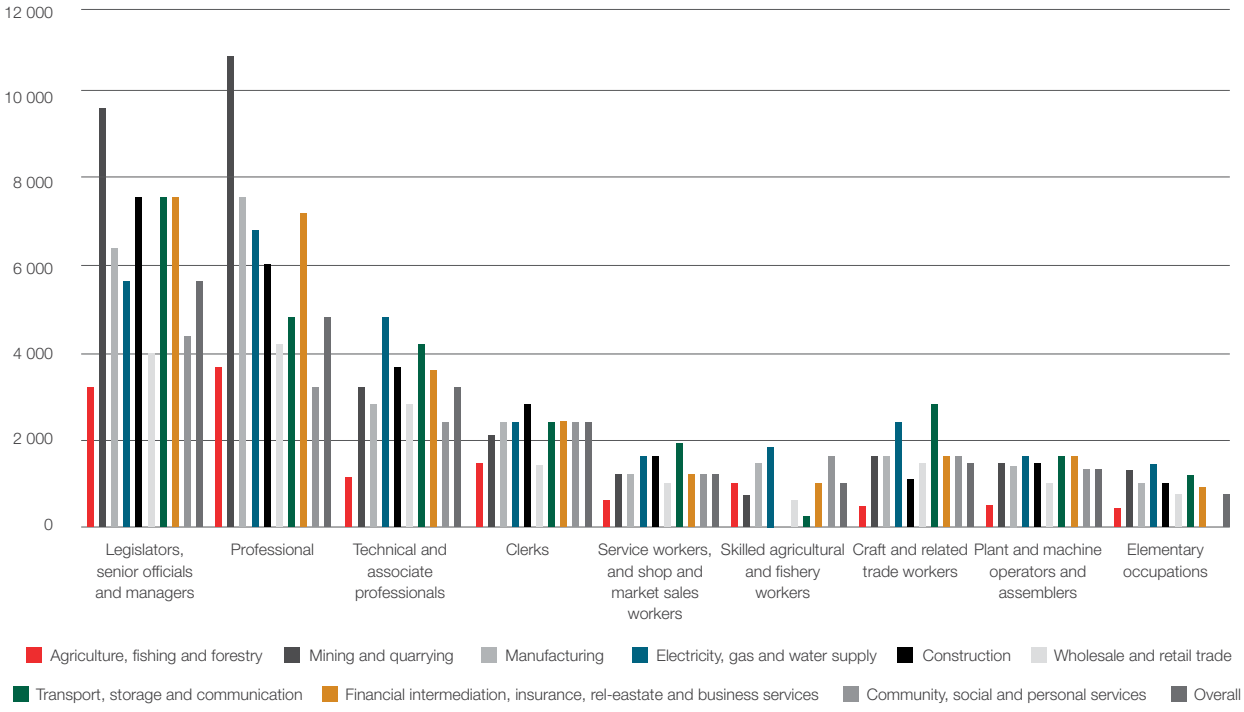

Figure A1d: Median wages by Occupation and Industry 2003 (Rand, at 1997 prices)

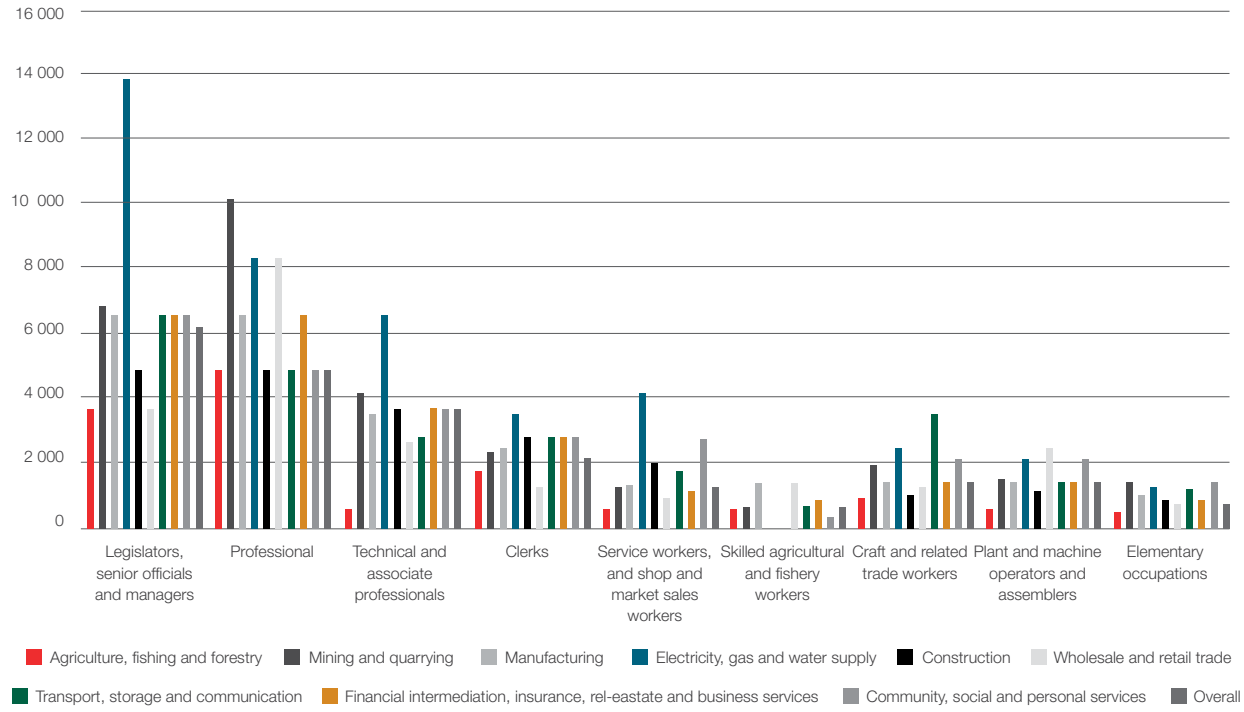

Figure A1e: Median wages by Occupation and Industry 2005 (Rand, at 1997 prices)

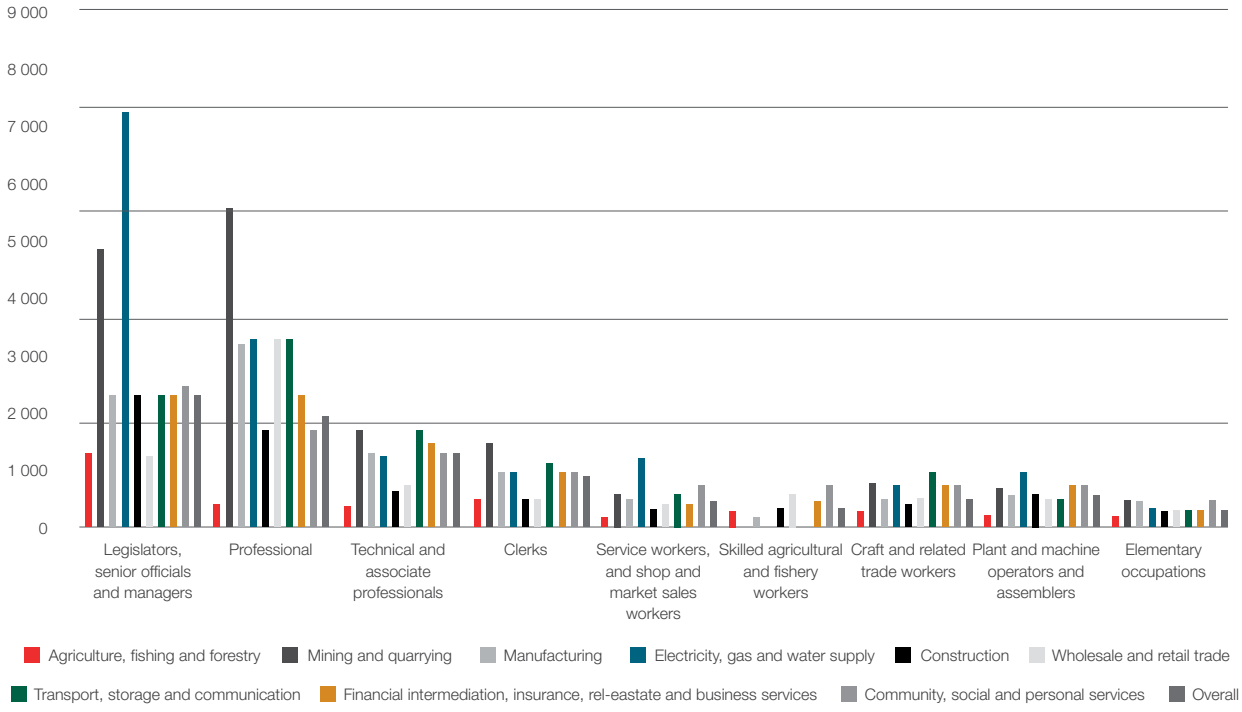

Figure A1f: Median wages by Occupation and Industry 2007 (Rand, at 1997 prices)

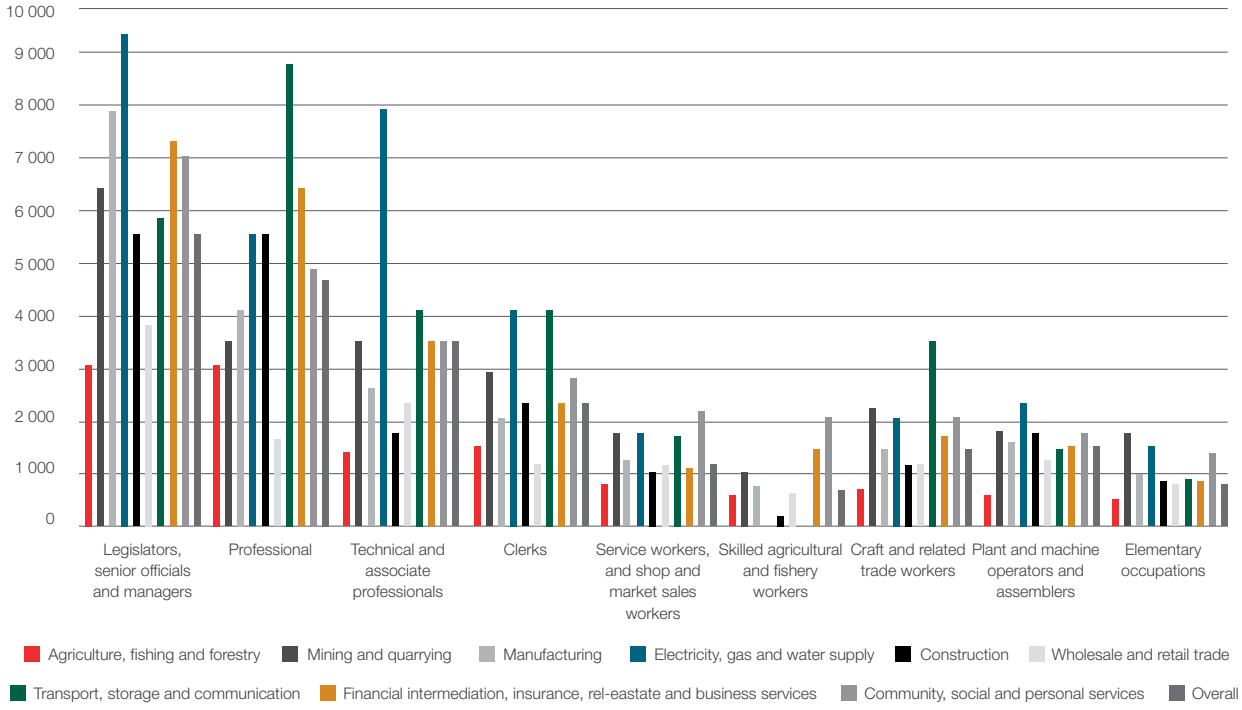

Table A3a: Median wages by education and industry, 1997, 2001 and 2007 (ZAR at 1997 prices)

	1997						2001						2007					
	No schooling	Primary	Incomplete secondary	Matric	Certificate or diploma	Degree	No schooling	Primary	Incomplete secondary	Matric	Certificate or diploma	Degree	No schooling	Primary	Incomplete secondary	Matric	Certificate or diploma	Degree
Agriculture	350	350	495	1 500	3 000	5 000	335	399	447	639	2 795	3 194	529	529	588	940	3 232	7 051
Mining and quarrying	1 250	1 250	1 800	2 500	3 000	4 000	1 278	1 437	1 597	2 062	5 110	18 365	1 586	1 763	1 998	2 292	5 582	13 514
Manufacturing	1 080	1 250	1 500	2 000	4 000	7 000	798	1 118	1 437	1 996	4 791	7 985	705	1 175	1 410	1 763	7 932	7 932
Electricity, gas and water supply	1 250	1 560	2 400	2 500	4 000	9 500	1 597	1 278	1 916	2 954	3 992	5 589	1 469	1 763	1 288	2 938	7 932	12 514
Construction	1 000	1 200	1 388	2 500	3 000	5 000	958	958	1 198	2 395	1 996	5 988	646	940	1 058	1 410	5 582	7 932
Wholesale and retail trade	750	1 001	1 250	1 900	3 501	3 000	639	798	998	1 437	2 395	3 194	940	881	1 058	1 234	2 762	4 701
Transport, storage and communication	1 250	1 280	2 000	3 000	3 400	5 250	1 597	1 118	1 797	2 635	4 192	5 190	2 350	1 175	1 645	1 998	5 582	9 989
Financial intermediation, insurance, real-estate and business services	1 040	1 200	1 500	3 000	4 000	6 000	1 198	958	1 198	2 395	4 791	6 388	1 293	1 058	1 116	1 763	3 085	10 576
Community, social and personal services	1 250	1 200	1 800	2 500	3 125	4 239	1 198	1 437	1 597	2 236	3 354	4 392	1 704	1 175	1 763	2 644	4 113	5 582
All	750	1 076	1 500	2 280	3 300	5 000	639	958	1 278	2 236	3 593	4 878	705	881	1 175	1 763	4 113	5 876
N	1 279	3 588	6 050	4 004	1 615	766	947	3 411	4 691	3 798	1 523	1 032	755	3 047	5 216	4 406	1 863	841

Source: own calculations based on OHS 1997and LFSs 2001:2, & 2007:2

Table A3b: Median wages by education and industry 2010 (ZAR at current prices)

	No schooling	Primary	Incomplete secondary	Matric	Certificate or diploma	Degree
Agriculture, fishing and forestry	1 200	1 200	1 300	2 000	9 500	2 000
Mining and quarrying	5 500	3 600	5 000	4 800	12 200	12 000
Manufacturing	2 000	2 166	2 500	4 212	10 000	12 000
Electricity, gas and water supply	500	4 700	2 700	6 000	10 700	5 900
Construction	1 300	1 950	2 166	3 250	10 000	17 300
Wholesale and retail trade	2 000	1 950	2 340	3 000	6 000	13 000
Transport, storage and communication	2 500	3 000	3 466	4 800	9 700	13 600
Financial intermediation, insurance, real estate and business services	1 516	1 950	2 470	4 500	8 000	15 000
Community, social and personal services	2 200	2 100	2 600	5 000	10 000	12 333
All	1 300	1 733	2 400	4 000	9 300	12 850
N	308	1 463	4 090	4 435	1 977	1 165

Source: own calculations based on Q LFS 2010:3

Table A4: Education levels for workers in the mining sector by occupation 1997, 2001, 2007 and 2010

		Legislators, senior officials and managers		Professionals		Technical and associate professionals		Clerks		Service workers, and shop and market sales workers		Skilled agricultural and fishery workers		Craft and related trades workers		Plant and machine operators and assemblers		Elementary occupations	
		Proportion	S.Err	Proportion	S.Err	Proportion	S.Err	Proportion	S.Err	Proportion	S.Err	Proportion	S.Err	Proportion	S.Err	Proportion	S.Err	Proportion	S.Err
1997	No schooling	0,115	0,033	0,019	0,019	0,036	0,034	0	0	0,077	0,039	0	0	0,093	0,016	0,107	0,02	0,08	0,021
	Primary	0,14	0,036	0,139	0,048	0,046	0,038	0,054	0,03	0,354	0,07	0,185	0,137	0,325	0,025	0,348	0,031	0,401	0,038
	Incomplete secondary	0,395	0,051	0,266	0,061	0,398	0,089	0,57	0,066	0,397	0,071	0,476	0,177	0,414	0,027	0,473	0,032	0,396	0,038
	Matric	0,283	0,047	0,241	0,059	0,322	0,085	0,367	0,064	0,15	0,052	0,339	0,167	0,151	0,019	0,048	0,014	0,091	0,023
	Certificate or diploma	0,029	0,017	0,085	0,039	0,136	0,063	0,008	0,012	0,022	0,021	0	0	0,014	0,006	0,02	0,009	0,031	0,014
	Degree	0,038	0,02	0,25	0,06	0,061	0,044	0	0	0	0	0	0	0,003	0,003	0,003	0,003	0	0
	N	94		53		31		57		48		9		343		237		164	
2001	No schooling	0	0	0	0	0	0	0	0	0,064	0,041	0	0	0,061	0,011	0,105	0,013	0,113	0,025
	Primary	0	0	0	0	0,071	0,044	0,143	0,038	0,349	0,081	0,346	0,476	0,366	0,022	0,524	0,022	0,407	0,039
	Incomplete secondary	0,053	0,046	0,091	0,077	0,171	0,065	0,298	0,05	0,264	0,074	0,654	0,476	0,365	0,022	0,297	0,02	0,375	0,038
	Matric	0,246	0,088	0,144	0,094	0,467	0,086	0,463	0,054	0,323	0,079	0	0	0,171	0,017	0,07	0,011	0,103	0,024
	Certificate or diploma	0,308	0,094	0,169	0,1	0,206	0,069	0,084	0,03	0	0	0	0	0,027	0,007	0,003	0,002	0,002	0,004
	Degree	0,393	0,1	0,596	0,131	0,084	0,048	0,012	0,012	0	0	0	0	0,01	0,004	0	0	0	0
	N	25	25	15	15	35	35	86	86	36	36	2	2	484	484	538	538	161	161
2007	No schooling	0	0	0	0	0	0	0	0	0,036	0,04	0	0	0,037	0,012	0,064	0,014	0,063	0,018
	Primary	0	0	0,044	0,042	0,069	0,051	0,102	0,045	0,145	0,075	0,478	0,25	0,276	0,027	0,373	0,028	0,242	0,032
	Incomplete secondary	0,196	0,089	0,405	0,1	0,31	0,092	0,26	0,065	0,406	0,105	0,442	0,248	0,385	0,03	0,396	0,029	0,395	0,037
	Matric	0,216	0,092	0,163	0,075	0,438	0,099	0,428	0,074	0,387	0,104	0,08	0,136	0,207	0,025	0,141	0,02	0,277	0,034
	Certificate or diploma	0,322	0,105	0,19	0,08	0,183	0,077	0,188	0,058	0,026	0,034	0	0	0,092	0,018	0,019	0,008	0,016	0,009
	Degree	0,265	0,099	0,2	0,08	0	0	0,022	0,022	0	0	0	0	0,003	0,003	0,006	0,005	0,008	0,007
	N	21		25		26		46		23		5		269		292		178	
2010	No schooling	0	0	0	0	0,028	0,034	0	0	0	0			0,037	0,014			0,014	0,012
	Primary	0	0	0	0	0,077	0,054	0	0	0	0			0,234	0,032			0,249	0,045
	Incomplete secondary	0,183	0,100	0,147	0,072	0,279	0,092	0,218	0,075	0,169	0,168			0,395	0,037			0,404	0,051
	Matric	0,168	0,097	0,154	0,074	0,391	0,100	0,465	0,091	0,831	0,168			0,299	0,035			0,316	0,048
	Certificate or diploma	0,111	0,081	0,320	0,095	0,109	0,064	0,278	0,082	0	0			0,036	0,014			0,017	0,013
	Degree	0,538	0,129	0,379	0,099	0,117	0,066	0,038	0,035	0	0			0	0			0	0

Source: own calculations based on OHS 1997, LFSs 2001:2 & 2007:2 and QLFS 2010:3.

Figure A2a: Education levels of workers in the mining sector, 1997

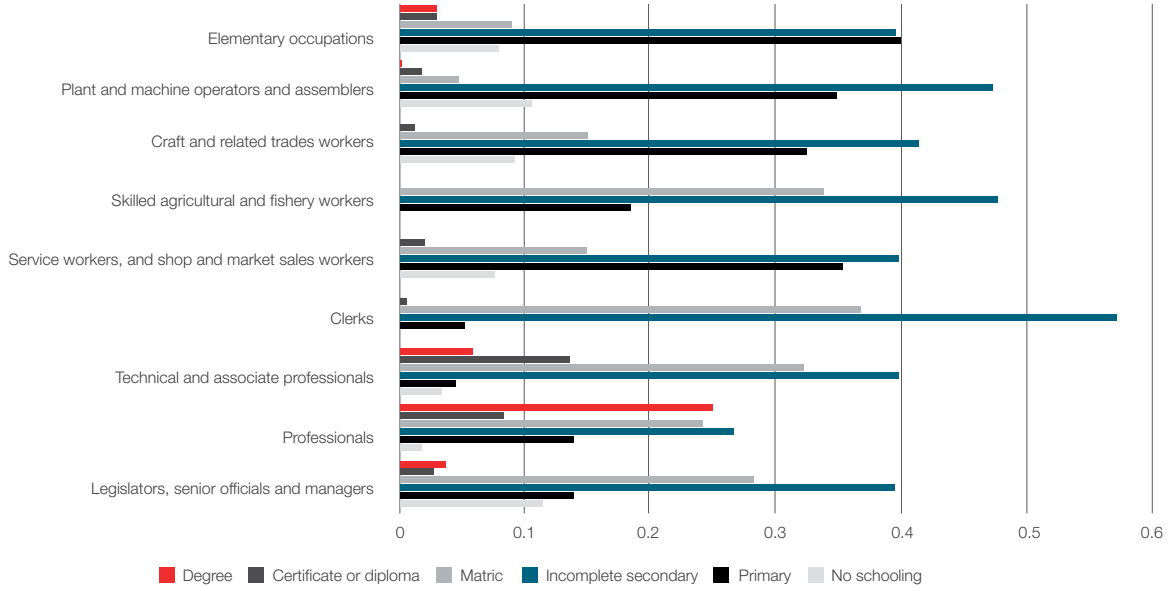

Figure A2b: Education levels of workers in the mining sector, 2001

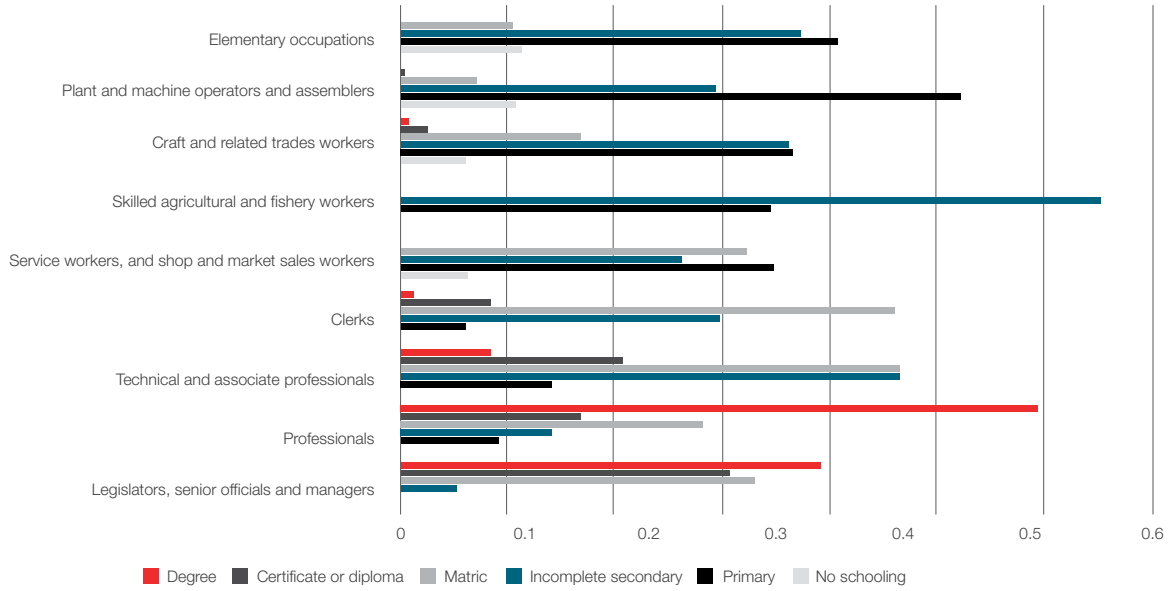

Figure A2c: Education levels of workers in the mining sector, 2007