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Using household assets as a proxy for monetary pay

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ABSTRACT

Teachers tend to be the largest group of workers in any country with wages driven by government policy. Teacher unions play an important role in determining these wages, but so does research into what levels and systems of teacher pay are best for educational outcomes in a specific political and economic context. One element of this research is international comparisons, and one purpose of these comparisons is to gauge whether teachers in general, or specific categories of teachers, are paid too little or too much in one country. These comparisons are often unreliable due to inconsistent use of definitions, unreliable data on what workers in countries actually earn, and complexities in determining purchasing power parity (PPP) exchange rates between currencies. Some widely publicised comparisons are misleading, yet why this is the case can be unclear because of insufficient transparency around methodologies. It seems PPP complexities often make monetary comparisons difficult. A key contribution of the paper is to demonstrate the use of household assets as an alternative to monetary wages, in this case through use of the IPUMS dataset of the University of Minnesota. Such an approach seems to produce intuitively correct comparisons. This is especially so for South Africa, the country the paper pays special attention to. The household assets approach is shown to be useful both for absolute comparisons of teacher purchasing power across countries, and for the calculation of the within-country advantage of teachers, which can then be compared internationally. Comparing teachers to other professionals in the same country is the basis for the UN's preferred teacher pay indicator. Though this indicator uses monetary wages, household assets are shown to be useful for this indicator too. Household assets are also used to estimate conditional purchasing power premiums for teachers in multiple regressions. The paper concludes that existing findings that South African teachers enjoy the purchasing power of teachers in, say, Denmark are incorrect, and that their purchasing power is not that different to teachers in other middle income countries.

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1 Introduction

Teachers are perhaps the largest group of workers in any country whose wages are driven by government policy. It is thus understandable that there would be a lively and often emotive debate around their wages. In South Africa, teacher pay accounts for around 3.3% of gross domestic product (GDP). This figure varies considerably across countries, and each country has unique ways of distributing the available funds across the teacher workforce, and possibly attaching incentives to pay¹. This variation feeds the debate around whether levels and systems of teacher pay in any country are optimal. Concerns around whether enough is being done to undo historical inequalities through pro-poor schooling policies easily lead to the question of whether teachers are paid enough, or perhaps too much given spending on non-teacher inputs in the schooling system.

Several factors shape the system of teacher pay in a country. History is a key factor. In South Africa, the dismantling of the apartheid system in the early 1990s included eliminating race-based teacher pay scales and creating a single set of scales. This largely involved bringing the pay of black teachers in line with their better paid white colleagues, a process which expanded the wage bill considerably. The political power of teacher unions, and the relationship between unions and government as the employer, is an important factor. The politicisation of teacher pay in countries with strong teacher unions means that evidence-driven planning, focussing on educational outcomes and national development, is easily sidelined. Instead, overall spending on teacher pay, and the design of the pay scales and incentives, tend to be determined by political power struggles. Yet the problem is not just one of politics overriding evidence. The evidence base is often thin and confusing, and does not receive the attention from economists and other analysts it deserves. This paper makes a contribution to the methodologies and evidence relating to international comparisons of the level of teacher pay. The point of departure is South Africa.

Section 2 describes the context of inequality and poverty in which the South African education sector and teachers find themselves. Section 3 briefly summarises some existing literature on cross-country comparisons of teacher pay. Section 4 discusses important complexities around the calculation of teacher pay in one country, South Africa. Section 5 presents an attempt to replicate the rather counter-intuitive finding, published in a prominent UNESCO report, that South Africa's teachers enjoy a level of purchasing power that is on a par with that of teachers in the world's most developed countries, for instance Denmark. Section 6 discusses a recently introduced UN Sustainable Development Goal (SDG) indicator on teacher pay, which focusses on pay differences between teachers and other professionals. This indicator, it is argued, could assist the debates. Section 7 presents a novel way of comparing the purchasing power of teachers across countries, using the household assets of teachers, and other professionals, in up to 20 countries, including South Africa. This approach can provide approximations of the SDG indicator, and circumvents the serious data and definitional problems associated with using monetary earnings as a basis for international comparisons. Section 8 concludes, in part by presenting a better and more nuanced account of how the purchasing power of South African teachers compares internationally.

The two authors of the paper regularly do analysis and policy work for South Africa's Department of Basic Education, the national authority for schools, in the area of teacher pay. The work presented in the paper was first presented at the 2019 Conference on Quantitative Education Research, at the University of Stellenbosch.

¹ Department of Basic Education, 2012.

2 The context of South Africa's income inequality

A World Bank review of poverty in South Africa says the following²:

...while a segment of the population enjoys wages that are on average equal to workers living in developed economies, the wages of those at the lower end of the distribution are comparable to those seen among the poorest countries.

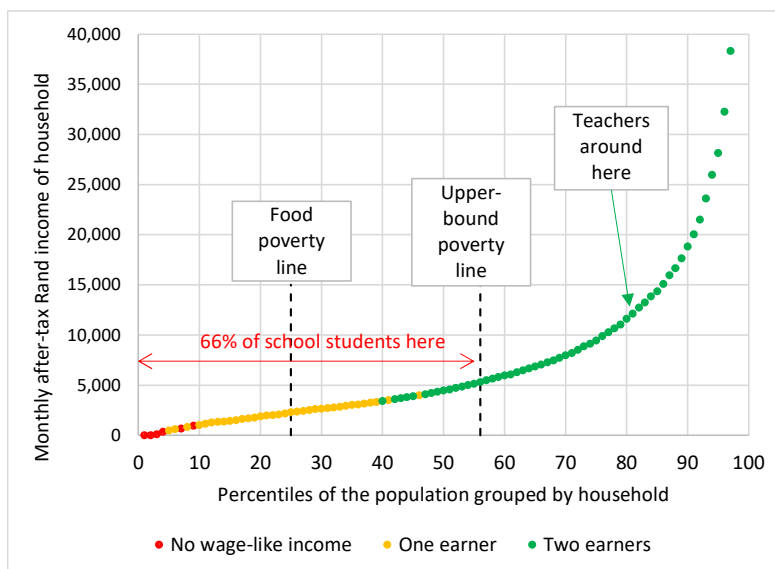
It may thus not come as a surprise to see reports, such as the UNESCO report discussed below, indicating that South Africa's teachers enjoy the purchasing power of teachers in the most developed countries. One finding of the current paper is that such reports are inaccurate. Yet it is true that an acute skills shortage in South Africa, which is linked to low levels of participation in post-school education, despite participation in schools being high, pushes the wages of professionals, including teachers, up in South Africa, beyond what one may see in other middle income countries.

Figure 1 summarises the South African income inequality and poverty context. In 2015, the proportion of the population living in poverty ranged from 56% to 25%, depending on what Statistics South Africa poverty threshold one used. Using the commonly applied 1.9 US dollar a day international poverty threshold, 19% of South Africans emerged as poor in 2015³. According to Figure 1, poorer households were far more likely to have just one 'earner', where this was defined broadly to include not just those earning wages, but also those receiving something 'wage-like', in particular some form of retirement or pension income, or remittances from an absent migrant worker. Five per cent of households had no 'earner' at all, defined in these broad terms. Of all school students in grades R to 12 (grade R is the grade preceding grade 1), 66% came from the poorest 56% of population-weighted households. Teachers were not identifiable in the National Income Dynamics Study (NIDS) data used for this analysis. However, an analysis of Community Survey 2007 household assets points to the average teacher being at the 81st percentile of households (further details on this data source appear in section 7). This informs the placement of teachers in Figure 1. Of course, this placement would depend in large part on the earnings of the teacher and his or her spouse or partner. Most teachers would be in households with two earners. In fact, the Community Survey data indicate that one-tenth of teachers live with another teacher.

² World Bank, 2018: xvii.

³ World Bank, 2018: xix.

Figure 1: Income inequality and the schooling system in 2015



Sources: The income distribution, earners per household, and distribution of school students are from the NIDS Wave 4 dataset, for the years 2014-2015, obtained through the DataFirst facility and described in Brophy et al (2018). Poverty percentages from Statistics South Africa (2017) were superimposed. Note: The top three percentiles are outside the graph area. The 100th percentile reaches 185,694. The number of earners per household is the average within the percentile, rounded to the nearest integer.

If the average after-tax income for teachers in 2015 is calculated, using the payroll-based approach explained in section 4, one arrives at a value of R17,440. This would place the earnings of just *one* teacher at the 89th percentile in Figure 1. There are good reasons to reject such a placement, given the evidence that income tends to be understated in surveys such as NIDS, meaning the true income curve in Figure 1 would be somewhat higher. Yu (2016) shows that in South Africa income reported in household surveys is often around three-quarters of what it should be.

3 Existing pay comparisons and why they are important

In what appears to be the earliest global cross-country comparison of teacher pay, Mingat and Tan (1998) conclude that as countries develop, the ratio of average teacher pay to GDP per capita declines. This is because at an early stage of development, teachers comprise a large proportion of all professionals, while at a later stage, there tend to be more non-teacher professionals, who are often better paid than teachers. The ratio of teacher pay over GDP per capita ranges from about 7, for the least developed countries, to about 2, for the most developed countries. The ratio stood at 5 in South Africa in 2015⁴, which can be considered high given South Africa's level of development.

The OECD appears to have started in 1996 with the systematic compilation of the teacher pay levels of its mostly rich member states. Over time, this has been extended to include a small number of non-OECD developing countries, including Argentina and Indonesia⁵. The OECD's analysis pays particular attention to salary cost per student, as a way of assessing the efficiency with which a country educates its young population⁶.

⁴ Gustafsson, 2015.

⁵ OECD, 2013: 388.

⁶ OECD, 2019.

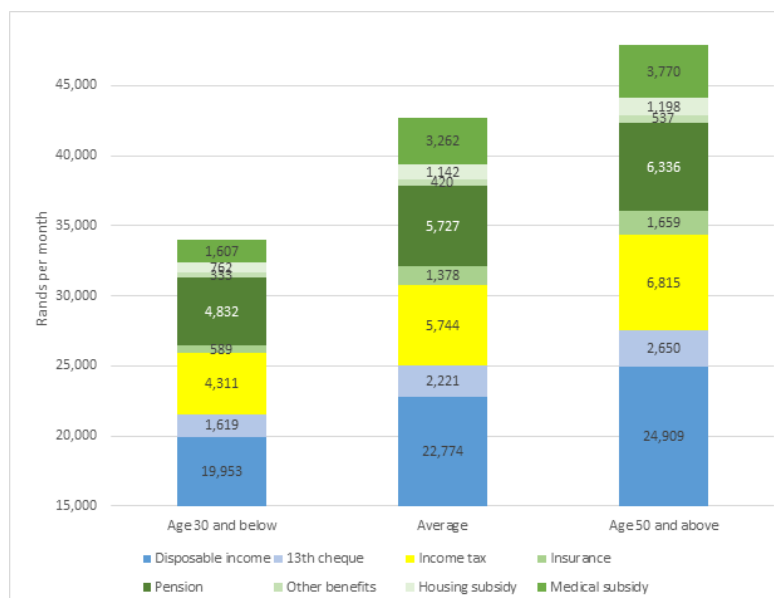
Considerable work has occurred in comparing teacher pay across countries in the Latin America region. Hernani-Limarino (2005), in a book chapter titled ‘Are teachers well paid in Latin America and the Caribbean?’, reviews this work and provides a new analysis. The Latin America comparisons have relied largely on national household surveys which included monetary income and occupation down to a level at which it was possible to identify teachers. Hernani-Limarino uses econometric techniques and household data to estimate the conditional wage premium for teachers, meaning the degree to which teachers are over- or under-paid in comparison to other workers, while controlling for factors such as gender, age, hours worked and the highest qualification obtained. The conclusion is that it is far more common for teachers to be over-paid, than under-paid, when the conditional premium is used. The size of the premium for teachers varies considerably across countries. The implied policy conclusion is that for virtually all countries in the region, teacher under-payment cannot be used as a motivation for wage improvements. However, differences in the wage premium could be concerning, for instance if this results in teachers migrating to countries with a better premium.

As explained below, sourcing household data from a large number of developing countries across the world which contain *both* monetary income (or even monthly expenditure in monetary terms) *and* who is a teacher, is far from easy. It may be an impossible task. Latin America seems to be an exceptionally well-endowed region in the developing world in this regard.

4 Elements of teacher pay in South Africa

Figure 2 below presents the results of an analysis of South African payroll data as it relates to teachers. The payroll data are from November 2019. It serves as a reminder of the various criteria one would need to consider in deciding on a global definition of what teachers earn. The first difficulty relates to defining who a teacher is. Figure 2 draws from the data of around 383,116 publicly paid teachers. It thus excludes the approximately 39,000 teachers working in private schools, and 29,000 teachers working in public schools who are paid privately through school fees collected by parents. The 383,116 would be all public employees officially counted as ‘educators’ in the nine provinces, who employ nearly all teachers. This would include school principals and other managers working in schools, and even a few people employed as educators outside schools, for instance in teacher centres.

Figure 2: South African teacher in 2019 according to payroll data



The month of the data plays a role. The figures represent November values. Annual salary increases occur in April, and in 2019 would have come to around 6%. Income tax is a clearly defined amount. However, subtracting benefits is complex. Pension and medical benefits, for instance, are each reflected in the payroll data partly as contributions made by the employer, and partly as contributions made by the employee. In the case of pension contributions, the teacher has mostly no say about the contribution amounts. However, for the 8% of educators on temporary contracts, the decision on what contributions to make rests entirely with the teacher, as a lump sum in lieu of benefits is paid to the teacher. This lump sum is included under 'Other benefits' in Figure 2. A temporary teacher may opt to make no social security contributions. For permanent employees, medical contributions are in part discretionary as employees may decide which medical insurance to use. The category 'Insurance' in Figure 2 reflects top-up contributions a teacher may make, for instance to additional retirement schemes. These are often reflected as deductions in the payroll data, though many such contributions would not be reflected in the payroll data at all. The thirteenth cheque amount would only be seen in November for around one-twelfth of employees, as payment depends on one's birthday.

A key conclusion from Figure 2 would be that, on average, disposable income plus the thirteenth cheque come to 59% of the total cost to the employer. Moreover, pay varies to a large degree by age. Disposable income plus thirteenth cheque is 28% higher for teachers aged 50 and above, compared to those aged 30 and below. Average teacher pay in a country is highly dependent on the age structure of the workforce. The average age of South Africa's teachers in 2019 was 46. A large bulge of older teachers is expected to retire in the coming decade, and to be replaced by a bulge of younger teachers. Younger teachers enter the system on lower salary scales. This demographic shift is expected to reduce the average cost of a teacher by as much as 10%⁷.

A similar variety of factors would influence teacher pay in other countries. Any global definition would need to provide guidance on how to deal with these factors. Even with a detailed and comprehensive global definition, any organisation attempting to compile internationally comparable statistics would need to depend to a large degree on interpretations made by national experts. Only national experts would fully understand national complexities. The risk is that national experts might interpret a global definition inconsistently.

5 Teacher purchasing power in South Africa on a par with Denmark?

UNESCO's 2013-2014 *Global Monitoring Report* for education, in discussing the need for adequate teacher pay, presents a graph, covering 74 OECD and African countries, which puts the purchasing power of South Africa's teachers slightly above that of Denmark⁸. Specifically, South African teachers were said to earn 128 USD a day, in US purchasing power terms. While South African teacher pay may be relatively high, given the context of high inequality described in section 2, someone with even a basic familiarity with South Africa and Denmark would consider UNESCO's finding counter-intuitive. There are other counter-intuitive rankings in UNESCO's graph. Teachers are found to be better off in Nigeria than Poland, for instance.

The UNESCO report provides a useful point of departure for a critique of these kinds of comparisons. A large part of the problem seems to lie with the manner in which two different sources, one covering OECD countries and another African countries, were combined. However, even within the set of OECD countries there appear to be discrepancies. In particular, the purchasing power of Mexican teachers is said to exceed that of teachers in Estonia, Hungary, Poland and Slovakia.

⁷ Gustafsson, 2018.

⁸ UNESCO, 2014: 255.

The first source used by UNESCO, the OECD's *Education at a glance 2013*, is publicly available and leads one to some details on how the OECD defines teacher pay. The UNESCO graph is said to reflect "daily teachers' wages in public primary institutions", using '2011 PPP US\$'. The OECD report presents a table of 2011 'statutory salaries', being the 'Starting salary, minimum training' for 'primary education'⁹. The OECD's figures have been made comparable across countries using purchasing power parity (PPP) ratios. It is clear that these values were divided by 365 days to produce the UNESCO figures. The OECD gathers statistics from countries using the 'OECD-INES Survey on Teachers and the Curriculum'. The collected data could not be found online, but the 2013 report provides some details on the definition used¹⁰:

Statutory salaries refer to scheduled salaries according to official pay scales. The salaries reported are gross (total sum paid by the employer) less the employer's contribution to social security and pension, according to existing salary scales. Salaries are "before tax", i.e. before deductions for income tax.

A differently defined set of statistics also exists in the OECD report, but clearly this was not used by UNESCO. This is the 'average ... actual salaries' of teachers¹¹.

For African countries, UNESCO says it used the 'Pole de Dakar database' of UNESCO. This database was found online, but the available version did not have any teacher pay values. How the African country values were calculated is thus not clear.

The first column of Table 1 below presents a calculation of South Africa's 2011 teacher pay, using the OECD methodology, in other words what one might expect to be used for South Africa in the UNESCO graph. The statutory starting salary is what was published in the 2011 salary scales as the starting 'notch value'. This notch value is the annual before-tax salary, without counting the *employer's* contribution to benefits. The result is 86 USD per day, in 2011 USD PPP terms, meaning essentially that teachers could purchase per day, in South Africa, goods which, if purchased in the United States, would come to 86 dollars in 2011. This would put South Africa on a par with England and Finland, and at a considerably lower level than the USD 128 which placed South Africa beside Denmark. England and Finland carry values of around USD 86 in the UNESCO graph referred to above. The second column makes the assumption that the intention of the OECD definition is to subtract *all* benefits, whether paid by the employer or employee. The difference is that the value in the first row drops to ZAR 132,809. The resultant daily wage, of USD 71, would put South Africa on a par with Italy and Japan. Finally, the third column uses an alternative PPP ratio, which lowers the final daily amount slightly, to USD 67. The alternative ratio considers only those goods within the category 'individual consumption expenditure by households'. These goods would represent a more accurate basket of goods for teachers than the goods considered in the general PPP ratio (used for the first two columns). This general ratio, which is the most commonly used ratio, covers all goods in the economy, including those that government would purchase, for instance military equipment¹².

⁹ OECD, 2013: 388.

¹⁰ OECD, 2013: 386.

¹¹ OECD, 2013: 391.

¹² World Bank, 2015: 116-121.

Table 1: South African starting salaries for teachers in 2011

	Strict adherence to OECD definition (A)	A, but with employee contributions to benefits excluded (B)	B, but with private consumption PPP ratio
Statutory starting salary (ZAR)	160,746	132,809	132,809
USD/ZAR	0.128	0.128	0.128
In USD	20,530	16,962	16,962
PPP ratio	0.66	0.66	0.70
In USD PPP	31,232	25,804	24,305
Divided by 365 days	86	71	67
Close to...	England/Finland	Italy/Japan	Turkey/France

Clearly, among developed countries there are large teacher pay differences, assuming that the OECD statistics accurately reflect differences between rich countries. Teachers in Denmark enjoy a level of purchasing power which is almost twice that of France. Yet even placing South Africa on a par with the lower end of the set of rich countries seems counter-intuitive. The second author of this paper has worked as a teacher in public schools in South Africa and Japan, and would consider Japanese teachers to enjoy a standard of living considerably above that of South African teachers.

What might explain these counter-intuitive figures? Differences in how teacher pay is initially calculated in a national currency could be a part of the problem, though the above analysis does not strongly support this. However one interprets the OECD definition, South African teachers emerge as better paid than what one might expect. It is likely that much of the problem lies with the available PPP ratios. The 2013 OECD report would have used PPP conversions based on the 2005 baseline ratios established by the World Bank. The World Bank subsequently calculated a new baseline, reflecting the 2011 situation, but these were only published in 2014. Deaton and Aten (2017) discuss technical difficulties relating to the calculation of PPP and indicate that the 2011 update resulted in households in many developing countries, including African ones, suddenly appearing to be as much as 26% better off. This could explain the oddly high PPP teacher pay values for many African countries published by UNESCO. Yet this does not resolve the whole problem. The PPP ratios in Table 1 are from the more reliable 2011 update, and yet even these produce counter-intuitively high teacher pay values for South Africa.

6 The new SDG indicator on teacher salaries

The Sustainable Development Goals of the United Nations come with a new international indicator on teacher pay. This seems to be the first time such an indicator has been officially endorsed within the UN system. This is likely to incentivise work on international comparisons. It is not one of the top-tier 'global' SDG indicators, but it fits into a second tier known as 'thematic indicators'. There is less pressure for countries to report to UNESCO on the thematic indicators, yet their official status improves the chances that institutions will invest in monitoring them.

The numbering, title and key details of the new indicator, according to the 2018 technical documentation, are as follows¹³:

4.c.5 Average teacher salary relative to other professions requiring a comparable level of qualification

Definition:

¹³ UNESCO, 2018: 103.

Annual gross statutory starting salary for a qualified primary or secondary teacher in public institutions relative to the average annual gross statutory starting salary for a basket of professions requiring a similar level of qualifications to qualified teachers. This indicator could be presented as a ratio.

Purpose:

To give an idea of the relative attractiveness of the teaching profession compared to other professions requiring a similar level of qualification. The rationale is that if salaries in the teaching profession are attractive, it is more likely to attract quality candidates.

The indicator is ultimately a ratio between monetary values, not the actual monetary wages of teachers. It addresses the problem where a country's teachers may appear exceptionally well paid in an international comparison, not because teachers in a country are especially advantaged, but because professionals as a whole are advantaged, due to structural inequalities such as those seen in South Africa. Such a problem clearly exists if one simply compares teachers in South Africa to teachers in other countries, without considering the wider economic context. This was discussed in some detail in Gustafsson and Patel (2008). The SDG indicator thus provides a better basis for assessing the under- or over-payment of teachers in a country than the PPP comparisons used in the Global Monitoring Report.

Two possible problems with the indicator stand out, and both are linked to the term 'statutory' in the definition. Statutory suggests the public service only. In the private sector, starting salaries tend to be market-driven, not statutory. Insofar as the indicator suggests, probably unintentionally, that only the public sector should be considered, this diminishes the value of the indicator. The teaching profession competes within the labour market as a whole in attracting good individuals to join the profession. Secondly, the suggestion is that analysts should seek documented and official starting salaries, rather than examine household survey microdata. A data-driven analysis would be better, in part because it would capture both the public and private sectors, and because it would provide a more consistent basis for comparing pay across professions, without the definitional problems around, for instance, the calculation of benefits. A labour force survey asks the same income questions to everyone, regardless of occupation. Of course, household surveys would not be a solution if they do not include monetary income, or monetary expenditure, which can serve as a proxy for income, *and* a variable indicating who is a teacher.

Labour economists typically compare pay while controlling for a number of factors, including level of education, age and gender. The SDG indicator implicitly includes controls for age – it is the *starting* salary – and for education, through 'comparable level of qualification'. Gender should ideally also be taken into account, probably not in the calculation of 'headline' indicator values, but in the background discussion of the indicator values. To illustrate, if an exceptionally high percentage of teachers are women, which is the case in many countries, and teacher pay appears low relative to the pay of other professions, this is likely to be due to both the under-valuation of the teaching profession, *and* the under-valuation of women's labour. Disentangling the two is important for understanding the impact of teacher pay on who becomes a teacher.

7 Alternative measures using household assets

The definitional, but even computational, problems discussed so far in relation to monetary income suggest that physical assets in the household could provide a useful alternative. Fortunately, an international dataset for this exists. The IPUMS¹⁴ dataset has been maintained by the University of Minnesota since around 2002, and draws from large household surveys around the world¹⁵. Survey questionnaires are examined, and variable names standardised for

¹⁴ Integrated Public Use Microdata Series.

¹⁵ Minnesota Population Center, 2019.

the international dataset. In the case of South Africa, data from the 2011 census, the 2007 ‘community survey’ (a mini-census) and the 2001 census have been drawn into the international dataset. Monetary income is not available for many countries. If one looks at data from 2000 or later, the variable ‘earned income’ provides the most data, but even here only six countries have values. On the other hand, data on household assets are relatively plentiful.

Twenty-one surveys from twenty countries were selected for an analysis of household possessions. In the case of South Africa, the two surveys of 2007 and 2001 were used. The 2011 census data of South Africa were not used as workers’ occupation was not included, meaning teachers would not be identified. Surveys were chosen to represent developing nations as far as possible, and were selected if a reasonable presence of data on household assets existed. Switzerland (and to some extent Greece) were included to provide a sense of the situation in rich countries. No survey earlier than 2000 was selected. Even 2000 is fairly historical, yet the economic situation for teachers is unlikely to have changed substantially since then. The most recent survey selected for the current analysis was that of Romania, for 2011. In 2020, the most recent surveys in IPUMS as a whole were two for 2015 (neither suitable for the current study). There are clearly substantial lags in the whole process, from data collection at the national level, to finalisation of the national dataset, to the conclusion of an agreement to share the data with IPUMS, and finally IPUMS’s own analysis, standardisation and release.

The sample sizes and presence of teachers is shown in Table 2 below. Three of the occupation categories seen in the data reflect teachers. The titles of the three are the column headings in the third to fifth columns. The titles are taken from the International Standard Classification of Occupations (ISCO)¹⁶ of the ILO¹⁷. The spread of teachers across the three is somewhat inconsistent. For instance, primary school teachers may either be professionals, as in Botswana, or ‘associate professionals’, as in Costa Rica (the third and fourth columns). Only in one instance does the category secondary school teacher (fifth column) seem completely incorrectly used. This is for the 2001 census data of South Africa. Here it seems secondary teachers were misclassified as primary teachers. The 2007 South Africa breakdown seems more logical. The sums of the three teacher columns (second-last column) seem correct. In the case of South Africa, using completely separate statistics confirms that around 4.0% of workers are teachers. The last column indicates that the samples are large, meaning confidence intervals around statistics would tend to be low. The 21 samples cover 358,421 teachers in total.

¹⁶ See ‘Alphabetical index of occupational titles’ at <https://www.ilo.org/public/english/bureau/stat/isco/isco88/alpha.htm>, accessed April 2020.

¹⁷ International Labour Organization.

Table 2: Percentage of workers who are teachers and other professionals

	Below technicians and associate professionals	Technicians and associate professionals (excl. primary teachers)	Primary and pre-primary education teaching professionals	Primary education teaching associate professionals	Secondary education teaching professionals	Other professional	Managers	Total	Sum of three teacher columns	Sampled teachers
Botswana 2011	80.0	6.4		2.2	2.6	4.5	4.3	100.0	4.7	2,776
Costa Rica 2000	73.6	13.7	2.5		1.0	6.2	3.0	100.0	3.5	4,020
Cuba 2002	65.4	13.5	1.3	0.6	1.3	7.5	10.4	100.0	3.2	12,691
Ecuador 2001	86.5	2.5	1.3	0.7	1.6	4.4	2.9	100.0	3.7	13,093
Egypt 2006	71.0	9.4	5.0	0.0	1.4	8.3	4.9	100.0	6.4	116,924
Greece 2001	70.8	8.1	1.6	0.2	2.1	8.5	8.8	100.0	3.9	14,660
Malaysia 2000	74.9	10.0	0.0	2.1	1.8	4.2	7.0	100.0	4.0	5,837
Mozambique 2007	95.4	2.1	0.1	1.0	0.1	0.6	0.7	100.0	1.3	7,690
Nicaragua 2005	84.3	4.7	0.5	1.9	0.8	4.7	3.0	100.0	3.3	4,618
Nigeria 2010	74.0	17.4	1.7	0.2	1.2	3.2	2.2	100.0	3.2	724
Philippines 2010	81.8	3.0	1.9		0.6	3.8	8.9	100.0	2.5	69,369
Portugal 2001	74.9	8.7		1.0	2.7	5.9	6.7	100.0	3.7	8,301
Romania 2011	71.4	9.3	1.0		1.8	13.7	2.8	100.0	2.8	22,005
Rwanda 2002	97.4	0.6	1.1	0.0	0.2	0.5	0.2	100.0	1.3	3,337
Senegal 2002	90.4	3.7	0.9		0.4	4.0	0.7	100.0	1.3	2,904
South Africa 2001	76.7	8.1	1.2	2.3	0.1	6.1	5.6	100.0	3.6	25,822
South Africa 2007	70.2	6.8	2.2	0.0	1.8	8.9	10.2	100.0	4.0	7,543
Switzerland 2000	52.9	20.2		1.7	2.1	12.1	11.0	100.0	3.8	4,777
Thailand 2000	81.8	3.7	2.5	0.0	1.0	3.9	7.1	100.0	3.6	7,091
Uganda 2002	92.0	4.2	0.0	2.3	0.3	0.7	0.4	100.0	2.6	15,260
Zambia 2010	90.8	2.3	1.9	0.3	0.8	2.9	1.1	100.0	2.9	8,979

Source: Own analysis of IPUMS microdata – Minnesota Population Center (2019). Percentages may not add up exactly to totals due to rounding.

Table 3: Means of household asset statistics for teachers

	Persons	Electricity	Phone	Cell phone	Internet	Hot water	Heating	Air con	Computer	Washing machine	Freezer	Refrigerator	TV	VCR	Radio	Cars	Rooms	Bedrooms	Variables
Botswana 2011	3.2	0.9	0.2	1.0	0.1							0.8	0.9		0.8	0.6	2.7		9
Costa Rica 2000	4.1	1.0	0.8			0.7			0.4			1.0	1.0			0.5	5.7	2.9	9
Cuba 2002	3.8	1.0															4.3	2.7	3
Ecuador 2001	4.5	1.0	0.6														3.9		3
Egypt 2006	4.6	1.0	0.7	0.4	0.0			0.1	0.2	1.0	0.1	1.0	1.0	0.1	0.8	0.1	3.9		14
Greece 2001	3.4	1.0					1.0										3.6		3
Malaysia 2000	4.9	1.0	0.8		0.2			0.2	0.4	0.8		0.9	0.9	0.7	0.9	1.1		3.1	12
Mozambique 2007	5.7	0.5	0.0	0.7					0.1				0.5		0.8	0.1	3.2	2.2	9
Nicaragua 2005	5.3	0.9	0.2	0.4	0.0			0.0	0.1	0.0		0.5	0.8		0.4	0.1		2.1	12
Nigeria 2010	4.8	0.8	0.0	0.9													3.5		4
Philippines 2010	5.1	1.0	0.2	1.0	0.2				0.4	0.6		0.8	0.9	0.8	0.8	0.2			11
Portugal 2001	3.2	1.0															4.6		3
Romania 2011	3.1	1.0				0.9	1.0	0.1									3.1		5
Rwanda 2002	6.5	0.2	0.1	0.1	0.0				0.0				0.1		0.9	0.0	3.6		9
Senegal 2002	11.1	0.7	0.3					0.0	0.0			0.4	0.6	0.2	0.9	0.1	4.5		10
South Africa 2001	4.1	0.9	0.5	0.8					0.2			0.9	0.8		0.9		5.5		8
South Africa 2007	4.3	0.9	0.4	0.9	0.1				0.4			0.9	0.9		0.9		5.4		9
Switzerland 2000	2.8					1.0	1.0										4.5		3
Thailand 2000	3.9		0.7					0.3		0.8		1.0	1.0		0.9	0.9			7
Uganda 2002	5.8	0.2	0.0	0.2									0.1		0.8			2.2	6
Zambia 2010	6.0	0.8	0.1	0.9	0.1				0.2			0.6	0.8		0.9	0.2	1.1	2.4	11

Table 3 provides descriptive statistics per survey relating to 17 variables of household assets. For 14 of them, the weighted means of 0-1 binary values are given – zero is not having the asset and 1 is having the asset. For three variables, cars, rooms and bedrooms, the statistic represents the mean number of this asset per household. The first column provides the average number of people per household as background information. Table 3 reflects only the assets of those counted in the three teacher columns of Table 2 above. Clearly, though surveys were chosen for their relatively high focus on household assets, there are many inconsistencies across surveys with respect to the availability of data. The fact that the South Africa values are highly consistent across the two years strengthens, firstly, the validity of the two South Africa source datasets and, secondly, to some extent, the assumption that teacher assets do not change dramatically over time.

The information available from Table 3 was used to arrive at the ranking of teacher socio-economic status (SES) seen in Table 4 below. Non-rounded values from Table 3 were used. The approach was as follows. Survey-to-survey comparisons which were not supported by at least three of the 17 asset variables were excluded, to avoid making comparisons on too few variables. (The term ‘survey-to-survey’ as opposed to ‘country-to-country’ is used only because South Africa had two surveys.) Thereafter, only surveys which could be compared to at least ten other surveys, were retained. This left the fifteen surveys listed in Table 4. The number of other surveys which each of the fifteen could be compared to was then calculated. This count appears in the last column of Table 3. Whether a survey-to-survey comparison resulted in a ‘win’ or a ‘lose’ for a survey (or country) was then assessed. For instance, the Botswana 2011 to South Africa 2007 comparison resulted in a win for South Africa and a lose for Botswana, because among the eight variables allowing for a comparison, seven were higher for South Africa and just one higher for Botswana. It was possible for countries to tie. An iterative process was then followed. Each of the surveys was given a score. This score was the total number of survey-to-survey comparisons per survey resulting in a ‘win’, divided by the total number of comparisons possible for the survey. The survey with the highest score was put at the top of the ranking and removed from the dataset. The process was then repeated, until all countries had been removed and placed into the ranking list.

Table 4: Ranking of teacher SES in 15 countries using household assets

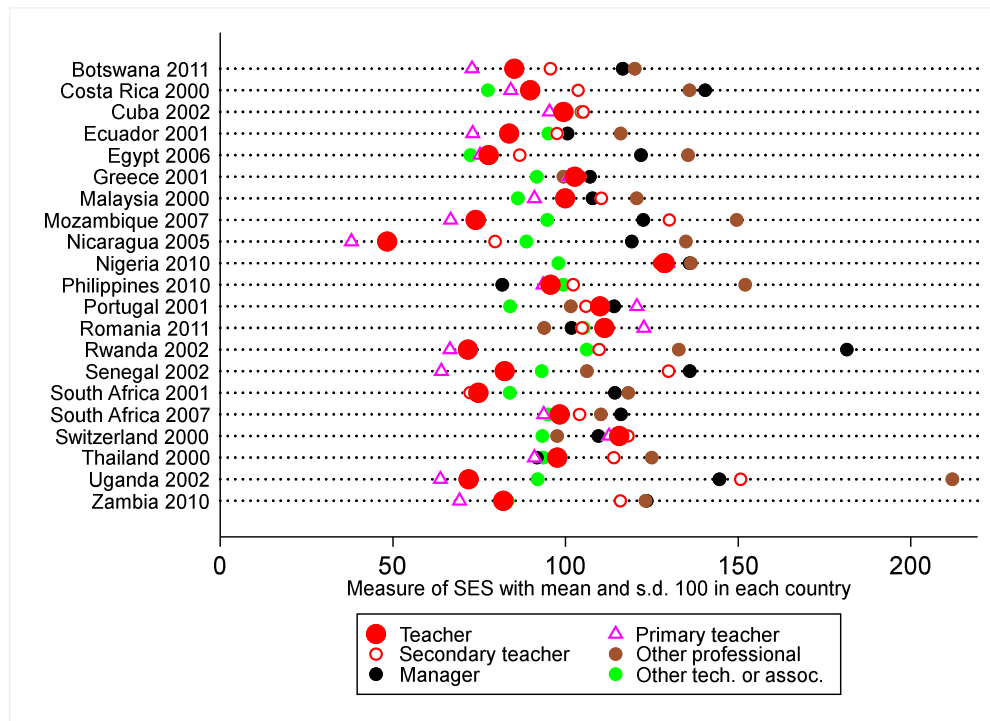
Survey	Ranking of teacher SES	Number of comparisons possible
Costa Rica 2000	1	14
Thailand 2000	2	13
Malaysia 2000	3	13
South Africa 2007	4	14
Botswana 2011	5	14
Egypt 2006	5	14
Philippines 2010	5	14
South Africa 2001	5	14
Zambia 2010	6	14
Nicaragua 2005	7	14
Senegal 2002	7	14
Nigeria 2010	8	12
Mozambique 2007	9	14
Rwanda 2002	10	14
Uganda 2002	11	14

The method is somewhat crude, yet the results look plausible. Middle income countries tend to be higher on the list, and low-income countries lower on the list. South Africa’s improvement between 2001 and 2007 would be consistent with both the fact that teacher pay, in the sense of pay notches in the salary scales, was increasing in real terms, and that the average age of teachers was rising, meaning the average salary notch would have risen.

The IPUMS data lend themselves to an analysis of the relative SES of teachers within each country, along the lines of the SDG indicator discussed in section 6. Within-survey differences in household assets would be far more meaningful than across-survey differences, given that each survey reflects just one year, and the fact that the meaning of specific assets tend to be rather country-specific. For instance, heating in the household is likely to be a better marker of SES in a country with a moderate climate than in a cold country where everyone needs heating to survive.

Estimating SES using household asset values seems to have been pioneered by Filmer and Pritchett (2001). Following their basic approach, simple principal components analyses per survey were run, using all the asset variables available in each survey. Each analysis included observations for managers, professionals and associate professionals only – these are ISCO groups 1, 2 and 3 respectively. This meant between around 7,000 (Rwanda) and 500,000 (Philippines) observations were available per survey. Figure 3 presents the results. The horizontal axis represents a scale where the mean SES, and standard deviation, across all observations in a survey are 100. Each point represents the SES of weighted individuals of a particular occupation group, in terms of this scale. The group ‘Primary teacher’ covers both professionals and associate professionals. The group ‘Teacher’ covers all teachers.

Figure 3: SES of teachers and other (associate) professionals



The next step was to calculate conditional purchasing power premiums for teachers, relative to other professionals. Managers (ISCO group 1) were left out, in order to approximate the SDG indicator. For each survey, three regressions were run. Those for South Africa 2007 are shown in Table 5 below. The dependent variable in all regressions is the assets index discussed previously, but with a mean of zero and standard deviation of 1.0. As explained earlier, the index was calculated with manager data taken into account, though managers were later removed. The first regression in Table 5 indicates that the premium was about negative 0.1 of a standard deviation. Teachers were worse off than other professionals, when controlling for the following: whether there was another teacher in the household; whether there was another person who was a non-teacher professional; age and age squared; and whether the person was female. The positive coefficient for being female, in South Africa and

virtually all countries outside Europe, is interesting. The coefficient ‘Is female’ for South Africa is a positive .15 if one removes all households with more than one professional, meaning that in a conditional analysis a household with a single female professional can be expected to be better endowed than a household with a single male professional. A similar finding emerges if one includes just households with one person aged over 20. This pattern is found across virtually all developing countries, but not the European countries. In other research, regressions of monetary pay on a range of explanatory variables for South Africa appear to yield mixed results: Adelekan and Bussin (2018) find a male pay advantage, except at the most senior management levels, while Steyn and Jackson (2015) find no male pay advantage in the South African formal sector. It is beyond the scope of the current paper to delve into these inconsistencies between monetary- and asset-based findings, but it could be worth pursuing elsewhere.

Table 5: Conditional purchasing power premiums for South Africa 2007

Dependent variable: Index of household assets			
	All	Primary (sec. excl.)	Secondary (prim. excl.)
Constant	-1.10	-1.10	-1.12
Is teacher	-0.098	-0.142	-0.044
Another teacher in household	0.40	0.38	0.39
Another non-teacher professional in household	0.67	0.67	0.67
Age	0.028	0.028	0.028
Age squared	-0.00015	-0.00015	-0.00016
Is female	0.11	0.12	0.12
N	34,307	30,972	30,099
Adjusted R squared	0.14	0.14	0.14

Note: All coefficients were highly statistically significant, with p never greater than 0.002. Household weights were used.

Table 6 presents key results for all 21 surveys, and 20 countries. In most countries, well over half of teachers are female. In a couple of Southeast Asian countries, a remarkably high number of teachers live with other teachers: 38% in Thailand and 35% in Malaysia. Nigeria also displays a high value, of 30%. Roughly, Thailand’s value of 38% of teachers translates into 23% of households with teachers having more than one teacher. The coefficient on ‘Is teacher’ is negative or near zero for all countries except for three European countries, and Nigeria, where teachers enjoy a positive purchasing power premium. The general pattern is thus that teachers, at least in developing countries, are not advantaged among professionals with respect to purchasing power.

Table 6: Teacher purchasing power premiums in 20 countries

	% of teachers who are female	% of teachers living with another teacher	Un-conditional teacher SES difference	Coeff. on 'Is teacher' for all	Coeff. on 'Is teacher' for primary	Coeff. on 'Is teacher' for secondary	Adj. R squared for first regression
Botswana	64	16	-.15	-.13	-.27		.13
Costa Rica	76	13	-.06	-.13	-.18		.13
Cuba	74	10	-.01				.08
Ecuador	64	22	-.25	-.27	-.35	-.16	.11
Egypt	45	23	-.24	-.20	-.23	-.11	.07
Greece	64	23	.07				.07
Malaysia	64	35	.04		-.07	.07	.07
Mozambique	33	17	-.33	-.23	-.29	.25	.20
Nicaragua	76	16	-.63	-.53	-.62	-.25	.22
Nigeria	51	30	.25	.22	.23	.18	.03
Philippines	81	16	-.33	-.29	-.30	-.22	.11
Portugal	76	20	.19	.14	.25	.10	.10
Romania	81	15	.13	.15	.30	.06	.02
Rwanda	47	24	-.47	-.37	-.42		.12
Senegal	19	21	-.17	-.13	-.29	.26	.09
South Africa 01	68	19	-.24	-.23	-.23	-.20	.11
South Africa 07	71	18	-.05	-.10	-.14	-.04	.14
Switzerland	60	14	.21	.12	.14	.10	.12
Thailand	63	38	-.12	-.26	-.33	-.09	.16
Uganda	37	19	-.38	-.31	-.38	.37	.14
Zambia	54	21	-.23	-.18	-.28	.11	.14

Note: A blank cell means the coefficient was not statistically significant at the 5% level.

Table 6 also includes the unconditional premium for teachers, being the mean weighted asset index for teachers minus that for non-teacher professionals. The values in this column are highly correlated with the coefficients for all teachers (from the first regression) – the correlation coefficient is .97. Yet differences across the two columns are worth attempting to interpret. In the case of South Africa, what the unconditional comparison would not capture is the fact that the average age of teachers increased over the 2001 to 2007 period. Once one takes that into account, the gains are smaller. The conditional gain is .13 (-.10 minus -.23), and not .19 (-.05 minus -.24).

The following four graphs are based on Table 6. Whether one performs the unconditional comparison (Figure 4), or the conditional comparison (Figure 5), South Africa emerges as having relatively well paid teachers. In both graphs, South Africa is in position four from the top among the developing countries. The conditional premium, which provides the more meaningful and policy-relevant comparison of the two, puts South Africa above several other middle income countries: Costa Rica, Botswana, Senegal, Egypt, Thailand, Ecuador, Philippines, and Nicaragua¹⁸.

¹⁸ World Bank classifications from 2019 used.

Figure 4: Within-country teacher purchasing power premium (unconditional)

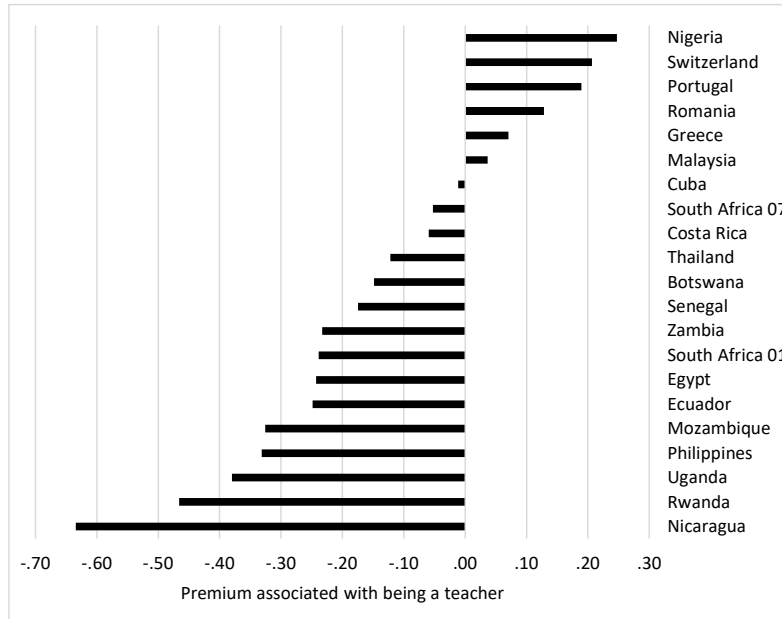
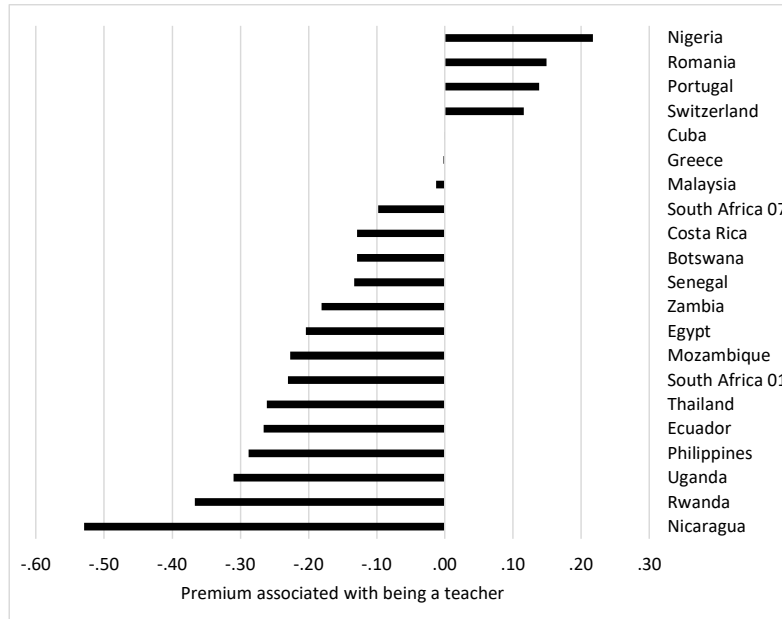


Figure 5: Within-country teacher purchasing power premium (conditional)



In 2001, but less so in 2007, South Africa (ZAF) belonged to the group of countries with negative premiums for both primary and secondary teachers. This is shown in Figure 6 below. Many other countries fell into this group. A number of African countries have clearly paid secondary teachers considerably more than primary teachers: Uganda, Mozambique, Senegal, and Zambia. Nigeria is an unusual African country insofar as it displays a large positive premium for both primary and secondary teachers.

Figure 6: Primary and secondary compared

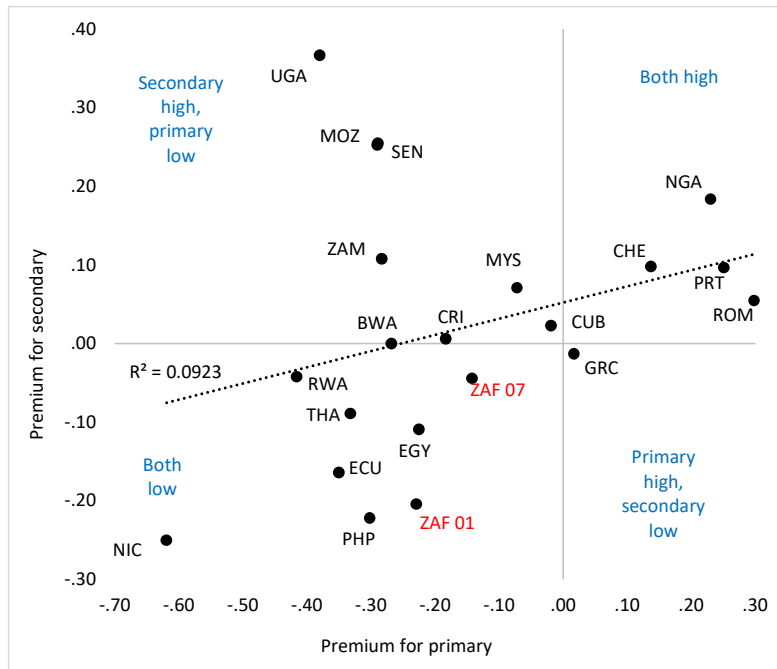
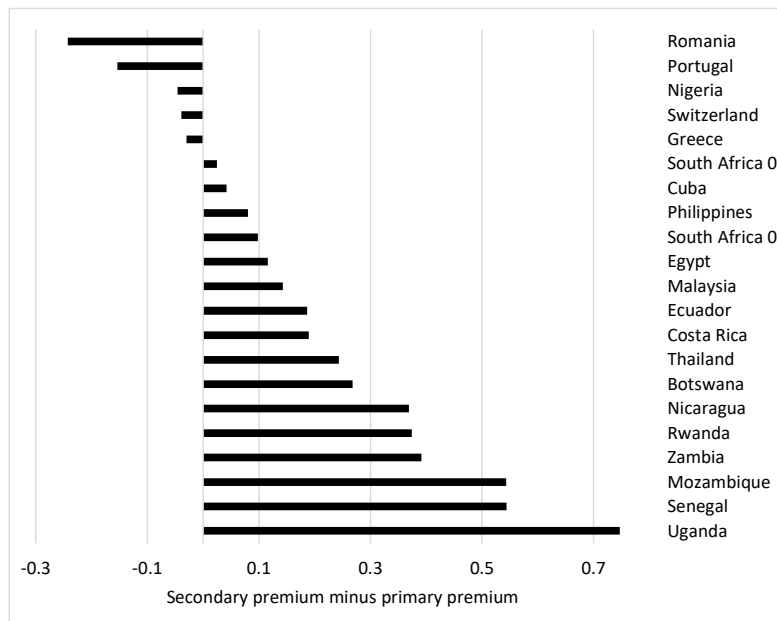


Figure 7 illustrates the difference between the secondary and primary premiums, both conditional. South Africa, in 2007, was in the bottom half of countries, and very near the bottom if one counts just developing countries, when it came to the purchasing power advantages of secondary teachers, relative to primary teachers. This reflects the fact that South Africa uses a single set of salary scales for both categories of teachers, where many other countries have different pay structures for the two.

Figure 7: Secondary minus primary premium



8 How relatively well-paid are South African teachers?

This question has many answers, depending on the method one uses for the comparison. Table 7 below provides the various answers derived from the foregoing analysis. By their very nature, household assets circumvent typical problems associated with comparing monetary values across countries. This reality, plus the fact that the asset-based comparisons seem to produce more intuitively correct results, should make one wary of the monetary comparisons summarised in the first three rows of Table 7.

Table 7: South African teacher purchasing power compared

Comparison type	Data and issues	Result
Absolute monetary PPP, OECD-like.	Own analysis of South Africa payroll data, OECD for other teachers. PPP clearly problematic.	USD 86 per day, like England and Finland
As above, with a more careful treatment of benefits.	As above.	USD 71 per day, like Italy and Japan
As above, with <i>private consumption</i> PPP.	As above, but PPP probably less problematic.	USD 67 a day, like Turkey and France
Absolute, using household assets.	IPUMS household data, 20 countries (16 developing). Careful interpretation necessary as household, not individual, wealth considered.	Like Malaysia and Botswana.
Relative to other professionals, using household assets, without conditioning on e.g. age and gender.	As above, except that this approach allows all asset variables in all countries to be used.	Like Costa Rica.
Relative to other professionals, using household assets, while conditioning on e.g. age and gender.	As above.	Like Costa Rica and Botswana.

9 Conclusion

A key contribution of this paper is a preliminary cross-country comparison of ‘teacher pay’, or purchasing power, using household assets in an international dataset drawing from national household surveys. This approach has a number of advantages. It circumvents the problem of missing income (or expenditure) values in many household survey datasets. But it also circumvents problems associated with placing national monetary pay values on some international metric. Such problems include a lack of standardisation in the definition of monetary income across different surveys, and well-known issues around PPP ratios. The fact that household assets represent the wealth of the household as a whole, and not in any direct way the income of household members, presents conceptual challenges. Yet viewing teacher pay in the context of the household highlights issues which are important for the analyst and policymaker. For instance, the extent to which teachers marry and partner with each other is an important sociological and economic matter. These and other matters relating to teachers could be explored beyond what has been presented here, using data such as IPUMS.

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