Incentives for teachers within the salary system

6 August 2012

Report developed by:

Martin Gustafsson
Department of Economics
University of Stellenbosch
mgustafsson@sun.ac.za

Table of contents

EXECUTIVE SUMMARY **3**
1 Introduction **5**
2 Conceptual framework **5**
3 Alignment of actual payments to teacher pay policy **7**
3.1 Key features of the payroll data used 7
3.2 Notch values and average unit costs 7
3.3 Use of temporary educator posts 21
3.4 Overall balance of educator and non-educator costs and numbers 26
3.5 Distribution of schools-based educators across rank 28
3.6 The costs of educator benefits 30
3.7 Increases during the 2001 to 2011 period 37
3.8 How do (mis)alignments influence incentives and costs? 41
4 Present and future age-wage curves **44**
5 Future costs implied by current salary agreements **46**
5.1 The debate around accurate personnel costing 46
5.2 Personnel cost pressures in the 2012/13 MTEF 47
5.3 A basic long-range costing model 49
5.4 Key long-range scenarios and their policy implications 53
6 A comparison of performance incentive options **56**
6.1 Criteria from the literature 56
6.2 An evaluation of key existing proposals 61
7 Policy recommendations **65**

EXECUTIVE SUMMARY

This report is one of a set of reports comprising a Unicef-funded study into public expenditure issues in South Africa's basic education sector. This report is aimed largely at planners within the Department of Basic Education.

After an introduction in section 1, section 2 provides a conceptual framework that emphasises the need to view teacher pay as an incentive, but also to view financial incentives, or teacher pay, in the context of the wider range of incentives that impact on teacher behaviour.

Section 3 deals with a variety of matters relating to the alignment between actual payments and the policy on teacher pay. This section involves viewing the payroll data from a variety of angles and drawing conclusions around alignment with policy and implications for the sizes of personnel budgets. This is summarised within a table presented in section 3.8. A key conclusion is that certain provinces, notably Limpopo, pay teachers more than other provinces, even after one controls for factors normally associated with pay. This begs an explanation, given the national nature of the teacher salary rules. The analysis suggests that irregular increases in certain provinces, occurring when very complex salary structure reforms were introduced, are a part of the explanation. It is recommended that certain provinces proceed prudently with a full awareness of the degree to which they are high-cost provinces. Where discretion at the provincial level exists, high-cost provinces should be conservative when it comes to future upward adjustments so that irregular unit cost differences between provinces can be reduced over time.

Section 3.3 looks at the use of temporary educators in the schooling system and in particular at what might be done to reduce the 'double parking' problem, whereby a temporary educator is hired to deal with the fact moving a permanent educator from one school to another in response to enrolment shifts is slow and bureaucratically difficult. An attempt is made to use the payroll data to explore the magnitude and nature of 'double parking'. The data suggest that well over half of schools are owed permanent educators from other schools. The phenomenon is thus widespread. The data also suggest that there is room for dealing with this problem, which is a costly one, through better *within*-school redeployment of teachers. This seems most feasible at the primary level. Put differently, given the constraints imposed by policy and budgets, it appears as if greater flexibility within schools as to who teaches what grades and subjects should be seen as a possible solution. It should be underlined that the payroll data on their own are not sufficient for a comprehensive analysis of the 'double parking' phenomenon. A dedicated investigation into this issue seems needed.

Section 3 also includes analysis and observations for policymakers relating to the ratio of schools-based staff to office-based staff, the distribution of schools-based staff across ranks and benefits received by educators.

Section 4 looks at a specific policy alignment issue that has received considerable attention in recent years, namely the so-called age-wage gradient, or the degree to which educators earn more the older and more experienced they are. The actual age-wage gradient is found to be 1.3. This would be the ratio of the pay of end-of-career teachers to the pay of start-of-career teachers, counting only teachers and not promoted educators. Current rules make a slope of 1.6 realisable over time. However, it is recommended that a slope of between 1.6 and 1.9 be established as an aim, with 1.9 being applicable to only some teachers, namely those whose performance stands out as exceptional.

Section 5 examines future costs in some detail. Section 5.1 provides a critique of the costing methods used in one province and suggests that ways be found of making the methods less cumbersome, whilst not detracting from the inherent complexity of the exercise. Section 5.2 finds that in all provinces the cost of educators over the total personnel budget rises sharply

from 2011/12 to 2012/13 and remains high in the years that follow. The national rise is from 88% to 92%. The situation is particularly acute for KwaZulu-Natal. The message put across by the available budget documents does not make the implied under-budgeting crisis clear, which suggests that budget documents are simply not doing their job, which is to make it clear to stakeholders what the coming opportunities and risks are, within a budget that is relatively fixed. Section 5.3 puts forward a model for gauging educator costs over the longer term. The model is implemented in an Excel tool which accompanies this report. A few scenarios run by this model describe the expected attrition, through retirement, of large numbers of educators, especially from around 2020. This underlines the need for the training of younger teachers. But it also points to the fact that demographic factors are likely to reduce the unit cost of educators after about ten years in ways that planners are not currently anticipating. These unit cost reductions make it easier to justify unit cost increases in the medium term. Such medium term increases will in a sense be offset by unit cost reductions, resulting from a reduction in the average age of teachers, over the longer term.

Section 6 examines the literature on performance-linked financial incentives and concludes that amongst several different possibilities, all worth exploring, the possibility with the smallest risks and perhaps the largest immediate gains is a scheme where teachers would be paid a once-off bonus for passing relevant subject content examinations.

Finally, section 7 sums up the policy recommendations of the report under six headings: (1) More monitoring of teacher pay is needed. (2) A more favourable age-wage gradient is needed. (3) The future of performance-related rewards for teachers needs to be more informed by analysis. (4) Solutions such as within-school reallocation of teachers to tackle the ‘double parking’ problem should be explored. (5) Flexible approaches to equalising teacher pay across provinces are needed. (6) Sufficient modelling of future scenarios needs to occur.

1 Introduction

This report is one of a set of reports comprising a Unicef-funded study into public expenditure issues in South Africa's basic education sector. This report is aimed largely at planners within the Department of Basic Education.

- Section 2, in providing a conceptual framework for the report, focuses in particular on economic concepts and theories that can assist in the analysis of teacher incentives.

- Section 3 deals with a variety of matters relating to the alignment between actual payments and the policy on teacher pay. This section involves viewing the payroll data from a variety of angles and drawing conclusions around alignment with policy and implications for the sizes of personnel budgets.

- Section 4 looks at a specific policy alignment issue that has received considerable attention in recent years, namely the so-called age-wage curve, or the degree to which educators earn more the older and more experienced they are. A key matter here is how best to signal anticipated salary curves to youths who may want to enter the teaching profession.

- Section 5 looks at what the current teacher salary dynamics mean for the medium to long term growth of the personnel budget. This section describes a long-range costing tool that was developed specifically for the report (the tool itself is within an Excel file that accompanies this report).

- Section 6 presents a framework for considering better performance-linked teacher incentives in the salary system. This framework is informed by both recent experiences in South Africa within this policy area, and examples of 'best practice' in other countries.

- Section 7 discusses the implications of the previous sections for policymaking.

Formal analysis of the payroll (Persal) data, something that features strongly in this report, occurs too infrequently in the education planning process in South Africa. This report goes some of the way to filling the gap, but a key recommendation arising out of this report is that this type of analysis should be more regular, institutionalised, and built in to the annual planning cycle. A rare example of an earlier analysis involving analysis of Persal data is the Education Labour Relations Council report of 2011 titled *Revised salary structure proposal*. In many ways, this reports expands on that earlier report. In one important respect this report draws a different conclusion to the earlier report. Here it is argued, in section 3.2, that provincial compliance with the national salary rules are *not* sufficient and that there is a need to reign in differences in the way provinces apply the rules, partly to limit budget shortfalls.

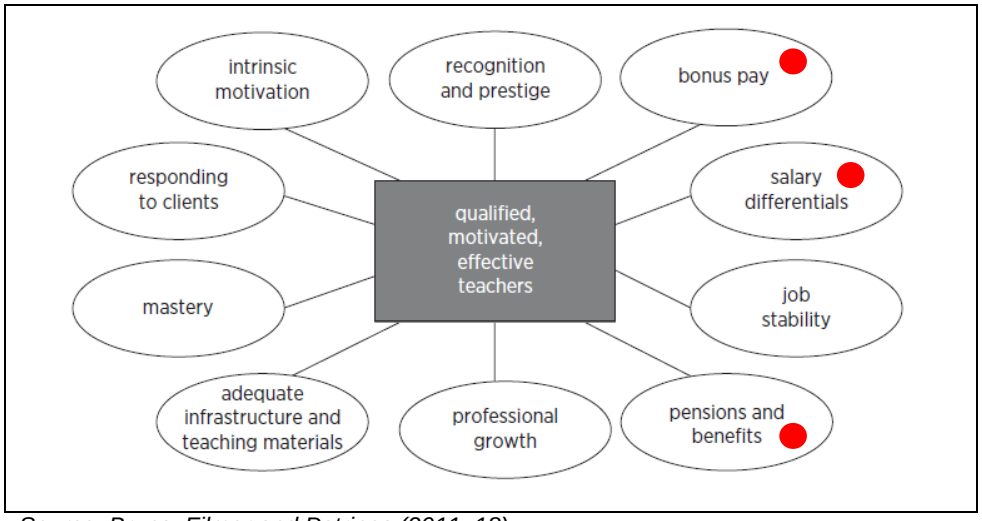
Apart from data analysis, this report is informed by a series of discussions held by the author with people in the Department of Basic Education, National Treasury, Gauteng Department of Education and the KwaZulu-Natal Department of Education.

2 Conceptual framework

Much of this report is informed by an incentives framework, or thinking about what factors, monetary or other, motivate people such as educators to be productive. Figure 1 presents a fairly typical way of viewing incentives that influence teachers. This report focuses on three of the ten types of incentives, namely (1) bonus pay, (2) salary differentials and (3) pensions and benefits. By implication, the focus in not on the more non-financial incentives, such as mastery or professional growth. It is important that the reader should be cognisant of this. In

particular, policy recommendations put forward in the report should not be viewed in isolation from other possible policy interventions aimed at improving teacher performance.

Figure 1: Incentives that influence teaching



Source: Bruns, Filmer and Patrinos (2011: 18)

A few economics principals not featured explicitly in the above diagram are also worth keeping in mind when reading this report.

Incentives are needed to deal with the **principal-agent** problem whereby the interests of the employer and the employee do not entirely coincide. Even if instructions are made clear to the employee and even if the employer pays the employee a fair salary, there is a risk that what the employee (or teacher) does will not coincide with the intentions of the employer (which strictly speaking is the education department, though the school principal and school governing body possess certain employer-like features). In designing incentives for the schooling system, however, there are some complexities to bear in mind. One is some ambiguity around who the employer is. If one designs incentives, who should be considered the incentivisor? Do the interests of the education department and the quasi-employers the school principal and the school governing body always coincide? In the classical principal-agent model, the assumption is made that the principal knows what is best for productivity and that the risk is that the agent will stray from the correct path. But in the schooling system, does the employer (however one defines this) always know what is best for maximising educational outcomes? Given the sensitivity of teaching to local context, is it possible that sometimes the teacher knows best? In such a case, what is the optimal incentive to have? Economists would argue that one should link incentives to what learners learn. But how does one measure this and how does one attribute productivity improvements to individual teachers?

A large part of the principal-agent problem relates to **information asymmetries**. The employer does not have all the information on what occurs in the classroom and often does not even have reliable information on what learners have learnt in a year. Therefore designing good incentives is often about improving the availability of good information. Without the latter, it becomes difficult to reward and sanction fairly.

In economic theory, efficient wages, or wages that are as high as they need to be, and no higher, to achieve the desired outcomes, are achieved through the interaction of the supply of the required skill and the demand for that skill. However, this theory only applies to a competitive environment. In public education systems, the theory does generally not apply. This is because in these systems, one has not just a single buyer of the educator skills, where the buyer is the state, but in some ways also a single seller of these skills insofar as often one

major teacher union, or a very united set of unions, negotiates the wage on behalf of everyone. One thus has both a **monopsony** (single buyer) and a **monopoly** (single seller) situation prevailing simultaneously. This is why analysis and comparison, of both teacher cost and teacher productivity, is so important. Analysis must, in some sense, compensate for the absence of competitive market forces which would otherwise establish what the efficient wage is.

3 Alignment of actual payments to teacher pay policy

3.1 Key features of the payroll data used

The payroll data used in most of this report is from three Persal downloads corresponding to the three months indicated in the first row of Table 1 below. The exception is section 3.7, where earlier downloads are also analysed. Table 1 summarises the employee numbers and annual costs reflected in the three downloads for 2009, 2010 and 2011. Each employee has a 'notch' value indicating what his or her basic salary should be in the year. In addition, the downloads for 2010 and 2011 contain actual payments made with respect to the basic salary and benefits. Payments in a month can be multiplied by 12 to produce annualised costs. Gaps in the data are indicated by ***. Requests to the State Information Technology Agency (SITA) to provide extracts from Persal tend to result in slightly different data structures, both in terms of the variables included but even, to some extent, different variable names[1].

Table 1: Basic statistics from the data

	Jun 2009	Oct 2010	Oct 2011
Total employees	490,084	521,324	530,794
Educators	401,740	423,952	429,261
% schools-based	93.5	***	92.9
% temporary	10.6	10.2	11.2
Educator notch value (R million)	57,719	69,992	81,188
Educator payments value (R million x 12)	***	95,368	112,025
Non-educators	88,344	97,372	101533
% schools-based	65.3	***	65.3
Non-educator notch value (R million)	6,579	7,635	8845
Non-educator payments value (R million x 12)	***	10,776	12,835

Note: The above values incorporate values for a few part-time educators. Specifically, around 0.4% of educators are employed part-time.

One risk is that retroactive salary payments, for instance when new notches are not implemented immediately, can distort the payments picture in any one month. This was checked with respect to the three downloads and was found not to be a factor that would unduly influence the analysis.

3.2 Notch values and average unit costs

Official notch values for educators for the period 2008 to 2011 are published in the following government notices and are available on the internet[2].

[1] For Table 1 the variable nature of appointment was used to determine who was an educator and who was not.

[2] http://www.gov.za. Click on 'Documents', then 'Notices'.

Table 2: Government notices governing notch changes

Notice number	Month and year of notice	Month and year in which new notches take effect
863	Aug 2008	Jul 2008
946	Oct 2009	Jul 2009
984	Oct 2010	Jul 2010
688	Aug 2011	May 2011

Moreover, the rationale for the 2010 and 2011 notch adjustments, in terms of percentage increases, are given in Resolution 4 of 2010 and Resolution 2 of 2011 of the Public Service Co-ordinating Bargaining Council[3] (PSCBC). Recent salary adjustments for teachers should be seen in the light of the introduction in 2008 of what has been described as a new conditions of service approach, the Occupation Specific Dispensation (OSD). The OSD was introduced through Resolution 1 of 2008 of the Education Labour Relations Council[4] (ELRC) and partly reversed through ELRC Resolution 4 of 2009.

The following table indicates what official set of notches (in terms of official date of implementation) is found in each of the three 2009 to 2011 downloads. Notably, in October 2010, July 2009 notches were still found as the July 2010 notches had not been implemented yet. As pointed out in Table 2Table 1 above, the notches that were to take effect in July 2010 were only published in October 2011. In Table 3 'OSD notch' means an ordinary basic salary notch as published in the government notice. 'OSD inclusive package' means an amount based on an OSD notch, but with benefits included. Educators who receive an 'OSD notch' basic salary also receive benefits as separate payments. Educators with the 'OSD inclusive package' are relatively senior managers. In the June 2009 dataset, 2.3% of educators were receiving a non-OSD salary amount. These were mainly further education and training (FET) college lecturers and educators working at adult basic education and training (ABET) centres. These educators were not originally covered by the OSD structure. However, by October 2011 most of them had been incorporated within this structure according to the payroll data. The last two datasets both included relatively large numbers of educators with a zero notch value. These educators were also classified as abnormal teacher appointments and totalled around 16,000 in October 2010. Most were in KN, nearly all were new appointments in the sense that the Persal employee number did not exist in the June 2009 dataset, and many appeared to be pre-school teachers paid special non-notch amounts.

Table 3: Notch types appearing (% of all educators)

Dataset ➔	Jun 2009	Oct 2010	Oct 2011
Notch appearing ➔	Jul 2008	Jul 2009	May 2011
OSD notch	97.2	93.6	94.3
OSD inclusive package	0.5	0.6	0.6
Notch is zero	0.0	3.8	4.3
Other	2.3	2.0	0.8
Total	100.0	100.0	100.0

The next table represents a breakdown by province of the October 2011 dataset. All educators, including part-time educators, were considered. Part-time educators were most present in MP and FS, where they constituted 2.9% and 1.0% of educators respectively. In other provinces there were no or virtually no part-time educators. Two key things stand out in Table 4. One is the high proportion of educators in KN who are employed on a temporary basis. The matter of temporary educators is discussed in some detail in section 3.3. The other

[3] http://www.pscbc.org.za.
[4] http://www.elrc.org.za.

thing that is perhaps striking is that the average notch value in LP should be on a par with those in GP and WC. The latter two provinces are known to have slightly higher educator unit costs because teachers are better qualified and due to legacies from the process when old apartheid-era teacher notch values were translated to a unified national structure. However, these factors are not usually associated with LP. If one looks at average payments, which includes benefits, then LP has the country's most costly educators. In fact, there is more inequality across provinces with respect to average payment than average notch.

Table 4: October 2011 details by province

	Educator values								Non-educator values				
	Educators	% schools-based	% temporary	Avg. notch value	Avg. payments value (x 12)	% OSD inclusive package	% notch is zero	% other	Non-educators	% schools-based	Avg. notch value	Avg. payments value (x 12)	Non-educators as % of all employees
EC	68,918	95.9	8.9	197,669	267,051	1.1	0.4	0.3	19,027	35.7	98,191	129,600	21.6
FS	27,609	87.8	8.9	195,956	245,365	0.7	8.0	1.7	6,537	74.0	94,859	135,217	19.1
GP	66,172	92.5	10.5	204,184	262,257	0.4	7.9	0.7	19,196	80.6	97,598	135,671	22.5
KN	99,782	95.4	17.1	187,757	247,783	0.5	6.0	0.3	19,871	75.7	89,168	110,788	16.6
LP	59,226	90.7	8.7	204,097	281,065	0.5	0.0	0.1	12,636	39.0	117,161	105,615	17.6
MP	37,035	93.5	10.8	192,948	249,452	0.3	5.9	3.7	8,370	75.5	86,762	124,026	18.4
NC	9,726	93.6	11.6	200,484	278,160	0.6	5.0	0.2	2,763	75.8	109,114	154,360	22.1
NW	28,156	88.6	7.8	200,373	261,378	0.6	6.7	0.3	4,406	69.1	105,073	148,515	13.5
WC	32,637	90.3	9.4	206,586	270,189	0.6	1.2	1.5	8,727	76.9	99,995	140,422	21.1
SA	429,261	92.9	11.2	197,731	260,971	0.6	4.3	0.8	101,533	65.3	97,464	126,408	19.1

A few other things also stand out. The percentage of educators who are based in schools varies from province to province. The percentages translate into ratios of schools-based educators per educator based somewhere else of, for instance, 23 in EC and 7 in FS. These ratios provide an indication of the degree of educational support from outside schools that is available to schools. However, these figures should be interpreted with caution. If educators and non-educators are viewed together, then EC has the most favourable ratio of employees in school per employee outside of a school, of 5. One's interpretation would need to be sensitive to the fact that different provinces may use different types of employees for different tasks. For instance, an office-based educator in FS may provide the administrative support to schools that would be offered by a non-educator in EC. However, it is unlikely that non-educators would be offering educational support.

The explanation for the high percentage of educators in MP with irregular 'other' payments is simply that in this province ABET educators had not been moved to the OSD structure, whilst in other provinces they had.

With respect to non-educators, the fact that LP should have an average notch value which *exceeds* actual average payments is strange. This is explained by the fact that around half of non-educators had a zero notch value whilst the averages in Table 4 consider only non-zero values. There was thus a large number of non-educators in LP with no notch values whose payments were relatively low.

Figure 2 illustrates the distribution of notch values in October 2011. Viewed in this manner, differences in pay across the four categories indicated in the graph were not large. Figure 3 suggests that the distribution pattern did also not differ greatly by province.

Figure 2: Percentile plot of notch values nationally

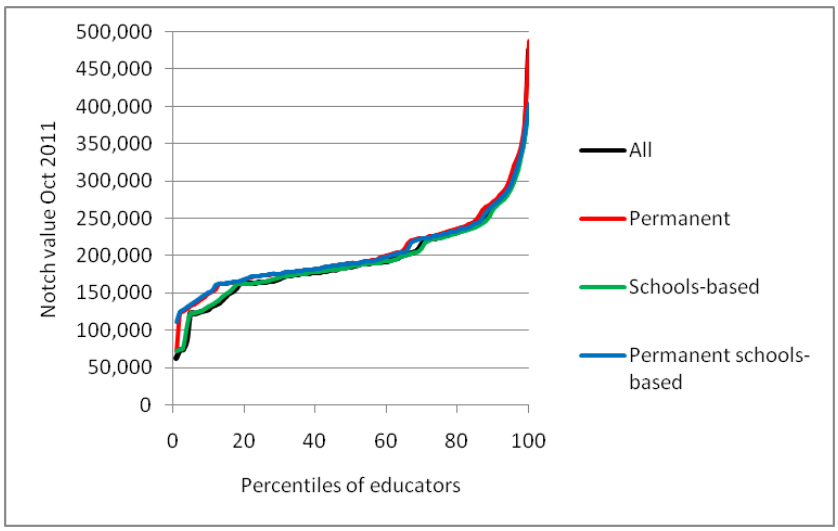
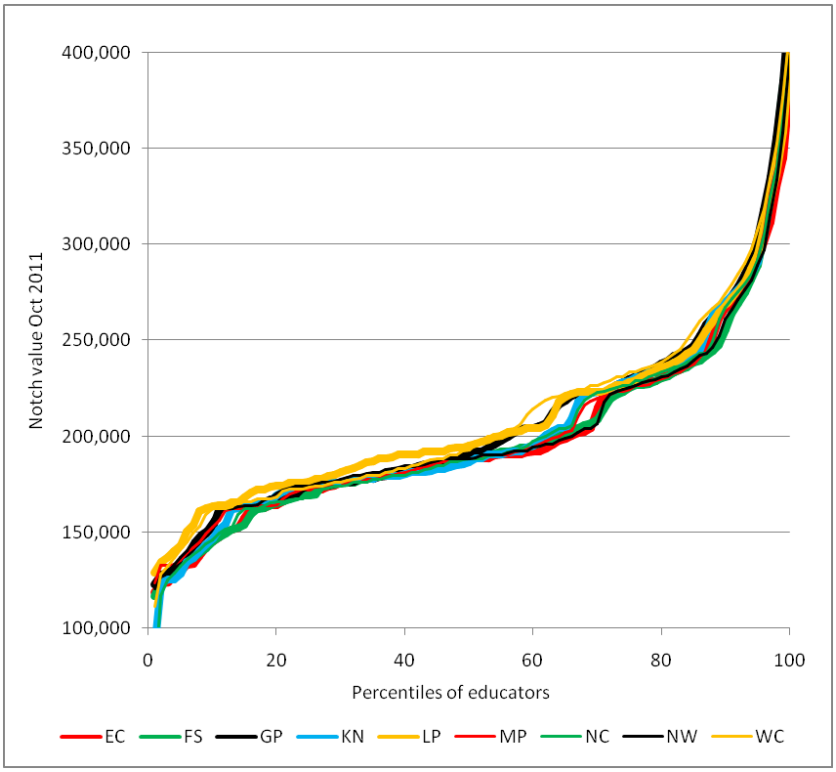


Figure 3: Percentile plot of notch values by province

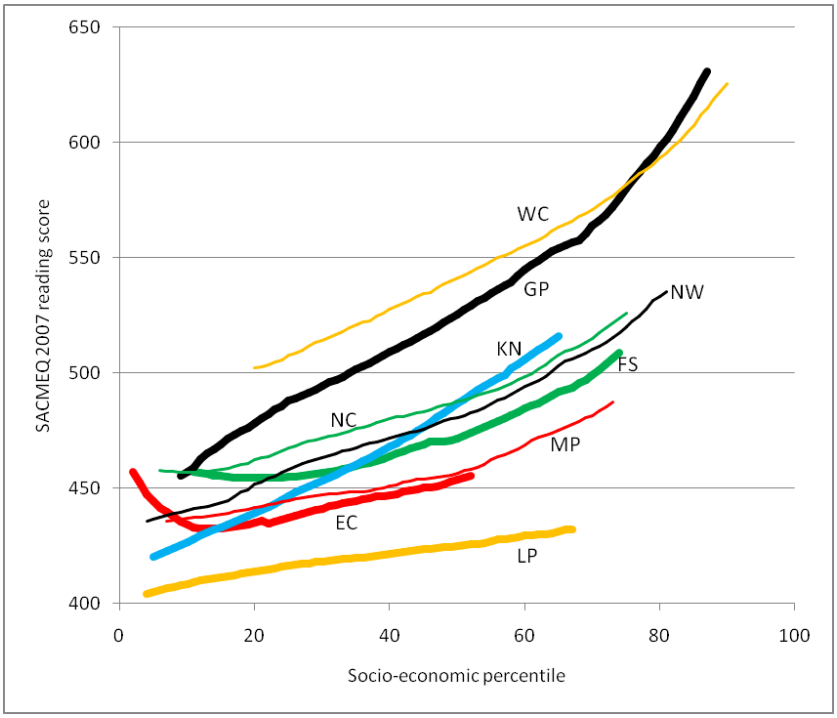


The median notch values shown in the next table confirm the patterns seen in the average notch values of Table 4. LP, followed by WC and GP, have the most costly educators. However, whilst WC and GP tend to produce the country's best learner results, LP has been shown to under-perform, even after taking into account the province's socio-economic context. This can be seen in the following graph, which makes use of SACMEQ 2007 data.

Table 5: Median notch values for permanent schools-based educators in 2011

EC	188,484
FS	188,485
GP	190,369
KN	186,622
LP	194,981
MP	188,485
NC	187,351
NW	188,485
WC	193,032
SA	188,484

Figure 4: Relationship between reading and SES across provinces



Source: SACMEQ III dataset (2007).
Note: Percentiles 1 to 20 represent the poorest one-fifth (or quintile) of learners, percentiles 21 to 40 represent the next poorest one-fifth, and so on. Socio-economic status is based on assets in the home reported by learners. The index values were calculated by Stephen Taylor. Within each province, the curve excludes the left-hand 5% of the SES range and the top 30% in order to exclude outliers and focus on the more disadvantaged. Smoothing of curves occurs using lowess smoothing.

There are of course many factors that might push the average notch or payment to teachers up in a province. For instance, in general older teachers are paid more as they have accumulated notch increases and perhaps salary improvements linked to qualifications improvements over the years. To establish whether a province's unit cost is abnormally high, one needs to take the various factors into account. This is what is attempted in Table 6, which presents the results of two regression analyses, using 2011 data, where notch and total payment are the dependent variables (more precisely, the natural logarithms of these variables were used). Most of the coefficients are unsurprising. For instance, all other things being equal, being a temporary educator with less than three year's training reduces one's notch value by 22%. More training is associated with better pay. This effect is strongest for African educators – this explains the mostly negative coefficients for other races where race and years of training are interacted. The years of service variable was converted to yes-no dummy variables due to discontinuities in the relationship between experience and pay that are discussed below. In the regression analysis, the relationship is an intuitive one. More years of service is always associated with better pay[5].

The R^2 values at the bottom of the table indicate the degree to which the various factors are able to explain notch or total payments. There are three key reasons why the system is not entirely predictable within the model (which would make R^2 equal 1.000). Firstly, historical

[5] It should be explained that the variables 'Office-based' and 'Schools-based' are not completely mutually exclusive and it is therefore possible to enter both in the model. What is excluded is above all educators working in further education and training (FET) colleges and adult basic education and training (ABET) centres.

inequities in the placement of teachers on salary scales, especially prior to 1994, would to some extent show up in the current system, partly because the salary equalisation process that occurred in the 1990s was not perfect. The historical inequities partly explain why race clearly predicts what one earns in the model. But certain historical dynamics would not be captured by the race dummies, for instance differences in the way white teachers were treated in different pre-1994 provinces, or differences between the pre-1994 homelands. Secondly, as will be seen in section 3.6, total payments, and specifically benefits, are influenced by matters of choice and spousehood not reflected in the model. Thirdly, the model is a log-linear one, yet even if the salary system was entirely predictable, the relationship between factors would not follow this form precisely.

What is of particular interest in Table 6 are the provincial coefficients. One would not expect these to be very large, given that the salary system is determined through national policy. Provinces where educators experience a relatively strong notch advantage are, in descending order, LP, WC, GP and EC. The possible reasons for this are discussed below. To provide a rough sense of the cost implications, we might consider 3.5% of LP's notch advantage to represent an excessive amount (the median coefficient across the provinces is about 3.5% and LP's coefficient is 7.0%). These 3.5% translate into around R2,700 per educator on average with respect to notch value. This is the equivalent of around R160m a year, at 2011 prices, or 1.0% of the annual spending on educators. In EC, the values would be around 0.2% and R32m.

Table 6: Regression of notch and payments on key variables

Dependent ➔	Notch		Payment		Mean
EC	.041	***	.033	***	.17
FS	.026	***	.010	***	.06
GP	.047	***	.048	***	.15
KN	.035	***	.044	***	.23
LP	.070	***	.074	***	.14
MP	Ref.		Ref.		
NC	.036	***	.079	***	.02
NW	.026	***	.030	***	.06
WC	.058	***	.041	***	.08
Teacher	Ref.		Ref.		
Head of department	.160	***	.153	***	.12
Deputy principal	.282	***	.269	***	.03
Principal	.376	***	.355	***	.06
Office-based	.479	***	.457	***	.04
Schools-based	.181	***	.153	***	.94
Training 2 years or less	Ref.		Ref.		
Training 3 years	.383	***	.354	***	.26
Training 4 years	.563	***	.526	***	.48
Training 5 years or more	.601	***	.562	***	.23
Training 4 years (coloured)	-.091	***	-.083	***	.03
Training 4 years (Indian)	-.011	**	-.029	***	.01
Training 4 years (white)	-.068	***	-.065	***	.06
Training 5 years+ (coloured)	-.071	***	-.068	***	.01
Training 5 years+ (Indian)	.012	***	.000		.01
Training 5 years+ (white)	-.031	***	-.023	***	.03
Temporary less than 3 years training	-.221	***	-.254	***	.03
Temporary 3 or more years training	-.052	***	-.051	***	.08
Years service 0 to 9 years	Ref.		Ref.		
Years service 10 to 19 years	.119	***	.108	***	.27
Years service 20 to 24 years	.241	***	.220	***	.15
Years service 25 to 29 years	.271	***	.239	***	.10
Years service 30 or more years	.310	***	.275	***	.09
African	Ref.		Ref.		
Coloured	.114	***	.118	***	.07
Indian	.047	***	.051	***	.03
White	.118	***	.120	***	.10
Female	-.035	***	-.052	***	.67
Female (coloured)	.003	*	.031	***	.53
Female (Indian)	.011	***	.026	***	.02
Female (white)	.026	***	.022	***	.07
Constant	77850	***	9328	***	
Observations	406111		406111		
Adjusted R squared	.793		.546		

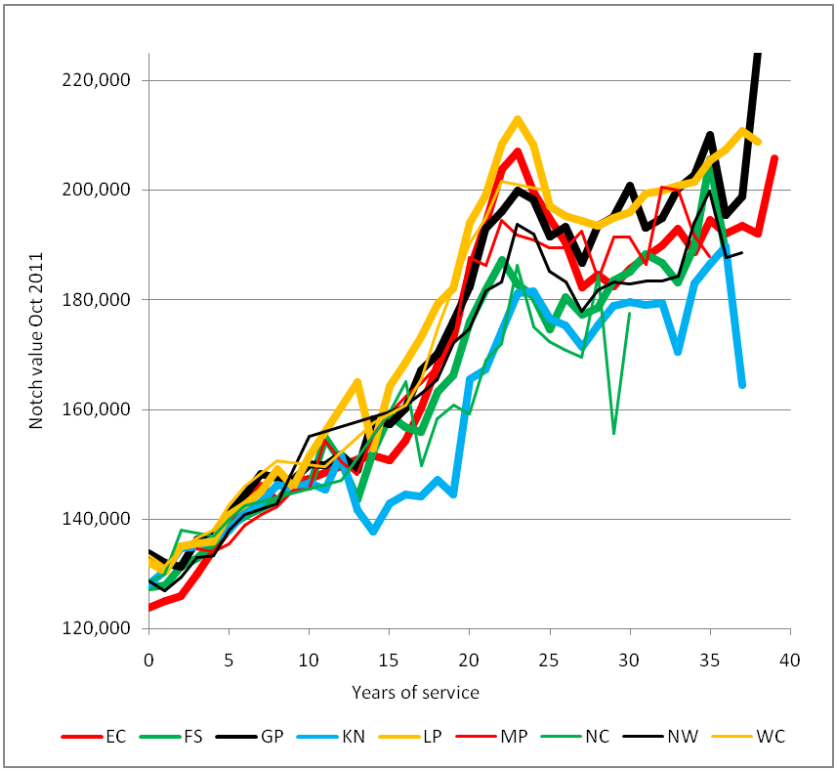
Source: Persal data of October 2011.
*Note: The natural log of the dependent values was used. This means that coefficient values refer to the percentage pay advantage associated with each explanatory variable. The constant values have been converted to Rand values to facilitate the understanding of the percentages. 'Ref.' means the variable is the reference variable against which other variables in the group are referenced. *** and * indicate that the coefficient is significant at the 1% and 10% levels respectively (*** thus indicates a high degree of significance). Given the large number of observations, one would expect virtually all variables to be highly significant in the model. For the payments model only nonzero positive values not exceeding R200,000 in the month were considered.*

A few alternatives to the notch model in Table 6 were run in order to understand the explanatory factors better. A model including only those variables which, in an ideal situation, should influence pay, was constructed. The variables were those relating to type of job, training, and tenure (permanent or temporary). The result was an adjusted R^2 value of .772, not too different from the .793 in Table 6. The implication is that although non-ideal variables, such as race, play a role in predicting pay, on the whole these variables do not make a large difference to the predictability of pay. The system is thus a relatively ordered one.

Very importantly, when the model with the 'ideal' variables was run with only younger teachers, adjusted R^2 was particularly high. When only those aged 32 and younger were included, the value was .914. Part of the explanation seems to be that in any schooling system, younger teachers would tend to display less variation, partly because they are less likely to have been promoted, so younger educators would display less 'noise' in the data. However, it could also be that the system is becoming more predictable, as an increasing proportion of teachers are affected only by the post-apartheid teacher pay system.

A more intuitive way of communicating what the above regression models say about provincial costs is seen in the following two graphs. For these and the remaining graphs in the report, the first five provinces – EC, FS, GP, KN and LP – carry the thick lines, whilst the remaining provinces carry thin lines. Here teachers with the same characteristics (from the list of characteristics in Table 6) are compared across provinces, with years of service indicated along the horizontal axis. Temporary teachers are excluded. One thing that once again stands out is that teachers in LP are better paid than similar teachers in other provinces. Another phenomenon that stands out is a peak at around 23 years of service. Teachers with, say, 30 years of service can justifiably feel unfairly treated insofar as similarly qualified teachers with 23 (but not 20!) years of service earn considerably more than they do. Partly to deal with the possibility that years of service might not be accurate (this could occur where employees leave and re-enter the system), a view using age is presented in Figure 7. That figure does not display the peak seen in the earlier two graphs. This is strange and no easy explanation for the anomaly could be found through analysis of the data. One possible explanation is that a large number of teachers with more than around 23 years of service carry a value of around 23 on the system. In other words, there would be an inaccuracy on the system. However, this explanation does not seem to be supported by the analysis presented in Figure 8. The graph displays no blip or discontinuity at around 23 years of service for the LP teachers covered in Figure 5. A similar graph for all educators in 2011 similarly showed no pattern that would support the existence of an irregularity in the years of service data. What is supported in all the following three graphs, whether age or years of service is used on the horizontal axis, is that teachers with similar characteristics are clearly paid somewhat more in some provinces than others. LP stands out as having the most advantaged teachers in this respect, especially if the analysis is done by age, as in Figure 7.

Figure 5: Average 2011 notch values for REQV 13 female African teachers



Note: Only points along the graph with at least 10 teachers were considered in this graph and the following similar graphs. The first five provinces in the legend have thick lines.

Figure 6: Average 2011 notch values for REQV 14 female African teachers

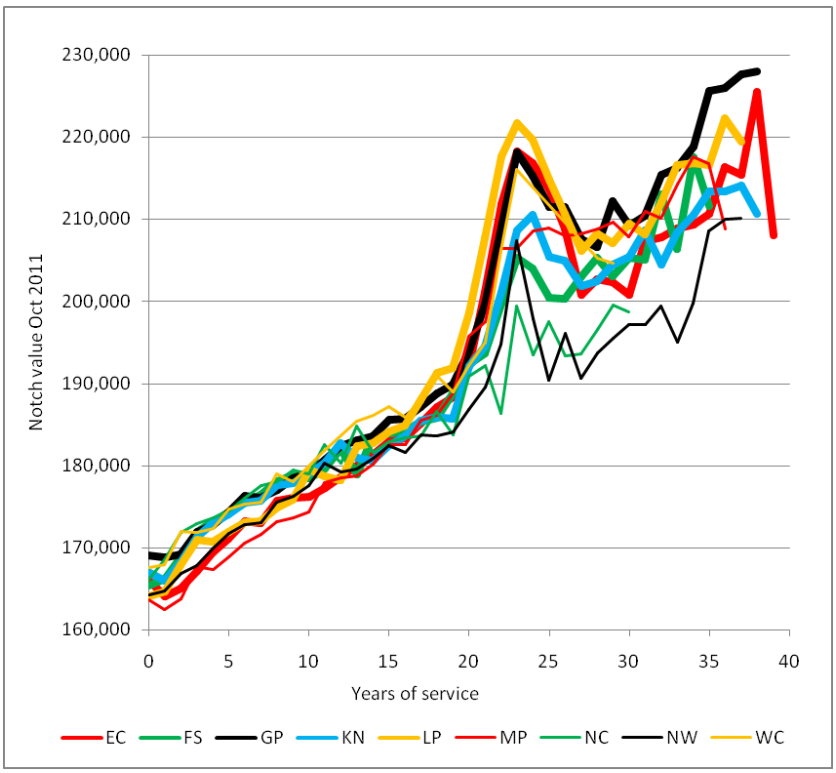


Figure 7: As for Figure 5 but by age

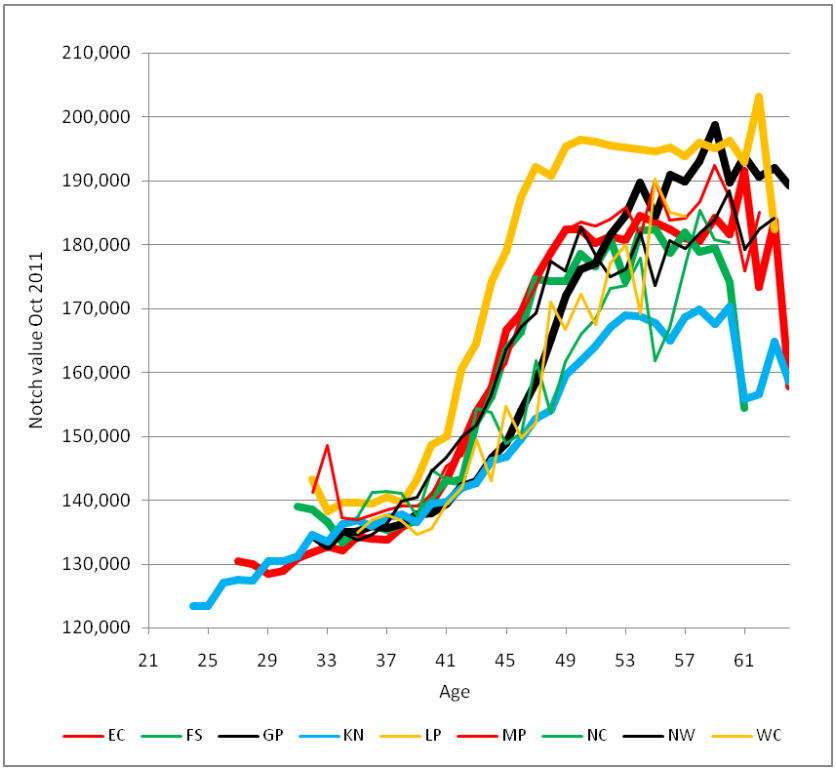
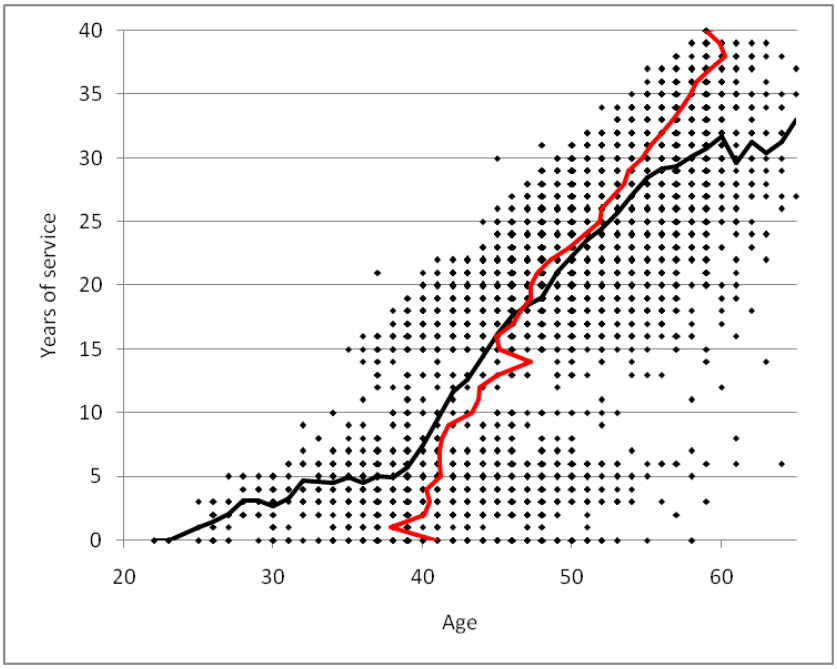


Figure 8: Years of service against age



Note: The black trendline represents a Lowess smoothing where years of education is the dependent variable. The red trendline is similar, except here age is the dependent variable.

The following graph provides an alternative view, relative to Table 6, of the relationship between race and notch. Teachers who are similar with respect to factors other than race are compared. Only one province is examined to remove across-provinces differences. Older white and Indian teachers appear to experience a salary advantage. This would largely be due to pre-1994 racial discrimination. What is not easy to explain, however, is why the differences should persist even for teachers with, say, 10 years of service in 2011 (so their service would have begun in 2001). Here it does seem as if problems with the years of service values are at play. Figure 10 provides a view by age and indicates that similarly aged teachers are not discriminated according to race in the salary system. The matter may still need further investigation. What these results point to, however, is how much care must be taken when interpreting the payroll data.

Figure 9: Average 2011 notch values for REQV 14 female teachers in KN

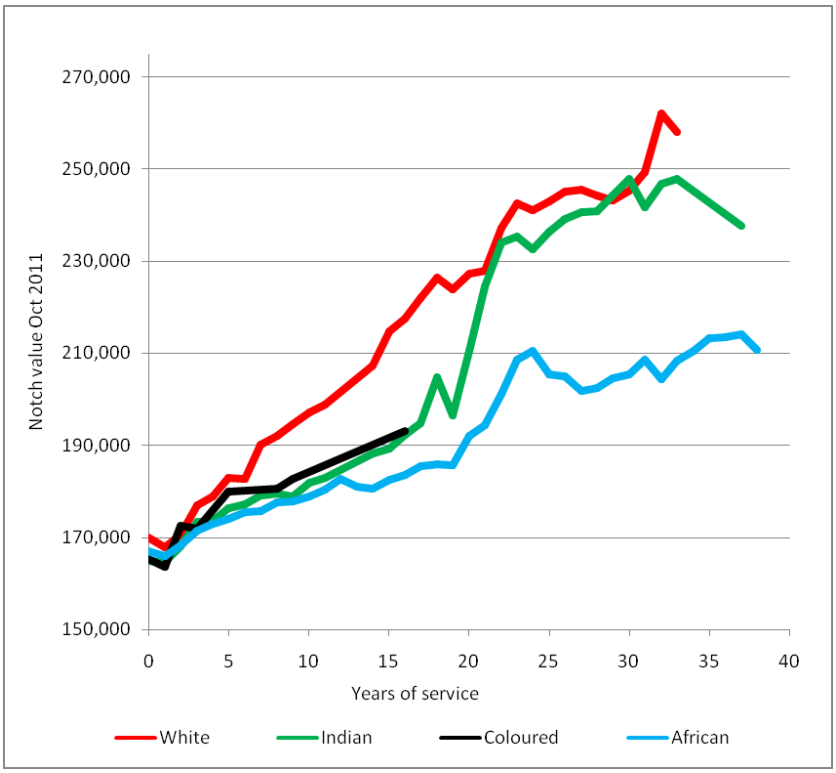
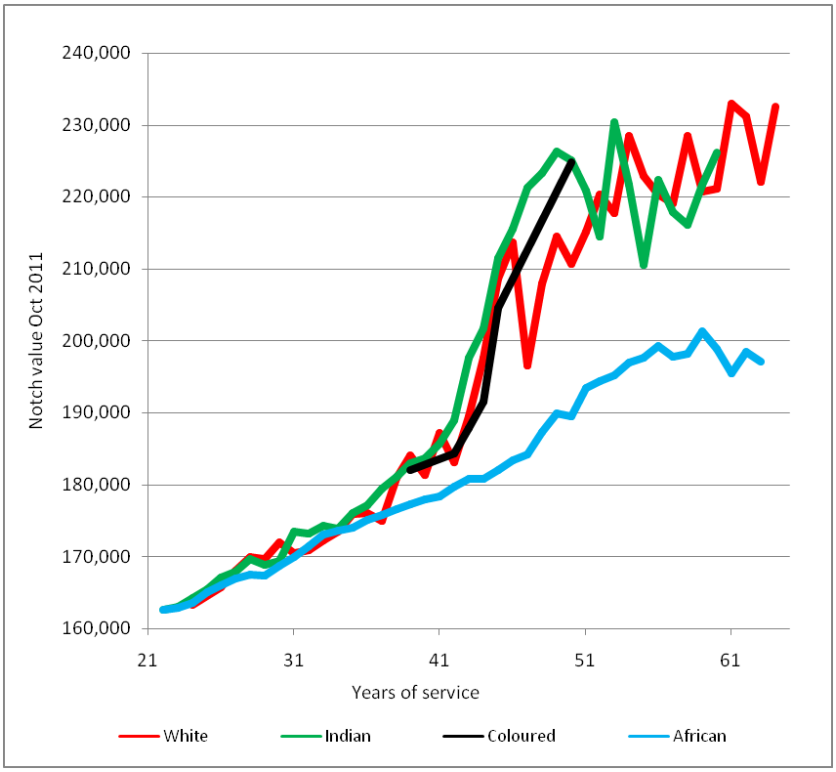


Figure 10: As for Figure 9 but by age



Returning to each province's notch values, a key question is whether the 2011 patterns seen above are new or whether they have existed for some years. Figure 11 below suggests that the situation has been relatively fluid. For instance, in 2009 LP was not unambiguously the best paying province across a wide range of years of experience. Its position was shared with other provinces, in particular EC.

Figure 11: As for Figure 5 but for 2009

3.3 Use of temporary educator posts

There appear to be five key reasons why provinces would employ temporary educators[6].

- Provinces employ teachers on a temporary basis when their qualifications are too low for them to become permanently employed teachers. The practice is for anyone with less than an REQV 13 level to be considered too poorly qualified.

- When posts are reallocated between schools to deal with enrolment shifts, labour regulations often make it difficult to redeploy 'excess' teachers away from schools that have lost posts towards schools that have gained posts. When this problem arises, the general practice is for a temporary post to be created in the school to which the post should move, whilst the movement of the excess educator is resolved. This has been referred to as one of the most difficult logistical challenges in human resources planning within the education departments. The term 'double parking' is often used to refer to the problem. Clearly, two sets of policies, namely conditions of service and the post provisioning norms, are not completely compatible.

- A province may employ an educator on a temporary basis when a post has been vacated and the employment of a new person is not finalised yet, for instance because it is difficult to find a suitable candidate or there has been a delay in the appointment process.

[6] When temporary educators are referred to here, this category excludes educators classified as 'CS EDUCATOR PERMANENT ON PROBATION', which constitutes a separate category on the payroll system. Thus an educator on the conventional one year of probation would not be considered a temporary educator.

- Analysis of the data suggest that in the case of two provinces, FS and GP, the category temporary is used to describe substitute teachers, or teachers who are hired when teachers are away on extended leave, for instance maternity leave. In other provinces, this does not seem to be the case judging from the extent of the use of the separate category 'CS EDUCATOR - RELIEVE'. The percentage of teachers in 2011 in this category amongst the other seven provinces ranges from 0.3% for EC to 2.5% in WC. In FS and GP the figure is virtually zero, yet it is reported that these two provinces do provide substitute teachers when needed.

- It is believed that some educators are willing to forfeit the tenure of their permanent educator status in order to benefit from the slightly higher and more fungible (or flexible) benefits enjoyed by temporary teachers. They therefore resign as permanent educators as take up posts as temporary educators. The data appear to support this belief. A comparison of the 2009, 2010 and 2011 Persal downloads reveals that there were 1,333 educators who were temporary in 2011 but permanent in 2009 or 2010 (see Table 9). Whilst the phenomenon seems limited, it is an important one as it has the potential to become a larger factor, with serious cost implications, but also implications for the province's ability to redeploy teachers across schools. The educators in question are not young educators, as one might expect. Young educators may be more inclined to sacrifice tenure and less inclined to take up benefits such as medical insurance. The average age of the educators who forfeited their permanent status between 2010 and 2011 was 45.

One cannot expect the data to clearly differentiate between the five reasons. For instance, an under-qualified temporary educator could have been hired to substitute a teacher on maternity leave. However, it is important to gain some sense of the magnitudes of the different effects. This is what is attempted in the analysis that follows.

The following table provides some sense of how large the first reason is by province. Around a quarter of all temporary educators have a qualification that is lower than REQV 13. Moreover, 80% of all educators with a qualification level below REQV 13 are temporary (this is not shown in the table). KN is clearly an exceptional province insofar as 50% of temporary educators do not have at least an REQV 13 level. Moreover, KN has an exceptionally high percentage of educators who are temporary.

Table 7: Temporary educators by REQV and province 2011

	blank	10	11-12	13	14	15	16-17	Total temp. eds.	% temp. eds with <REQV 13	% temp. eds.
EC	53	201	1314	2,547	1,874	114	20	6,123	25	9
FS	213	293	56	1,123	703	52	14	2,454	16	9
GP	488	83	310	1,971	3,687	343	57	6,939	6	10
KN	336	8,225	198	4,317	3,514	373	78	17,041	50	17
LP	144	24	104	1,851	2,944	109	16	5,192	3	9
MP	81	189	114	1,213	2,146	208	38	3,989	8	11
NC	22	263	44	295	461	37	11	1,133	28	12
NW	63	23	122	905	987	76	17	2,193	7	8
WC	458	160	314	641	1,230	188	69	3,060	18	9
SA	1,858	9,461	2,576	14,863	17,546	1,500	320	48,124	26	11

The following table attempts to use the payroll data to provide an idea of the distribution of the temporary educators. What is clear is that over half of the approximately 26,000 schools have temporary educators. If one weights schools by the total number of educators (roughly this would be similar to weighting schools by learners), one finds that around three-quarters of schools have temporary educators. Another way of putting this is to say that in three-quarters of the schooling system temporary educators are found. On average, schools with

temporary educators have around three such educators. The phenomenon is thus a widespread one, which we can assume affects the teaching process in substantial ways. The figures for GP suggest strongly that one is not just dealing with remote rural schools. The phenomenon affects all kinds of schools. The last column in Table 8 suggests that the previous columns under-state the phenomenon in the case of FS and LP. It is very likely that where temporary educators are not linked to schools on the payroll system this is because the system has failed to capture this detail. In this regard, it should be noted that 97% of educators who are employed on a temporary basis are classified as teachers, and not, for instance, office-based officials.

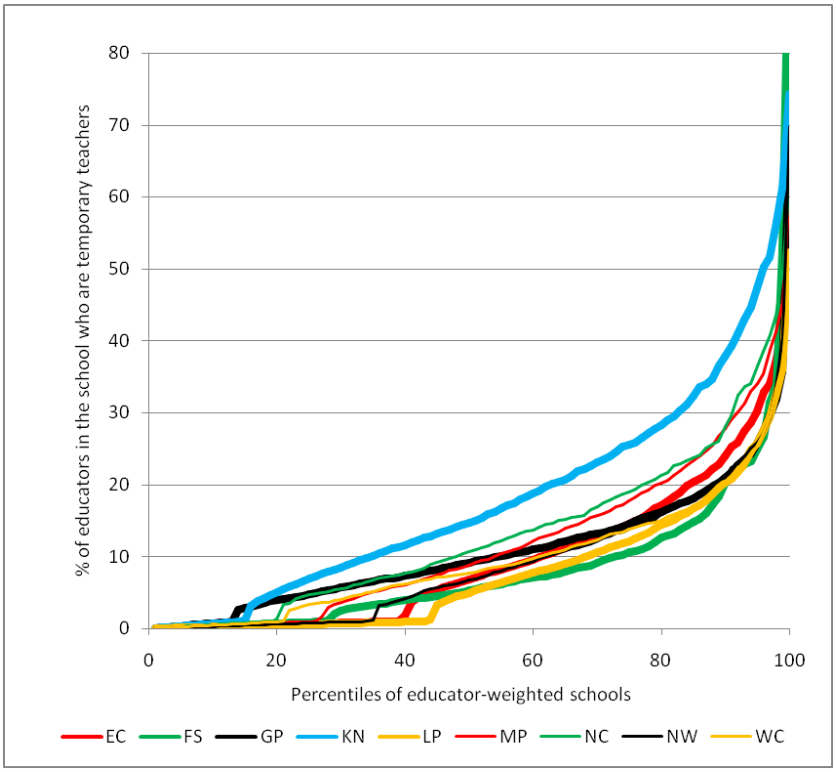
Table 8: Distribution of temporary educators across schools 2011

	Schools with temp. eds.	Schools without temp. eds.	% of schools with temp. eds.	Educator-weighted % of schools with temp. eds.	Avg. temp. eds. per school	% of temp. eds. without a link to a school
EC	2,619	3,060	46	61	2.3	1
FS	700	774	47	71	2.0	36
GP	1,744	466	79	87	3.4	1
KN	4,617	1,386	77	85	3.6	0
LP	1,710	2,293	43	56	2.3	21
MP	1,131	710	61	74	3.4	0
NC	415	207	67	80	2.7	0
NW	906	957	49	65	2.3	3
WC	1,002	550	65	79	2.3	4
SA	14,844	10,403	59	74	2.9	5

Note: Values in the last column refer only to those temporary educators who are classified as teachers (97% of temporary teachers have this classification).

The next graph indicates what percentage of the educators in each school are employed on a temporary basis. To take an example, in around 40% of educator-weighted schools in KN, over 20% of educators would be temporary.

Figure 12: Percentage of educators per school who are temporary 2011



The following table reflects an attempt to isolate those temporary educators in 2011 who might reflect the phenomenon of 'double parking' (the second of the five reasons mentioned above). The first four columns in the table are mutually exclusive, in other words no educator is counted in more than one column. The first column reflects educators who apparently chose to become temporary. These educators are unlikely to be 'double parked' educators. The second column reflects indicators who were not on the payroll in October 2010. Many of these would educators who were appointed in 2011 on a temporary basis to replace educators on extended leave or who had left the system. But some could be double parked educators appointed to deal with reallocations of posts in 2010 and 2011. The third column reflects educators who do not qualify for the first two columns and who were under-qualified in 2011. Some of these educators could be double parked. The fourth column reflects those who do not qualify for the previous three columns. This column can probably be regarded as the lower limit of the number of double parked temporary educators. But as discussed previously, double parked educators are also likely to constitute some of the educators in the second and third columns.

Table 9: Attempt to identify 'double parking' temporary educators in 2011

	Were permanent in 2009 or 2010	Were not on the system in 2010	Were under-qualified in 2011	Remainder	% of educators who are temporary
EC	167	672	1,343	3,941	9
FS	46	851	257	1,300	9
GP	413	3,073	205	3,248	10
KN	394	5,532	6,000	5,115	17
LP	28	1,248	89	3,830	9
MP	86	688	295	2,920	11
NC	29	332	213	560	12
NW	26	831	93	1,244	8
WC	144	914	368	1,634	9
SA	1,333	14,141	8,863	23,792	11

The 23,792 educators of the fourth column were distributed across 14,683 schools. This begs an important question. Would one not expect a much lower percentage of schools to have temporary teachers captured in the fourth column? One might expect up to half of schools to have temporary educators standing in for non-deployed teachers, in a situation where a half of the system owed the other half the system posts. The apparently very high prevalence of double parked temporary teachers suggests that a part of the solution may lie *within* schools that have *both* excess educators and temporary double parked temporary educators. Specifically, there may be scope for the movement of educators into another post in the same school following training that would prepare the educator for the new post.

Temporary teachers affect the educator wage bill in two very different ways, depending on why they were employed. (A third issue, the different costs of the benefits of temporary educators is dealt with below in section 3.6) If temporary teachers represent a response to an under-supply of qualified teachers, then having temporary teachers lowers the average unit cost of educators, because under-qualified educators are paid less. The first panel of Table 10 provides a rough idea of the additional cost involved if all teachers were qualified. Insofar as temporary teachers are employed due to difficulties in re-allocating excess teachers, the overall cost of providing teachers is increased through the 'double parking' phenomenon. The second panel in the table estimates the savings gained from removing this phenomenon. It is important to point out that the reliability of these estimates in the second panel is limited by difficulties around identifying the double parking phenomenon using just the payroll data. The matter is a vital one for planning the education system and warrants more dedicated analysis, using a variety of data sources.

Table 10: Cost implications of temporary teachers 2011

	Additional cost of paying temp. eds. what other teachers receive		Savings from removing all temp. eds. in fourth column of Table 9	
	Rm	% of spending	Rm	% of spending
EC	319	1.7	1,121	1.6
FS	110	1.6	412	0.5
GP	167	1.0	1,314	1.4
KN	851	3.4	2,802	4.2
LP	100	0.6	1,211	1.4
MP	108	1.2	821	1.5
NC	35	1.3	241	0.3
NW	55	0.8	453	0.4
WC	77	0.9	601	0.6
SA	1,821	1.6	8,976	1.9

There was a request for some analysis of permanent educators who become temporary. One may not expect educators to willingly forfeit their permanent status, but as shown in the next table, this is indeed a phenomenon in the system. It is more common in GP and WC. Interviewees speculated that this was because the educators concerned wanted greater control over their benefits and wanted the slightly higher level of benefits they could enjoy as temporary teachers.

Table 11: Permanent teachers who become temporary

	2009 to 2010	2010 to 2011	Total 2009 to 2011	% of all educators in 2011
EC	179	7	186	0.3
FS	39	18	57	0.2
GP	256	158	414	0.6
KN	183	219	402	0.4
LP	7	9	16	0.0
MP	64	14	78	0.2
NC	15	7	22	0.2
NW	15	7	22	0.1
WC	144	58	202	0.6
SA	902	497	1,399	0.3

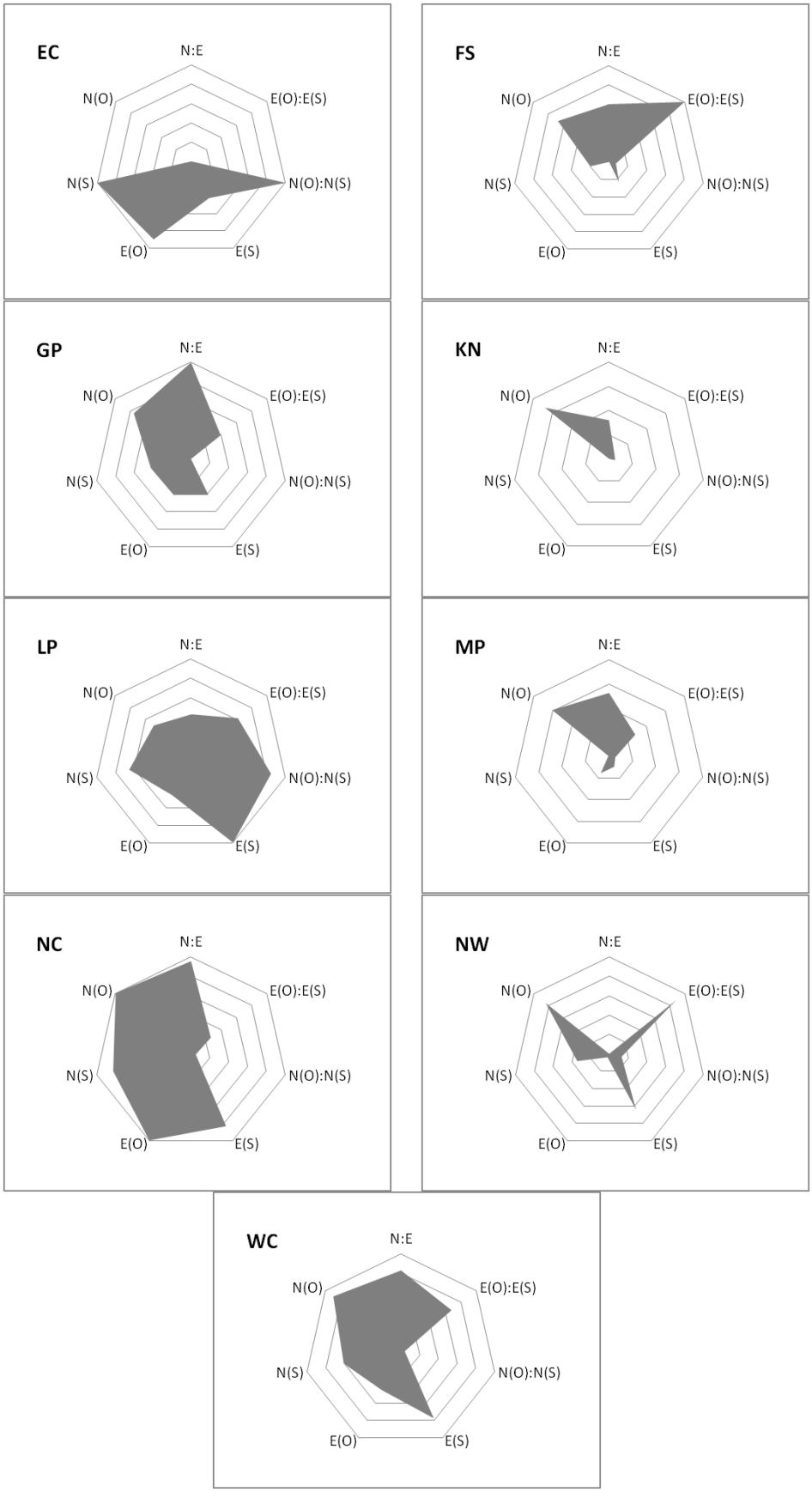
3.4 Overall balance of educator and non-educator costs and numbers

Whilst this report focuses on educators, the payroll data analysed includes data on non-educators. The number of non-educators, in particular non-educators in schools, relative to the number of educators, as well as the unit cost of non-educators, has a bearing on the budget available for teachers but also the effectiveness of schools. Figure 13 represents an attempt to illustrate key indicators from each province relating to the unit cost and numbers of educators and non-educators. Each of the seven indicators is calibrated in such a way that zero represents the lowest of the nine provincial values and one (corresponding to the outer line of the polygon) the highest of the nine values. The seven indicators are the following:

N:E	Ratio of non-educators to educators
E(O):E(S)	Ratio of office-based educators to schools-based educators
N(O):N(S)	Ratio of office-based non-educators to schools-based non-educators
E(S)	Unit cost of schools-based educators
E(O)	Unit cost of office-based educators
N(S)	Unit cost of schools-based non-educators
N(O)	Unit cost of office-based non-educators

Generally an increase with respect to any of the above seven indicators would be associated with a more costly education service. Thus, roughly speaking, the larger the grey polygon for a particular province in Figure 13, the more costly the education service of that province.

Figure 13: The shape of provincial personnel cost pressures 2011



A key matter on the policy agenda is the need to strengthen provincial and district capacity to support schools, partly through better staffing of provincial and district offices. The first column in the next table indicates that the cost of office-based staff (educators and non-educators) relative to total staff costs of offices plus schools varies greatly across provinces. This seems to confirm that the offices of certain provinces, in particular KN, are indeed under-staffed. However, the fact that relative spending on offices in a few other provinces exceeds the level found in GP and WC, provinces often considered to offer relatively good district services, suggests that the 'bloated bureaucracy' phenomenon could be a reality in these provinces, specifically EC and NC. The NC level may be justifiable due to the exceptional distances in that province. To provide some sense of the maneuverability of funds, but also funding shortfalls, the second and third columns in the table indicate the cost or savings implied by moving to the WC level of 10.5% of staffing costs going to office-based services[7]. The assumed intervention is to increase or decrease the magnitude of staffing in offices, without changing the level of staffing in schools.

Table 12: Cost of changing office-based versus schools-based balance

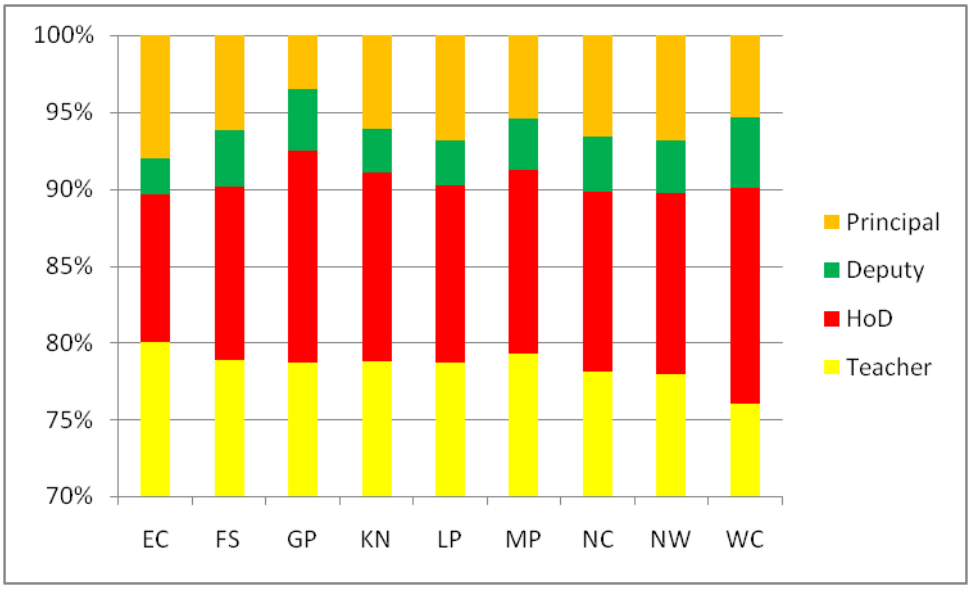
	Spending on office-based staff as a % of spending on school plus office	Additional annual spending (in Rm of 2011) to achieve WC level	Previous column as a % of total spending on educators
EC	11.7	-234	-1.3
FS	10.9	-27	-0.4
GP	10.8	-60	-0.3
KN	7.1	901	3.7
LP	8.5	333	2.2
MP	9.0	155	1.7
NC	12.5	-62	-2.3
NW	9.9	49	0.7
WC	10.5	0	0.0

3.5 Distribution of schools-based educators across rank

The following two graphs illustrate how different provinces distribute human and financial resources across the four key rank categories within schools. The first graph breaks down educators numbers whilst the second one breaks down 'notch cost' or payments towards the basic salary. Had total payments, including benefits, been used for Figure 15, the picture would have not have changed substantially. Here again, WC was considered to display a human resourcing pattern other provinces may wish to attain. If all provinces were to convert teachers to heads of department to the extent that they reduced the percentage of educators to the WC level in Figure 14, namely 76.0%, then additional annual costs as seen in Table 13 would be incurred.

[7] In determining the cost of office-based staff, the cost of educators and non-educators not in schools but in colleges or ABET centres was excluded.

Figure 14: Educators by type in schools 2011



The following graph illustrates the distribution of total spending on the basic salary (or the 'notch cost'). A similar picture emerges if instead of basic salary, one selects total payments, including benefits.

Figure 15: Educator cost by type in schools 2011

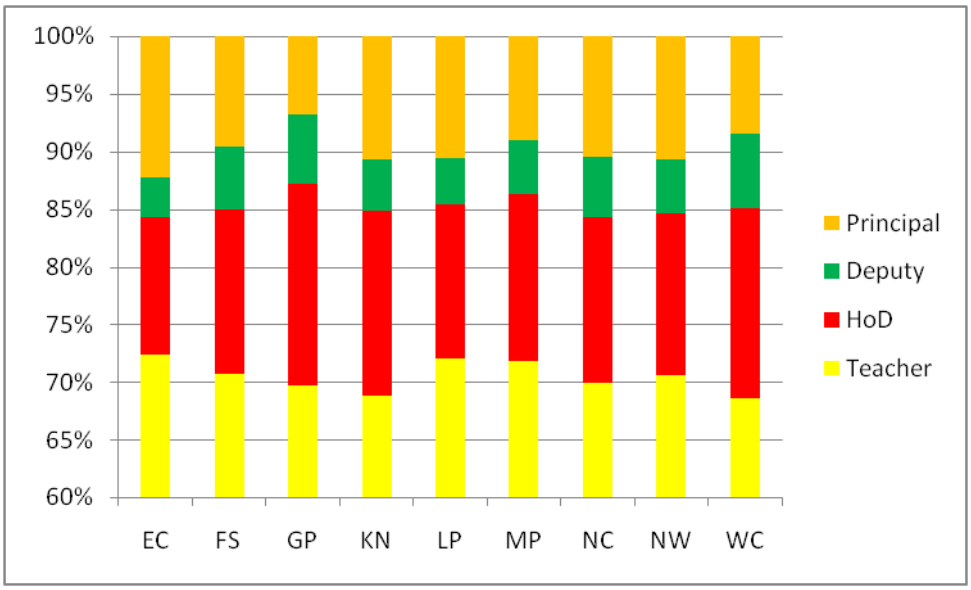


Table 13: Cost of increasing number of heads of department

	Conversions from teacher to head of department needed	Total annual cost of the conversion (in Rm of 2011)	Previous column as a % of total spending on educators
EC	2,675	214	1.3
FS	670	57	0.9
GP	1,630	139	0.9
KN	2,587	249	1.1
LP	1,454	84	0.6
MP	1,061	77	0.9
NC	182	17	0.7
NW	478	34	0.5
WC	0	0	0.0

3.6 The costs of educator benefits

The costs of educator benefits are sensitive to both policy changes and behavioural changes amongst educators. In particular as far as the medical insurance benefit and the housing benefit, what educators receive on a monthly basis is partly the outcomes of personal choices they have made. The following table provides details on the 45 largest payment categories in the 2011 dataset. Many of these are benefits of one kind or another. Table 21 in the appendix provides just the total 2011 amount for all 103 payment types. The rows not included in the next table come to just 0.1% of the overall total payment amount (see the final row 'Other'). The '% of basic' statistics are median statistics – the percentage for each recipient was calculated and the median for these percentages was then reported.

Table 14: Details on benefits 2011

Payments category	*% receiving*	*% temp. eds. receiving*	*% perm. eds. receiving*	*Avg. received*	*10th percentile received*	*90th percentile received*	*% of basic*	*% of all payments*
0001 -BASIC SALARY	95.4	99.6	94.8	16,498	11,077	22,595	100	72.3
9995 -PENSION EMPL CONTR	89.1	50.9	93.9	2,207	1,529	2,996	13	9.0
0005 -SERVICE BONUS	7.5	4.2	7.9	16,509	11,077	22,821	98	5.7
9994 -MEDICAL EMPL CONTR	64.1	14.0	70.4	1,547	987	2,320	10	4.6
0431 -37% SERVICE BENEFITS	5.6	44.1	0.7	4,768	2,276	6,108	39	1.2
0547 -HOUSING RENTAL	31.5	22.5	32.6	800	800	800	6	1.2
0002 -BASIC BACKDATED	16.6	6.7	17.9	1,128	404	934	9	0.9
0546 -HOUSING PAID UP	15.7	2.0	17.4	800	800	800	5	0.6
0543 -HOUSING MAXIMUM	13.5	0.1	15.2	800	800	800	4	0.5
0522 -INTERN/LEARNER 182	1.6	0.0	1.8	5,630	2,292	9,805	60	0.4
0204 -COMPENSATION ALLOW	0.9	0.5	0.9	9,334	2,000	24,208	132	0.4
0591 -REMOTENESS INCENTIVE	2.6	0.5	2.8	2,662	1,069	11,932	17	0.3
0043 -QUALIFICATION BON	0.4	0.1	0.4	15,683	15,202	16,235	96	0.3
0168 -LEAVE GRATUITY	0.1	0.0	0.1	82,794	16,058	166,641	323	0.3
0518 -EARLY CHILD DEV PRAC	1.5	0.0	1.7	3,331	3,000	3,630	59	0.2
0545 -HOUSING NEW OWNER	6.0	0.9	6.7	800	800	800	5	0.2
0471 -ACTING ALLOWANCE	0.7	0.1	0.8	5,113	1,068	11,617	30	0.2
0177 -PART-TIME CLASSES	0.5	0.4	0.6	6,291	2,245	11,466	38	0.2
0143 -PERIODICAL PAYMENTS	0.7	0.8	0.6	4,427	2,198	7,005	31	0.1
0470 -TRAV ALLOW:<8000 KM	0.7	0.4	0.8	3,919	346	10,088	17	0.1
0102 -BASIC SAL ARREARS	0.4	1.2	0.3	6,194	551	15,202	69	0.1
0356 -SHIFT ALL (RECURR)	0.4	0.0	0.4	6,110	3,640	10,317	22	0.1
0544 -HOUSING LESS MAX	2.4	0.0	2.7	800	800	800	4	0.1
0395 -CAPITAL REMUNERATION	0.6	0.0	0.7	2,570	1,958	3,219	10	0.1
0469 -TRAV ALLOW:>8000 KM	0.2	0.0	0.2	8,179	1,274	17,138	28	0.1
0181 -SUPERVISORS ALLOWANC	0.6	0.3	0.7	2,380	1,246	3,791	15	0.1
0428 -NP CASH (SMS/MMS)	0.6	0.0	0.7	2,406	436	5,010	7	0.1
0397 -FUEL ALLOWANCE	0.4	0.0	0.5	2,665	1,266	4,559	10	0.1
0562 -LEAVE ENCASHMENT 20	0.1	0.0	0.2	7,347	5,135	9,604	41	0.0
0174 -DIFFERENTIATED ALL	0.2	0.2	0.2	5,638	123	17,065	50	0.0
0267 -FUEL ALLOWANCE	0.1	0.0	0.1	7,214	1,645	13,833	26	0.0
0563 -LEAVE ENCASHMENT 30	0.1	0.0	0.1	12,503	7,476	17,742	63	0.0
0175 -SUPERVISOR ALL	0.3	0.1	0.3	3,150	1,246	4,484	16	0.0
0613 -37% SERVICE BENEFITS	0.1	0.4	0.0	11,404	482	34,442	84	0.0
0423 -MOTOR CAR (SMS/MMS)	0.3	0.0	0.3	3,017	1,000	5,212	9	0.0

Payments category	*% receiving*	*% temp. eds. receiving*	*% perm. eds. receiving*	*Avg. received*	*10th percentile received*	*90th percentile received*	*% of basic*	*% of all payments*
0006 -ADD SERVICE BONUS NT	3.3	0.6	3.7	237	127	269	2	0.0
0092 -LWP PAYMENT	0.2	0.0	0.2	3,783	493	7,660	21	0.0
0396 -MAINTENANCE ALL	0.6	0.0	0.7	936	717	1,085	4	0.0
9993 -EMPLOYER CONTR: ELRC	95.4	99.6	94.8	5	5	5	0	0.0
0288 -SERVICE BONUS PRO RA	0.1	0.0	0.1	6,942	1,374	15,838	35	0.0
0136 -HOUSING ALLOW ARRS	0.3	0.9	0.2	1,494	800	2,400	12	0.0
0552 -SSIP AND RMIP	0.1	0.1	0.1	4,471	1,500	8,250	27	0.0
0025 -HEAD OF HOSTEL ALLOW	0.1	0.0	0.1	3,423	1,759	4,904	15	0.0
0219 -SERVICE BON ADD TAX	1.4	0.4	1.5	274	125	272	2	0.0
0024 -HOUSEMOTHER/-FATHERA	0.1	0.1	0.2	2,484	1,584	3,780	13	0.0
0525 -LONG SERV AWARDS -30	0.1	0.0	0.1	4,183	3,710	4,365	22	0.0
0210 -S/BONUS ARR-ONCE TAX	0.0	0.2	0.0	7,011	1,019	13,801	63	0.0
0515 -S&T : PETROL ALLOW	0.0	0.0	0.0	8,541	3,641	14,827	31	0.0
0436 -S&T ALLOWANCE (N/T)	0.4	0.2	0.4	753	110	1,246	4	0.0
0302 -CLAIMS OFF KILOS PR	0.1	0.0	0.1	4,446	656	11,108	16	0.0
0424 -HOUSING (SMS/MMS)	0.2	0.0	0.2	1,416	374	3,309	4	0.0
Other	95.4	99.6	94.9	19	1	1	0	0.1

The approximately 5% of educators on the 2011 payroll download who do not receive a salary were discussed previously, in section 3.2.

One pattern in the above table that deserves mention is the fact that around half of temporary educators receive the pension and service bonus (thirteenth cheque), whilst around half receive a cash amount coming to 37% of the basic salary (see '37% SERVICE BENEFITS' row). With regard to the service bonus, the 4.2% figure in fact represents about a half of temporary educators as this payment is spread across the twelve months of the year, so full coverage would equal about 8.3% (1 divided by 12). The receipt of the actual pension and service bonus benefits, as opposed to the cash amount, is most prevalent in the provinces GP, KN and MP, all of which have over 80% of temporary educators receiving the actual benefits. As discussed below, actual benefits do not reach the theoretical 37% for most educators, because not everyone takes full advantage of the system, meaning that paying a cash amount equalling 37% of the basic salary would be the most costly option for a province to pursue.

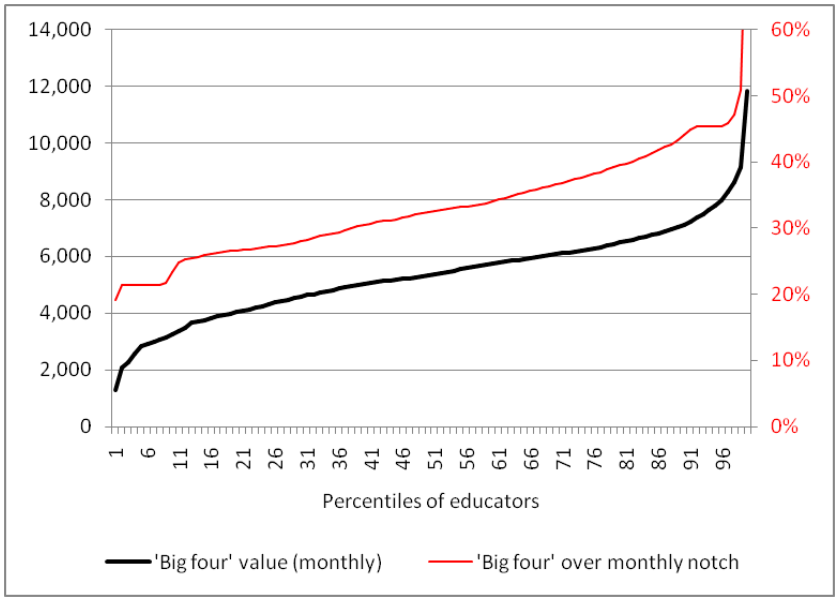
The medical insurance subsidy varies by amount, from R987 at the 10th percentile to R2,320 at the 90th percentile. If one examines this benefit as a percentage of basic salary, the variation is even larger, from 5% to 16% between the 10th and 90th percentiles. Regression analysis to investigate possible explanatory factors behind the amount of the medical subsidy and whether employees receive it at all was conducted. It was difficult to detect patterns that seemed informative from a policy perspective and the overall explanatory power of the models, as measured by R^2, was low.

The housing benefit is found in five Persal payment categories. In Table 14 these are the five rows where the mean, 10th percentile and 90th percentile are all R800. Overall 78% of educators receive the housing benefit. The statistics are 79% for permanently employed educators and 70% for temporary educators.

The remoteness incentive is seen as a strategically important one due to difficulties in attracting teachers to remote rural areas. The policy for this incentive, Government Notice 25 of 2007, has largely not been implemented due to budget constraints. Of the 10,999 educators who received this incentive in October 2011, 6,403 were from LP and 3,524 in KN. 90% of recipients are thus in these two provinces. The incentive is not used at all in four provinces: EC, MP, NC and WC.

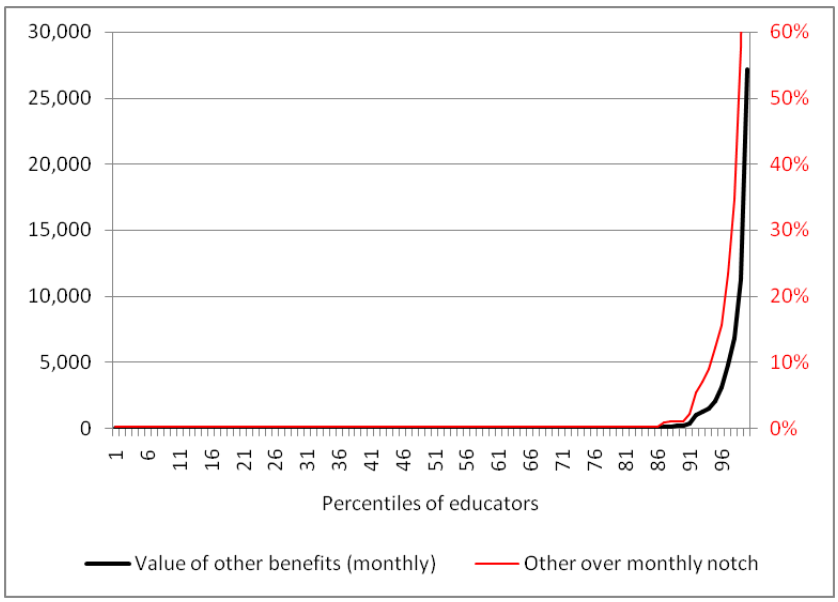
One often hears planners say that the four key benefits – pension, service bonus, medical and housing – come to 37% of the basic salary. In fact, for most educators the percentage is less than this, as seen in Figure 16, which covers just permanent educators. Three-quarters of these educators receive benefits (considering just the 'big four') which amount to less than 37% of the basic salary. For half of educators the statistic is less than 32%. The average statistic across all permanent educators is 33%. The gap between this 33% and the full 37% represents an expenditure risk insofar as it is possible for this gap to be narrowed if more educators take full advantage of the system. Such a shift would largely be beyond the control of the employer.

Figure 16: Distribution of 'big four' benefits 2011



A further risk is that employees will use the less monitored benefits, specifically those other than the 'big four', to improve their overall income. In the next graph, 'other' means all payment categories other than the 'big four', the 37% cash amount to temporary educators and the basic salary. Overall, this 'other' came to 3.6% of all payments in October 2011. For 85% of educators there is virtually a zero receipt of these 'other' benefits. Table 14 provides descriptions and amounts for the 'other' benefits covered in Figure 14. There is nothing that is strikingly irregular in the information presented here. However, 3.6% of all payments is not an insignificant amount and it is possible that deeper analysis of the data, combined with some interviews, for instance relating to the meaning of the various categories, would reveal areas of inefficiency or even irregularities.

Figure 17: Distribution of other benefits 2011



The following table examines, by province, medical and housing benefits, the two of the 'big four' benefits with a high degree of variability (though in the case of the housing benefit, not the amount but just the extent of uptake varies). The first two rows contain figures from Table 4. The '% of notch' row in Table 15 reflects the total annualised cost of medical insurance

subsidies divided by the notch cost (or basic salary) of all educators, whether they receive medical insurance or not. This is followed by the additional cost, in million Rand in 2011, of attaining the '% of notch' level of the highest paying province, namely NC. In the case of the housing subsidy, the additional cost of offering R800 per month to 86% of educators (as occurred in MP in 2011) is calculated.

Table 15: Provincial figures on medical and housing benefits

	EC	FS	GP	KN	LP	MP	NC	NW	WC
Educators	68,918	27,609	66,172	99,782	59,226	37,035	9,726	28,156	32,637
Average notch value	197,669	195,956	204,184	187,757	204,097	192,948	200,484	200,373	206,586
Medical insurance									
% receiving	79	75	70	74	64	68	79	77	76
% of notch	8.5	8.2	6.9	8.1	8.3	7.3	9.7	8.2	8.7
Annual cost of reaching max. (NC)	161	78	377	301	162	168	0	80	64
Housing subsidy									
% receiving	84	71	73	75	87	86	81	76	63
Annual cost of reaching max. (MP)	21	42	89	115	0	3	6	32	75
Total additional annual cost	182	120	466	416	162	170	6	112	139

3.7 Increases during the 2001 to 2011 period

Table 16 lists the upward adjustments in notch values that have been mandated between July 2006 and July 2011, and the increases expected thereafter up to July 2014. These would be represented by the 'cost of living increase' rows. Moreover, the major restructuring of the notches that occurred in January 2008 as part of the introduction of the OSD is listed. The 'notch progression' and OSD II rows would all refer to instructions to move some or all educators up to a higher notch. The historical adjustments are specified in various policy notices whilst the expected future adjustments are determined by Treasury to guide planning. The '% increase' column reflects the implied increase between one average notch value and the new one. For certain rows, in particular the two OSD rows, these percentages would be the outcome of complex calculations as different educators would experience different increases[8].

Table 16: Policy-driven increases 2006-2014

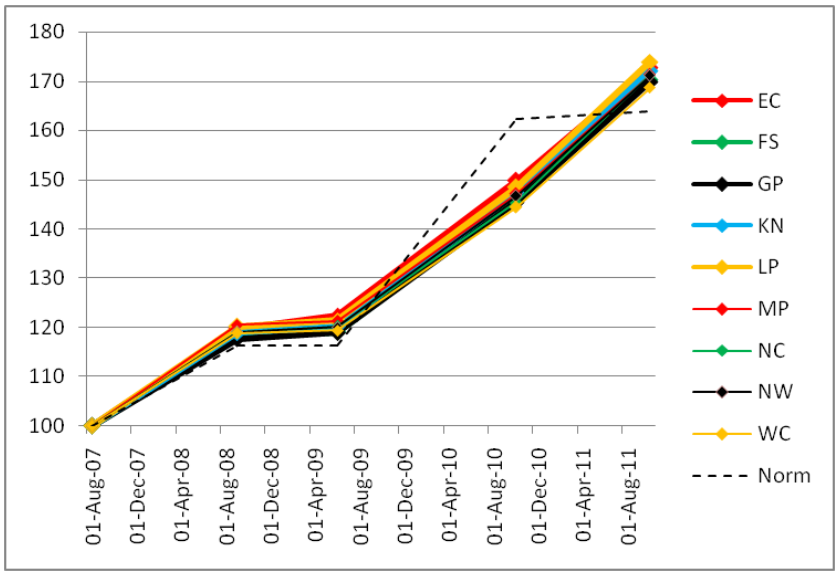
Month	Description	% increase
Jul 2006	Cost of living increase	5.3
Jul 2006	Notch progression	1.0
Jul 2007	Cost of living increase	7.5
Jul 2007	Notch progression	1.0
Jan 2008	'OSD I' adjustments	5.4
Jul 2008	Cost of living increase	10.5
Jul 2009	Cost of living increase	11.5
Jul 2009	'OSD II' adjustments	7.8
Jul 2010	Cost of living increase	7.5
Jul 2010	Notch progression	1.0
May 2011	Cost of living increase	6.8
Jul 2011	Notch progression	1.0
Apr 2012	Cost of living increase	4.0
Jul 2012	Notch progression	1.0
Apr 2013	Cost of living increase	4.5
Jul 2013	Notch progression	1.0
Apr 2014	Cost of living increase	4.0
Jul 2014	Notch progression	1.0

This section explores the alignment between the increases set by policy and seen in the previous table and actual increases reflected the payroll data. The following three graphs are based on 322,025 educators who could be linked across the three payroll downloads already referred to above plus two earlier downloads, for the months August 2007 and September 2008. Moreover, only educators who did not switch provinces were considered. The first graph converts provincial average notch values to a scale where values in August 2007 are equal to 100 in all provinces. The dotted line illustrates the policy norm, in other words the implementation of the increases seen in Table 16. The dotted line is plotted only for those months where a payroll download was available. In the last period, October 2011, the average across all provinces with respect to actual notch values was 4.4% above what one would expect, given the policy norm. However, in October 2010, the norm was *above* the actual notch averages. Part of the explanation for the misalignments would be that there is a delay in the implementation of adjustments. These delays would bring about retroactive pay, or back pay, but such payments are not reflected here. What is reflected here is just what the notch values of educators were according to the payroll data. What might explain the misalignments between actual notches and the policy norm in October 2011? This is not the result of delayed implementation of policy, because the actual values are *above* the policy norm. It is possible that misalignments in the sense of actual notch values that are higher than the policy norm

[8] Details relating to the calculations are available from the author.

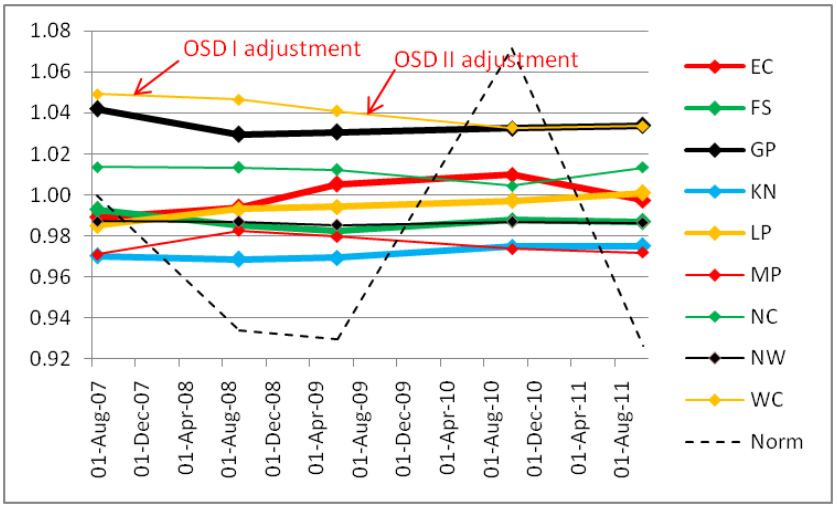
crept in already before October 2010 and only became fully manifested by October 2011. The analysis that follows throws some light on these matters.

Figure 18: 2007-2011 trend for notches of all educators



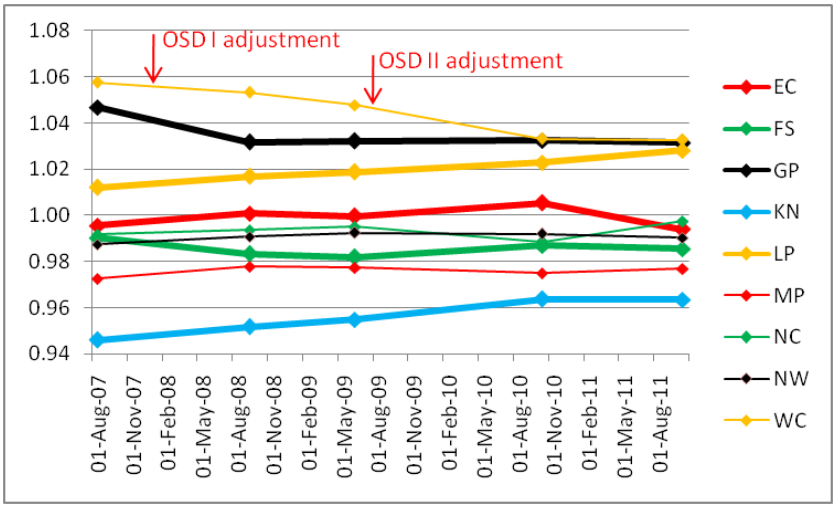
The next graph provides an alternative view of the data from the previous graph. The vertical axis reflects each province's value divided by the average across all nine provinces.

Figure 19: 2007-2011 trend for notches of all educators II



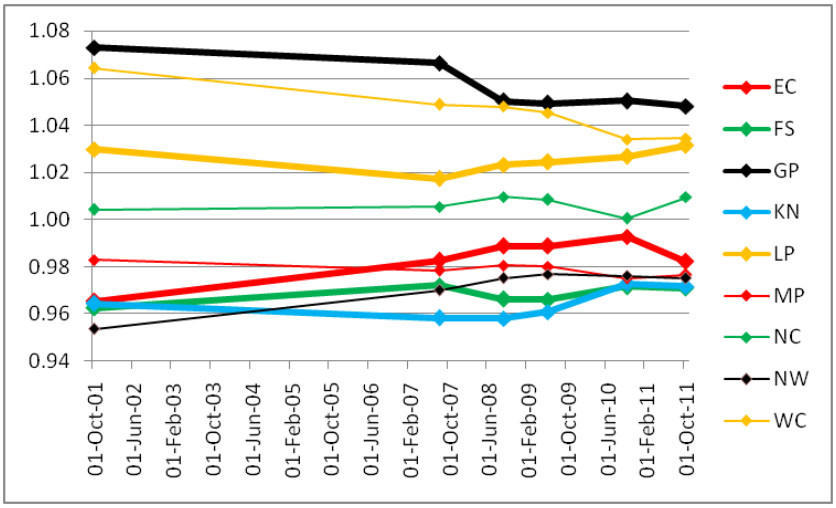
The following graph is like the previous graph but only teachers are considered (225,355 teachers could be joined across all downloads). There has been a general movement towards less inequality across the average provincial values. Curves have been converging. However, LP, which was already a relatively high-cost province in August 2007, has seen its relative position rise. By October 2011, LP, together with GP and WC, were at least three percentage points above other provinces.

Figure 20: 2007-2011 trend for notches of just teachers



A Persal download for October 2001 was found. This permitted a much longer range view of the notch trend. 157,277 teachers were linkable from 2001 through to 2011. Even as far back as 2001, LP was a relatively high-cost province with respect to the average notch value of teachers.

Figure 21: 2001-2011 trend for notches of just teachers



An earlier analysis[9], which focussed on comparing payroll downloads from August 2007 and September 2008, and viewing this against the expected increases, but with the analysis occurring at the level of the *individual* educator, produced the following table. Table 17 indicates that the gap between the expected and actual level of pay in September 2008 varied to a large degree by province. In theory, the values in the final column of Table 17 should all be zero. However, one might expect a small gap resulting from the fact that certain educators would be promoted, for instance from a teacher to a head of department position. In the analysis, all educators and not just teachers were analysed and promotions were not explicitly taken into account. Promotions could explain the GP gap of 1.2%. However, other explanations, for instance that irregular notch adjustments occurred, would be needed with respect to some of the other gaps. It is significant that LP, which already had a relatively high educator cost in August 2007 (see Figure 20), should have allowed such large increases to

[9] The document is titled 'A comparison of actual and expected educator pay notches in provinces' and is dated 9 February 2009. It was produced by the author of the current report.

occur during the August 2007 to September 2008 period. The gap representing unexplained increases in LP was the second-highest in the country, after MP.

Table 17: Expected and actual average notch values in September 2008

	Expected	*Actual*	*% above expected*
EC	142,514	146,425	2.7
FS	142,260	144,592	1.6
GP	150,634	152,415	1.2
KN	138,872	141,926	2.2
LP	142,557	146,739	2.9
MP	139,914	144,513	3.3
NC	144,589	147,430	2.0
NW	142,205	145,543	2.3
WC	150,984	153,934	2.0
Total	143,247	146,542	2.2

Interviewees indicated that LP could have experienced irregularly large notch increases because controls over the payroll system were devolved to a lower level than what was appropriate. In other words, it became too easy for educators to argue for adjustments and too easy for controllers to implement those adjustments. What should be kept in mind is that there is considerable room for manipulation due to the complexity of the rules that have accumulated over time, the fact that educators can argue for an upward adjustment due to some unfairness that occurred many years ago and possibly ambiguities around what academic qualifications entitle educators to what notch movements. Importantly, LP is being considered a notable example here. But it is unlikely to be the only province where upward notch adjustments were implemented irregularly or without sufficient controls.

In the next table, promotions do not play a role because only teachers are considered. For the entire June 2009 to October 2011 period, the average notch increase, viewed here in terms of actual number of notches, ranged from 8.6 in the case of WC to 11.0 in the case of LP (number of notches would be close to percentage increases, as each notch is approximately 1.0% greater than the previous notch). One would expect less variation across provinces given that the rules governing notches are national.

Table 18: Movements across the OSD notches for just teachers

	Jun 09 to Oct 10	Oct 10 to Oct 11	Jun 09 to Oct 11
EC	9.2	0.3	9.5
FS	9.0	1.4	10.4
GP	8.5	1.4	9.9
KN	9.6	1.4	10.9
LP	9.0	2.0	11.0
MP	8.4	1.7	10.1
NC	7.9	2.3	10.2
NW	8.6	1.3	9.9
WC	7.1	1.5	8.6
Overall	8.9	1.4	10.2

In the absence of retroactive adjustments, all values in the middle column in Table 18 would be 1.0. The only movement up the notch structure that should have occurred in the October 2010 to October 2011 period was the notch progression of July 2011, and here educators should move up one notch only, and only if they were deemed to have performed satisfactorily (which is reportedly what occurs for virtually all educators). The next table, which focuses only on LP, shows that over half of educators moved up by two or more notches in the period. To some extent this could be legitimate if not all notch promotions in

the previous June 2009 to October 2010 were fully implemented. There is a negative correlation between notch promotions received in the first period and notch promotions received in the second period, so the data do support, to some extent, the hypothesis of delayed notch movements. However, it is strange that such a large proportion of educators should experience delayed improvements. This would imply that the notch promotions occurring between June 2009 and October 2010 were very incorrectly implemented. What is also strange is that the data suggest that where adjustments were made, these were always upward adjustments. If there were major errors in the June 2009 to October 2010 period, one might expect errors working both in favour of and against individual teachers. It is possible that corrections were made only in response to queries from educators, and not as the result of a systematic analysis of all the notch movements that had occurred. Teachers are unlikely to bring overly generous upward adjustments to the notice of the employer.

Table 19: Notch movements of teachers in LP 2009 to 2011

10 to 11 → 09 to 10 ↓	-1 or less	0	1	2	3	4	5 or more	Total
-1 or less		13	10	5			8	36
0	10	97	132	88	2		37	366
1	5	49	76	23	2		17	172
2	1	5	11	4			7	28
3	1	27	135	624	6	1	102	896
4	2	179	731	3,530	32	6	448	4,928
5	2	278	1,064	557	2	1	174	2,078
6		51	205	313	16	3	50	638
7	1	102	579	2,202	67	11	123	3,085
8		271	1,353	3,541	75	21	91	5,352
9		427	1,678	3,477	66	9	10	5,667
10	1	391	2,101	2,124	135	5	19	4,776
11		244	1,028	1,837	96	2	9	3,216
12		168	740	1,570	30	3	9	2,520
13		105	502	1,018	8	1	5	1,639
14		45	241	401	3		1	691
15 or more	5	209	609	1,358	8	1	4	2,194
Total	28	2,661	11,195	22,672	548	64	1,114	38,282

The data were analysed to see whether inexplicable notch movements were concentrated in certain schools in the case of LP. This could point towards corrupt relationships between individual schools and the administration. However, patterns clearly suggesting this could not be found. As confimed by interviewees, there is a limit to what the data on its own can say about possible irregularities. The analysis provided in this section should form the basis for further investigative work involving examination of the personnel files of individual educators. Specifically, it would be good to extract from the data examples of individuals whose increases seem irregularly high and then to examine the physical personnel files of these individuals. Reasons for notch movements exceeding the policy norm should be stated within these files.

3.8 How do (mis)alignments influence incentives and costs?

The table on the following page sums up key conclusions from section 3 relating to the relationship between provincial alignment to policy (or implied norms), on the one hand, and budgetary cost, on the other.

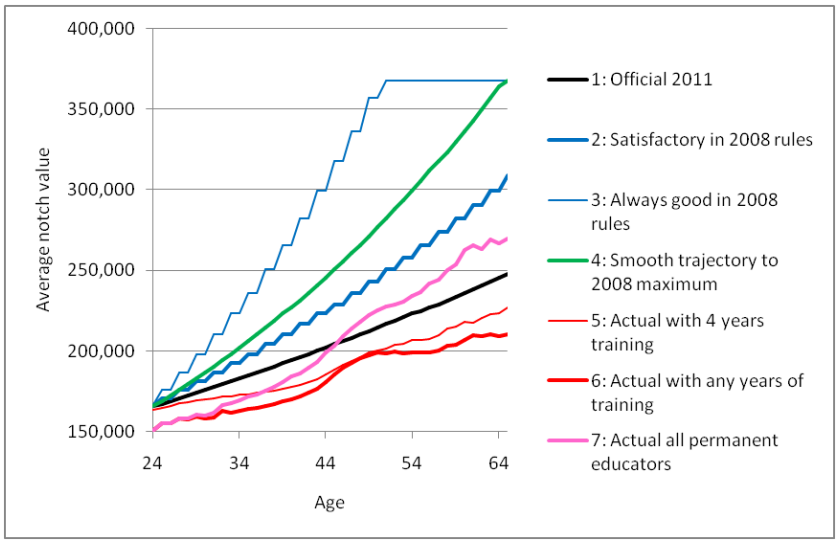
#	*Alignment issue*	*Cost implication*	*Policy and implementation advice*
1	Despite the fact that the salary policies are national, relatively large differences in the average basic salary of each province are seen, even after controlling for factors one would expect would explain these differences. A related problem is that increases in recent years that exceed what one would expect from the national policies, appear to exist across all provinces, though this is more pronounced in certain provinces such as LP.	In LP, having salaries for educators that are higher than what is found in other provinces implies an additional cost to the province of around 1.1%, or R180m annually during 2011. Other provinces with similar problems are WC, GP and EC. Moreover, actual average pay across the nine provinces in 2011 was on average around 4.4% higher than one would expect, given the national policies governing increases (and using 2007 as one's point of departure).	Though notch promotion is subject to a national system, it seems clear that this has not occurred uniformly across provinces. Moreover, the general trend across provinces would appear to be more generous than what national policy dictates. An immediate challenge would be to ensure that these anomalies are corrected. However, one could perhaps go further and argue that in provinces with serious budget pressures, slightly reduced notch promotion, through a differentiated application of the IQMS policy over a few years, would be justified in order to bring high-cost provinces, such as LP, in line with other provinces. This would violate the spirit of national policies, however, yet it could be justified that one would be employing one violation to correct another violation that had already been committed.
2	Temporary educators constitute around 11% of all educators, a level that is higher than what policy implies should be the case.	Because many temporary educators are under-qualified, having temporary educators reduces costs. Removing this phenomenon and replacing temporary educators with permanent educators would raise the salary bill by around 1.6%. The highest provincial figure is that of KN at 3.4%, corresponding to an annual amount of R851m in 2011. On the other hand, insofar as temporary educators represent the 'double parking' phenomenon, savings of around 1.9% could be realised if deployment of teachers were more effective and the need to employ 'double parked' teachers on a temporary basis were removed.	Better information on the impact on learning outcomes of under-qualified teachers should inform any decision-making. It is noteworthy and counter-intuitive that KN, though being the province with the highest proportion of under-qualified teachers by far, should also perform relatively well in standardised tests when considering the province's socio-economic position. A separate issue is the question of the redeployment of teachers and the problem of double parking. Here the rather basic analysis undertaken using the Persal data suggests that double parking is more widespread than what can easily be explained and that a part of the challenge relates to building the capacity of teachers to take on a variety of responsibilities within their school, in order to reduce across-school redeployment blockages. The fact that there should be so little analysis available of the important matter of the operations surrounding the post provisioning model should be worrying to policymakers.
3	Spending on office-based staff (educators and non-educators) relative to spending on schools-based staff varies greatly across	If WC, a province with a relatively high level of spending on office-based staff, with some presence of rural schools and with a reputation for relatively good	Provincial and national planners should monitor carefully the 'capture' of budget by office-based staff with a view to ensuring that South Africa does not fall victim to the

#	*Alignment issue*	*Cost implication*	*Policy and implementation advice*
	provinces. There are no national norms or benchmarks in this regard, though policy does emphasise the need for better staffed district offices.	district-level support is considered a benchmark, very different implications for other provinces emerge. KN would need to spend an additional R901m a year (3.7% of spending on educators). However, ECwould realise savings amounting to over 1.0% of the educator wage bill through reducing costs on office-based services.	widespread 'bloated bureaucracy' syndrome.
4	The presence of 'promotion posts' (such as head of department posts) varies across provinces and schools.	If the WC proportion of schools-based educators who are in 'promotion posts' were to be replicated across the country, the cost would be highest in the provinces EC (annual cost would rise by 1.3%) and KN (1.1% rise).	It seems likely that the proportion of 'promotion posts' will remain a provincial prerogative. Moreover, increasing the number of educators in promotion posts does not appear to be high on the unions' list of priorities. The figures referred to in this row thus represent a relatively small expenditure risk.
5	Two of the 'big four' benefits, namely medical insurance and the housing subsidy, have different cost implications in different provinces due to differences in uptake and (in the case of medical insurance) the amount received.	If current entitlements of educators were used more extensively, to the level of the provinces currently spending most per employee on medical insurance and the housing subsidy, the educator wage bill of several provinces would increase substantially, for instance by R466m in the case of GP, or 2.7% of the total educator wage bill.	It is probably unlikely that the patterns of uptake of the two benefits medical insurance and housing will change rapidly. Yet such changes are a risk that should be monitored closely.

4 Present and future age-wage curves

A key concern of the 2011 ELRC report[10] is that there have been confusing and contradictory signals to youths regarding what future wages they can expect if they become teachers. Uncertainty could dissuade people from joining the profession. As pointed out in Gustafsson and Patel (2009), if *expected* lifetime pay for new entrants into the profession is better than what is reflected in the current earnings of teachers, then it is especially important for government to communicate this, else youths are likely to make decisions based on what they see teachers actually earn, rather than what is implied by the pay scales. Gustafsson and Patel (2011) make this argument in a context where the 2008 'OSD I' rules had been passed and future earnings for teachers were in fact better than what teachers were actually earning. This can be seen in Figure 22 by comparing the curve '5: Actual with 4 years of training' to any of the curves 2, 3 or 4. The latter curves represent different prospects made possible by the 2008 rules. Clearly, these options represented future prospects that were considerably better than the current age-wage curve of teachers. An extremely serious problem has been caused by the 2009 rule changes which, essentially, brought about a flattening of the age-wage gradient as a price to pay for substantial above-inflation increases to the notch values. The rules introduced in 2009 imply the age-wage gradient illustrated by the '1: Official 2011' curve. This curve is slightly more favourable than the comparable curves reflecting the actual situation, namely curves 5 and 6. (Curve 7 has been included for illustration purposes, but is not strictly comparable to curve 1 because curve 7 includes the pay of educators at ranks above the rank of teacher.)

Figure 22: Age-wage curves for teachers as seen in 2011



Part of the problem arises because the employer has shown how very unstable policy on future pay can be, so even if the rules are changed to make future pay more favourable, prospective teachers might trust commitments less. Put differently, prospects may look good now, but the rules may change in a few years, making the decision to become a teacher less attractive. As argued in the ELRC report, the '1: Official' curve seems insufficiently steep to attract the teachers needed by the schooling system. A large part of the problem is that talented individuals who would prefer a pay system that rewards exceptional performance

[10] Education Labour Relations Council, 2011.

would not see such rewards in the system, apart from what could be obtained from a promotion to a position involving more management and less teaching.

How steep should the age-wage curve be for teachers? A household data analysis that accompanies this report indicates that in 2007 (in other words before the major OSD changes) the ratio of pay at 30 years of experience relative to pay at zero years of experience was around 1.5 for teachers, but around 1.8 for nurses and a few other roughly comparable occupations (30 years of experience was roughly the peak in the age-wage gradient)[11]. In that analysis, factors other than experience, such as years of education, were controlled for. In Figure 22, curves 5 and 6 reflect a ratio of around 1.3 and curve 7 a ratio of around 1.6. The household data and the payroll data agree broadly with each other, even though they refer to different years (the fact that in the household data analysis one has controlled for other factors is likely to make the resultant curve flatter, thus the difference between the 1.5 of that analysis and the ratio of 1.6 seen in curve 7 should not surprise us). Curve 2, which can be said to reflect the flattest possible curve implied by the 2008 OSD rules produces a ratio of around 1.6. The highest ratio possible for teachers who were not promoted to a higher rank in the 2008 rules was 1.9 (see curves 3 or 4). What these figures suggest is that there is a clear justification, at least judging from the 2007 figures, to steepen the age-wage gradient for teachers (nurses were in a more favourable situation). The optimal steepness is of course a complex matter that should be subject to debate and more analysis than is presented here, yet the figures referred to above suggest that for non-promoted teachers (in other words employees who remain largely in the classroom) the range 1.6 to 1.9 can be considered a reasonable range. How high the top end of the range goes should depend partly on the degree to which the system rewards good performance. Moreover, one should not think of the age-wage gradient only in terms of the salary scales as they currently stand, but also in terms of once-off bonuses that could conceivably become a part of the system (this is elaborated on in a subsequent section). Such once-off bonuses could be a larger proportion of the basic salary in the case of teachers with more years of service.

As argued in the following section, a return to something similar in terms of cost and intention to the 2008 rules would be sustainable in the long term, though in the medium term it would cause budgetary pressures. An optimal phased approach may be to return to the 2008 satisfactory pathway, so the implementation of curve 2 in the graph, as a minimum. This would involve a minimum of a three notch promotion every second year for all teachers displaying satisfactory performance according to relatively generous criteria. This is more or less what the ELRC report recommends, though that report recommends that the percentage change between notches be restructured so that a notch difference becomes 1.5%, instead of 1.0%. Teachers would then advance 1.5% every year as opposed to 3.0% every second year[12]. This report recommends, somewhat tentatively, retaining the existing notch structure, partly because the evidence suggests that when the salary structure changes fundamentally, this creates room for irregularities that result in greater than anticipated costs. It should be possible for around half of teachers to receive the three notch increase in one year, and for the other half to receive this the following year. One would need to randomly select half of teachers in an initial year. As far as new teachers are concerned, the implementation of the first notch increase could occur in the year following entry into the post. The approach described here would obviate the problem of up and down swings in the overall personnel budget, something Treasury has indicated would cause problems.

[11] See Paula Armstrong's analysis, specifically her Figure 4. The reason why that analysis did not use more recent data is that the Labour Force Survey of Statistics South Africa changed and has not included earnings questions for some years.

[12] What is not explained here to make the discussion easier is that due to compounding, three notches representing 1.0% increases each do not amount to exactly 3.0%, but 3.03%.

An alternative to the 2008 'accelerated progression' rules for 'good' and 'outstanding' teachers that should receive careful consideration, is the investment of equivalent funds into schools-based bonuses based on observed learner performance improvements over time, where these bonuses would be sensitive to the socio-economic status of learners (see the discussion is section 6 below).

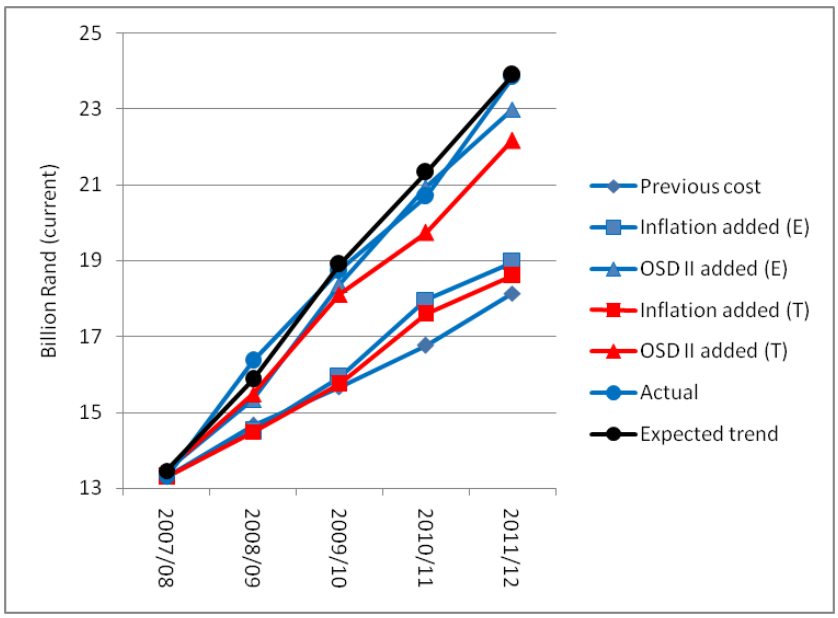
5 Future costs implied by current salary agreements

5.1 The debate around accurate personnel costing

There has been some controversy around what the personnel costs should currently be, given recent policy decisions, specifically the official increments reflected in Table 16. To gain some idea of the controversy, the costing work of one province, KN, was analysed and the matter was discussed with one National Treasury official. Both these sources were said to be important indicators of the current debates.

The next table reflects the KN education view as reflected in a spreadsheet tool produced within the provincial department.

Figure 23: KN reflection of educator cost trend



The costing tool essentially traces the costs that would have occurred if original policy rules had applied, where this means salary increments for educators with OSD I and with notch progression, but without OSD II and with lower cost of living adjustments than what was eventually applied. As seen in Figure 23, the education department's (E) own projections indicated that with actual policy rules, spending would be 23.0 Rbn in 2011/12 (OSD II added (E)), against an original projection of R18.1bn in that year (Previous cost). The actual spending by the province, according to the tool, was R23.8bn in 2011/12. The difference of R0.8bn could be due to problems in interpreting the tool, but in the overall picture it is not a very large difference. Importantly, a calculation independent of the tool, using the increments reflected in Table 16, results in a cost at the end of the period of R23.9bn (Expected trend). This suggests that at least roughly, the provincial costing reflected in the tool is correct. The red curves in the graph reflect the education department's view of what the provincial treasury had committed to spending on educators. According to the tool, Treasury's estimate of what educators should cost in 2011/12, of R22.2bn, is around R1.9bn short of what the actual

policy-induced cost is (according to the independent assessment of cost and the provincial education reflection of actual cost). To conclude, the picture is one of accurate costing by the provincial education department and a clearly incorrect under-estimate of cost by the provincial treasury. Importantly, the tool breaks this under-estimate up according to the two factors cost of living (or inflation) and OSD II. A large portion of the under-estimate, about 40% of it, relates to inflation and not OSD II. Whilst one might expect controversy around the costing of OSD II, it seems strange that there should be controversy in relation to something as straightforward as inflation. The overall conclusion one can draw is that there is a need for better costing tools, not just in the sense of standard spreadsheet tools, but also analytical reports where the differences of interpretation are explained.

The analysis of the KN tool, and previous analyses of similar tools, raise some questions around how costing is structured. Two issues stand out. On the one hand, there is a tendency to calculate the sum of current spending over several years, in particular over the three years of an MTEF. So for instance, in a summary the total spending on educator salaries over three consecutive years will be provided. Such totals could be meaningful with respect to capital costs. One would want to know how much capital investment there had been over three years. However, these totals in the case of current spending do not seem to add any value to the analysis or debates. The second issue is that a salary adjustment in one year will often be expressed as a 'carry-through' amount in future years. So, for instance, the fact that the salary inflation was 7.5% and not 6.0% in 2007, is expressed in terms of a carry-through amount in all future years in the calculation. When all the accumulated carry-through amounts are presented, the result is rather complex. It is not clear how this complexity helps the costing process, relative to an approach where increases in the average unit cost from one year to the next are expressed in a more holistic manner.

5.2 Personnel cost pressures in the 2012/13 MTEF

Below, a basic picture of the sufficiency of provincial education personnel budgets in the medium term is provided. Specifically, personnel budgets published in 2012 as part of the 2012/13 MTEF (which stretches to 2014/15) are compared to educator personnel costs derived from the October 2010 and October 2011 Persal downloads used for this report, as well as annual commitments made to teachers in the 2012 to 2014 years.

It should be emphasised that the analysis presented here is a basic one. Several complexities which should ideally taken into account are not, mainly due to data limitations (both in the sense of datasets, but also in the sense of information around salary strategies from planners in individual provinces). The key complexities, and suggestions on how to deal with them, are as follows:

- **Month-by-month historical data are ideally required.** Employee numbers vary by month. As suggested by Table 1, numbers from one year to the next can vary by as much as 5%. Calculation of future numbers of employees should ideally occur by month to cater for situations where, for instance, temporary teachers are hired near the beginning of the year to deal with enrolment movements between schools. However, not all future fluctuations can be predicted, partly because fluctuations depend partly on factors beyond the control of the employers such as the supply of teachers in the labour market and when teachers decide to resign. For this reason, it would be ideal to have month-by-month values per province for (1) the number of educators employed and (2) the average unit cost. This, however, would require having the kinds of Persal downloads analysed for this report available on a monthly basis. This is possible and arguably important. Currently, the DBE obtains monthly Persal downloads that include notch values but not actual payments. The latter would include payments of benefits. The ideal would be for the DBE to obtain the payments data on a monthly basis and to produce, on a monthly basis,

updates of the two values mentioned above per province. This would greatly facilitate the DBE's monitoring of personnel trends and make it easier to predict future costs.

- **Province-specific hiring and promotion plans are needed.** Each province will to some extent have its own province-specific plans around hiring of new teachers and promotion into higher ranks. This information is needed if accurate cost projections are to be made.

- **Cost projections must take into account that notch increases occur within the financial year.** As shown in Table 16, increases in the notch values can occur in different months within the financial year. This means that projections of cost must take into account month-specific adjustments to the unit cost. Moreover, notch increases affect the cost of the pension and service bonus benefits proportionally, but do not affect the values of other benefits, such as the medical and housing benefits, which change through separate decision-making processes.

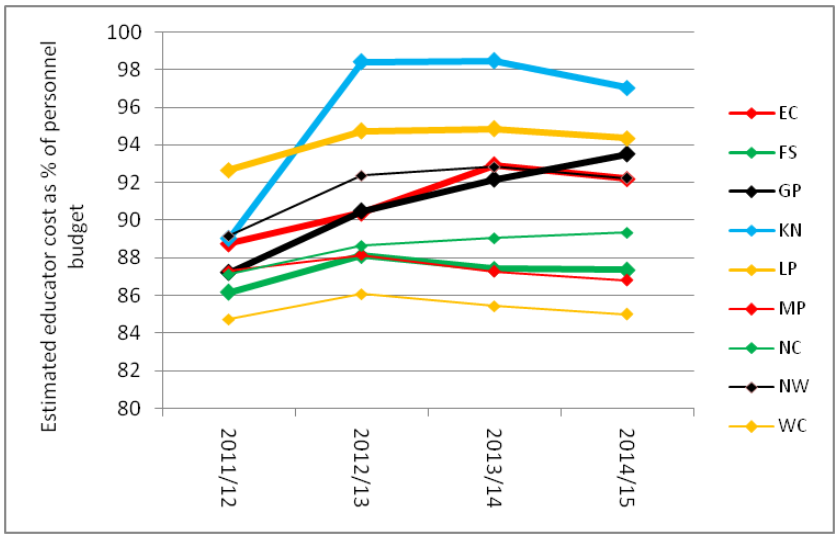
The analysis presented below takes into account only the third of the three complexities listed above. With respect to the first one, a constant number of educators is assumed, where this is the number of educators employed in October 2011, according to Persal. This number by province was reflected in the first column of Table 4 above. With respect to the third complexity, the adjustments for May 2011 to July 2014 reflected in Table 16 were applied to the average payments applying in October 2011 (see Table 4). Thereafter monthly values were combined to produce financial year unit costs and this was multiplied by the number of educators.

Table 20: Educator costs and personnel budgets in 2012/13 MTEF

	2011/12	2012/13	2013/14	2014/15
Personnel budget in 2012/13 MTEF (Rm)				
EC	18,141	19,284	20,354	21,379
FS	6,549	7,098	7,492	7,869
GP	16,856	18,184	19,192	20,159
KN	23,899	25,906	27,343	28,721
LP	16,109	17,442	18,409	19,337
MP	9,005	9,680	10,217	10,732
NC	2,626	2,835	2,992	3,143
NW	7,125	7,711	8,139	8,549
WC	8,586	9,240	9,752	10,243
Total	108,897	117,380	123,888	130,132
Estimated cost of just educators (Rm)				
EC	20,441	21,337	21,905	23,185
FS	7,602	8,054	8,570	9,009
GP	19,329	20,099	20,823	21,556
KN	26,849	26,325	27,765	29,599
LP	17,383	18,409	19,407	20,491
MP	10,313	10,980	11,706	12,365
NC	3,014	3,198	3,360	3,517
NW	7,989	8,349	8,766	9,270
WC	10,131	10,734	11,412	12,050
Total	123,051	127,486	133,715	141,042
Estimated cost over budget percentage				
EC	89	90	93	92
FS	86	88	87	87
GP	87	90	92	94
KN	89	98	98	97
LP	93	95	95	94
MP	87	88	87	87
NC	87	89	89	89
NW	89	92	93	92
WC	85	86	85	85
Total	88	92	93	92

The percentages from the bottom panel of the previous table are illustrated in the next graph.

Figure 24: Educator cost over personnel budget in 2012/13 MTEF



What the previous table and graph suggest is that relative to 2011/12, in the years 2012/13 to 2014/15 provinces will experience serious budget pressures. Specifically, at a national level educator cost as a percentage of the personnel budget increases from 88% in 2011/12 to around 92% in the following three years. Within the last three years, however, the situation is relatively constant, so budget pressures are equally bad across the three years. One notable exception is GP, which sees its percentage in Figure 24 increase from 90% to 94% between 2012/13 and 2014/15. What is also notable is the very steep increase the percentage in KN from 2011/12 to 2012/13, from 89% to 98%. This is a virtually impossible situation implying huge layoffs with respect to educators or non-educators. As explained earlier, educator numbers have been held constant, so the differences in the provincial patterns seen in Figure 24 are due to differences in the trends in expenditure and budget figures appearing in the provincial budget documents. Very importantly, the 2012/13 provincial budget documents have not been published online in the case of a few provinces, specifically KN and GP. In fact the Gauteng Provincial Treasury has not published its provincial budget documents online either during 2011 or 2012. The budget figures appearing in Table 20 were obtained off a DBE database into which figures from the provincial budget documents are captured. There seems to be no reason to believe that the budget figures themselves are incorrect. However, the absence of widely available budget documents for some provinces, which should explain why the expenditure and budget patterns are what they are, suggests there are general management problems in the budgeting process, problems which could also lie behind the patterns seen in Figure 24. It seems unlikely that large layoffs of employees are being planned. Instead, it appears as if budgets are put together without sufficient consideration of their implications for service delivery and that the system, in a sense, is gearing itself for crisis management where as a last resort the treasuries rescue education departments.

5.3 A basic long-range costing model

Below, a long-range costing model that was developed in conjunction with this report is described. Moreover, a few key scenarios generated by that model are discussed.

There is a need for better long-range modelling of teacher issues in South Africa. A key reason for this is that teacher planning depends on a variety of demographic, economic and educational variables in a complex way, meaning that some degree of formal modelling is required if the interaction of the variables is to properly understood. Moreover, teacher planning is particularly susceptible to the 'butterfly effect' whereby decisions taken now may

have important and unforeseen effects two or more decades into the future. The only way to understand these effects is to employ long-range modelling. The model described below should not be considered a finished product, but rather as a step towards better modelling of teacher dynamics in South Africa. The model presented here aims, above all, to provide informative future costs. It is not a full teacher supply and demand model and excludes important elements such as a breakdown between primary and secondary schooling, subject specialisation details at the secondary level, determinants of teacher supply, and an analysis of the relationship between learner/educator ratios and class size. Crouch (2001) provides what is perhaps the most comprehensive set of specifications available for a South African teacher supply and demand model.

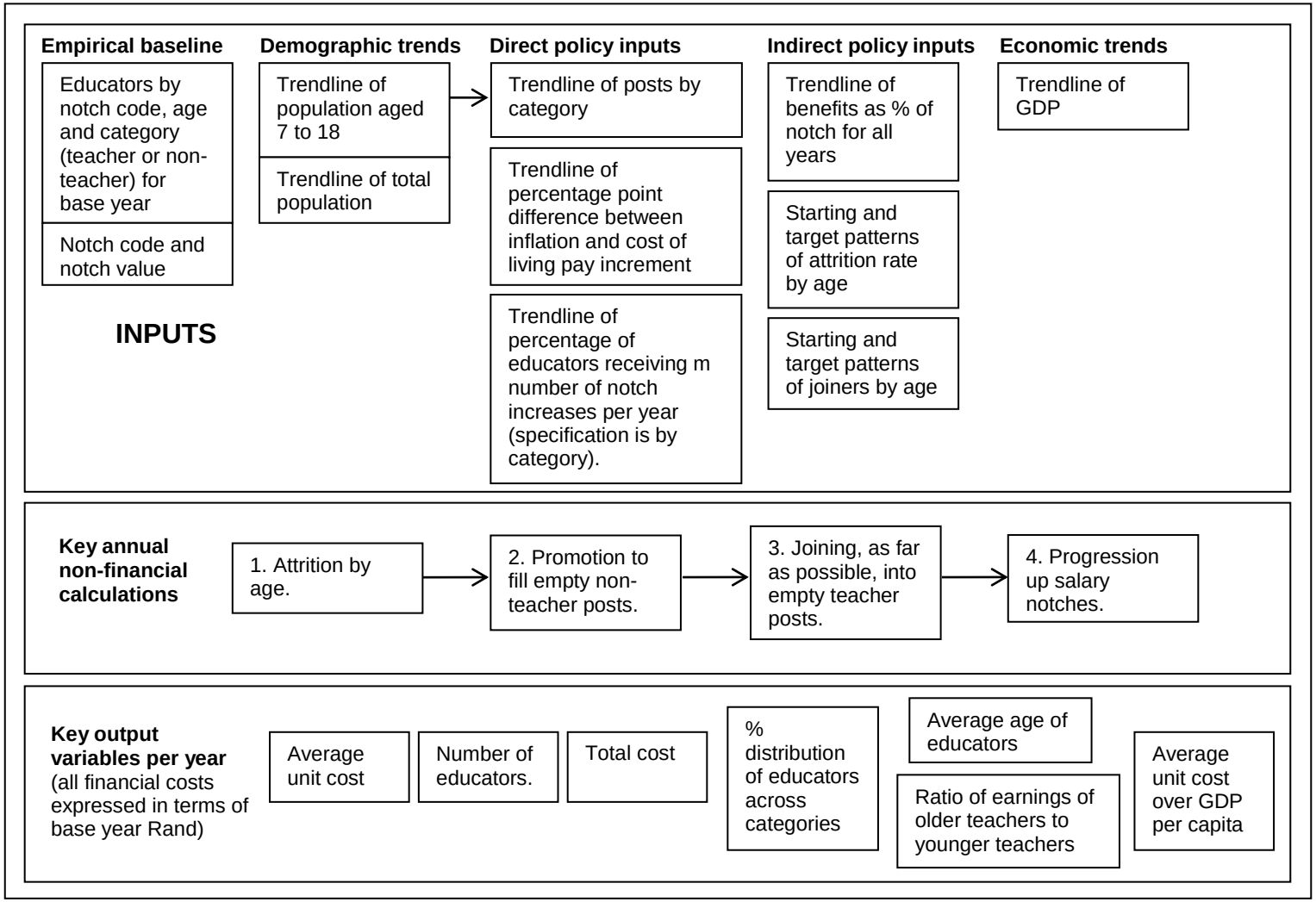
The model is implemented in an Excel file named *Costing tool 2012 06 01 (accelerated SA).xls*. This file contains a scenario for the country which assumes 'accelerated' progression up salary notches more or less of the kind envisaged in the 2008 OSD agreements.

The introductory text within the Excel file reads as follows:

> In a nutshell, the tool uses as its main base year data input a breakdown of educators by notch, age, and category (teacher or manager). It also uses basic demographic projections, expected values for key economic indicators plus various inputs influenced by education policy. The outputs of the model are principally future projections, over the next fifty years, of the average unit cost of educators, the number of educators, total cost, average educator age, and two key ratios, namely average educator pay relative to GDP per capita and the annual real increase in the average pay of educators. The tool can be used for either provincial or national scenarios. However, it is not designed to replicate nine provincial scenarios simultaneously.
>
> The 'KwaZulu-Natal accelerated progression scenario' of 24 May 2012 serves as an example scenario demonstrating the format of the input data.

The elements of the model are illustrated in the following diagram.

Figure 25: Long-range costing model



The Excel file should be consulted for details on how the model is structured. Key matters requiring some explanation are dealt with here. In particular, the focus is on limitations of the existing model and suggestions for future enhancements.

- **The use of one empirical baseline.** The model uses personnel details from just one point in time as its point of departure. A possible improvement would be to have baseline data for a few consecutive years, partly so that it becomes possible to check what the model projects during the initial years to what actually occurred. This could provide greater certainty around the correctness of the projection methodology.

- **Educator dimensions.** An important feature of the existing model is that in each year a three-dimensional 'table' (or cube) with educator counts is populated, where the dimensions are age (21 to 65), category (teacher or non-teacher) and notch (there are 221 notches). There are thus 19,890 cells within each year's 'table'. The model does not deal with individuals. Possible enhancements would be to add the dimensions school level (primary or secondary) and gender.

- **Categorisation of educators.** The model categories educators into just two categories, teachers and non-teachers. Breaking the non-teacher category up into school management educators and office-based educators would add more complexity to the model, in particular as far as promotions between one sub-category and another are concerned, but this cost may be worthwhile in terms of the additional outputs of the model that would be obtained.

- **Modelling of benefits.** The existing model takes a simple approach to benefits by simply viewing benefits as a percentage of the basic salary, where this percentage can change over time. It seems worthwhile to explore a more comprehensive approach that would model the different benefits separately.

- **Modelling of joiners.** The current model simply requires a total number of joiners per year and their distribution across age. The distribution across age can change with time. What the model does not do is require inputs relating to the pre-service training process, which is sensitive to variables such as the number of learners graduating successfully from Grade 12, the degree to which youths chose to become teachers, programmes in which trainees enrol, the drop-out rate of teacher training institutions, and student repetition within these institutions.

- **GDP growth and CPI.** The current model assumes that gross domestic product (GDP) and consumer products follow the same price inflation, when in fact the GDP deflator and the consumer price index (CPI) differ to some extent. Had these differences been taken into account, the ratio of teacher pay to GDP per capita would have differed somewhat in the model outputs.

- **Attrition assumptions.** The model randomly selects educators for annual attrition according to an age-specific attrition rate, where this may change over time. What is not done is to differentiate between the different attrition patterns of teachers and non-teachers or by gender (gender is not considered in the model at all).

- **Promotion into non-teacher posts.** This occurs in two stages. Firstly, posts vacated due to attrition are, as far as possible, filled by remaining non-teachers who were at a lower salary notch previously. Of course the non-teachers who are promoted themselves leave a vacancy which must, if possible, be filled by another non-teacher. This creates another vacancy, and so on. The first stage continues until it is not possible to effect any more promotions because no non-teacher exists at a lower notch. This is when the second stage begins. In this stage, teachers are promoted into vacant non-teacher posts. However, there

is a constraint that may be imposed by the user of the model. The user can diminish the number of non-teacher (or teacher) posts. If this occurs, the number of teachers promoted into non-teacher posts will be adjusted accordingly. Promotion into non-teacher posts occurs in a such a way that older and better paid teachers tend to be selected for promotion, though there is a user-determined factor which allows for a greater variety of teachers (in terms of age and notch) to be promoted. Promotions are the most complex part of the existing model and arguably the part most open to debate. A key enhancement would be the development of a promotions component in the model that is more informed by actual promotions dynamics as observed in historical data.

- **Joining into empty teacher posts.** The current model assumes that all joiners do so ideally, in other words through movement into the starting salary for qualified new teachers. The model does thus not consider the possibility of under-qualified people entering teaching posts at a lower notch (something which in fact occurs, in particular in KN).

- **Progression up salary notches.** In each year, educators move up salary notches according to the user's inputs, which include the percentage of educators moving up *x* number of notches, by category (teachers and non-teachers). What is not done is to consider what notch progressions individual teachers experienced in earlier years (the model does not deal with individuals) or that progression up notches could differ by age.

5.4 Key long-range scenarios and their policy implications

The following graph illustrates outputs from the long-range costing model when the following assumptions were applied to the country: The October 2011 Persal data were considered an appropriate reflection of the situation in 2011. The entry notch for new teachers was assumed to be R165,609, in other words the level implied by the 2008 OSD agreement. The number of teacher and non-teacher posts was assumed to remain constant for the next 50 years – given demographic trends, this would permit a reduction in the ratio of the population of school-going age to teachers from around 41 to around 32. Annual cost of living adjustments were assumed to equal inflation exactly. Every year, 25% of educators would advance one notch, 17% would advance two notches and 8% would advance three notches. This would be the equivalent of the 'accelerated progression' scenarios being considered in 2008 (that scenario assumed progression every second year, and for this reason the percentages of educators were halved as the model only works for progression every single year). Average benefits as a percentage of basic salary was assumed to remain 32% in all years (this was the actual value in the October 2011 data). The number of newly qualified teachers available to join the profession was assumed to increase linearly from 29,000 to 56,000 in the 2011 to 2060 period (actual absorption into the system would however depend on the number of available posts). The age-specific attrition rates were assumed to remain unchanged for all years whilst the distribution by age of joiners was expected to move from the actual 2011 distribution to a distribution where all joiners would be distributed in the age range 23 to 29 years. GDP growth for the country was expected to be 3.1% per year.

The assumptions described above would be those set within the file *Costing tool 2012 06 01 (accelerated SA).xls.*

Figure 26 indicates that the unit cost and total cost trends would follow two humps. Initially, the relatively generous progression up the notches would result in considerable real increases. In the second year the increase in total cost (in real terms) would be 2.0%, but this would decline gradually, reaching 0.6% in the tenth year. Why would cost increases become smaller? The explanation relates largely to the average age of educators. This is a crucial matter when considering future teacher costs. As indicated in Figure 27, the average age of educators in the start year is high, at 45 years. This average age is higher than what one would

expect if the teaching profession were in a state of equilibrium, with a number of younger teachers replacing an equal number of older teachers every year. The disequilibrium exists in South Africa because there has been a shortage of young, newly graduated teachers, a shortage which has fortunately been filled by the entrance of older teachers and to some extent young under-qualified teachers (in KN this factor has been particularly large). The higher the average age, the higher one would expect the average unit cost to be as older teachers are paid more due to accumulated notch increases. The fall in the average unit cost starting 18 years after the start year would to a large degree be a result of the fact that the average age was declining. Essentially, South Africa is approaching a point where large numbers of older teachers will retire. The teachers that move in to replace these older teachers will be younger and this will result in a fall in the average unit cost. This explains the first (left-hand) hump in Figure 26. The second hump would come about as the average age stabilises and educators who entered on low historical starting salaries (for instance in the case of teachers with three years of professional training) become scarcer and eventually disappear out of the system. Figure 27 indicates that the scenario in question, despite being generous relative to the progression rules currently prevailing, results in a steady downward trend in average educator pay relative to GDP per capita. This downward trend is normal. As a country develops and its average GDP per capita improves, teachers become less and less of a professional elite as other professions expand. The 2060 average of 1.3 in the ratio by 2060 is in fact too low if one considers that developed countries reach a ratio of around 1.7 on average (Mingat and Tan, 2003). What this suggests is that the scenario sketched here is not so generous that it would lock the country into an unsustainable commitment towards teachers. In fact, the scenario is a relatively modest one, at least from a long-range perspective.

Figure 26: Unit costs to 2060 assuming generous notch progression

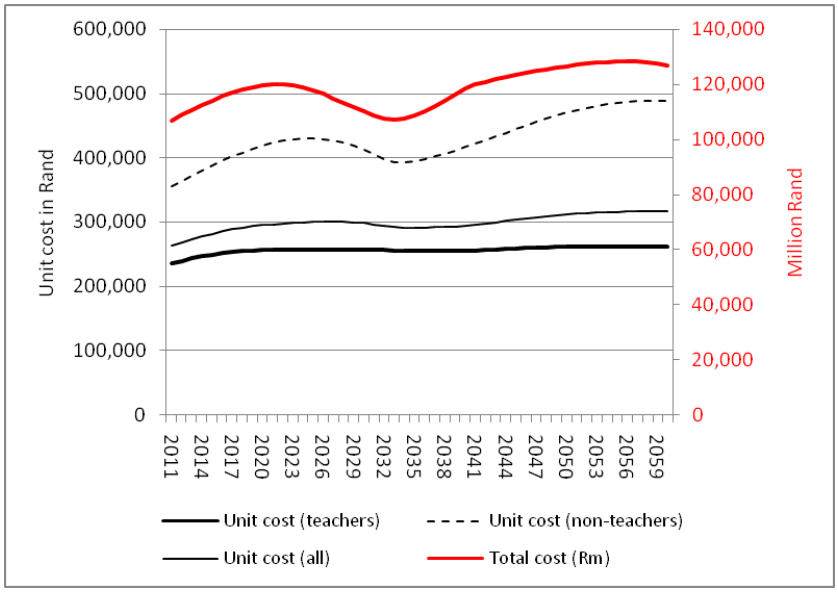
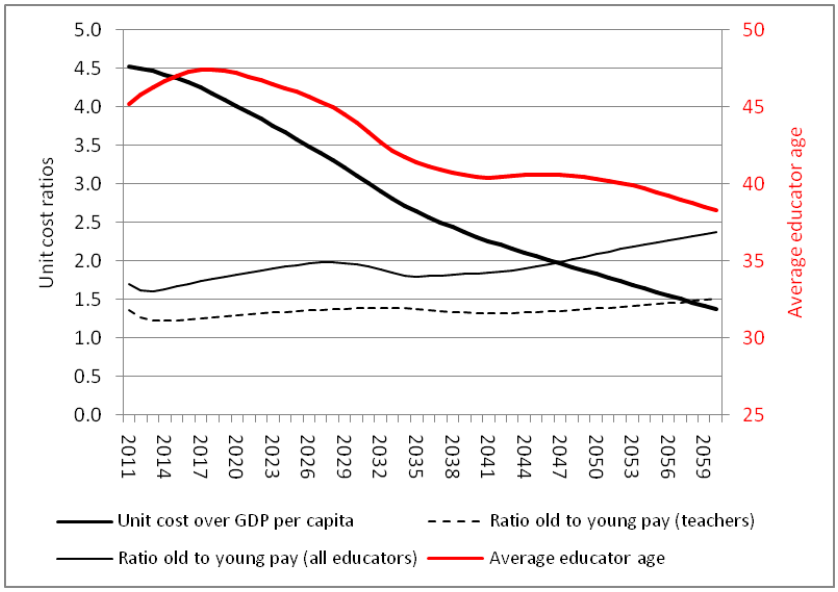
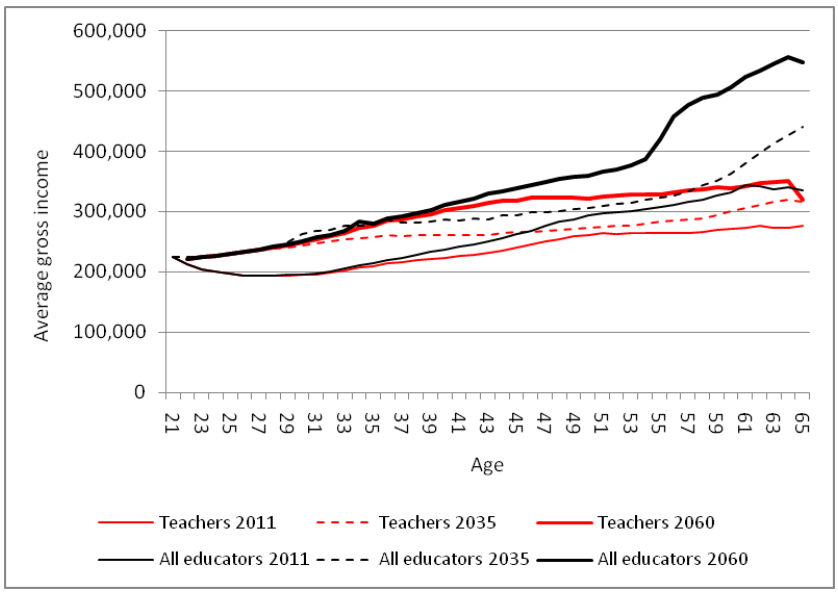


Figure 27: Age and ratio of pay to GDP per capita (corresponds to previous graph)



The next graph illustrates the age-wage gradients that would result from the scenario described above. The ratio of the pay of older to younger employees (this is indicated as one of the outputs in the tool) would move, over the 50 years, from 1.4 to 1.5 for teachers and 1.7 to 2.4 for all educators (teachers plus non-teachers).

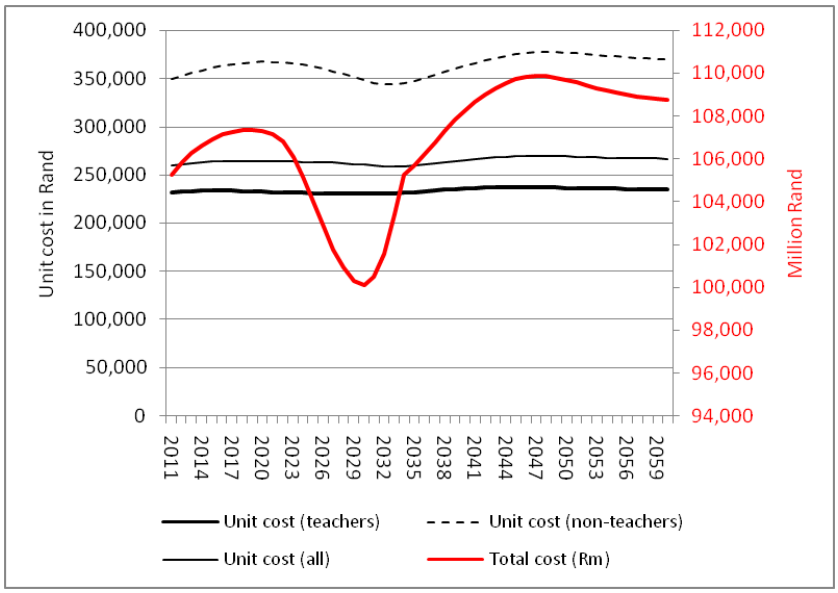
Figure 28: Future age-wage gradient (corresponds to Figure 26 scenario)



The following graph illustrates an alternative scenario which is similar to the previous one except in one respect. Here the status quo of a one notch progression annually for everyone is assumed to continue for the 50 year period. The total cost is, as one would expect, lower. The ratio of teacher pay to GDP per capita would be even further below what can be considered a norm, at 1.2 (this is not illustrated in any graph here). Following the discussion about the age-

wage gradient in the previous section, the previous scenario seems preferable to the one illustrated below.

Figure 29: Unit costs to 2060 assuming slow notch progression



If from a long-range perspective more generous movements up the pay scales seem desirable, what does the situation look like from a medium-range perspective, given the problems highlighted in the existing MTEF budgets, and described in section 5.2? A crude estimate of the annual increase in real terms implied by the first scenario above (25%, 17% and 8% for 3, 6 and 9 notches respectively every year) yields a figure of 2.6%. After ten years, with compounding, this becomes 28.8%. The notch progression arrangement in force involves a 1.0% increase per year. The net additional cost of the more generous scenario is thus about 1.6% in the first year, 3.2% in the second year, and so on to around 18.3% in the tenth year. Seen against the background of a real increase in the unit cost of around 37% between 2006 and 2012, a period of six years, a future increase of 28.8% over ten years is relatively modest. Moreover, the tool used to generate the previous graphs reveals that if demographic factors are taken into account, the 28.8% figure mentioned previously becomes around 12%, due to the fact that demographic shifts slow down the increase in the unit cost. Obviously the method behind the demographic modelling is open to debate, yet it seems that demographic factors would substantially reduce costs, relative to a cruder approach that does not take the ages of teachers into account.

6 A comparison of performance incentive options

6.1 Criteria from the literature

Several key texts relating to experiences in different parts of the world in differentiating teacher pay according to teacher performance, in order to improve educational outcomes, were consulted. What follows a summary of where the evidence appears to be pointing, with a special emphasis on understanding options for a developing country like South Africa. The discussion makes reference to Figure 30, which attempts to provide a diagrammatic mapping of the various issues.

To a large degree the discussion draws from an excellent meta-study by Bruns, Filmer and Patrinos (2011), henceforth referred to as BFP, though a few other texts were also used where this was considered necessary.

As illustrated in Figure 30, one can think of four main types of programmes where pay between teachers is differentiated on the basis of some assessment, however imperfect, of the quality or performance of the teacher. The four types are arranged, in the diagram, from least to most focussed on outcomes in the form of the learning outcomes of learners. The first type is the reward paid to teachers who upgrade their qualifications. This kind of intervention is found in many countries. It is considered the least outcomes-oriented here because a qualification does not necessarily improve either the teacher's own abilities nor those of the teacher's learners. The second type is the reward for demonstrating the attainment of a critical level of knowledge in a test. This is not a common intervention. Amongst developing countries, a Chilean programme aimed at doing this is noteworthy (BFP: 179; Taut, Santelices and Stecher, 2011). The third type is the reward for demonstrating good professional behaviour, for instance through a classroom observation or by submitting for scrutiny one's class preparation notes. Fourthly, and most closely related to learning outcomes, are rewards linked to improvements in the test scores of learners.

The literature tends to favour rewards which are more outcomes-focussed. West and Mykerezi (2011) use data from the United States to conclude that the use of less outcomes-focussed rewards, specifically rewards for upgrading one's qualifications, tend to receive stronger emphasis where teacher unions are more influential. This is understandable. Qualifications are commonly used as a basis for determining who should be promoted to a higher position. Moreover, upgrading one's qualifications is an important way of attracting resources, including free time to pursue one's studies.

The first three types of rewards work at the level of the individual teacher, whilst the last one has mostly been found at the level of groups of teachers in individual schools. There are good reasons for this. It is only in the fourth type of reward, where teachers are rewarded for improvements in learner performance, where it is difficult to establish a clear linkage between what is being rewarded and individual teachers. Specifically, because teaching tends to be a team effort, with teachers in one grade and subject achieving greater success of there is good teaching in earlier grades and other subjects, it is only in exceptional circumstances that it is possible to attribute improvements in the performance of learners in one class to just one teacher. Muralidharan and Sundararaman (2007) refer to the example of an experimental intervention in India where it was possible draw this linkage, but such situations are rare. Most intervention programmes that have tried to link rewards to improvements in learner performance have focussed at the level of the school. It is argued below that this basic policy design point has not been fully appreciated in the South African policy discourse.

Figure 30 refers to the question, in the case of the first three types of rewards, of whether the reward recipient is expected to take on new managerial responsibilities. Generally, programmes do link rewards to more such responsibilities. However, the arguments is often made, for instance in ELRC Resolution 1 of 2008 (the 'OSD I' agreement), that there should be more opportunities for outstanding teachers to remain teachers.

There are three key policy design questions that apply just to the fourth type of reward. Firstly, there needs to be a sufficiently accurate way of measuring improvements in learning outcomes, at least at the level of the school, if not at the level of the class. Amongst developing countries, perhaps the most robust measurement system of this type used for

determining rewards, and a very widely studied system, is SIMCE[13] in Chile. The teacher reward system itself is known as SNED[14]. Meckes and Carrasco (2010) provide a history of this system, started in 1988, and ways in which improvements were made based on lessons learnt. Secondly, the fact that socio-economic status plays such an important role in learning means that this status must be taken into account in some way when schools are compared to each other. In the case of SNED, schools compete only with other schools in the same socio-economic quintile. A sufficiently accepted division into quintiles based on socio-economic data exists. Thirdly, it is important to ensure that schools do not game the rewards system by excluding weaker students from the assessment, or from enrolling in the school in the first place. One widely discussed solution, which has received mostly positive coverage, is Brazil's Index of Basic Education Development, or IDEB[15]. A nationwide monitoring system attaches an IDEB value to each school every year, where this value depends both on student performance in tests and degree to which students do not drop out. Thus a school that pushed out or kept back weaker students would improve its test scores, but presumably not its IDEB score, because IDEB also takes into account retention of students from one grade to the next (BFP: 169; Parandekar, Amorim, and Welsh, 2008). One policy design question not included in Figure 30 is whether school-level targets should be set for future student performance levels. Targets are not only a good thing. If set too high, they can produce a sense of failure, even where there is some movement towards the target. What targets to set for different schools can be a divisive process that adds little value to the project of improving how teaching and learning occurs in schools (BFP, 180).

Questions relating to the value, reach and frequency of reward programmes in the case of once-off bonuses are relevant to all four types of rewards. The higher the value of the reward, the greater the risk that teachers and schools will game the system, in other words devote effort to obtaining the reward in a manner that makes no contribution to the improvement of learning outcomes (BFP: 187). Very importantly, the proportion of teachers receiving the reward should be such that the number of teachers near the cut-off between receiving and not receiving the reward is high. In other words, one wants the outcome of the rewards process to be unpredictable for as large a number of teachers as possible. The more predictable the outcome, the smaller the probability that the programme will impact on behaviour. Rewards that are not too frequent allow the system time to internalise its understanding of the rewards system and shift its focus to new techniques that improve outcomes. To give an example, SNED in Chile is run every second year.

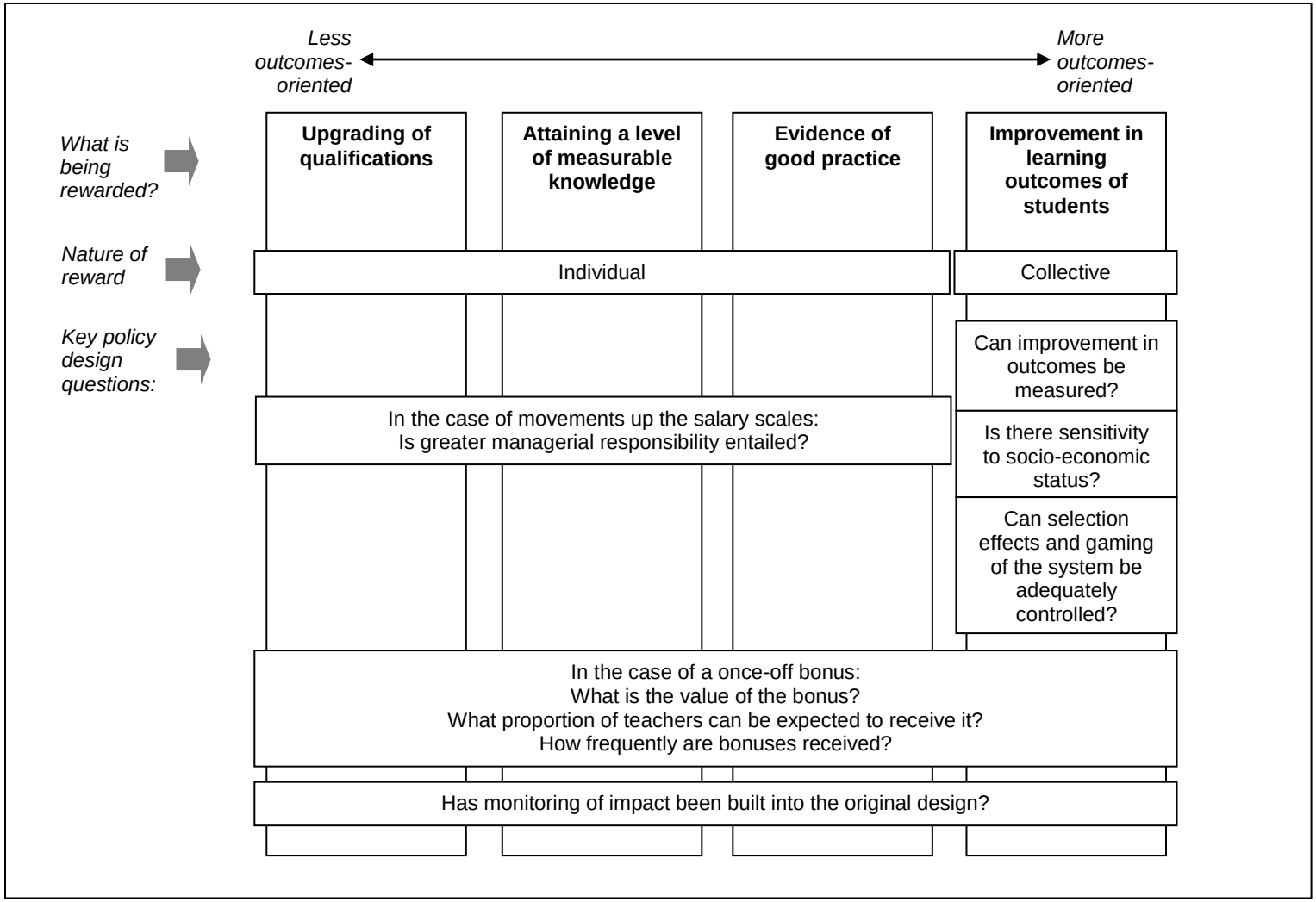
Ideally, the design of a rewards programme should be clear from the outset how the monitoring of the programmes impact will occur. Unfortunately, this ideal is very seldom realised outside small experimental interventions. Instead impact evaluations tend to be introduced after a programme has been running for some years and when the authorities realise that the benefits of the programme are not as self-evident as originally imagined. By this time it is often very difficult to construct a proper impact evaluation using historical data that was never intended for such an evaluation. BFP (169) make a few design recommendations that will facilitate monitoring, for instance the presence of discontinuities, specifically cut-offs between receivers and non-receivers of rewards which are fairly abrupt and not determined, for instance, according to a sliding scale. Most impact evaluations have focussed on those explicitly aimed at improving learning outcomes, in other words the fourth type of reward in Figure 30. BFP (178) argue that it is important to note that although impact evaluations conducted in the United States, of which there have been many, tend to find no

[13] National System for Performance Evaluation of Subsidized Educational Establishments (original in Spanish is Sistema Nacional de Evaluación del Desempeño de los Establecimientos Educativos Subvencionados).
[14] National Evaluation System (original in Spanish is Sistema de Medición de Calidad de la Educación).
[15] Acronym for Índice de Desenvolvimento da Educação Básica.

impact, the situation in developing countries, as revealed by a rising number of studies, is more hopeful. One might expect different impacts depending on how inefficient the schooling system is to begin with. BFP's meta-analysis of the most methodologically rigorous evaluations in developing countries in recent years suggests that reward programmes, if well constructed, can make an impact in developing countries. An important individual study (and one not covered in BFP) is that of Rau Binder and Contreras (2008), which finds that at least some of Chile's considerable progress in educational performance in the last twenty years (for instance according to the international testing programmes) can be attributed to SNED. Woessman (2011) is another landmark study where standardised data from 28 countries are used to establish that the presence of monetary rewards of, above all, the first and third types (upgrading of qualifications and evidence of good practice) are associated with better performance in international tests. Importantly, Woessman (2011) is not saying anything about the effectiveness of the other two types of rewards. These do not exist in enough countries to be amenable to analysis in a cross-country model.

The above discussion presents a brief overview of a complex field. There is some certainty around what appears to be the optimal policy choices. However, there are also many questions which have not been empirically answered. BFP (185) remind us that any reward programme must be designed in way that acknowledges that, at best, only parts of it will succeed. Periodic adjustments based on lessons learnt need to be explicitly catered for. BFP (183) moreover stress the point that though paying for improvements may appear to be a particularly attractive option, policymakers need to view teacher incentives holistically and acknowledge that how non-financial incentives are arranged can be at least as important as the design of financial rewards.

Figure 30: Schema for deciding on monetary rewards for teachers



6.2 An evaluation of key existing proposals

The following table provides a systematic summary of recent thinking around rewards for teachers in South Africa with respect to the last three types of rewards illustrated in Figure 30. One well-known foreign programme is also inserted in the table to provide some international perspective.

Details on an existing non-South African rewards for performance initiative and three South African proposals made in the recent past			
Programme name	*Basic programme description in terms of the four types*	*Basic dimensions*	*Apparent risks with respect to key policy design questions*
SNED (Chile – provided as a point of reference, all remaining rows refer to South African interventions)[16]	SNED is an example of the fourth type. Schools faring well with respect to an indicator where recent learner test scores count for 65% of the indicator value, receive monetary rewards, 90% of which should be paid in the form of bonuses to teachers.	On average, each teacher in a rewarded school receives more or less one additional 'thirteenth cheque' for two consecutive years. Around 20% of teachers in each socio-economic school quintile receive the bonus every second year.	SNED appears to function well. The greatest risk is probably that the impact made by the programme does not justify its cost, which amounts on average to around 1.8% of total public spending on schools.
'Rewards for performing schools', a proposal accompanied by considerable analysis that was presented to HEDCOM in 2007 and that focussed on the secondary school level, and specifically Grade 12.	This proposal was closest to the fourth type, although it envisaged the spending of rewards on non-personnel capital items, not on teachers. However, its design similarity to SNED and the possibility of using this proposal as a basis for rewarding teachers seems to justify its mention here. Rewards were to be paid to schools with the best Grade 12 results within socio-economic quintiles, with a learner retention factor being used to minimise selection effects. The programme was envisaged as a precursor to similar programmes at lower grades when those grades acquired proper testing programmes.	The reward would have amounted to around R50 per learner, approximately 1.0% of public expenditure on schools. Each year around 25% of schools would receive the reward.	The documentation accompanying the proposal indicates that a key risk would be that the selection of rewarded schools could be considered unfair due to relatively unavoidable data and methodology problems with respect to the measurement of learner retention between Grade 8 and Grade 12.
Integrated Quality Management System (IQMS) as conceptualised in Resolution 1 of 2008 of the ELRC (this proposal was never realised, and should be distinguished from the IQMS	This proposal refers mainly to the third type of reward. Teachers displaying above average performance with respect to, for instance, ongoing professional development, punctuality, class preparation and classroom practices	The expected benefits for teachers have been described in section 5.4. Around 50% of teachers in every second year would be identified as above average. On average, this would increase the salary cost by around 1.6% (assuming	Perhaps the largest risk with this proposal was that though it was signed by unions and the employer, it was unclear about a number of key matters relating to 'accelerated progression'. There was little indication of how sufficient standardisation in the evaluation process undertaken by principals

[16] Details in this row are drawn largely from a report titled *Quality enhancement options for the schooling system*, developed with UNICEF funding for the Department of Education by Martin Gustafsson in 2009.

Details on an existing non-South African rewards for performance initiative and three South African proposals made in the recent past			
Programme name	*Basic programme description in terms of the four types*	*Basic dimensions*	*Apparent risks with respect to key policy design questions*
actually implemented, which does not really constitute a reward programme).	would receive above average and non-reversible movements up the salary scales. Judgement on the level of performance would be made by both the school principal and officials outside the school.	one does not take demographic movements into account).	and non-school administrators would guarantee sufficient fairness across schools. Moreover, how the number of teachers receiving the accelerated progression would be kept at an optimal level, given the desired impact and budgetary constraints, was not dealt with.
Bonus for performance by teachers in tests, a proposal put forward in the National Planning Commission's 2011 national development plan.	This proposal deals with the second type of reward. Teachers would receive a bonus for attainment of particular levels of performance in content knowledge tests, which teachers would take on a voluntary basis.	The proposal does not specify the amount of the bonus (though it is specified it would be paid over a three year period), nor the envisaged number of teachers receiving it (though the number would be pre-determined).	This appears to be a relatively risk-free proposal, largely because the dynamics of the programme (which would be similar to Chile's AVDI[17] programme) are fairly simple and straightforward. What would need to be specified, however, is how equity across categories of schools would be achieved, given that teachers have very different teacher training histories. This could be done by, for instance, having separate quotas of reward recipients for each of the school quintiles, or even according to the pre-1994 education department. One risk relates to the fact that the impact of teacher subject knowledge on learner performance is not well known. Spaull (2011) finds that at the primary level, the impact is smaller than one would expect. However, there is no similar analysis for the secondary level, where one would expect subject knowledge amongst teachers to play a larger role.

[17] 'Variable Allocation for Individual Performance' (Asignación Variable por Desempeño Individual).

What does the above table suggest to policymakers? Firstly, it is clear that relatively substantial analytical and consultative work has occurred in the past, though this work has not 'taken off' for a variety of reasons. These reasons need to be well understood.

Neither the academic literature nor South Africa's recent experiences provide conclusive answers to the question of which of the last three types of rewards (rewards for knowledge, good practices or learner performance improvements) offer the most cost-effective means of improving educational quality. Choices around how much weight to attach to the different approaches need to be informed by further consultation and analysis. The schemas provided above are intended to facilitate a more holistic view of the options.

What does seem clear is that the operationally simplest intervention would be one where teachers are rewarded for performance in subject knowledge tests. It is relatively easy to make this intervention fair and thus avoid tension between teachers and between unions and the employer. The measurement and selection problems associated with rewards attached to improvements in learner performance are moreover avoided. Establishing a national teacher testing system would of course not be simple, yet it seems simpler than the establishment of the systems required for the two other types of rewards. One is thus perhaps dealing with a 'low hanging fruit', or an intervention that can be successfully introduced in a relatively short space of time. An advisable route would be to pilot the intervention in a limited geographical area and to insert sufficient impact evaluation within the pilot to extract key lessons for a more widespread implementation. It is important to bear in mind what economists would refer to externalities. Externalities are effects, positive or negative, of an action that are not explicitly or typically considered. In the case of the piloted teacher testing programme, it may be tempting to think that it would only have an impact within the targeted geographical area. However, if the right kind of publicity surrounded the pilot, a positive externality might be a greater awareness across the country of the importance of subject knowledge, what the specific subject knowledge gaps are and what environments are needed to translated better teacher knowledge to better learner performance. Moreover, if teachers across the country anticipated a national roll-out, they may begin improving their subject knowledge even before this roll-out.

What about the future of rewards for better practices and learner performance? It seems as if the re-introduction of the rewards for better practices, more or less along the lines of 'OSD I', are currently a priority amongst policymakers. Here it is important to acknowledge the importance of sufficient prior analysis, for instance relating to cost and how quotas of reward recipients can maximise impact, as well as some piloting. Whilst it would be difficult to pilot the entire programme in a limited area (one cannot give teachers in just one area a pay advantage), what can be piloted are the procedures for determining which teachers should be rewarded.

A programme where all the teachers in schools displaying sufficient improvements in learner performance shared rewards, is not high on the agenda within the national education policy discourse currently. Should it be? There are certainly a few interesting models of 'best practice' from around the world. The new Annual National Assessments (ANA) programme offers an unprecedented opportunity to introduce these kinds of rewards below the Grade 12 level. At the same time, there are many other ways in which ANA can be used to improve learner performance, for instance through better accountability to parents. There should moreover not be an overcrowding of the policy agenda. Whether South Africa should introduce a programme such as Chile's SNED in the near future seems to be a debatable matter.

7 Policy recommendations

Policy recommendations in the area of teacher incentives and teacher pay must be made with care. The area is a particularly complex one. There are essentially three kinds of current complexity one is dealing with: (1) The complexity of existing salary patterns, which are largely a function of current and past policies, but to some extent also a function of administrative idiosyncrasies. (2) The complexity of the negotiation process between the employer and unions that to a large extent influences teacher pay policy. (3) The complexity of teacher psychology in the context of various incentives, in other words of how teachers respond to the various elements of the pay system. This report has analysed data relating to (1). The fact that (2) and (3) have not been studied in any depth obviously limits what can be recommended, and the certainty around the recommendations that are made.

Below, various kinds of policy recommendations have been considered. There are policy recommendations relating to possible changes in the actual national policy. In this regard, a recommendation that a policy should not change can be as important as a recommendation that a policy should change. There are recommendations relating to changes that should be made without changing policies, but rather through advocating different behaviour within the current policy setup or through the establishment of better systems to support current policies.

Roughly, the recommendations that were considered most critical were placed nearer the top of the list.

1. **More monitoring of teacher pay is needed.** A critical recommendation is that more policy-focussed analysis and monitoring needs to occur within the area of teacher pay. Some of this work should be highly institutionalised and to some degree routine, meaning there should be regular analysis happening within key organisations such as the Department of Basic Education, National Treasury, the Department of Public Service and Administration and the Education Labour Relations Council. This work should result in periodic and standard reports. There is a need, from time to time, for special focus analyses, and then external capacity can be brought in. However, there must also be regular in-house monitoring taking place, partly because teacher pay accounts for about 3.5% of the country's gross domestic product. Government has clearly acknowledged this need. For instance, in the 2009 to 2013 strategic plan of the Department of Education[18], a commitment was made to improvements in the education human resources management information system (EHRMIS) and it was stated that for the years 2009 to 2013 an annual report on human resources planning would be produced. Why these commitments have not all been met needs to be understood. Concretely, it is recommended that the DBE put into motion a 'system' that produces a quarterly report on personnel expenditure trends. Here the reference is not so much to an information technology solution but rather a solution in terms of people, skills and possibly partnerships with organisations outside the DBE. Very importantly, the proposed report should be informed by a set of key questions indicating what one is monitoring and why. The report should not just be a set of tables, but should include some narrative interpretation. The report should partly involve relatively routine analysis of Persal downloads, including the payments data (so that trends with respect to benefits can be analysed). The interpretation of the data should draw from explanations provided by key people, such as provincial planners, as to why certain trends are occurring. This need not require standard reports from the provinces (something which can delay and complicate the report generation process). Instead, it may be more efficient to rely more on information obtained through communication with people in provinces who understand the nature of the problem, as the need arises in the analysis process.

[18] Available at http://www.docstoc.com/docs/72814349/Strategic-Plan-2009---2013 [June 2012].

Currently, when analysis occurs within the DBE of the payroll data, this is often in response to a specific policy question, for instance a question around the cost of changing some aspect of the rules. This is obviously important work. However, the more pro-active approach advocated above will, firstly, ensure that when ad hoc analysis requests are made there is already a solid base of data and understanding that has been built up through the more routine work and, secondly, facilitate responses to the ad hoc questions that are more holistic and more sensitive to knock-on effects.

2. **A more favourable age-wage gradient is needed.** Certainty around the degree to which teachers enjoy wage increments with years of experience, relative to people in other professions, is made difficult partly because in recent years no household surveys have included the earnings and occupation values needed for the comparison. However, an analysis using 2007 data (in a separate report that accompanies this one) found that teachers experienced a flatter age-wage gradient than, for instance, nurses. This provides some justification for a steeper curve for teachers in the future. Perhaps an even stronger justification would be the fact that the age-wage gradients put forward in the 2008 OSD rules, and considered optimal at the time, are much steeper than what the current rules permit. It has been argued in section 4 that the system ought to move towards an age-wage gradient of between 1.6 to 1.9 (this is the ratio of the pay of older teachers to younger teachers). This would be for teachers who are not promoted to management positions and variation amongst teachers in the slope ought to depend on performance in some way (see next point below). The actual situation if one looks at teachers currently employed is a slope of around 1.3. The current rules, permitting a one notch increment for virtually everyone each year, translate into a future gradient of around 1.6. The long-range modelling described in 5.4 indicates that a an approach over the longer term that in terms of cost was more or less the equivalent to what was proposed in the 2008 OSD rules, would result in a declining ratio of teacher pay over GDP per capita, and in fact a ratio by the year 2060 that would be below the international norm, in other words implying a particularly low level of teacher pay. This is significant. Teacher pay rules determined now must be informed by a long-range view because decisions taken now exert effects far into the future. What the analysis presented in this report indicates is that whilst a more generous approach adopted now would exacerbate existing budget pressures in the medium-term, in the longer-term, and using a range of assumptions around variables such as economic growth, this would in fact be a conservative approach.

3. **The future of performance-related rewards for teachers needs to be more informed by analysis.** Section 6 provided a framework and some high-level analysis of trade-offs that could inform the way forward with respect to performance-related monetary incentives. What is vital is that the issues need to be considered holistically. One should not consider a re-introduction of 'OSD I' in isolation from what the National Planning Commission has proposed around rewards for teachers who participate in tests. One should not consider rewards linked to the Annual National Assessments programme in isolation from the larger impact of ANA. Moreover, there needs to be a stronger emphasis on scenario-building and piloting with respect to the various approaches. Recent experience, in particular with respect to 'OSD I', has shown that taking a programme to the stage of full-scale national implementation too quickly can be counter-productive and might undermine the very interest in incentives as a means of improving educational quality. Understandably, policymakers want to move as fast as possible. One way of dealing with the tension between urgency and thoroughness is to think of the policy discussions and piloting as being more than just that, but also as ways of bringing about a greater national awareness of how quality is improved. Put differently, if well done and, above all, well communicated, the preparatory work need not constitute a delaying of implementation, it becomes a part of the countrywide improvement process which is partly driven from the top, but partly also driven by schools, districts, provinces and non-government stakeholders.

One area of 'low hanging fruits' where the national department could move relatively quickly is the area of rewards for teachers who perform well in subject knowledge tests. There is some, but not much evidence, of successful work in this area in other countries. The national development plan of the National Planning Commission clearly supports this type of intervention, so the political will is clearly present. The attractiveness of this intervention relates to the fact that compared with other teacher incentive interventions, it is relatively straightforward to implement and is difficult to pervert. Moreover, piloting in a limited geographical area would not be too difficult, partly because the bonuses can be once-off bonuses. Piloting should be considered important and could carry the positive externality effects referred to above, if communicated well to the rest of the country. One reason why piloting ought to occur is that currently there is insufficient evidence on the degree to which teacher knowledge influences learner performance, in particular at the secondary school level.

4. **Solutions such as within-school reallocation of teachers to tackle the 'double parking' problem should be explored.** The 'double parking' problem is largely a structural problem arising out of contradictions between existing policies. On the one hand, policy states that parents have a relatively high degree of freedom in choosing which public school to send their children, and when enrolment numbers change, teaching posts are quickly moved from one school to another. On the other hand, conditions of service rules protect teachers to a high degree against being redeployed from one school to another if they do not want this redeployment. The result is the 'double parking' problem' where a temporary teacher is employed in one school to take the place of a permanently employed teacher working elsewhere who is not willing to move to the school where the demand is (the problem is more complex than this as there is not a clear one-to-one correspondence between the two teachers, but roughly this describes the problem). The policy contradiction cannot be easily resolved as the policies concerned are deeply rooted in a sense of the rights of the various stakeholders. To a large degree, solutions need to be found in the form of more efficient manoeuvring within a difficult policy framework. The importance of these solutions is underscored by the fact that the 'double parking' problem is estimated to keep the wage bill about 1.9% higher than it would otherwise be.

   This report has shown ways in which the payroll data can be used to understand the nature and size of the 'double parking' problem (see section 3.3). This is important work as the nature and size of the problem have not been studied in much depth. But further analysis using other sources of information is needed before a point of greater certainty around the challenges and possible solutions can be found. This report has pointed to two possible solutions. Firstly, it seems as if the 'double parking' phenomenon is about as widespread in primary schools as it is in at the secondary level. Over a half of schools have temporary educators who appear to be employed for double parking reasons. This suggests that there are a number of schools which simultaneously owe other schools teachers and are owed teachers by the system. In a secondary school context this is easy to understand. A school's overall enrolment may have declined, making one English teacher redundant, whilst enrolment in physical science may have increased (this is a subject that learners may choose to take from Grade 10), creating a shortfall of one physical science teacher. It is realistic not to expect the English teacher to teach physical science, in most situations. However, at the primary level the nature of the curriculum and pre-service training dictate that more within-school reallocation of teaching responsibilities is possible. The fact that the 'double parking' problem is as extensive as it is at the primary level suggests that within-school reallocation is not being employed to the extent that it could be.

   Secondly, the payroll data analysis revealed one surprising trend. A few permanently employed educators gave up their permanent tenure in order to become temporary teachers. The phenomenon is not large. Educators making this move in the 2009 to 2011

period constitute just 0.3% of all educators (though the figure varies across provinces). Interviewees speculated that this was because the educators concerned wanted greater control over their benefits and wanted the slightly higher level of benefits they could enjoy as temporary teachers. This suggests one possible solution to the 'double parking' problem, but it would need to be based on a firmer understanding than what is offered in this report of the degree to which teachers are prepared to downgrade their tenure in exchange for better remuneration. The solution would be to create a special category of posts where teachers would forfeit certain rights with respect to their geographical deployment in exchange for better pay. In exploring such a solution, inputs from teachers themselves should be used. The profile of teachers willing to opt for the new status is likely to be sensitive to age and gender. These dynamics should be well understood and should inform the pay structure of the alternative structure.

5. **Flexible approaches to equalising teacher pay across provinces are needed.** Section 3.2 looked at the extent to which similar teachers in different provinces enjoy better pay due to the province they find themselves in. Ideally, there should be no such differences as the salary rules are national. However, these differences are in fact noteworthy. In Limpopo Province, the wage bill for educators is around 1.1% higher than it would be if teachers were paid at a level more in line with what is found in other provinces. Though a 1.1% discrepancy may seem small, it should be remembered that such a discrepancy translates into roughly 5% less spending on non-personnel items. A few other provinces experience similar challenges, though of a proportionally smaller magnitude. A part of the explanation for these differences has to do with inter-provincial inequalities created when the very complex apartheid era pay scales were normalised into one national set of scales. Another part of the problem, however, is that the implementation of major rule changes in recent years, in particular the 'OSD I' and 'OSD II' changes of 2008 and 2009, occurred somewhat differently in different provinces, perhaps because manual adjustments and corrections were province-specific. What are the policy implications of this? Two can be highlighted. Firstly, information on the degree to which teachers are paid more in a specific province should be fully incorporated into the planning cycles and the discussions with unions. Where teachers are paid more, the province can justifiably be a bit more conservative in areas where it has control, for instance with respect to the approval of promotion posts such as heads of department positions. Secondly, the national department should advocate caution where further rule changes are being discussed, especially where such rule changes could create further opportunities for provinces to widen the pay gap between provinces. Clearly, the existence of a national set of rules is not a guarantee that teachers will be treated in exactly the same way in different provinces.

   It is important to underline what this report has not done. It has not attempted a full simulation of all the rule changes to check alignment between the actual and expected pay of individual teachers in, say, 2011. The report has presented some analysis in this regard, but it is not a full simulation. There is thus room for further analysis in this area, in particular if policymakers want to begin an anti-corruption process whereby incorrect upward adjustments by provinces in the past were reversed. The anomalies found in the analysis within the report suggest that such a process could be justified.

6. **Sufficient modelling of future scenarios needs to occur.** This report has presented a model or tool for gauging the future cost of teachers in South Africa. It has also discussed the strengths and weaknesses of this model and how further work could proceed. The scenarios generated by the tool underline the importance of taking into account the very South Africa-specific demographic patterns of teachers as these patterns influence strongly the average unit cost of teachers in future and what decisions around teacher incentives are sustainable in the long-run and which are not. Generally, not taking into account demographic factors is likely to result in decisions that are more conservative than they should be, given that demographic shifts are likely to reduce the future unit cost,

starting in around 2020. In line with the recommendations made under point 1 above, the national department should avoid the temptation of over-investing in one comprehensive long-range teacher supply and demand and cost model that will capture all key variables. The nature of the analytical challenge is such that the analysis needs to be multi-faceted and needs to be driven by a few different people who to some degree work separately, in order to reduce the risk of using incorrect assumptions and of modelling emerging from just one analyst or just one software product. There is a need for sophisticated modelling, but the future of teacher pay is to some degree a question of debate and judgement. It is not an exact science.

References

Bruns, B., Filmer, D. & Patrinos, H.A. (2011). *Making schools work: New evidence on accountability reforms*. Washington: World Bank. Available from: <http://siteresources.worldbank.org/EDUCATION/Resources/278200-1298568319076/makingschoolswork.pdf> [Accessed October 2011].

Crouch, L. (2001). *Turbulence or orderly change? Teacher supply and demand in the age of AIDS*. Pretoria: RTI. Available from: <http://www.rti.org/pubs/turbulence.pdf> [Accessed August 2010].

Education Labour Relations Council (2011). *Revised salary structure proposals*. Pretoria: ELRC. Available from: <http://www.elrc.org.za> [Accessed January 2012].

Gustafsson, M. & Patel, F. (2009). *Managing the teacher pay system: What the local and international data are telling us*. Stellenbosch: Stellenbosch University. Available from: <http://ideas.repec.org/p/sza/wpaper/wpapers99.html> [Accessed June 2010].

Meckes, L. & Carrasco, R. (2010). Two decades of SIMCE: an overview of the national assessment system in Chile. *Assessment in education: Principles, policy and practice*, 17(2): 233-248.

Mingat, A. & Tan, L.-P. (2003). On the mechanics of progress in primary education. *Economics of Education Review,* 22: 455–467.

Muralidharan, K. & Sundararaman, V. (2007). Teacher *incentives in developing countries: Experimental evidence from India*. Washington: World Bank. Available from: <http://siteresources.worldbank.org/INTINDIA/4371432-1194542398355/21543218/TeacherIncentivesinDevelopingCountries.pdf> [Accessed March 2010].

Parandekar, S., Amorim, É. & Welsh, A. (2008). *Prova Brasil: Building a framework to promote measureable progress in learning outcomes*. Washington: World Bank. Available from: <http://siteresources.worldbank.org/INTENBREVE/Newsletters/21809358/Mar08_121_Prova_EN_FINAL.pdf> [Accessed November 2009].

Rau Binder, T. & Contreras, D. (2008). *Tournaments, gift exchanges, and the effect of monetary incentive for teachers: The case of Chile*. Santiago: University of Chile. Available from: <http://www.depeco.econo.unlp.edu.ar/cedlas/ien/pdfs/meeting2008/papers/rau-contreras.pdf> [Accessed February 2012].

Spaull, N. (2011). *A preliminary analysis of SACMEQ III South Africa*. Stellenbosch: Stellenbosch University. Available from: <http://ideas.repec.org/p/sza/wpaper/wpapers139.html> [Accessed May 2011].

Taut, S., Santelices, M.V. & Stecher, B. (2011). *Validation of the Chilean national teacher evaluation system*. Santiago: Sociedad Chilena de Políticas Públicas. Available from: <http://www.sociedadpoliticaspublicas.cl/archivos/BLOQUEM/Docentes_y_Directivos_Escolares/Teacher_Evaluation_System.pdf> [Accessed June 2012].

West, K.L. & Mykerezi, E. (2011). Teachers' unions and compensation: The impact of collective bargaining on salary schedules and performance pay schemes. *Economics of Education Review,* 30(1): 99-108.

Woessman, L. (2011). Cross-country evidence on teacher performance pay. *Economics of Education Review,* 30(3): 404-418.

Appendix

Table 21 provides total spending in October 2011 for all payment categories (and not just the largest, as for Table 14). Sorting is by monetary value (million Rand in the month).

Table 21: All payment types October 2011

Description	*Rm*	*Description*	*Rm*
0001 -BASIC SALARY	6,755.1	0321 -PERIODICAL TRAVEL& S	0.4
9995 -PENSION EMPL CONTR	844.2	0448 -RESETTLEMENT FEES	0.4
0005 -SERVICE BONUS	531.8	0169 -OVERTIME NON PROG	0.4
9994 -MEDICAL EMPL CONTR	425.5	0466 -S&T PHONE COST (N/T)	0.4
0431 -37% SERVICE BENEFITS	114.4	0183 -MARKING FEES	0.4
0547 -HOUSING RENTAL	108.1	0382 -MARKING : JUNE	0.4
0002 -BASIC BACKDATED	80.6	0541 -ACTING ALLOW (ADD)	0.3
0546 -HOUSING PAID UP	53.9	0101 -LWP RECOVERY	0.3
0543 -HOUSING MAXIMUM	46.3	0011 -OVERTIME	0.2
0522 -INTERN/LEARNER 182	38.2	0588 -S&T: EXP (MEALS)	0.2
0204 -COMPENSATION ALLOW	34.6	9992 -EMPLOYERCONT:PSCBC	0.2
0591 -REMOTENESS INCENTIVE	29.3	0465 -S&T : TOLL FEES(N/T)	0.2
0043 -QUALIFICATION BON	26.6	0185 -OVERTIME : SCH CLOSE	0.2
0168 -LEAVE GRATUITY	26.6	0564 -CELL PHONE COST	0.1
0518 -EARLY CHILD DEV PRAC	21.6	0384 -MARKING: NOV/DES	0.1
0545 -HOUSING NEW OWNER	20.7	0429 -MEDICAL PRO (SMS/MMS	0.1
0471 -ACTING ALLOWANCE	16.3	0443 -S&T ALLOW -TAXABLE	0.1
0177 -PART-TIME CLASSES	14.4	0324 -REM PUBLIC HOLIDAYS	0.1
0143 -PERIODICAL PAYMENTS	12.4	0618 -TEMPORARY ACTING ALL	0.1
0470 -TRAV ALLOW:<8000 KM	12.0	0060 -LEAVE DISCOUNTING	0.1
0102 -BASIC SAL ARREARS	10.3	0343 -PNPA (ROLE PLAYING)	0.1
0356 -SHIFT ALL (RECURR)	9.8	0526 -S&T EXP NO RECEIPT	0.0
0544 -HOUSING LESS MAX	8.3	0463 -S&T:PUBL TRANS (N/T)	0.0
0395 -CAPITAL REMUNERATION	6.7	0432 -ACTING ALLOWANCE	0.0
0469 -TRAV ALLOW:>8000 KM	6.7	0385 -MARKING:SUPPLEMENTAR	0.0
0181 -SUPERVISORS ALLOWANC	6.6	0332 -STD DANGER ALLOWANCE	0.0
0428 -NP CASH (SMS/MMS)	6.1	0018 -BUS DRIVERS ALLOWANC	0.0
0397 -FUEL ALLOWANCE	5.0	0042 -PERFORMANCE BONUS	0.0
0562 -LEAVE ENCASHMENT 20	4.5	0265 -CAP REMUNERATION	0.0
0174 -DIFFERENTIATED ALL	4.2	0376 -SETTING/TRANSLATING	0.0
0267 -FUEL ALLOWANCE	4.0	9997 -UIF EMPLOYER CONTRIB	0.0
0563 -LEAVE ENCASHMENT 30	4.0	0388 -ORAL/PRACTICAL WORK	0.0
0175 -SUPERVISOR ALL	3.9	0375 -SETTING PAPERS	0.0
0613 -37% SERVICE BENEFITS	3.7	0464 -S&T:PARKING EXP(N/T)	0.0
0423 -MOTOR CAR (SMS/MMS)	3.6	0608 -LAPTOP ALLOWANCE	0.0
0006 -ADD SERVICE BONUS NT	3.4	0306 -CLAIM OFF KILOS PRIV	0.0
0092 -LWP PAYMENT	3.0	0386 -RE-MARKING	0.0
0396 -MAINTENANCE ALL	2.4	0579 -SHIFT WORK : SUNDAYS	0.0
9993 -EMPLOYER CONTR: ELRC	2.1	0473 -S&T OVERSEAS (N/T)	0.0
0288 -SERVICE BONUS PRO RA	2.0	0383 -MARKING : AUGUST	0.0
0136 -HOUSING ALLOW ARRS	1.9	0026 -ACTING PRINCIPAL ALL	0.0
0552 -SSIP AND RMIP	1.7	0581 -SHIFT PUBLIC HOLIDAY	0.0
0025 -HEAD OF HOSTEL ALLOW	1.7	0266 -MAINTENANCE ALLOW	0.0
0219 -SERVICE BON ADD TAX	1.7	0378 -MODERATING/TRANSLATE	0.0
0024 -HOUSEMOTHER/-FATHERA	1.6	0279 -SUPERVICE ALLOWANCE	0.0
0525 -LONG SERV AWARDS -30	1.5	0531 -SCARCE SKILLS AL HEA	0.0
0210 -S/BONUS ARR-ONCE TAX	1.4	0093 -M/FIN OFFCIAL KM	0.0
0515 -S&T : PETROL ALLOW	1.4	0280 -AGRICULTURAL ALLOW	0.0
0436 -S&T ALLOWANCE (N/T)	1.3	0049 -UNIFORM ALL SA NT	0.0
0302 -CLAIMS OFF KILOS PR	1.2	0476 -S&T : FOREIGN ACCOM	0.0
0424 -HOUSING (SMS/MMS)	1.2	0054 -SHOE ALLOWANCE	0.0
0587 -VOLUNTARY ADD DUTIES	1.1	0589 -S&T: FOREIGN (MEALS)	0.0
0098 -S/BONUS - ARREARSNT	1.0	0073 -SUB INS DEV BRD	0.0
0462 -S&T: ACCOMMODATION	0.9	9989 -EMP CONTRIB: GPSSBC	0.0
0377 -MODERATING PAPERS	0.6	0007 -SURCHARGE NT	-0.8