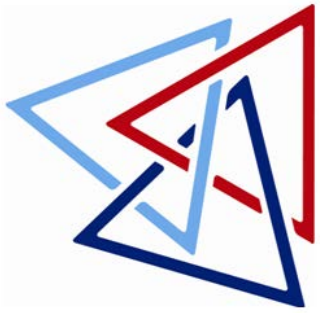

South African employment trends: How reliable are the different data sources?

Derek Yu, Rulof P. Burger and Neil Rankin

Abstract

There are many sources of South African employment data, including Statistics South Africa (Stats SA) household and establishment surveys and data series constructed by research organisations and private companies. Different South African research clusters tend to use different data sources that can produce contradictory labour market trends, and such inconsistencies may have contributed to the cluster-specific perspectives on the South African unemployment problem. This paper aims to evaluate critically the reliability of the two most popular data sources: the Stats SA household and establishment surveys. A comprehensive discussion of the sampling and surveying approaches used to obtain employment data is followed by a comparison of the resulting employment trends for the total non-agricultural formal economy, and at a one digit SIC industry level. We find that the establishment and household surveys provide relatively consistent estimates of the long-run trend in total and industry-specific non-agriculture formal employment once we account for the most obvious shortcomings in the data. Finally, panel data techniques are applied in combination with other data sources to investigate the relative reliability of the establishment and household employment data. There is evidence of measurement error in the employment estimates from both sources, but the household survey data appears to generally provide a more reliable reflection of employment growth during the period under consideration.

KEYWORDS: Income mobility, inequality, longitudinal data analysis, measurement error
JEL CODES: J62, D63, C23

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South African employment trends: How reliable are the different data sources?

Derek Yu[1], **Rulof Burger**[2] and **Neil Rankin**[2]

1. Introduction

Accurately identifying employment trends requires reliable employment measures. South African researchers are fortunate to have different employment measures to choose from, including those derived from Statistics South Africa (Stats SA) household and enterprise surveys, and qualitative data collected by the Bureau for Economic Research (BER)[3]. Fourie (2011) points out that different South African research clusters have tended to use different data sources to investigate South African employment trends: empirical micro-economic research is usually based on Stats SA household survey data, whereas macro-economic research is typically performed on the time-series data derived from the Stats SA enterprise-based surveys. Yet, there has been little research that try to understand why these datasets sometimes produce contradictory labour market trends, and how such inconsistencies may have contributed to the cluster-specific perspectives on South African unemployment.

This paper will investigate the reliability of the different sources of employment data commonly used by researchers. We begin by discussing the Stats SA household surveys[4], namely the 1995-1999 annual October Household Surveys (OHSs), the 2000-2007 biannual Labour Force Surveys (LFSs) and the Quarterly Labour Force Surveys (QLFSs) introduced in 2008. Next, we consider the enterprise-based surveys, namely the Survey of Employment and Earnings (SEE), collected between 1998 and 2005 and the Quarterly Employment Statistics (QES), introduced in 2004. These data sources will be used to construct national and industry-specific employment series and compared across time and industries.

The remainder of the paper is structured as follows: Section 2 documents what we know about these data sources, including the sampling frames, sample sizes and the questions that were used to derive the employment measure. Section 3 performs a thorough descriptive analysis that compares the employment trends (economy-wide and at an industry level) across the various data sources in 1995-2014. It attempts to explain the observed inconsistencies in light of changes and

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The authors are indebted to Jan Mosalo, principal survey statistician at Statistics South Africa, and Andrew Kerr for helpful discussions about the establishment survey data, and to George Kershoff from the Bureau for Economic Research (BER) for providing access to the BER employment series and an explanation of how this data was gathered. We also acknowledge the useful suggestions by two anonymous REDI reviewers. All remaining errors are our own.
[3] Private companies Quantec and Adcorp produce additional employment data, but these will not be considered in this study.
[4] Stats SA also conducted other surveys like the Income and Expenditure Surveys (IESs) and General Household Surveys (GHSs), but since these surveys are not primarily designed to capture labour market information, the labour force surveys are usually deemed to be more reliable for labour market analyses. The same applies to the South African Census data.

differences in how these measures were constructed, as discussed in section 2. Section 4 uses statistical techniques to investigate the reliability of the different data sources. Specifically, it investigates the extent to which the employment measures, when combined with industry capital and output data, is congruent with a standard industry production function. The motivation for this approach is that actual fluctuations in employment should be observed to have an impact on output, whereas artificial variation in employment measures due to changes in measurement should not. We also compare the industry employment trends to the qualitative industry employment series collected by the Bureau for Economic Research. Section 5 concludes.

2. Data sources

2.1 Household surveys

Sampling and survey

In October of 1993 Stats SA conducted the first of a series of nationally representative household surveys known as the October Household Surveys (OHS), which was replaced by the Labour Force Surveys (LFS) in February of 2000 and the Quarterly Labour Force Survey (QLFS) in the first quarter of 2008[5]. Until 1995 these surveys used sampling frames based on the 1991 Census. The OHS 1994 was the first to include households from the former homelands of Transkei, Bophuthatswana, Venda and Ciskei, but sampling of these households were based on rough estimates of population sizes and new informal settlements were excluded from the sampling frame (Orkin 1998: 2). However, since the OHS 1995 coincided with an Income and Expenditure Survey, Stats SA went to great lengths to provide a more representative sampling frame for these areas. The improved coverage in 1995 has prompted Stats SA (1996, p. 2) to warn that the 1994 and 1995 surveys were "not directly comparable in all respects", and we therefore follow convention in omitting the pre-1995 household surveys from our comparative analysis.

OHS 1996 was the first to use a sampling frame no longer based on the 1991 census. The new frame, which was derived from the preliminary database of enumerator areas (EA) created during the demarcation phase of the 1996 census, had the effect of enumerating more non-urban EAs (Statistics South Africa, 1999, p. 13) where wages are usually lower and unemployment is higher. This shift has led some studies to draw overly pessimistic inferences regarding wage and employment trends by comparing 1995 to subsequent years (Kingdon & Knight, 2005; Casale & Posel, 2002). In 1998 the sampling frame was again adjusted, this time to achieve a more adequate coverage of those residing in mining hostels (Statistics South Africa, 2000, p. 6). In 1999 the first Stats SA master sample was created from the 1996 census, and this was used to draw a sample for OHS 1999 and the first Labour Force Surveys, until a new master sample based on the 2001 Census was introduced for the LFS 2004b. The transition to the master sample survey in 1999 meant that survey workers would henceforth interview all the households that resided at the sampled dwelling unit, whereas previous surveys used a sampling procedure that was likely ignore the small households on the property (Kerr & Wittenberg 2013). This led to a sudden increase in the number of single person

[5] For the remainder of the paper, the OHSs will be referred to as OHS 1993, OHS 1994, etc., while the LFSs will be referred to as LFS 2000a (for the first round of LFS in 2000), LFS 2000b (second round in 2000), LFS 2001a, and so forth. Finally, the QLFSs will be referred to as QLFS 2008Q1 (for the first round of QLFS in 2008), QLFS 2008Q2 (second round in 2008), and so forth.

households in the sample, which may be expected to have improved the capturing of low-wage workers in the economy.

The samples for all the OHSs, LFSs and QLFSs were drawn using a multistage sample design, usually stratifying the sample explicitly by province and area type and implicitly (within magisterial districts) by population group or income levels. Starting with the September 2004 LFS the samples were explicitly stratified by the 53 district councils alone, although they continued to be post-stratified by province. Whereas all of the OHSs were independent cross-sections, the LFSs were originally designed as a 20% rotating panel, although the rotation scheme had to be adjusted in order to address "response fatigue" (Statistics South Africa, 2002, p. i) and possibly some other survey shortcomings as well. Most of the household surveys use in this study sampled around 30,000 households, with the exception of the 1996 OHS (which coincided with the enumeration for the 1996 Census), the 1998 OHS (budget issues) and the February 2000 LFS (pilot study). This sampling methodology was adopted again with the introduction of the QLFS (Stats SA 2008a). The rotating panel approach was also maintained, although the selected dwelling units would now remain in the sample for four consecutive surveys (i.e., a duration of one year), with a quarter of these dwelling units rotating out at each round of the survey.

Derivation of employment measure

Another potential source of comparability problems for the employment estimates from the Stats SA household surveys is the changes in the survey questionnaires. The metadata document for the OHS 1995 does not explain exactly how the labour market status variable was derived, but we know that at least since OHS 1996 a variety of questions were used to derive both the narrow (strict) and broad (expanded) labour market status of the respondent. Over time there have been numerous changes in the methodology used by Stats SA to derive the employed under both definitions[6]. Table 1 shows the questions used to classify individuals as employed for all the household surveys since OHS 1995. In 1995 respondents were asked "[w]hat [they] did most during the last 7 days" and were allowed to specify working either part-time or full-time. In 1996 respondents were asked whether "during the past 7 days [they] actually [did] work for pay, profit or family gain?"[7] The 1997 and 1998 surveys added "casual work" as a third potential response to the question, and in 1999 this option was relabeled "casual / seasonal work".

In 1996 individuals who reported working full-time or part-time during the last seven days were defined as employed, while the 1997 and 1998 surveys also allowed individuals to report doing 'casual work' and in 1999 the 'seasonal worker' option was added. In all these surveys the employment question did not clearly explain what is meant with 'full-time', 'part-time', 'casual work' or 'seasonal worker', so we may be concerned that respondents who were engaged in certain marginal economic activities might not have self-identified with being employed in one of the specified categories, and would therefore be incorrectly classified as economically inactive or unemployed. For this reason, we suspect that the OHS may have under-captured total employment.

[6] For detailed explanation on the algorithm to derive the labour market status of the participants in each survey, refer to Yu (2007 & 2009).

[7] Note that "most" was dropped from the question between 1995 and 1996, so that individuals who did some work, but did not feel that this is what they did most in the preceding week may have answered in the negative in 1995 but not in 1996.

Starting with the LFS 2000a, the surveys specifically asked respondents whether they were involved in any one of a number of mostly low-income activities such as 'guarding cars' or 'making things for sale' for at least one hour in the preceding week. The probing nature of the question was aimed at more accurately capturing informal, self-employed and low-income employment. If a substantial number of employed individuals were misclassified as unemployed or inactive before 2000 due to the vague way in which the question was formulated, then we would expect to see a discontinuous jump in employment, and informal employment in particular, between OHS 1999 and LFS 2000a that has little to do with actual employment trends.

Although survey weights for OHS 1993-1995 were initially calculated using the 1991 Census, the 1995 OHS was later re-weighted using the 1996 Census weights. The OHS 1996 to LFS 2000a were all released with sampling weights calculated from the 1996 Census weights (Stats SA 2000a), but later rereleased with the 2001 census weights. The LFS 2004b to QLFS 2013Q3 were released with sampling weights calculated using the Census 2001 weights. Since QLFS 2013Q4, the sampling weights have been calculated from the Census 2011 weights. Also, when the QLFS 2013Q4 data was released, Stats SA updated the 2008Q1-2013Q3 labour market aggregates using Census 2011 weights.

2.2 Enterprise surveys

Sampling and survey

In 1998 Stats SA replaced the collection of business surveys it had hitherto conducted with the standardised quarterly Survey of Total Employment and Earnings (STEE), later renamed the Survey of Employment and Earnings (SEE). The sampling frame for this survey included private and public sector firms with turnover that exceeded the VAT threshold of R300,000 per year, but excluded firms in a number of industries[8]. Industry and aggregate employment can be estimated from data on the slightly more than 10,000 sampled enterprises, but we would expect such an estimate to understate total employment due to the incomplete industry coverage and the omission of small firms. Employment data for the mining and quarrying industry was sourced directly from the Minerals Bureau of the Department of Minerals and Energy. The lack of industry coverage was addressed in 2002 when Stats SA, with the help of the South African Revenue Service, the Department of Trade and Industry, and the Department of Labour, extended the sampling frame to include all the previously omitted industries, apart from agriculture and domestic services. This sampling frame continued to omit firms with an annual turnover of less than R300,000 per year.

In the last quarter of 2004, Stats SA introduced the Quarterly Employment Statistics (QES) survey, which sampled around 20,000 establishments and would eventually replace the SEE from the second quarter of 2005. The sampling frame for the QES was further broadened to include all establishments registered for income tax. Firms that paid some form of income tax without being

[8] These industries included: agriculture, hunting, forestry and fishing; restaurants and other eating and drinking places, boarding houses, caravan parks and guest farms; storage, water and air transport; telecommunication services; financial institutions other than banking institutions and insurance companies; real estate and business services; educational services; medical, dental and other health services; welfare organizations; religious organizations; and recreational and cultural services (Altman, 2008:128).

registered for VAT were now included in the QES sampling frame, whereas they would have been excluded from that of the SEE. As in the SEE, the employment information in the mining and quarrying industry in the QES continued to come from the Minerals Bureau of the Department of Minerals and Energy.

Although the extension of the 2004 sampling frame to all enterprises registered for income tax effectively extended the coverage of South African firms, not all entities registered for income tax are employing enterprises. Stats SA therefore decided in 2006 to change the business sampling frame to include all enterprises registered for VAT, as well as all enterprises that made contributions on behalf of employees for Pay As You Earn income tax, to the Unemployment Insurance Fund or to the National Skills Fund. At this point Stats SA also began continually updating the business register to reflect the addition of new enterprises and the ceasing of dead enterprises.

Stats SA's sampling methodology entails first stratifying firms by firm size and industry before sampling from each of the strata. The largest firms within each industry were sampled with certainty, and a smaller share of each of the other strata was sampled randomly. Sampling weights used to estimate total and industry employment levels are adjusted for non-response. Sampled firms are surveyed for several rounds before the sample is refreshed[9]. After updating the sampling frames in 2002Q3, 2004Q4 and 2006Q2, Stats SA released employment figures using both the old and new sampling frames for the next two quarters. The more recent sampling produces different employment estimates due to a variety of factors (Stats SA, 2007c) ranging from the extension of the boundary of the formal sector as a result of legislative changes, the more complete coverage of industries, better capturing of the small businesses in the registration process, greater compliance with administrative requirements to register as an employer, and increased coverage of the list of employer entities on the Business Register.

Derivation of employment measure

There are several ways in which the workers captured in the establishment surveys differ from those in the household surveys. The establishment surveys used a sampling frame which excluded the informal sector, domestic workers, the agricultural sector and business that were not registered for VAT and that did not pay income tax. Furthermore, these surveys asked firms to identify all part-time or full-time workers who earned a salary, but to exclude those working for commissions only.

2.3 The BER employment index

The Bureau for Economic Research at Stellenbosch University conducts qualitative business tendency surveys among senior business executives in the construction, retail and wholesale, manufacturing, and financial services sectors[10]. These surveys ask qualitative questions on a number of issues, including business confidence, sales and employment. The question on employment asks respondents whether the firm's number of employees had increased, decreased or remained constant in the current quarter compared to the same period a year ago. Each firm's response is

[9] According to Kerr, Wittenberg and Arrow (2014) such updates occurred in June 2006 and March 2010 for the QES.
[10] Kershoff (2002) provides more information about the BER's sampling methodology.

weighted in relation to turnover or size of workforce. A "net change in employment" index is then constructed as the weighted percent "higher" minus the percent "lower." A positive number represents an expanding workforce, whereas a negative number indicates net employment losses.

Although not much analysis has been performed on this employment index, the composite business confidence index has been published quarterly since 1975 and has been shown to be highly correlated with the overall business cycle in South Africa (Kershoff 2000: 5). From the perspective of this study, the main benefit of this data source is that the employment data were gathered without sudden adjustments to its sampling frame over the period under consideration.

In section 4 we compare the BER employment index for the four covered industries to the employment growth in the same industries for the establishment and household survey data. Even though the BER series may suffer from its own idiosyncratic shortcomings, these measurement issues are unlikely to induce errors that coincide and are similar in magnitude to the errors in the establishment or household survey data sources. If the BER employment index is highly correlated with either the establishment or household survey data, then this correlation is most likely due to the common capturing of actual employment trends in the industry. Such a correlation will therefore be interpreted as an indication of the relatively reliability of the employment data.

3. Employment comparisons

3.1 Household surveys

Total employment

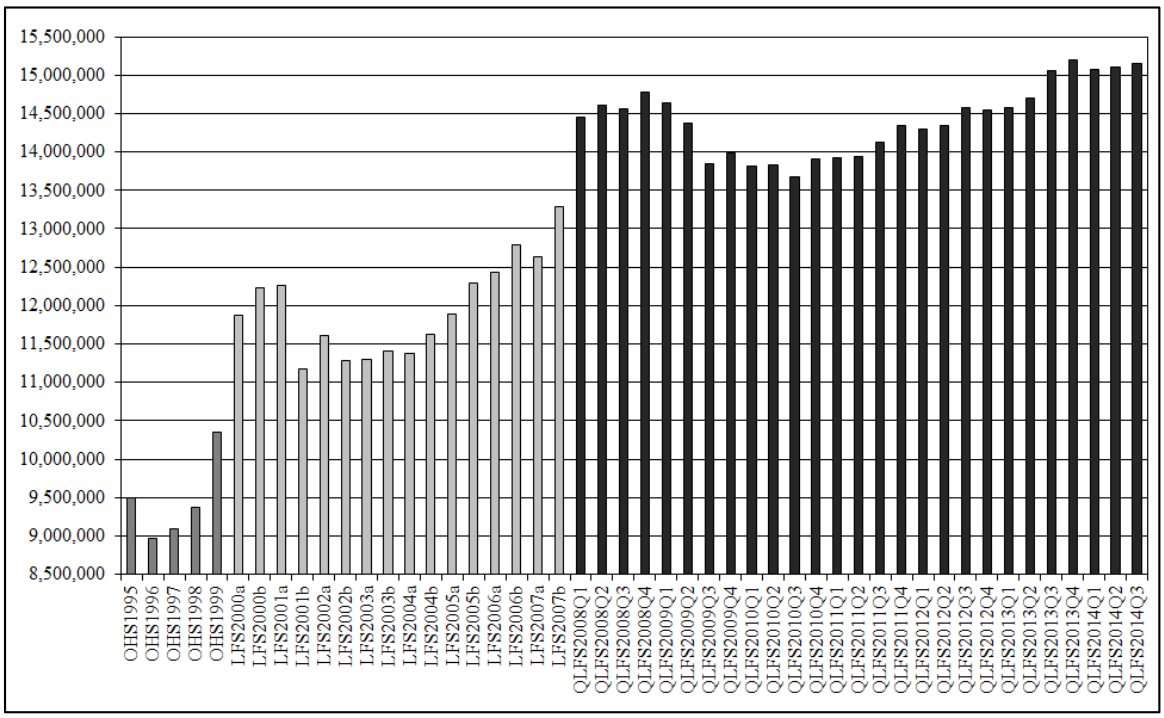
Figure 1 and Table 2[11] show the total number of workers employed in South Africa between 1995 and 2014, as estimated using the Stats SA household surveys. A naïve comparison of total estimated employment at the beginning and end of this period suggests that employment increased by approximately 5,65 million (or nearly 60%) over this period. However, part of this increase may reflect the changes in sampling and survey design discussed in section 2.1. In a few instances the observed changes between successive surveys are surprisingly – perhaps implausibly – large. The differences in sampling methodology, questionnaire structure, survey weights, and the algorithm used to derive employment status mean that the employment estimates obtained from the different surveys may not be directly comparable unless these issues are explicitly taken into consideration (e.g., Casale, Muller and Posel 2005, Yu 2007, Altman 2008). However, we can use the factors reviewed in Section 2.1 to help distinguish actual changes in employment from fluctuations in the employment estimates due to survey-specific changes. The information respondents provided about the nature of their economic activities can be used to further scrutinise the explanations for these changes in employment. Table 3 reports the estimated number of workers employed in various sectors[12]. The large number of unspecified workers in OHS 1995-1996 is due to the fact

[11] These employment figures are slightly different from those published by Stats SA in, for example, the Historical Revision data series, since our we include 65 year olds in our definition of the employed.

[12] Until LFS 2007b, Stats SA's definition of informality focused on whether or not the enterprise that the employed worked for (regardless of whether they worked as employees or self-employed) was registered for VAT, by using the respondents' answer to the direct, self-perception question on the enterprise registration status (Essop & Yu, 2008a: 6-7). With the inception of QLFS in 2008, the enterprise characteristics remained the important criteria to distinguish informal workers, but questions other than the direct question mentioned above were also considered. The self-

that employees were not asked to declare their formal/informal sector status[13]. Table 4 presents the number and the proportion of employed working as employees and self-employed respectively.

Figure 1: Total employment, 1995-2014



Source: Own calculations using OHS/LFS/QLFS data.

In Table 2 there are six instances where total estimated employment changed by more than 5% between successive surveys. Between OHS 1995 and OHS 1996, total employment dropped by more than half a million. The next two discontinuous jumps in total employment occur between OHS 1998 and OHS 1999 (an increase of nearly one million) and between OHS 1999 and LFS 2000a (an even greater increase of about 1.5 million). Then, between LFS 2001a and LFS 2001b there was a sudden drop in employment of more than 1 million. The last two jumps occurred between LFS 2007a and LFS 2007b (an increase of almost than 700,000) and between LFS 2007b and QLFS 2008Q1 (another increase of almost than 1.2 million). Not surprisingly, five of these six discontinuities coincided with specific changes in sampling or questionnaire design already discussed in Section 2.1.

The employment decrease that occurred between OHS 1995 and OHS 1996 coincided with a change in the sampling frame that was based on the new census. The industry composition of workers (not shown) reveals that this decrease was mainly due to a sudden decrease in employment in the agriculture, forestry, fishing and hunting industry between these two surveys.

Table 3 reports the estimated number of workers employed in the different sectors across surveys and reveals that the large jumps in employment in OHS 1999, LFS 2000a and LFS2001b are all largely attributable to changes in the number of workers in the informal or subsistence agriculture

employed were considered as informal workers if their businesses were not registered for either income tax or value-added tax, while the employees were classified as informal sector workers if they were not registered for income tax and worked in establishments that employed fewer than five employees (Essop & Yu, 2008b: 4-5).

[13] Only the self-employed were asked to declare the enterprise registration status in these OHSs.

sectors. The sudden increase in the number of informal workers in OHS 1999 coincided with Stats SA's adoption of a new sampling frame that we would expect to have better captured low-wage workers (who resided on the same property as larger households). The transition from the OHSs to the LFSs in 2000 resulted in a sharp increase in subsistence agricultural workers, and smaller but still substantial increases in informal sector and domestic workers. Again, this is not surprising, given the more probing questions that were asked about involvement in marginal economic activities in the LFS. Table 4 shows that this transition was also associated with a doubling in the number of self-employed workers. The fact that these changes were all very large, sudden, isolated to specific sectors and coincided with a change in sampling methodology or questionnaire design, leads us conclude that much of these estimated changes are reflective of changes in the survey methodology rather than changes in the labour market.

The next big change in estimated employment occurred between LFS 2001a and LFS 2001b, and Table 3 reveals that this was mainly due to an anomalous spike in informal sector employment in LFS 2001a, which was reversed in the subsequent survey. For the LFS 2001a Stats SA had decided to use all individuals who reported being self-employed and operating in a non-VAT registered business as the basis for a follow-up survey about the non-VAT registered businesses (the Survey of Employers and Self-employed, or SESE). Survey workers were therefore paid a bonus for each completed SESE interview, which created an incentive to capture informal sector workers that did not exist in the other surveys (Kerr, 2015). It seems likely that this sudden jump and subsequent drop in informal sector employment reflect this change in survey worker incentives, rather than actual changes in employment[14]. Table 3 also shows that the short-lived increase in informal sector employment in LFS 2001a coincided with a temporary decrease in formal sector and domestic workers, so some of these workers may have been inconsistently classified in informal sector employment, which would mean that formal sector employment (our focus from Section 3.2 onwards) may be under-estimated in LFS 2001a.

The final discontinuous change in employment that occurred in the period under consideration coincided with the transition from the LFS to the QLFS in the first quarter of 2008. In this QLFS there was suddenly about 20% more workers employed as domestic workers and informal sector workers, as well as almost 10% (or 1 million) more workers in formal sector employment. Again, the sudden nature of this change and the fact that it coincided with a known change in the survey (and the census from which the survey weights are calculated) leads one to suspect that this is not reflective of changes in the South African labour market.

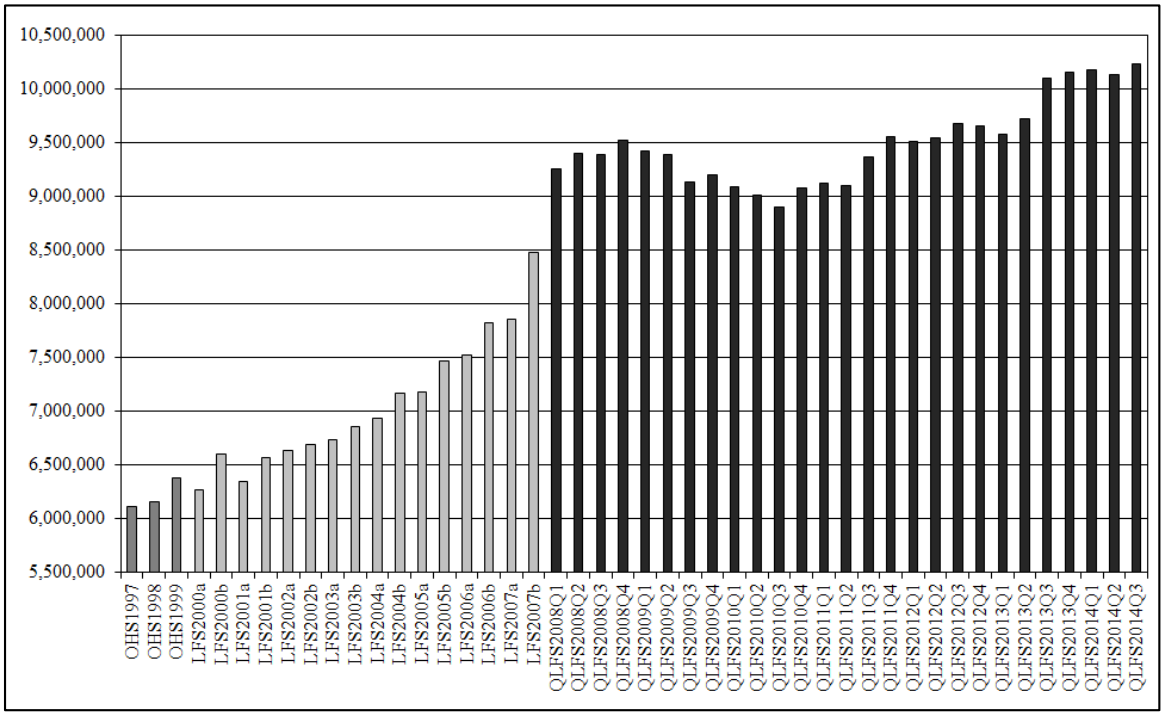
The only large jump in employment that cannot be directly linked to a well-documented change in survey design or sampling methodology is the big increase of formal sector employment between LFS 2007a and LFS 2007b (of about 600,000). Unlike most of the sudden changes discussed earlier, this increase was not concentrated in a single sector or industry, and is mainly attributable to the higher number of sampled professionals that appear in the LFS 2007b.

The erratic fluctuations in total estimated employment – especially the under-estimation of employment during the OHS years – can therefore be mainly attributed to abrupt changes in the

[14] Devey, Skinner and Valodia (2006: 309) argue that the LFS 2001a informal employment figure is not an outlier, but rather the 'correct' estimate, with the estimates in other surveys significantly under-representing the true level of informal employment.

informal employment, agricultural employment and self-employment due to changes in sampling and surveying methodology. A more reliable indication of employment trends can be obtained by focussing our attention on formal non-agricultural employment since 1997. This has the additional advantage of producing an employment series that is more directly comparable to that estimated from the establishment surveys. Table 5 and Figure 2 show the estimated number of formal non-agricultural employees between 1997 and 2014. After excluding the workers in the informal sector, the agriculture industry or self-employment, as well as the pre-1997 surveys, most of the abrupt changes in employment seen in Figure 1 disappear. Formal non-agricultural employment now evolves in a relatively stable way between 1997 and 2014, except for the remaining large jumps in employment between LFS 2007a and LFS 2007b (attributed to the higher number of sampled professionals in the latter survey, as discussed in Section 2.1) as well as between LFS 2007b and QLFS 2008a (due to the change in the census used to calculate survey weights[15]). The employment estimates in Table 5 suggests that total formal non-agricultural employment increased by more than 4.1 million between 1997 and 2014. However, since this number includes a sudden increase of almost 1.4 million between LFS 2007a and QLFS 2008 Q1, a more reasonable estimate would be that the economy probably added about 3 million jobs over this 17-year period, at an annualised growth rate of 2.4 percent. We can also clearly distinguish the pro-cyclicality of employment from Figure 2. Employment growth accelerates with the business cycle upswing in 1999 (particularly since 2003) until the global financial crisis triggered a decrease in employment of 600,000 employment between the fourth quarter of 2008 and the third quarter of 2010. Since then employment has shown a steady recovery.

Figure 2: Number of formal non-agricultural employees, 1997-2014



Source: Own calculations using OHS/LFS/QLFS data.

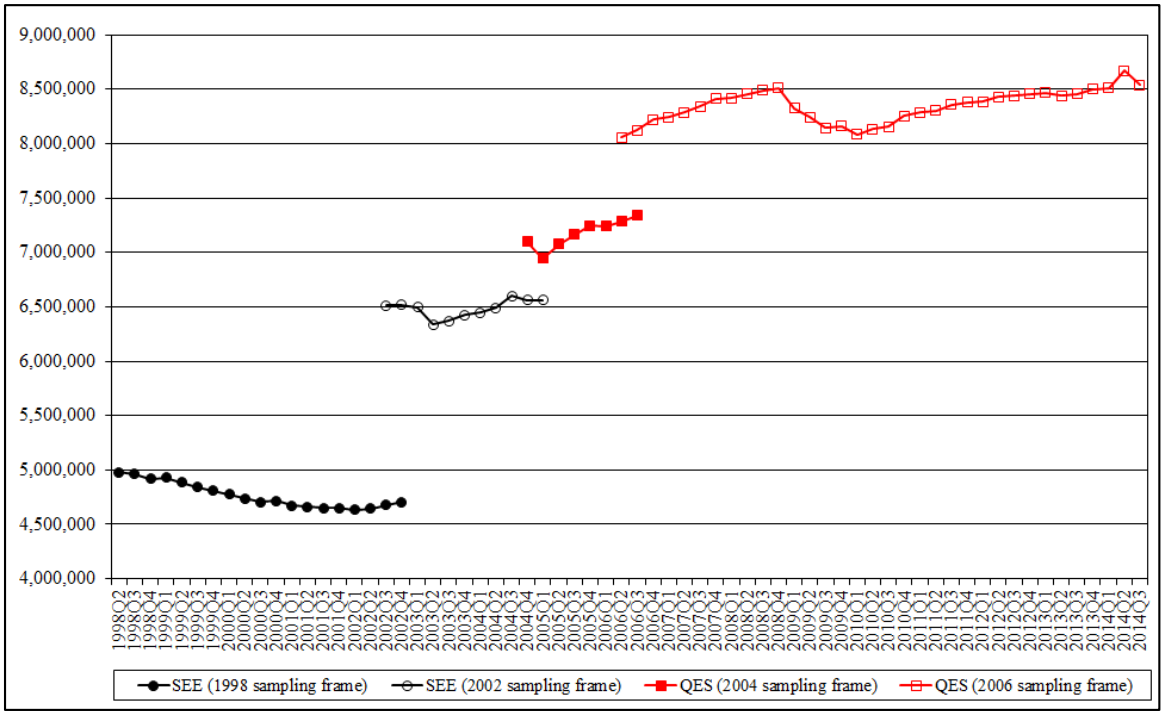
[15] This conclusion is further validated by the fact the change in employment between these surveys is substantially reduced when using cross entropy weights produced by a consistent demographic model.

Table 6 provides more detailed employment information by reporting the number of formal non-agricultural employees in each of the one-digit SIC industry categories. The employment estimates indicate very slow employment growth in the mining, manufacturing and utilities industries. The financial services and construction industries experienced the most rapid job growth, followed by wholesale and retail; community, social and personal services; and transport, storage and communication.

3.2 Establishment surveys

Table 7 and Figure 3 present the formal non-agricultural employment estimates from the SEE and QES data. The effects of the adjustments in the sampling frames in 2002, 2004 and 2006 are clearly observable in every industry apart from mining (which was not affected by these adjustments since data was directly sourced from the Department of Minerals and Energy). Interestingly, the sample update in 2010 had an almost negligible effect on employment estimates. Between SEE 1998Q2 and SEE 2002Q3 total estimated formal non-agricultural employment decreased by approximately 300,000. The extension of the sampling frame to include the previously omitted sectors in 2002Q3 coincided with 1.8 million new workers being added to total estimated formal non-agricultural employment.

Figure 3: Number of formal non-agricultural employees in SEE and QES, 1998Q2-2014Q3



Data source: Stats SA's SEE and QES Statistical Release, various issues

Tables 8 and 9 provide additional employment estimates at the one digit SIC level for the SEE and QES survey periods respectively. The new sampling frame can be seen to have led to very large increase in employment in the financial intermediation, insurance, real estate and business services, and somewhat smaller increases in the wholesale and retail, and community, social and personal services industries. These are precisely the industries in which we would have expected a severe under-capturing of establishment based employment prior to 2002 due to the omission of the sectors listed in footnote 7. However, even some of the industries unaffected by this sectoral

extension experienced jumps (albeit smaller jumps than for the affected industries) along with the sampling frame adjustment, which suggests that perhaps this was not the only change that occurred between the sampling frames. After such a large and sudden in increase total estimated employment in 2002Q3, a mere 50,000 further workers were added to the estimate of total formal non-agricultural employment until discontinuation of the SEE in 2005Q1.

The introduction of the QES in 2004 and the concurrent expansion of the sampling frame to companies registered for income taxes led to another abrupt increase in total estimated formal non-agricultural employment of approximately half a million. As with the previous employment increase, the bulk of the newly employed were discovered in the financial intermediation, insurance, real estate and business services industry. Smaller but substantial increases were also experienced in the transport, storage and communication, and construction industries. Over the next two years employment grew by fewer than 200,000 workers, before the new sampling frame introduced in 2006Q2 resulted in a more than a three-quarter million increase in employment. This time the employment gains were concentrated in the manufacturing, wholesale and retail, financial intermediation, insurance, real estate and business services, and community, social and personal services industries. This sampling frame continued to be used for the next 8 years, during which time total employment grew by less than half a million workers.

The establishment survey estimates in Table 7 therefore reveal that total formal non-agricultural employment increase from slightly less than 5 million in 1998 to about 8.5 million in 2014. However, almost 90% of this 3.5 million worker increase occurred as discontinuous upward jumps along with sampling frame adjustments, rather than in the form of gradual employment growth during periods in which the sampling frame remained constant. If the sudden employment increases are interpreted to be completely artificial, then the implied employment growth over this period is less than half a million; much lower than the estimate obtained from the household surveys.[16]

An alternative interpretation is that the sampling frame that is used to calculate the sampling weights was not frequently updated to reflect the emergence of new firms. In their firm-level analysis of the QES, Kerr, Wittenberg and Arrow (2014) point out that estimated employment growth between resampling periods will capture the effects of reductions or expansions in employment of firms in the initial sampling frame, as well as employment losses due to firm closures, but will fail to accurately reflect the employment growth due to firm births (or firms growing large enough to be included in the sampling frame). This type of employment growth will only be captured once the sample of firms is refreshed, or if the business register is updated and the sample weights are inflated to reflect the increased number of firms represented by each sampled firm. If the sampling frame adjustments in 2002, 2004 and 2006 coincided with the infrequent updating of the business register or a new sample of firms being drawn, then at least some of the observed discontinuities may reflect actual employment growth rather than merely an improved capturing of existing employment.

It is worth stating that whereas our discussion of inconsistencies in the household survey employment data draws on the contributions of numerous papers on this topic, relatively few

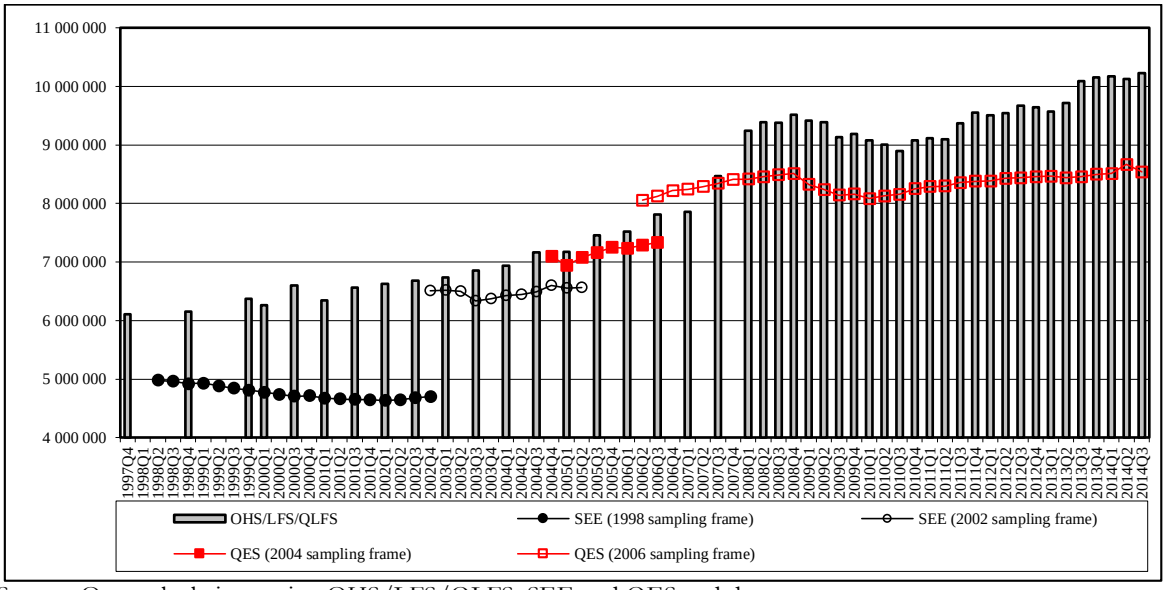
[16] This assumption is implicitly maintained by approaches that link the employment estimates from different sampling frames by backwardly adjusting earlier series by a constant factor while keeping the employment growth during these periods unchanged.

studies have investigated inconsistencies in the establishment employment data. This may be because analysts have not had access to the establishment level data as they have the household data, and means that the problems with the establishment data are not as well understood as they are for the household survey data.

3.3 Comparison of household and establishment surveys

We turn now to a comparison of the employment levels and trends between the household and establishment surveys. Figure 4 compares the two series for total formal non-agricultural employment. At the start of the SEE series in 1998 the establishment survey estimate of employment was about 1.2 million below the household survey estimate, but this gap narrowed to less than 250,000 after the SEE sampling frame was extended to include the previously omitted sectors in 2002. At the implementation of the QES in 2004, the gap between total employment estimates from these two sources was even smaller: less than 100,000 workers or about 1% of total employment. The QES sampling frame adjustment in 2006 resulted in the establishment surveys producing slightly higher but still very similar total employment estimate as the household surveys. The discontinuous increase in household survey employment due to the reweighting of the QLFS data with 2011 census weights led the household surveys to produce a total employment estimate in 2008Q1 that exceeds that of the establishment surveys by about 800,000.

Figure 4: Number of formal non-agricultural employees, 1997Q4-2014Q3



Source: Own calculations using OHS/LFS/QLFS, SEE and QES and data.

Since the establishment surveys started using the business register as a sampling frame in 2002, the two data sources have produced very similar employment estimates on the dates that coincided with sampling frame adjustments for the establishment surveys. However, apart from the jumps in employment that coincides with these adjustments the establishment surveys estimate much slower employment growth than the household surveys between 2002 and 2006. One possible explanation for this was provided in the previous section: that employment growth resulting from firm births will be automatically reflected in household surveys but will go uncaptured in the establishment surveys until the sampling frames are updated. If these updates occur mainly with adjustments in the sampling frame, then this could explain the observed discrepancy in employment growth, and

would suggest that the household surveys provide a more reliable indication of the pace of employment growth. Figures A.1 to A.8 in the appendix compare formal employment estimated from establishment and household surveys at the one-digit SIC industry level.

4. Econometric analysis

We now more rigorously assess the relative reliability of the employment estimates from establishment and household surveys by performing an econometric analysis of the two data sources. First, we include each of the (one-digit SIC) industry-specific formal sector employment series in a production function regression with capital and output measures. The capital and output data are collected from South African firms at quarterly intervals using the Quarterly Financial Survey and measured at constant 2000 prices. The motivation is that we expect true industry employment to be an important determinant – along with physical capital stock and total factor productivity – of industry output. More reliable measures of employment should therefore reveal a closer correspondence with the variation in industry output levels that remain unexplained by fluctuations in physical capital.

Our econometric model is based on standard production theory, according to which industries combine physical capital, K, labour, L and Hicks-neutral technology, A, to produce output, Y. The production function is of the constant returns-to-scale Cobb–Douglas form: $Y_{it} = A_{it}K_{it}^{\alpha}L_{it}^{1-\alpha}$, where i and t denote industries and time respectively. This can be expressed as in logarithmic form as

$$\tilde{y}_{it} = \eta_i + (1-\alpha)\tilde{l}_{it} + u_{it} \quad [1]$$

where $\tilde{y}_{it} \equiv \log\frac{Y_{it}}{K_{it}}$, $\tilde{l}_{it} \equiv \log\frac{L_{it}}{K_{it}}$ and technology is assumed to consist of both an industry-specific fixed component, η_i, as well as a stochastic time varying component, u_i.

It is well understood that poorly measured regressors will produce attenuated regression coefficients, and that this attenuation bias will be greater the noisier the regressor. We would expect the labour coefficient in this regression to be roughly equal to labour's share of national income, probably somewhere between 0.45 and 0.75. If the labour coefficient estimate from an OLS regression of equation [1] is substantially below this range, then this may suggest that the employment series is unreliable. Furthermore, if one of either the establishment or household survey series produces a much lower labour coefficient than the other, then this would suggest that this measure is less reliable. If the two employment series suffer from independent measurement error, then using one as an instrumental variable for the other in a 2SLS regression should provide a consistent estimate of the true labour coefficient.

Concerns that industry fixed effects may be correlated with employment or the capital stock require that we use a fixed effects (FE) or first-differenced (FE) estimator to estimate equation [1]. However, by transforming away all cross-industry variation in the variables, the FE and FD estimators are known to be highly sensitive to time-varying measurement error (Griliches and Hausman, 1986), particularly where the time series variation in the regressors has a low signal-to-noise ratio. Wooldridge (2002, p. 312) shows that if a mismeasured regressor has a high degree of

autocorrelation relative to its measurement error, then we would expect attenuation bias to be more severe in the FD than the FE estimates. A comparison of the FE and FD estimates may therefore also be instructive about the persistence of the measurement error that affects the two employment measures.

Table 10 reports the pooled OLS estimates from estimating equation [1] with the household survey employment estimates (column 1), the establishment survey estimates (column 2) and the establishment series with backward adjustments that inflate the earlier employment series by a constant factor in order to remove the discontinuous jumps associated with changes in the sampling frame. The household survey data produces an employment coefficient of 0.6, whereas the two establishment series both yield somewhat smaller estimates. Since all three series almost certainly suffer some measurement error, this would suggest that the true employment coefficient is probably somewhat larger than 0.6 and also that the establishment employment figures (backward adjusted or unadjusted) are less reliable measures than the household survey estimates. In column 4 all three variables are included simultaneously. The household survey employment variable remains a strong predictor of industry output, whereas both establishment survey variables have a fairly weak partial correlation with output after conditioning on the variation already contained in the household survey data. The final two columns report the 2SLS estimates in which the unadjusted establishment variable is used to instrument for the household survey variable (column 5) and the household variable is used to instrument for the unadjusted establishment variable (column 6). The resulting point estimates indicate that the labour coefficient obtained with the household survey employment estimate is very close to the true value, and that this measure is therefore relatively reliable.

The same production function is estimated with FE and FD estimators, and the results shown in Table 11. For both estimators and all employment measures the labour coefficient is seen to suffer from additional attenuation bias relative to those reported in Table 10. This is not surprising; once we remove the highly informative cross-industry variation in employment levels and are only left with the less reliable employment time trends this exacerbates the measurement error problem. We observe that the unadjusted establishment survey employment series reveals a more severe attenuation bias than the household survey estimates (for both the FE and FD estimators), which suggest that the household surveys provide a more reliable indication of employment time trends.

Interestingly, the attenuation bias is relatively more severe in the FE estimates for the household survey and unadjusted establishment survey measures, while being relatively more severe in the FD estimates for the backward adjusted establishment survey variable. This would suggest that the measurement errors in the household and unadjusted establishment employment measures have a low serial correlation, whereas it is highly persistent in the backward adjusted establishment measure. This is consistent with what we know about the series. After omitting agricultural workers, informal sector workers and the self-employed, the household surveys produce relatively consistent employment trends that probably still suffer idiosyncratic survey-specific measurement error shocks – like the under-capturing of formal sector employment in LFS 2001a– but these shocks are generally not very persistent. The measurement errors should therefore be roughly serially uncorrelated. We hypothesised that the establishment surveys provide accurate estimates of employment on the quarters in which the sampling frames are updated, but may tend to under-capture employment growth in the in-between periods. This will lead to a measurement error term

that grows gradually more negative, until being reset to zero with each sampling frame update. The measurement error should therefore be serially correlated within sampling frames but uncorrelated across sampling frames. In the backward adjusted variable, which essentially removes the resetting of the error term to zero, the measurement error term will therefore be highly serially correlated. This explanation is entirely consistent with what is observed with the pattern of estimates between the POLS, FE and FD estimates.

As an additional reliability check, we compare the employment trends in our establishment and household survey data to employment data gathered by the Bureau for Economic Research (BER) from firms in the manufacturing, construction, retail and wholesale and financial services industries. The BER's survey questionnaire includes a question about the change in employment that the firm experienced over the previous year. Respondents are asked to indicate whether there has been an increase, a decrease or no change in employment, which allows the creation of a quarterly "net change in employment" series for these four industries. Whatever the shortcomings of this qualitative data, we would not expect the resulting measurement issues to be correlated in time with the issues experienced by the establishment or household employment estimates. The correlation matrix for the various industry employment series are reported in Table 12. (The BER series is compared to the change in employment for the household and establishment employment variables.) We observe that the BER employment trends are more highly correlated with that of the household surveys than with either the adjusted or unadjusted establishment survey series. This provides further evidence that the more rapid employment growth captured by the household surveys provides a more reliable indication of labour market trends between 1998 and 2014.

5. Conclusion

This paper has scrutinised the differences in sampling and surveying approaches used to collect employment data from households and establishments and then compared the resulting estimates of formal non-agricultural employment. We find that the two data sources provide relatively consistent estimates of the long-run trend in total and industry-specific non-agriculture formal employment since 2002. However, this consistency requires interpreting the discontinuous increases in establishment employment figures that coincide with sampling frame adjustments prior to 2006 as reflecting employment growth due to new or initially small firms, rather than the improved capturing of existing employment due to extensions of the sampling frame. The econometric analysis confirms that the employment estimates from the household surveys provide a more reliable reflection of employment growth during the period under consideration.

* * *

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Table 1: The answer that must be provided by the respondents before they could be qualified as employed, OHS 1995-QLFS 2011Q4

OHS 1995 – OHS 1996 Now I am going to ask questions about ... activities. What did ... do most during the last 7 days? 1: Working full-time 2: Working part-time
OHS 1997 – OHS 1998 During the past 7 days, did (the person) do work for pay, profit, or family gain? 1: Yes, full-time 2: Yes, part-time 3: Yes, casual
OHS 1999 During the past 7 days, did (the person) do work for pay, profit, or family gain? 1: Yes, full-time 2: Yes, part-time 3: Yes, casual/seasonal
LFSs In the last seven days, did …… do any of the following activities, even for only one hour? 1: Run or do any kind of business, big or small for himself/herself? 2: Do any work for a wage, salary, commission or any payment in kind? 3: Do any work as a domestic worker for a wage, salary, or any payment in kind? 4: Help unpaid in a family business of any kind? 5: Do any work on his/her own or the family's plot, farm, food garden, cattle post or kraal or help in growing farm produce or in looking after animals for the household? 6: Do any construction or major repair work on his/her own home, plot, cattle post or business or those of the family? 7: Catch any fish, prawns, shells, wild animals or other food for sale or family food?
QLFSs In the last week, 1: Did you work for a wage, salary, commission or any payment in kind (including paid domestic work), even if it was for only one hour? *Examples: A regular job, contract, casual or piece work for pay, work in exchange for food or housing, paid domestic work.* 2: Did you run or do any kind of business, big or small, for yourself or with one or more partners, even if it was for only one hour? *Examples: Commercial farming, selling things, making things for sale, construction, repairing things, guarding cards, brewing beer, collecting wood or water for sale, hairdressing, crèche businesses, taxi or other transport business, having a legal or medical practice, performing in public, having a public phone shop, etc.* 3: Did you help without being paid in any kind of business run by your household, even if it was for only one hour? *Examples: Commercial farming, help to sell things, make things for sale or exchange, doing the accounts, cleaning up for the business, etc.*

Table 2: Number of employed and the employment change between consecutive surveys, 1995-2014

	Number of employed	Absolute change	Percentage change
OHS 1995	9 499 347		
OHS 1996	8 966 307	-533 040	-5.6%
OHS 1997	9 093 647	127 340	1.4%
OHS 1998	9 370 130	276 483	3.0%
OHS 1999	10 356 143	986 013	10.5%
LFS 2000a	11 874 409	1 518 266	14.7%
LFS 2000b	12 224 406	349 997	2.9%
LFS 2001a	12 260 207	35 801	0.3%
LFS 2001b	11 167 541	-1 092 666	-8.9%
LFS 2002a	11 603 398	435 857	3.9%
LFS 2002b	11 283 924	-319 474	-2.8%
LFS 2003a	11 297 621	13 697	0.1%
LFS 2003b	11 411 351	113 730	1.0%
LFS 2004a	11 378 217	-33 134	-0.3%
LFS 2004b	11 630 196	251 979	2.2%
LFS 2005a	11 894 320	264 124	2.3%
LFS 2005b	12 287 798	393 478	3.3%
LFS 2006a	12 437 963	150 165	1.2%
LFS 2006b	12 787 285	349 322	2.8%
LFS 2007a	12 634 896	-152 389	-1.2%
LFS 2007b	13 293 327	658 431	5.2%
QLFS 2008Q1	14 450 646	1 157 319	8.7%
QLFS 2008Q2	14 604 053	153 407	1.1%
QLFS 2008Q3	14 561 398	-42 655	-0.3%
QLFS 2008Q4	14 784 916	223 518	1.5%
QLFS 2009Q1	14 631 692	-153 224	-1.0%
QLFS 2009Q2	14 374 908	-256 784	-1.8%
QLFS 2009Q3	13 841 980	-532 928	-3.7%
QLFS 2009Q4	13 982 850	140 870	1.0%
QLFS 2010Q1	13 820 568	-162 282	-1.2%
QLFS 2010Q2	13 834 144	13 576	0.1%
QLFS 2010Q3	13 668 819	-165 325	-1.2%
QLFS 2010Q4	13 915 884	247 065	1.8%
QLFS 2011Q1	13 917 447	1 563	0.0%
QLFS 2011Q2	13 933 454	16 007	0.1%
QLFS 2011Q3	14 131 609	198 155	1.4%
QLFS 2011Q4	14 349 931	218 322	1.5%
QLFS 2012Q1	14 297 605	-52 326	-0.4%
QLFS 2012Q2	14 348 370	50 765	0.4%
QLFS 2012Q3	14 583 192	234 822	1.6%
QLFS 2012Q4	14 541 707	-41 485	-0.3%
QLFS 2013Q1	14 569 906	28 199	0.2%
QLFS 2013Q2	14 706 731	136 825	0.9%
QLFS 2013Q3	15 061 904	355 173	2.4%
QLFS 2013Q4	15 195 491	133 587	0.9%
QLFS 2014Q1	15 073 201	-122 290	-0.8%
QLFS 2014Q2	15 111 626	38 425	0.3%
QLFS 2014Q3	15 146 354	34 728	0.2%

Source: Own calculations using OHS/LFS/QLFS data.

Table 3: Formal vs. Informal employment (1 000s), 1995-2014

	[A]	[B]	[C]	[D]	[E]	[F]	[G]	All
OHS 1995	695	522	219	27	50	0	7 987	9 499
OHS 1996	766	330	304	25	56	0	7 485	8 966
OHS 1997	828	1 043	6 436	187	526	0	73	9 094
OHS 1998	747	1 077	6 508	202	725	0	110	9 370
OHS 1999	812	1 572	6 796	284	799	0	93	10 356
LFS 2000a	1 003	1 820	6 673	1 508	757	86	29	11 874
LFS 2000b	941	2 026	7 077	1 074	767	108	230	12 224
LFS 2001a	844	2 836	6 798	742	785	214	40	12 260
LFS 2001b	881	1 965	7 019	382	765	127	29	11 168
LFS 2002a	875	1 821	7 089	863	865	75	15	11 603
LFS 2002b	843	1 779	7 173	550	852	62	26	11 284
LFS 2003a	885	1 828	7 223	443	841	57	19	11 298
LFS 2003b	895	1 901	7 365	365	832	36	18	11 411
LFS 2004a	846	1 765	7 474	341	913	26	15	11 378
LFS 2004b	880	1 944	7 685	425	624	53	19	11 630
LFS 2005a	849	2 068	7 742	513	647	28	47	11 894
LFS 2005b	858	2 460	7 980	338	578	34	41	12 288
LFS 2006a	849	2 188	8 052	703	606	14	27	12 438
LFS 2006b	885	2 376	8 376	473	605	47	25	12 787
LFS 2007a	936	2 129	8 415	460	603	53	40	12 635
LFS 2007b	1 024	2 084	9 034	368	667	47	69	13 293
QLFS 2008Q1	1 234	2 439	9 935	166	676	0	0	14 451
QLFS 2008Q2	1 257	2 452	10 074	124	697	0	0	14 604
QLFS 2008Q3	1 349	2 282	10 121	116	693	0	0	14 561
QLFS 2008Q4	1 376	2 369	10 233	128	679	0	0	14 785
QLFS 2009Q1	1 393	2 291	10 168	133	646	0	0	14 632
QLFS 2009Q2	1 287	2 247	10 088	100	653	0	0	14 375
QLFS 2009Q3	1 255	2 110	9 794	78	605	0	0	13 842
QLFS 2009Q4	1 232	2 250	9 853	109	538	0	0	13 983
QLFS 2010Q1	1 272	2 154	9 711	91	592	0	0	13 821
QLFS 2010Q2	1 253	2 301	9 624	89	566	0	0	13 834
QLFS 2010Q3	1 216	2 282	9 496	89	586	0	0	13 669
QLFS 2010Q4	1 214	2 322	9 730	94	556	0	0	13 916
QLFS 2011Q1	1 215	2 282	9 792	99	530	0	0	13 917
QLFS 2011Q2	1 219	2 309	9 780	88	538	0	0	13 933
QLFS 2011Q3	1 205	2 266	10 007	85	569	0	0	14 132
QLFS 2011Q4	1 224	2 234	10 220	87	585	0	0	14 350
QLFS 2012Q1	1 261	2 216	10 127	89	605	0	0	14 298
QLFS 2012Q2	1 259	2 211	10 203	90	586	0	0	14 348
QLFS 2012Q3	1 230	2 333	10 320	87	613	0	0	14 583
QLFS 2012Q4	1 192	2 353	10 278	85	635	0	0	14 542
QLFS 2013Q1	1 221	2 337	10 246	87	678	0	0	14 570
QLFS 2013Q2	1 217	2 365	10 383	96	646	0	0	14 707
QLFS 2013Q3	1 266	2 333	10 722	112	629	0	0	15 062
QLFS 2013Q4	1 245	2 455	10 780	101	614	0	0	15 195
QLFS 2014Q1	1 233	2 340	10 791	116	594	0	0	15 073
QLFS 2014Q2	1 291	2 386	10 765	99	571	0	0	15 112
QLFS 2014Q3	1 183	2 411	10 867	104	582	0	0	15 146

Source: Own calculations using OHS/LFS/QLFS data.

Note: [A]: Domestic workers
[B]: Informal sector workers (excluding agricultural workers)
[C]: Formal sector workers (excluding agricultural workers)
[D]: Agricultural workers in informal sector (also known as subsistence agricultural workers)
[E]: Agricultural workers in formal sector (also known as commercial agricultural workers)
[F]: Don't know
[G]: Not specified

Table 4: Type of employment, 1995-2014

	Employee		Self-Employed	
	Number (1 000s)	Percentage	Number (1 000s)	Percentage
OHS 1995	8 123	85.5%	1 376	14.5%
OHS 1996	8 313	93.2%	611	6.8%
OHS 1997	8 167	89.8%	926	10.2%
OHS 1998	8 340	89.0%	1 026	11.0%
OHS 1999	8 845	85.5%	1 506	14.5%
LFS 2000a	8 787	74.1%	3 074	25.9%
LFS 2000b	9 371	76.8%	2 825	23.2%
LFS 2001a	9 025	73.7%	3 218	26.3%
LFS 2001b	9 012	80.8%	2 144	19.2%
LFS 2002a	9 082	78.4%	2 509	21.6%
LFS 2002b	9 082	80.6%	2 191	19.4%
LFS 2003a	9 194	81.4%	2 099	18.6%
LFS 2003b	9 276	81.3%	2 131	18.7%
LFS 2004a	9 356	82.3%	2 019	17.7%
LFS 2004b	9 414	81.0%	2 207	19.0%
LFS 2005a	9 536	80.3%	2 340	19.7%
LFS 2005b	9 846	80.3%	2 423	19.7%
LFS 2006a	9 772	78.6%	2 659	21.4%
LFS 2006b	10 184	79.7%	2 593	20.3%
LFS 2007a	10 253	81.3%	2 365	18.7%
LFS 2007b	10 936	82.5%	2 323	17.5%
QLFS 2008Q1	12 215	84.5%	2 236	15.5%
QLFS 2008Q2	12 320	84.3%	2 284	15.7%
QLFS 2008Q3	12 287	84.4%	2 274	15.6%
QLFS 2008Q4	12 463	84.2%	2 322	15.8%
QLFS 2009Q1	12 322	84.2%	2 310	15.8%
QLFS 2009Q2	12 143	84.4%	2 232	15.6%
QLFS 2009Q3	11 840	85.4%	2 002	14.6%
QLFS 2009Q4	11 838	84.6%	2 145	15.4%
QLFS 2010Q1	11 737	84.8%	2 084	15.2%
QLFS 2010Q2	11 688	84.4%	2 146	15.6%
QLFS 2010Q3	11 510	84.2%	2 159	15.8%
QLFS 2010Q4	11 698	84.0%	2 217	16.0%
QLFS 2011Q1	11 731	84.3%	2 186	15.7%
QLFS 2011Q2	11 744	84.2%	2 190	15.8%
QLFS 2011Q3	11 960	84.5%	2 172	15.5%
QLFS 2011Q4	12 194	84.9%	2 156	15.1%
QLFS 2012Q1	12 158	84.9%	2 139	15.1%
QLFS 2012Q2	12 182	84.8%	2 167	15.2%
QLFS 2012Q3	12 328	84.5%	2 255	15.5%
QLFS 2012Q4	12 321	84.7%	2 220	15.3%
QLFS 2013Q1	12 331	84.7%	2 239	15.3%
QLFS 2013Q2	12 495	85.0%	2 212	15.0%
QLFS 2013Q3	13 003	86.3%	2 059	13.7%
QLFS 2013Q4	13 047	85.9%	2 148	14.1%
QLFS 2014Q1	13 045	86.5%	2 028	13.5%
QLFS 2014Q2	13 003	86.0%	2 109	14.0%
QLFS 2014Q3	13 011	85.9%	2 135	14.1%

Source: Own calculations using OHS/LFS/QLFS data.

Table 5: Number of formal non-agricultural employees, 1997-2014

	Number	Absolute change	Percentage change
OHS 1997	6 106 480		
OHS 1998	6 152 049	45 569	0.7%
OHS 1999	6 373 966	221 917	3.6%
LFS 2000a	6 267 411	-106 555	-1.7%
LFS 2000b	6 599 086	331 675	5.3%
LFS 2001a	6 344 431	-254 655	-3.9%
LFS 2001b	6 561 860	217 429	3.4%
LFS 2002a	6 628 924	67 064	1.0%
LFS 2002b	6 683 855	54 931	0.8%
LFS 2003a	6 734 887	51 032	0.8%
LFS 2003b	6 854 277	119 390	1.8%
LFS 2004a	6 933 927	79 650	1.2%
LFS 2004b	7 168 055	234 128	3.4%
LFS 2005a	7 174 750	6 695	0.1%
LFS 2005b	7 461 742	286 992	4.0%
LFS 2006a	7 518 986	57 244	0.8%
LFS 2006b	7 816 075	297 089	4.0%
LFS 2007a	7 855 731	39 656	0.5%
LFS 2007b	8 471 270	615 539	7.8%
QLFS 2008Q1	9 247 283	776 013	9.2%
QLFS 2008Q2	9 391 118	143 835	1.6%
QLFS 2008Q3	9 384 829	-6 289	-0.1%
QLFS 2008Q4	9 515 536	130 707	1.4%
QLFS 2009Q1	9 421 196	-94 340	-1.0%
QLFS 2009Q2	9 390 078	-31 118	-0.3%
QLFS 2009Q3	9 132 771	-257 307	-2.7%
QLFS 2009Q4	9 191 637	58 866	0.6%
QLFS 2010Q1	9 082 183	-109 454	-1.2%
QLFS 2010Q2	9 005 280	-76 903	-0.8%
QLFS 2010Q3	8 898 260	-107 020	-1.2%
QLFS 2010Q4	9 078 842	180 582	2.0%
QLFS 2011Q1	9 116 138	37 296	0.4%
QLFS 2011Q2	9 095 339	-20 799	-0.2%
QLFS 2011Q3	9 367 510	272 171	3.0%
QLFS 2011Q4	9 550 354	182 844	2.0%
QLFS 2012Q1	9 511 341	-39 013	-0.4%
QLFS 2012Q2	9 543 641	32 300	0.3%
QLFS 2012Q3	9 669 358	125 717	1.3%
QLFS 2012Q4	9 648 083	-21 275	-0.2%
QLFS 2013Q1	9 569 472	-78 611	-0.8%
QLFS 2013Q2	9 715 282	145 810	1.5%
QLFS 2013Q3	10 092 106	376 824	3.9%
QLFS 2013Q4	10 152 545	60 439	0.6%
QLFS 2014Q1	10 176 615	24 070	0.2%
QLFS 2014Q2	10 127 864	-48 751	-0.5%
QLFS 2014Q3	10 227 986	100 122	1.0%

Source: Own calculations using OHS/LFS/QLFS data.

Table 6: Number of formal non-agricultural employees (1 000s) by industry in OHSs/LFSs/QLFSs, 1997-2014

	[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	All
OHS 1997	382	1 347	107	320	1 071	409	612	1 643	216	6 106
OHS 1998	426	1 234	103	342	1 115	429	730	1 665	108	6 152
OHS 1999	469	1 262	73	291	1 216	395	786	1 744	138	6 374
LFS 2000a	460	1 222	86	355	1 295	403	704	1 668	75	6 267
LFS 2000b	584	1 270	90	336	1 211	404	842	1 791	71	6 599
LFS 2001a	558	1 263	92	319	1 195	391	785	1 673	68	6 344
LFS 2001b	548	1 342	93	303	1 258	393	838	1 750	38	6 562
LFS 2002a	536	1 350	80	301	1 227	418	861	1 796	59	6 629
LFS 2002b	549	1 381	83	320	1 166	421	899	1 795	69	6 684
LFS 2003a	552	1 318	79	338	1 275	404	853	1 883	32	6 735
LFS 2003b	549	1 293	88	355	1 334	369	908	1 927	30	6 854
LFS 2004a	553	1 330	101	374	1 322	409	894	1 923	28	6 934
LFS 2004b	403	1 425	98	451	1 449	404	974	1 942	24	7 168
LFS 2005a	414	1 369	121	473	1 464	416	934	1 963	22	7 175
LFS 2005b	407	1 389	95	535	1 608	428	1 083	1 895	23	7 462
LFS 2006a	394	1 435	98	515	1 721	388	1 010	1 927	29	7 519
LFS 2006b	395	1 425	115	538	1 731	423	1 128	2 022	40	7 816
LFS 2007a	451	1 443	90	577	1 752	390	1 168	1 970	15	7 856
LFS 2007b	426	1 422	90	611	1 826	504	1 308	2 258	26	8 471
QLFS 2008Q1	348	1 766	94	766	1 999	530	1 443	2 300	0	9 247
QLFS 2008Q2	368	1 781	107	797	1 941	539	1 483	2 372	4	9 391
QLFS 2008Q3	337	1 739	100	803	2 007	539	1 487	2 371	3	9 385
QLFS 2008Q4	345	1 787	87	845	1 990	547	1 497	2 412	5	9 516
QLFS 2009Q1	355	1 727	108	810	1 901	539	1 558	2 419	5	9 421
QLFS 2009Q2	346	1 740	100	799	1 887	513	1 574	2 430	2	9 390
QLFS 2009Q3	323	1 623	88	796	1 790	546	1 544	2 416	7	9 133
QLFS 2009Q4	319	1 609	104	799	1 812	531	1 608	2 406	4	9 192
QLFS 2010Q1	322	1 566	75	744	1 847	549	1 485	2 487	7	9 082
QLFS 2010Q2	331	1 511	100	693	1 822	524	1 538	2 479	7	9 005
QLFS 2010Q3	323	1 541	100	698	1 842	530	1 428	2 435	1	8 898
QLFS 2010Q4	319	1 588	91	687	1 840	543	1 426	2 585	1	9 079
QLFS 2011Q1	327	1 617	97	700	1 848	507	1 452	2 562	6	9 116
QLFS 2011Q2	299	1 542	94	675	1 843	532	1 494	2 614	2	9 095
QLFS 2011Q3	342	1 562	78	742	1 905	557	1 549	2 629	4	9 368
QLFS 2011Q4	350	1 615	86	692	1 955	579	1 541	2 726	6	9 550
QLFS 2012Q1	360	1 594	93	612	1 980	567	1 568	2 730	7	9 511
QLFS 2012Q2	382	1 534	102	672	1 891	585	1 564	2 809	4	9 544
QLFS 2012Q3	373	1 557	104	679	1 872	621	1 653	2 808	1	9 669
QLFS 2012Q4	376	1 552	98	700	1 843	601	1 660	2 816	2	9 648
QLFS 2013Q1	393	1 564	121	679	1 817	589	1 594	2 810	3	9 569
QLFS 2013Q2	401	1 552	121	694	1 851	614	1 663	2 816	3	9 715
QLFS 2013Q3	420	1 516	137	719	1 961	651	1 769	2 916	3	10 092
QLFS 2013Q4	422	1 488	124	727	2 021	632	1 746	2 989	3	10 153
QLFS 2014Q1	421	1 521	124	792	1 985	628	1 743	2 959	3	10 177
QLFS 2014Q2	416	1 480	114	716	1 958	676	1 686	3 080	2	10 128
QLFS 2014Q3	438	1 477	117	764	2 011	655	1 709	3 053	3	10 228

Source: Own calculations using OHS/LFS/QLFS data.

Note: [A]: Mining and quarrying
[B]: Manufacturing
[C]: Electricity, gas and water supply
[D]: Construction
[E]: Wholesale and retail
[F]: Transport, storage and communication
[G]: Financial intermediation, insurance, real estate and business services
[H]: Community, social and personal services
[I]: Other / Unspecified

Table 7: Number of formal non-agricultural employees, 1998Q2-2014Q3

	SEE (1998 sampling frame)	SEE (2002 sampling frame)	QES (2004 sampling frame)	QES (2006 sampling frame)
1998Q2	4 978 203			
1998Q3	4 962 952			
1998Q4	4 918 934			
1999Q1	4 927 516			
1999Q2	4 886 032			
1999Q3	4 842 191			
1999Q4	4 811 204			
2000Q1	4 776 757			
2000Q2	4 739 895			
2000Q3	4 706 447			
2000Q4	4 713 534			
2001Q1	4 673 766			
2001Q2	4 659 748			
2001Q3	4 649 208			
2001Q4	4 649 174			
2002Q1	4 632 343			
2002Q2	4 646 015			
2002Q3	4 678 609	6 510 000		
2002Q4	4 703 459	6 517 000		
2003Q1		6 497 000		
2003Q2		6 336 000		
2003Q3		6 369 000		
2003Q4		6 425 000		
2004Q1		6 447 000		
2004Q2		6 492 000		
2004Q3		6 600 000		
2004Q4		6 559 000	7 097 000	
2005Q1		6 560 000	6 945 000	
2005Q2			7 078 000	
2005Q3			7 165 000	
2005Q4			7 248 000	
2006Q1			7 238 000	
2006Q2			7 285 000	8 059 000
2006Q3			7 338 000	8 124 000
2006Q4				8 222 000
2007Q1				8 243 000
2007Q2				8 289 000
2007Q3				8 343 000
2007Q4				8 411 000
2008Q1				8 417 000
2008Q2				8 457 000
2008Q3				8 490 000
2008Q4				8 512 000
2009Q1				8 326 000
2009Q2				8 241 000
2009Q3				8 144 000
2009Q4				8 163 000
2010Q1				8 086 000
2010Q2				8 132 000
2010Q3				8 155 000
2010Q4				8 251 000
2011Q1				8 289 000
2011Q2				8 300 000
2011Q3				8 358 000
2011Q4				8 379 000
2012Q1				8 383 000
2012Q2				8 430 000
2012Q3				8 439 000
2012Q4				8 456 000
2013Q1				8 465 000
2013Q2				8 438 000
2013Q3				8 457 000
2013Q4				8 498 000
2014Q1				8 511 000
2014Q2				8 669 000
2014Q3				8 540 000

Data source: Stats SA's SEE and QES Statistical Release, various issues

Table 8: Number of formal non-agricultural employees (1 000s) by industry in SEE, 1998Q2-2005Q1

	[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	All
	Using the 1998 business sampling frame								
1998Q2	462	1 352	39	284	800	245	218	1 578	4 978
1998Q3	457	1 353	44	280	798	247	216	1 567	4 963
1998Q4	443	1 328	44	252	833	248	215	1 555	4 919
1999Q1	443	1 324	44	249	858	245	210	1 555	4 928
1999Q2	441	1 314	43	232	872	243	205	1 535	4 886
1999Q3	428	1 308	42	228	894	228	204	1 511	4 842
1999Q4	418	1 316	40	225	898	234	198	1 482	4 811
2000Q1	416	1 304	40	224	875	234	198	1 485	4 777
2000Q2	413	1 307	40	223	866	222	197	1 473	4 740
2000Q3	417	1 295	40	220	858	222	195	1 461	4 706
2000Q4	420	1 280	39	222	894	217	196	1 445	4 714
2001Q1	412	1 266	39	218	878	210	197	1 453	4 674
2001Q2	405	1 260	39	225	885	208	193	1 446	4 660
2001Q3	402	1 265	39	219	880	210	192	1 442	4 649
2001Q4	407	1 260	39	213	892	209	192	1 437	4 649
2002Q1	403	1 253	39	214	882	201	190	1 451	4 632
2002Q2	410	1 261	39	214	885	200	186	1 452	4 646
2002Q3	418	1 279	39	216	884	202	186	1 454	4 679
2002Q4	416	1 289	39	214	887	200	187	1 471	4 703
	Using the 2002 business sampling frame								
2002Q3	419	1 250	47	350	1298	208	1 230	1 708	6 510
2002Q4	418	1 253	46	350	1312	208	1 203	1 727	6 517
2003Q1	417	1 249	46	337	1296	201	1 209	1 742	6 497
2003Q2	420	1 237	43	296	1264	206	1 131	1 739	6 336
2003Q3	428	1 247	42	288	1275	205	1 124	1 760	6 369
2003Q4	436	1 255	43	288	1285	205	1 151	1 762	6 425
2004Q1	453	1 265	44	267	1286	204	1 163	1 765	6 447
2004Q2	457	1 265	44	273	1277	206	1 172	1 798	6 492
2004Q3	458	1 282	44	281	1326	208	1 183	1 818	6 600
2004Q4	456	1 254	45	284	1365	210	1 112	1 833	6 559
2005Q1	453	1 222	46	283	1372	210	1 117	1 857	6 560
Employment difference: 2002 business sampling frame vs. 1998 business sampling frame									
2002Q3	1	-29	8	134	414	6	1 044	254	1 831
2002Q4	2	-36	7	136	425	8	1 016	256	1 814

Data source: Stats SA's SEE Statistical Release, various issues

Note: [A]: Mining and quarrying
[B]: Manufacturing
[C]: Electricity, gas and water supply
[D]: Construction
[E]: Wholesale and retail
[F]: Transport, storage and communication
[G]: Financial intermediation, insurance, real estate and business services
[H]: Community, social and personal services

Table 9: Number of formal non-agricultural employees (1 000s) by industry in QES, 2004Q4-2014Q3

	[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	All
	Using 2004 business sampling frame								
2004Q4	456	1 178	42	373	1 388	313	1 565	1 782	7 097
2005Q1	449	1 176	44	375	1 347	312	1 449	1 793	6 945
2005Q2	444	1 182	44	432	1 373	320	1 478	1 805	7 078
2005Q3	444	1 189	45	439	1 381	322	1 524	1 821	7 165
2005Q4	439	1 195	45	449	1 430	312	1 559	1 819	7 248
2006Q1	446	1 193	46	457	1 393	306	1 557	1 840	7 238
2006Q2	458	1 196	45	447	1 403	311	1 586	1 839	7 285
2006Q3	463	1 192	44	450	1 421	319	1 596	1 853	7 338
	Using 2006 business sampling frame								
2006Q2	458	1 331	52	456	1 664	352	1 745	2 001	8 059
2006Q3	464	1 334	51	459	1 673	360	1 773	2 010	8 124
2006Q4	475	1 333	53	458	1 739	364	1 799	2 001	8 222
2007Q1	484	1 322	54	470	1 706	361	1 819	2 027	8 243
2007Q2	497	1 323	54	473	1 730	359	1 825	2 028	8 289
2007Q3	505	1 318	55	475	1 741	358	1 851	2 040	8 343
2007Q4	506	1 315	56	466	1 774	360	1 872	2 062	8 411
2008Q1	508	1 312	58	468	1 739	364	1 883	2 085	8 417
2008Q2	520	1 307	59	474	1 726	364	1 907	2 100	8 457
2008Q3	532	1 300	59	467	1 709	366	1 924	2 133	8 490
2008Q4	518	1 275	59	474	1 747	366	1 914	2 159	8 512
2009Q1	500	1 239	60	458	1 681	362	1 863	2 163	8 326
2009Q2	492	1 220	59	441	1 672	353	1 824	2 180	8 241
2009Q3	487	1 204	56	418	1 632	356	1 784	2 207	8 144
2009Q4	488	1 185	56	415	1 665	359	1 796	2 199	8 163
2010Q1	491	1 187	56	418	1 630	359	1 742	2 203	8 086
2010Q2	497	1 170	57	413	1 636	360	1 769	2 230	8 132
2010Q3	505	1 159	57	406	1 650	355	1 783	2 240	8 155
2010Q4	504	1 164	58	399	1 687	361	1 812	2 266	8 251
2011Q1	511	1 160	59	413	1 645	360	1 798	2 343	8 289
2011Q2	517	1 148	60	419	1 659	357	1 818	2 322	8 300
2011Q3	519	1 150	59	434	1 669	365	1 834	2 328	8 358
2011Q4	518	1 158	59	426	1 700	369	1 831	2 318	8 379
2012Q1	523	1 155	61	431	1 678	369	1 832	2 334	8 383
2012Q2	534	1 146	62	433	1 688	374	1 834	2 359	8 430
2012Q3	518	1 150	62	434	1 690	372	1 835	2 378	8 439
2012Q4	515	1 149	62	427	1 710	383	1 843	2 367	8 456
2013Q1	515	1 148	62	432	1 689	380	1 841	2 398	8 465
2013Q2	511	1 144	63	428	1 689	375	1 843	2 385	8 438
2013Q3	507	1 145	62	426	1 697	375	1 847	2 398	8 457
2013Q4	499	1 149	62	419	1 733	376	1 847	2 413	8 498
2014Q1	491	1 143	62	426	1 698	373	1 856	2 462	8 511
2014Q2	491	1 140	61	430	1 714	369	1 861	2 603	8 669
2014Q3	499	1 131	61	427	1 718	366	1 867	2 471	8 540
Employment difference: 2006 business sampling frame vs. 2004 business sampling frame									
2006Q2	0	135	7	9	261	41	159	162	774
2002Q3	1	142	7	9	252	41	177	157	786

Data source: Stats SA's QES Statistical Release, various issues

Note: [A]: Mining and quarrying
[B]: Manufacturing
[C]: Electricity, gas and water supply
[D]: Construction
[E]: Wholesale and retail
[F]: Transport, storage and communication
[G]: Financial intermediation, insurance, real estate and business services
[H]: Community, social and personal services

Table 10: POLS and 2SLS estimates of employment coefficient

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Output / Capital					
	POLS			2SLS		
Employment / Capital measures						
- Household survey estimate	0.605***			0.498***	0.604***	
	(0.0251)			(0.107)	(0.0261)	
- Establishment survey estimate		0.537***		-0.0661		0.585***
		(0.0253)		(0.0873)		(0.0265)
- Establishment survey estimate (backward adjusted)			0.555***	0.170*		
			(0.0244)	(0.0913)		
Observations	272	272	272	272	272	272
R-squared	0.682	0.625	0.656	0.686	0.682	0.620

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11: Panel data estimates of employment coefficient

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Output / Capital					
ESTIMATOR	Fixed effects			First differenced effects		
Employment / Capital measures						
- Household survey estimate	0.429***			0.201***		
	(0.0242)			(0.0281)		
- Establishment survey estimate		0.169***			0.0627***	
		(0.0168)			(0.0165)	
- Establishment survey estimate (backward adjusted)			0.0166			0.348***
			(0.0337)			(0.0504)
Observations	272	272	272	240	240	240
R-squared	0.544	0.278	0.001	0.177	0.057	0.167
Number of industries	8	8	8	8	8	8

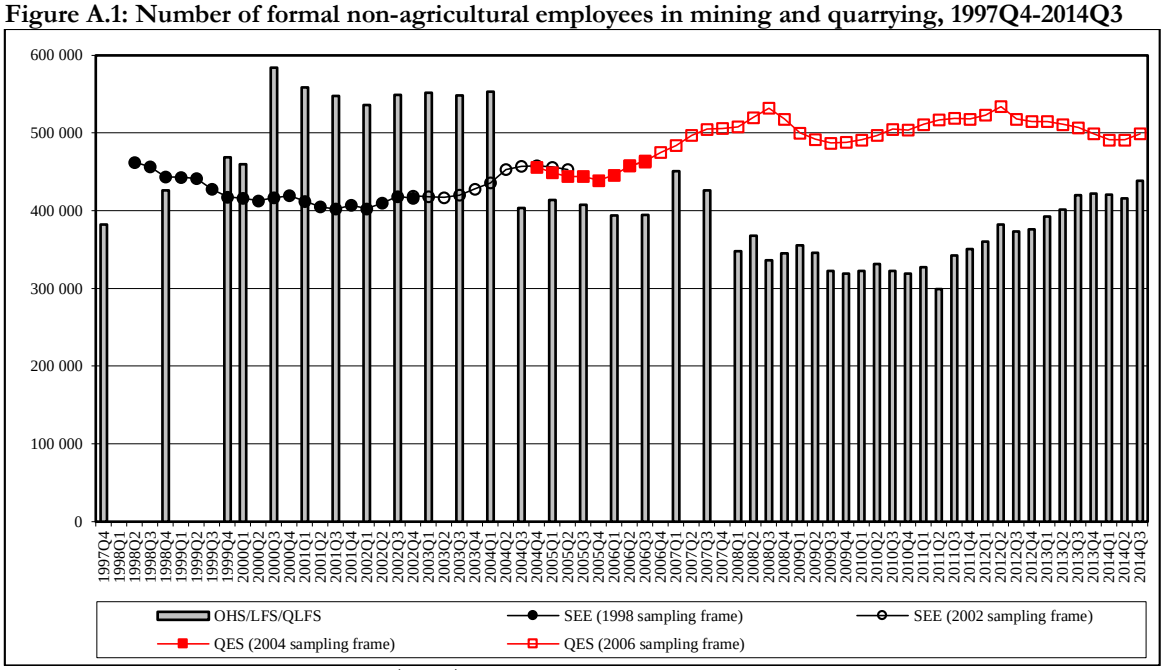
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 12: Pairwise correlations of employment changes from different sources

	Household survey	Establishment survey	Establishment survey (adjusted)	BER
Household survey	1			
Establishment survey	0.1401	1		
Establishment survey (backward adjusted)	0.3335	0.2178	1	
BER	0.5353	0.2021	0.4307	1

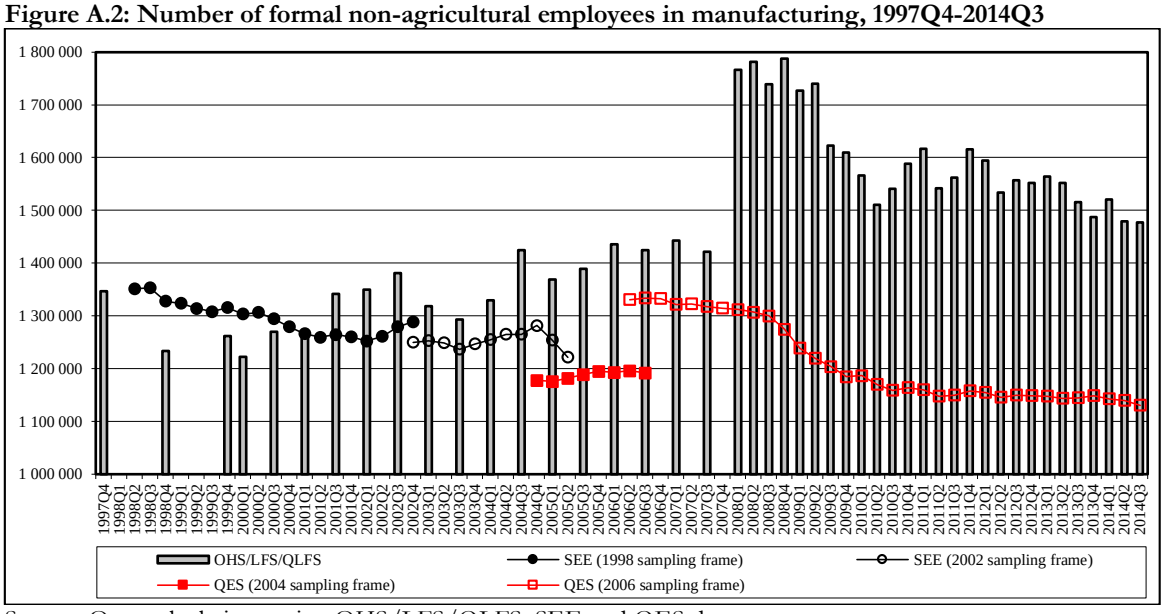
Appendix

Figure A.1: Number of formal non-agricultural employees in mining and quarrying, 1997Q4-2014Q3



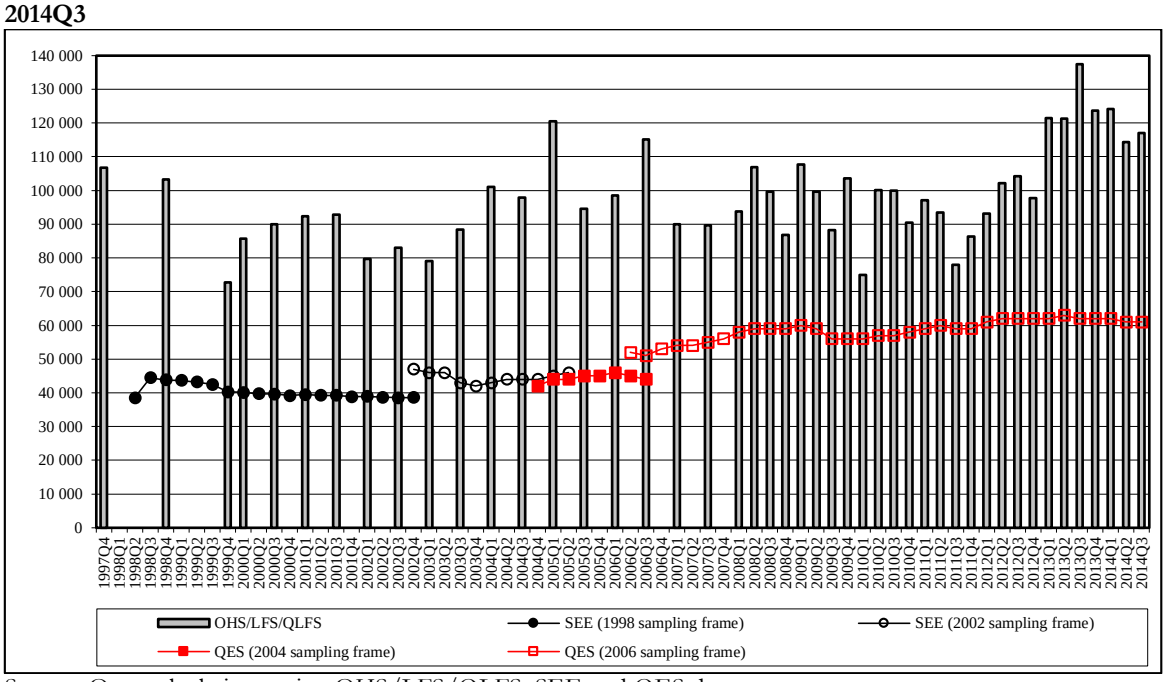
Source: Own calculations using OHS/LFS/QLFS, SEE and QES data.

Figure A.2: Number of formal non-agricultural employees in manufacturing, 1997Q4-2014Q3



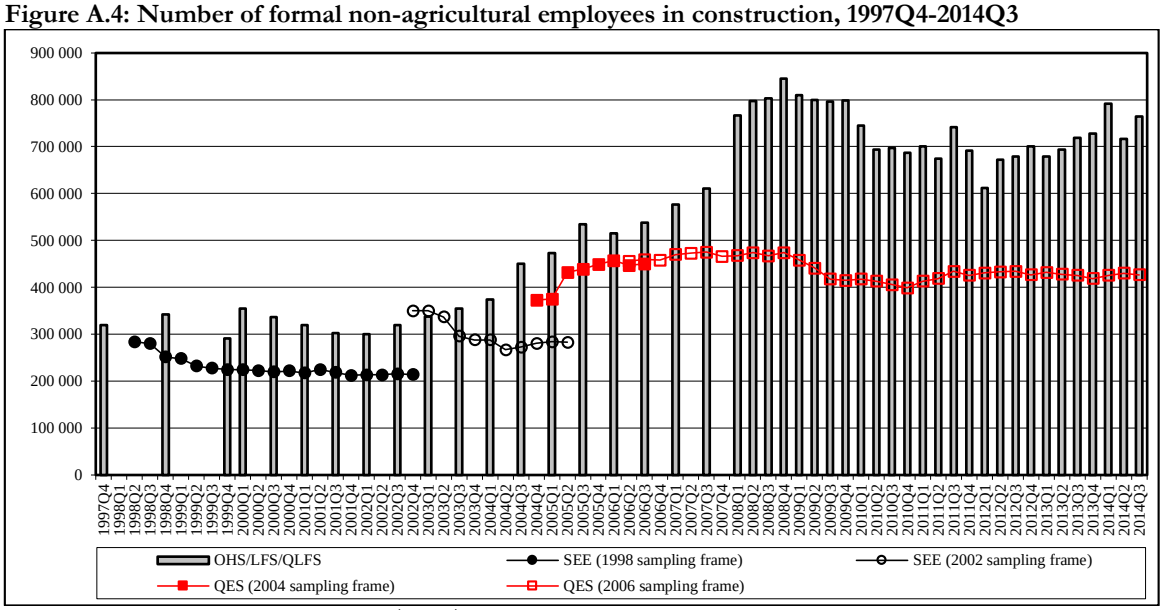
Source: Own calculations using OHS/LFS/QLFS, SEE and QES data.

Figure A.3: Number of formal non-agricultural employees in electricity, gas and water supply, 1997Q4-2014Q3



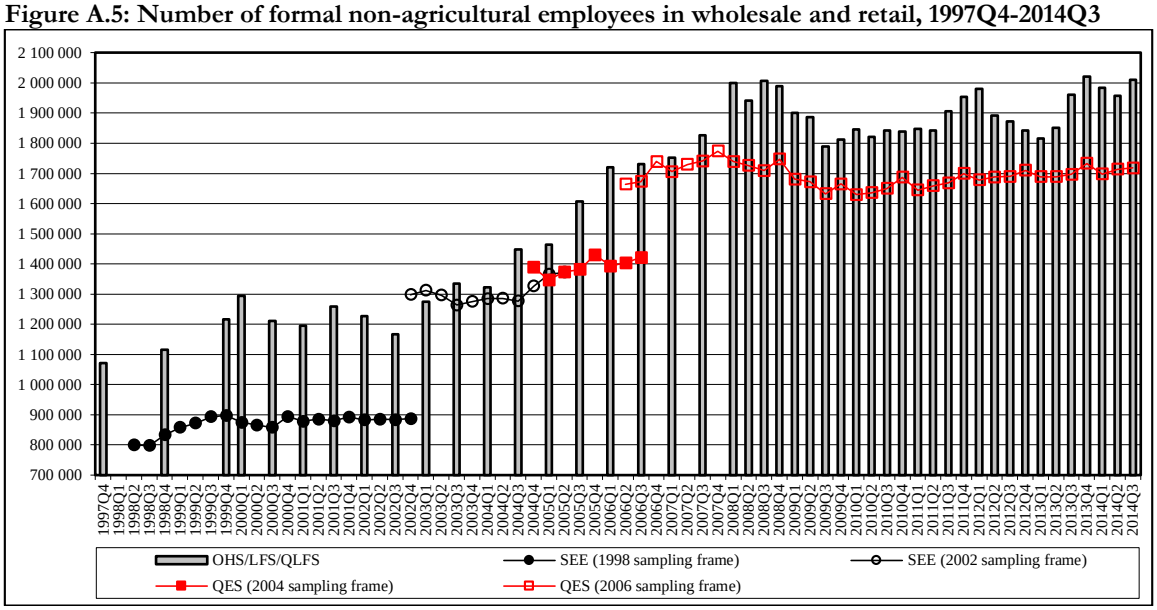
Source: Own calculations using OHS/LFS/QLFS, SEE and QES data.

Figure A.4: Number of formal non-agricultural employees in construction, 1997Q4-2014Q3



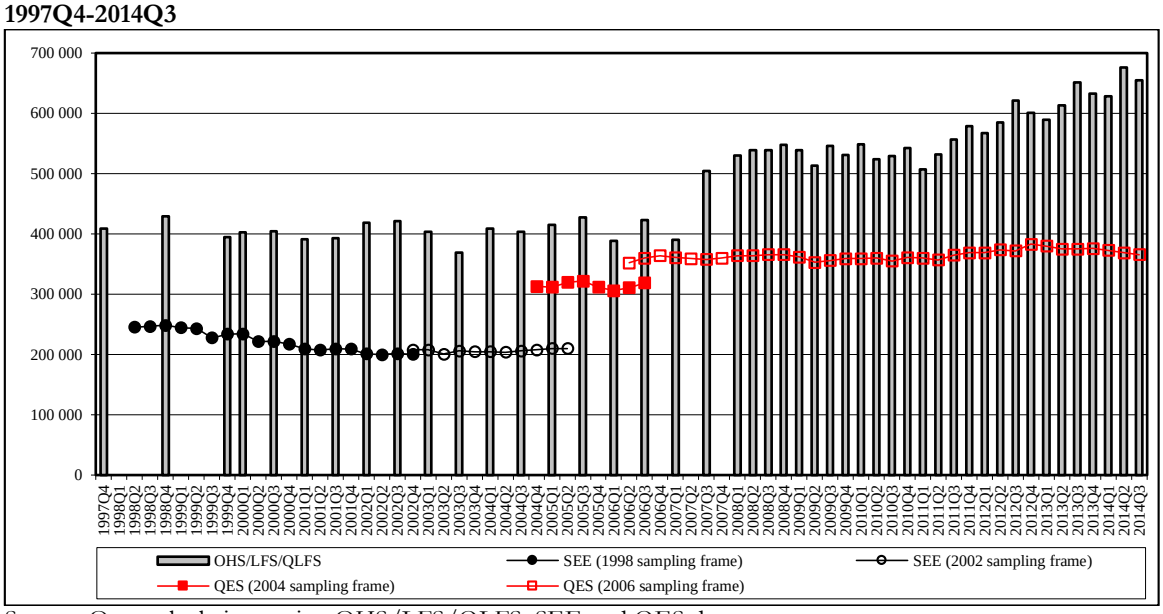
Source: Own calculations using OHS/LFS/QLFS, SEE and QES data.

Figure A.5: Number of formal non-agricultural employees in wholesale and retail, 1997Q4-2014Q3



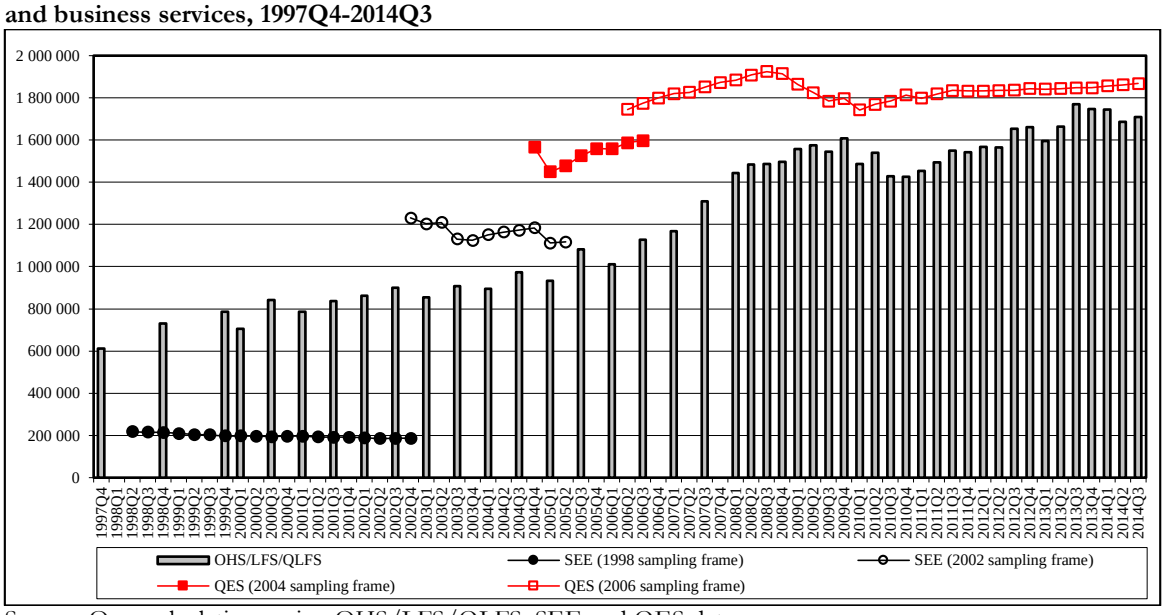
Source: Own calculations using OHS/LFS/QLFS, SEE and QES data.

Figure A.6: Number of formal non-agricultural employees in transport, storage and communication, 1997Q4-2014Q3



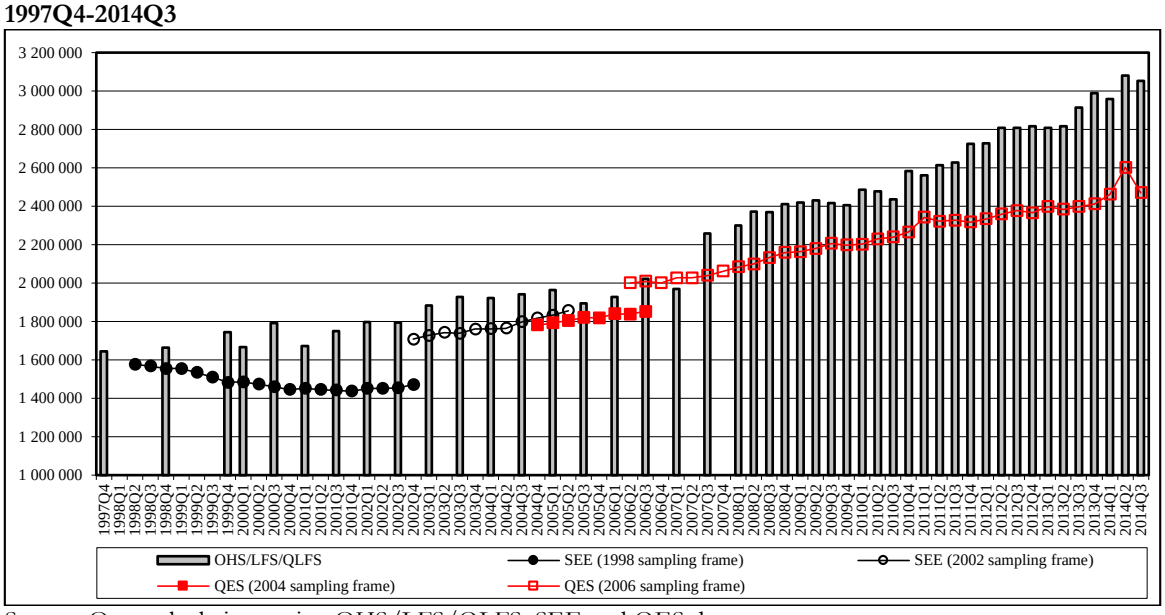
Source: Own calculations using OHS/LFS/QLFS, SEE and QES data.

Figure A.7: Number of formal non-agricultural employees in financial intermediation, insurance, real estate and business services, 1997Q4-2014Q3



Source: Own calculations using OHS/LFS/QLFS, SEE and QES data.

Figure A.8: Number of formal non-agricultural employees in community, social and personal services, 1997Q4-2014Q3



Source: Own calculations using OHS/LFS/QLFS, SEE and QES data.

The **Research Project on Employment, Income Distribution and Inclusive Growth (REDI3x3)** is a multi-year collaborative national research initiative. The project seeks to address South Africa's unemployment, inequality and poverty challenges.

It is aimed at deepening understanding of the dynamics of employment, incomes and economic growth trends, in particular by focusing on the interconnections between these three areas.

The project is designed to promote dialogue across disciplines and paradigms and to forge a stronger engagement between research and policy making. By generating an independent, rich and nuanced knowledge base and expert network, it intends to contribute to integrated and consistent policies and development strategies that will address these three critical problem areas effectively.

Collaboration with researchers at universities and research entities and fostering engagement between researchers and policymakers are key objectives of the initiative.

The project is based at SALDRU at the University of Cape Town and supported by the National Treasury.

Consult the website for information on research grants and scholarships.

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Research Project on Employment, Income Distribution & Inclusive Growth

Towards an integrated response to unemployment, inequality and poverty