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Education Screening in South Africa's Labour Market?

Simon Ssekabira Ntege and Steven F. Kochf

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Simon Ssekabira Ntege* and Steven, F. Koch**

Abstract

This paper empirically contributes towards the debate between the human capital and screening theories. Using South Africa's September 2004 Labour Force Survey data, and after controlling for self-selection, the weak and strong versions of screening hypothesis are tested. The honour's degree, and certificates or diplomas got without grade twelve, provide evidence for the SSH for both public and private sectors, as per the Wolpin (1977) methodology. The same methodology yield evidence in support of the WSH, at the masters and beyond certificate levels in the private sector, but stretching lower to include all other credentials up to and including certificates or diplomas got after grade twelve, in the public sector. Support for the WSH as per the Psacharopoulos (1979) methodology, prevails across the certificate levels, for the entire screened sample. The human capital theory, per se, is supported in the private sector for credentials below the honour's, except for certificates or diplomas got without grade twelve. There is no evidence to support the use of education entirely for its skills bestowing role in the public sector. Results from the Altonji and Pierret (1996) methodology do not also confirm any post-employment screening, whatever the sector. (Words :194)

* PhD student, School of economics; University of Pretoria. E-mail: ssekabiran@postino.up.ac.za

** Professor of Economics; University of Pretoria, steve.koch@up.ac.za

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1. Introduction

Two explanations: the human capital theory and the screening theories, are currently in place regarding the positive relationship between schooling, productivity and remunerations. These theories are put to use by firms while searching for the more able workers. In both, potential employees aspire for, and acquire the upper most realisable level of education; either as a means of acquiring greater skills, or as a way disclosing one's inner and desirable personality. Employers base themselves on the education signal while recruiting and efficiently utilising labour in the production activities (Weiss, 1995).

The human capital theory postulates that schooling equips students with potential skills, usable at the work place (Wolpin, 1977:949). It entails a proportionate correlation between marginal returns and the cost of schooling. The screening theories on the other hand embrace a process that identifies qualities that enable distinguishing one individual from another. They latter theories account for productivity differences among workers, which are not correlated with the costs and benefits of schooling. That is, innate qualities that exist before and after one's schooling, which qualities are positively correlated with better productivity.

Screening theories are qualified to either i) manifest the informational role played by education, in unveiling ones innate qualities/abilities, which abilities are pro labour productivity. In this case, education is perceived as a filter that reveals differences in workers abilities, which in turn accounts for wage differences. Or ii) in facilitating bare-recruitment into specified professions (according to Berg, 1970 and Thurow, 1970). Close to nil relationship is assumed between schooling, productivity or wages (adjustments), in this latter 'credentialist', bare-recruitment facilitating view. Practically, financial institutions' initial offer of better service rates for the better educated, prior to receiving good financial conduct from these clients, illustrates strong screening. Tests of the former hypothesis appear under the description: the weak screening hypothesis (WSH) (Spence, 1973;

Arrow, 1973; Stiglitz, 1975), while those of the credentialist view appear under the label; the strong screening hypothesis (SSH) (Psacharopoulos', 1979).

Arrow (1973:194) is of the view that the human capital, and screening theories are more of complementary than antagonistic. Similarly, Weiss (1995) and Chatterji *et al.* (2003:191) entertain the idea that screening theories augment the basis laid down in the human capital theory. Lack of consensus however persists between proponents of the two theories; labour economists versus micro economists (Weiss, 1995).

Past empirical tests of the screening concept have yielded equivocal results (and are destined to continue doing so given data constraints. Riley, 1979a:S229). Altonji and Pierret (1998 and 1999 as reported in Bauer and Haisken-Denew, 2001:162) show that returns to years of schooling register an independent or even decreasing relationship with a worker's experience in the labour market, but an increasing one with measures of natural ability. Bauer and Haisken-Denew, 2001, using panel data, realise a positive relationship in both cases. No evidence (in the later study) of employer-learning regarding a worker's productivity is realised for white-collar workers, but there is for blue-collar workers whose engagements dominantly yields tangible production results.

Brown and Sessions (1999 & 1998) suggest some relationship between education screening and the nature of institutions in a specified region, as well as with the indigenous cultures of the work-force involved. To this effect, estimations in Japan (Sakamoto and Chen, 1992), Israel (Ziderman, 1992), and Australia (Miller and Volker, 1984) have registered support for screening. Those in the Netherlands (Oosterbeek, 1992) and Malaysia (Lee, 1980) have not. While mixed result have been registered for studies in UK and USA, as respectively conducted by Psacharopoulos (1979); and Layard and Psacharopoulos (1974)

Empirical tests of the SSH and the WSH commonly employ screened and unscreened sample categorisations (Wolpin, 1977 and Psacharopoulos, 1979). Result from estimations of these two screening hypothesis have tended to support the WSH and not SSH (Brown and Sessions, 1999 & 1998; Wolpin, 1977; Riley, 1979a), while those between screening and human capital theories, have registered more support for the latter. Chatterji *et al., (2003)* offer the most recent estimation

procedure. A measure of the extent of the signal, as a function of firm, job and individual attributes is derived in the first stage ordered-probit model. They derive continuous measure of the signal is then incorporated into the second stage wage equations. Their results entail a significant, positive return to an education signal; the signal being a difference between the required and necessary qualification for a specified job. Data constraints (towards a measure of the monitoring costs) prohibit use of their methodology. Similarly, data constraints also disenable use of the Kroch and Sjoblom (1994) method; which employees a worker's ranking in the distribution of educational attainment for her cohort as a direct measure of the signal.

Given that no earlier study of returns to education for South Africa has addressed the possibility of the screening bias as its central focus, this paper aims at empirically contributing towards the debate between schooling's productivity boosting and the innate-abilities unveiling qualities, across the different education certificates. It caters for the employed, in three sectors (private, public or self-employed) in South Africa, but adjusts for the sample selection bias. The self employed serve as the control group and as an exhibitor, entirely of education's productivity boosting role.

Basing on the Wolpin (1977) methodology, this paper provides evidence in support of the WSH at the masters and beyond, credential levels in the private sector, and at credential levels stretching up to as low as certificates or diplomas acquired after grade 12, in the public sectors. Results from the Psacharopoulos (1979) methodology also support the WSH. The SSH is supported at the honour's and certificate or diplomas acquired without grade 12, in both the private and public sectors, as per the Wolpin (1977). The private sector, and not the public one, is shown to utilise education for its skills bestowment quality (as per the human capital theory), at levels below the honours, excluding certificates or diplomas acquired without grade 12.

The reminder of this paper contains: the background to the study in section 2, followed by description of the data and methodology in section 3, while the results appear in section 4. A summary of the finding and policy implications are given in sections 5.

4.2 Background

A considerable number of studies on returns to investment in education have been conducted for South Africa. The analysed has mainly utilised the Mincerian logarithmic function framework, or its expanded form (Moll, 1996; Bhorat, 2000; Michaud and Vencatachellum (2001); Hofmeyer, 2001; Keswell and Poswell, 2004). The dependent variables used have included a range of descriptions: average annual log earnings, gross monthly pay including overtime and bonuses, gross weekly earnings, hourly wage, etc.[1] Most studies have considered important and thus controlled for arguments such as race, gender, union membership, physical location, and spline in years of education. (Keswell and Poswell, 2004; Michaud and Vencatachellum 2003; Michaud and Vencatachellum, 2001; Bhorat, 2000; Schultz and Mwabu, 1998; Mwabu and Schultz, 1996; Moll, 1993). However, some other issues likely to cause a bias in estimations of returns to education; such as education quality, family back ground and screening/signalling, have yet to be addressed at all or in depth.

Most studies on returns to education in South Africa firstly ascribe to existence of high returns relative to those of other economies with comparable economic performance (NAME SOME), and that returns are non-linear (Keswell and Poswell, 2004; Bhorat 2000; OTHER EXAMPLES). What constitutes the high returns is however not explained. Keswell and Poswell (2004), utilising four data sources conducted in different years, and gross monthly pay as the dependent variable, consistently confirms convexity in the structure of returns to human capital investment in South Africa. That is, returns to education in South Africa are highly regressive, favouring (disfavouring) holders of tertiary (–early learning- primary) credentials. Could this convexity be traceable to a screening practise? A zero marginal return is registered for every additional year of investment in primary education and slightly thereabout. Drastic increases in marginal returns to education follow a few years after completing primary education Keswell and Poswell (2004). Moll (1996) shows that the inferior inputs into primary education for the African population (who make up the majority) in South Africa, beget inferior output, thus the negligible impact of primary education on the market wages. (The response to employers' demand for workers of differing human capital quality - inferior/superior- but similar academic-level credential) is however not analysed). According to

[1] According to Keswell and Poswell (2004:838) the impact of differences in measures of earnings used (hourly, weekly, monthly or annually) is trivial. However, comparison requires conversion into a similar unit.

Bhorat (2000), an additional year of education for African workers with tertiary education yields a 16 per cent return, but a 4 per cent for holders of primary education.

The (total) rate of return to full time wage earners is shown to occur between 15 and 26 per cent (Keswell and Poswell, 2004). However, highly aggregated description of a human capital accumulation (schooling/training) variable misses the important detail and the possible specific roles of varying education credentials towards the determinants of wages (Blundell, Dearden, Meghir, and Sianesi, 1999:6-7). The range realised by Hofmeyer (2001) who disentangles the schooling credentials further, is much wider. Schultz and Mwabu (1998) are also reported (Michaud and Vencatachellum, 2001) to have realised a 60 per cent return for African women, which was however, challenged by Butcher and Rouse (2001).

The marginal rate of returns to education in South Africa is shown to be sensitive to race and gender. Returns to workers belonging to the African population group, and those to men, exceed those of other races and sex, respectively. However, Bhorat's (2000:6) 26 and 16 per cent return on additional year of tertiary education, for the whites and Africans respectively, contradict the racial attribute by Schultz and Mwabu (1998). They also therefore antagonise the explanation that the returns to Africans (Whites) are higher (lower) due to the low (high) proportion of those workers among possessors of high academic credentials. Bhorat (2000) attributes the higher returns to whites as compared to that to the Africans, possibly, to differences in education quality; perceived or actual. What is left unanswered is the variation in returns to persons of the same race and quality of education.

Mwabu and Schultz (1996), predict a reverse in the pattern of returns to education as the impact of education rationing implemented by the apartheid government to Africans, is rectified by the new and democratically elected government. The high returns to Africans registered in 1993, are predicted to decline as more of the Africans acquired higher education. However, their study having been done in 1996, could not have captured the full pass-through impact of the new; information asymmetry sustaining policies. They also make no mention of the possible impact of

the HIV pandemic and the protective laws, nor do they distinguish the honours master's and above, as credentials beyond mandatory education levels.

The findings of Michaud and Vencatachellum's (2003) investigation of how the average level of human capital per population group affects wages in South Africa, are contrary to Mwabu and Schultz's(1996), prediction of a reversal in the pattern of returns to education. They show that the positive externalities (such as improvement in productivity, reduction in supervision costs, a boost in earnings, consumption and production) due to increase in average education level of a population group render the demand effect to exceed the supply one thus a positive net effect. This positive net effect is shown to be racially pervasive. While Michaud and Vencatachellum (2003) control for sectoral effects, this is not done using multiple regressions.

With the exception of Mwabu and Schultz (1996), who ascribes to screening in their search for alternative explanation for returns to education by race in South Africa, across quantiles of the wage function, all other studies have not attempted to disentangle returns to education that accrue to the skills acquired from those that honour inborn differences in individual. Using quartile regression, they show that the impact of worker abilities on wages differs with population group and spline in years of education. For whites with higher education, Mwabu and Schultz's (1996:338) results subscribe to the screening theories by relating education achievement and ability, but to the human capital one for whites with secondary education or African males with primary credentials. In the latter case, education and ability are shown to be substitutes. Would a more disaggregated higher education category and possibly analysis at the sectoral level, exhibit deeper revelation?

From the review of empirical literature, (portions of which are summarised above) it is evident that little emphasis has been paid on disentangling the informational role of human capital accumulation (screening theories) from that which accrues to the skills bestowing role of education (human capital theory), in explaining wages. Yet, in South Africa's labour market, there are lots of imperfections and information asymmetries likely to provoke the use of the innate attribute, unveiling role of education (screening) to counter the imperfections and information asymmetries, and thus influence wages.

The imperfections and information asymmetries include among others: differences in workers' mental or physical productivities, government interference through entry and exit policy, laws enforcing/addressing worker-employment-security, workers' rights concerning health information, and addressing apartheid-initiated inequalities, the current levels of unemployment; demand for and supply of, labour varies across labour categories, the influence of labour unions on market operations, the globalisation impact, as well as the impact of the HIV/AIDS pandemic. A few of these are expanded on below.

The apartheid legacy has had an impact on the quality of labour in South Africa. Attempts at self actualisation were racially controlled. The Bantu education act, implemented in 1953, restricted education aspirations of non whites. This education model was vertically integrated, culminating in racially demarcated: all white and all blacks universities[2]. (The Indian race and the so called coloureds in South African terminology enjoyed the intermediary education mixes.) The then twenty one government assisted universities yielded varying quality of degrees.

The previously, racially demarcated universities have now been amalgamated. They issue the same certificates. Differences at the build up levels (to tertiary education) have not however been fully levelled. The new democratic government is trying to establish a new education environment, but with most teachers being products of Bantu education, the desired changes will take some time (Moll, 1996). Other policies such as AA are instituted to better work opportunities for the previously disadvantaged and can prove beneficial in the long run if backed by education merit, but scarily to an employer if the education merit is lacking.

The HIV/AIDS pandemic is also fundamentally influencing the labour market. With South Africa declared as the country with the highest number of people leaving with HIV/AIDS (http://www.avert.org/aidsindia.htm), employers are expected to have concern about the likely impact of the epidemic on the workers productivity. However, anti-discrimination laws towards the HIV positive or those that society assumes to be, as well as those that oppose mandatory testing for HIV, perpetuate information asymmetry.

[2] Commonly referred to as historically white universities (HWU) and historically black universities (HBU), respectively.

Another aspect of law likely to influence the labour market in South Africa is that of the newly enacted labour policy intended to address apartheid discrepancies. Examples include extensive protection of employees against unfair dismissal and the minimisation of retrenchments, the mandatory transfer of workers to a new business owner, and the extension of bargaining council agreements to non parties/employers so long as they fall within the scope of the bargaining council. These labour policy of the 90's, occasion a negative impact on both the cost and flexibility in the work place (Barker, 1999:13). They manifests in a heavy burden on investment and on the decision of who to employ (Barker, 2003:81).

Globalisation and changes in the economic and social, business environment also necessitate implementation of several survival firm policies. Among these are: pre- and post- employment screening for the more productive workers. Information asymmetries in general, and the labour market laws existing specifically in South Africa, compound the need to screen.

With information asymmetries, employee protective laws, and the profit maximisation objective antagonised, employers are compelled to unveil each workers non-disclosed innate traits. Schooling may serve as the desired screening devise. Do firms conduct employment screening relying on individuals' accumulated human capital?

This study thus investigates whether amid information asymmetries, accumulation of human capital beyond the level mandated by society, is used as an employment screening device, in South Africa's labour market. Analysis is conducted mostly in a wage equation framework[3], controlling for the sector effects through use of multiple (sector) regressions. The schooling variable is disaggregated to cater for the different certificates level, with detailed qualification of tertiary credentials. Unlike most studies of returns to education in South Africa that have focused on the employed, this one also accounts for the possible sample selection bias.

[3] Early to mid earnings ratios are also used.

4.3 The data and methodology

4.3.1 The data

A single data source is utilised in this study. It is South Africa's 2004 Labour Force Survey (LFS), conducted by Statistics South Africa. The LFS is a bi-annual rotating panel household survey. It portrays the statistics of the dynamics of issues in South Africa's labour market. For instance, the survey offers a macro and micro view of the (un)employment situation in the country, the latter includes among other things, developments at work places. Information is sought about individual persons, workers, migrants and households.

The number of recorded individual respondents in the entire survey are 73 797. Of the four data files (person, household, workers and migrant) that constitute the LFS, the one utilised in this study is the workers file. A table of the actual variables utilised in this study is included in among the appendices. The actual variables are explained somewhere below.

Sampling

To establish the new Master Sample constituting the Primary Sampling Units (PSUs) for the September 2004 LFS, the census 2001 frame was adjusted (by Statssa) by eliminating i) the Enumeration Areas (EAs) that had a less than twenty-five household count, ii) all institution EAs other than workers' hostels, convents and monasteries. EAs from census 2001 were then pooled, in two stages. Pooling in the (first) before sampling stage included EAs containing a hundred or more households. The (second) after sampling stage brought on board EAs with less than sixty households. The latter was necessitated by disparities between information on the data base and the reality.

The resultant Master Sample is a multi-stage stratified sample. It constituted 3000 PSUs; stratified into 53 district councils/metros (DCs). All PSUs were allocated among the DCs using the power allocation method. The PSUs were then sampled using probability proportional to size principles. Size here denotes the number of households in a PSU as calculated in the census.

Basing on the dwelling unit as the listing unit, the sampled PSUs were listed. From these listings systematic samples of dwelling units per PSU were drawn, to form clusters. The size of the clusters

is dictated by the requirements in a specific survey, for instance, ten dwelling units in case of this LFS.

Weighting

A two-stage weighting procedure was carried out –by Statssa- on LFS March 2003. Firstly to separate estimates of the population size, based on the population census of October 2001, as adjusted by a post-enumeration survey (PES). The next stage weighting utilised post-stratification by province, gender, population group and five-year interval age groups derived form mid-year estimates.

4.3.2 The methodology

Wage equations are estimated, and assessed for possibilities of screening; weak or strong, basing the Wolpin (1977) methodology, and the Psacharopoulos' (1979) mid-to-early career earnings ratio, technique. Under the former methodology, the following variables: schooling credentials, gender, race, age and contract-type, are assumed likely to attest to screening against the impact of the information asymmetries: and are thus scrutinised emphatically. The males, the whites and the middle aged (and not the youth) are expected to receive favourable treatment given the nature of information asymmetries. Through incorporation of the (absenteeism and schooling) product variables with tenure, the Altonji and Pierret (1996) methodology helps qualify the aspect of pre-employment screening.

According to Wolpin (1977) the self employed have no need to signal their productivity. They are not faced with the agent-principal goal deviation problem, and the associated information asymmetry. They invest in human capital accumulation to acquire productivity boosting skills. The coefficients to their schooling variables are thus taken to entirely signify schooling's role in accumulating productivity boosting skills; as per the human capital theory. The self-employed thus form the unscreened sample.

On grounds that the government is the setter of the labour laws and enforcer of non discriminative conducts, it is not expected to be screening. On the other hand, it may have to screen given the size of employees that it handles. The private sector, whose profit maximisation target is

compromised by the information asymmetry perpetuating policies, is foreseen to screen. Workers employed in the private sector need to signal their positive work attributes (and so constituting the screened group).

The innate attributes of the screened group would account for the excess in elasticity above that recorded for the self employed, thus supporting the WSH. The schooling variables for the non-screening, self-employed are however, expected to be significant and positive. In case of the SSH, education is perceived to have an entirely informational role regarding a worker's innate attributes (i.e. with no productivity boosting component). The schooling variable for the self-employed are thus expected to be insignificant, while those of the screened, are significant. Returns to schooling have to be significant, positive and equal or less that those of the self employed, to justify the human capital theory.

Psacharopoulos (1979:181) distinguishes between the WSH and the SSH by comparing the trends between the initial and eventual[4] wage offers for the more educated and less educated. The SSH is empirically supported if the wedge between the pay for the more educated and the less educated, is maintained (not more divergent) after a firm has had both worker categories in employment over time. The WSH on the other hand entails adjustment of the initial wage gap, in realisation of a worker's true productivity displayed while in employment.

The scope of screening possibility is further qualified using Altonji and Pierret (1996) methodology. Their perception is that returns to schooling manifests an independent or decreasing relationship with years of work experience/tenure, while returns to innate abilities[5] increase with an individual's worker experience in a wage equation. Product variables between: schooling and tenure and between absenteeism and tenure are thus generated to capture the above relationships respectively.

[4] i.e. the pay after the worker has been observed for some considerable time while in employment with a specified firm.

[5] Altonji and Pierret (1996) suggest use of any of the following as measures of innate abilities: standardised aptitude test, parents' education, or wages of siblings. Data constraints however prohibit inclusion of these variables. (See explanation in Chapters 4 and 5).

4.3.3 The estimation technique

This study is specifically focuses on the employed; regarding estimating the wage equations. Estimations are thus vulnerable to the sample selection bias due to ignoring the unemployed and in-active in wage determinations. To account for this likely bias, the Heckman, 'two-stage' estimation procedure is adopted. At the (first) *selection model* stage, a labour participation probit model –that includes the employed, in-active and the unemployed- is run. An inverse Mill's ratio (IMR) is generated immediately thereafter. It accounts for the probability of belonging to the employment pool and not the unemployment or in-active ones. The IMR is incorporated into the successive run (second stage) model(s). These include estimations of wage equations. The wage equations are run singly for each observation category; self-employed, private and public sector, using the ordinary least square (OLS) estimation procedure. Robust estimations are conducted for the labour participation, OJT and wage models. A Chow test is conducted to ascertain that the coefficients to the schooling credentials in the different samples, wage equations are significantly different.

For identification purposes, the first stage model has to include at least one variable that is not related to the dependent variable in the substantial/second stage equation. Given the non-linear quality of the IMR, it may suffice as the identifying variable, on conditional the labour-participation probit model passes the normality test (Refer to results in the appendix). Data constraints prohibit use of other variables for this identification purpose.

The IMR (Lambda) is an estimation of the covariance between errors in the first stage and second state equations. The IMR outcome at the second stage is thus the expected value of earnings subject to the fact that the sample employed is not randomly selected. A significant coefficient to the lambda (IMR) tells that use of the sub-sample embraced a bias, and qualifies the direction of that bias.

The variables

The weekly wage/income variable is computed from three variables[6] in the LFS. All remunerations stated as monthly or annual, are converted into the per week equivalent. Then, the mid-point and weekly equivalent, is established for workers that offered their wage as falling within a The derived

[6] Respondents who did not state their wages/salaries are eliminated from the study.

weekly income variable is then adjusted for inflationally tendencies, using the consumer price index (CPI) for services, honouring the year and month when a survey was conducted. The log form of this income variable (*real weekly wage*) is generated and used, thus estimating semi-log wage equations.

Reduction in labour productivity is captured by the absenteeism variable[7]. A general absenteeism variable (i.e. one that ignores the actual reason for absenteeism) is computed as the negative difference between hours actually worked (including overtime), less the hours usually worked (including overtime). The absenteeism variable is actually a direct proxy for productivity, and so is the product variable generated with it, used in the Altonji and Pierret, (1996) Methodology.

The LFS data addresses the issue of course completion since it requires the respondent to offer her highest level of education completed. The levels of schooling are not numbered according to years of schooling. Instead the numbering commences with no schooling, through primary and secondary education, with several manpower and college certificates and diplomas credentials interjected between high school and a university degree. Postgraduate qualifications appear thereafter, while provision is made for other qualifications that have to be specified by the respondent[8]. The schooling dummy variables (used in the wage equations) thus stretch between primary (1), and the masters and beyond (24). No schooling serves as the comparison group

Tenure is computed in monthly terms. To the month equivalent of complete years a worker has served under her current employer, is added months in employment that do not sum-up to a complete year, inferred from a variable which registers the month when a worker resumed employment. The tenure variable partly captures returns to seniority. A tenure squared variable is also included to account for the possible non linear relationship with wages. Two tenure-product variables are also generated, one with schooling and the other with absenteeism. These are for the purpose of establishing learning about a worker's true productivity, as per the Altonji and Pierret (1996) methodology.

[7] The Bureau of Economic Research (BER), in South Africa uses absenteeism as a measure of reduction in labour productivity.
[8] This 'other' qualification is eliminated from this study, since no details are offered in the version of the LFS accessed to the public.

No experience variable is put to use in these estimations since it is tenure and not overall experience that matter in a firm's wage determination history (Bauer and Haisken-Denew, 2001). Secondly, in the absence of data on actual experience, computation which assumes automatic assumption of employment on 'graduation' sounds unrealistic in an economy experiencing close to forty per cent unemployment.

A series of dummies with relevance in the labour participation and wage equations are also generated. These are: 1 if the worker is a member of a trade union and 0. Work security is addressed using dummy variables generated for contract types; permanent, fixed employment period), temporary contract and jointly, the causal and seasonal contracts. Nine industry dummies are also generated (as per the standard industrial classifications (SIC)), with electricity serving[9] as the comparison industry. (See detailed of industrial classifications in the appendix).

Dummies of business size; 20-49 regular workers, and 50 regular workers or more, are included to capture the possible relationship between firm size and the size of the wages offered. The 1-19 regular workers' category is used as the comparison group. The size of the firm; expressed as the number or regular workers (and thus its labour related responsibilities) is also a crucial factor towards determining whether an employer screens or not. The bigger the worker-force, the more likely is the firm is to screen for labour productivity since it bears greater worker responsibility. This argument follows from the restrictive labour laws and the possible fear of the HIV/AIDS pandemic. A policy regime variable is also utilised, to capture the times (I if 1994 and beyond, 0 before 1994) when screening is most likely to have been effected.

AA appears in form of a dummy for the previously advantaged population group; 1 if white and zero for the other population groups. A gender variable is also generated; 1 if male, and zero if female. An age and age squared variables are included in the labour participation and wage equations, on grounds that screening may be age (and gender) discriminative (Booth, 1991). Age embraces variations in unemployment, the health risk, as well as chances of being offered OJT.

[9] Bhorat (2001) establishes this industry as one with the highest median wage in South Africa.

Most of the variables that determine a worker's earning capacity, and that appear in the wage equations, have been explained above. There are however, other variables that capture one's urge to earn a living. The 'worker file' in the September 2004 LFS allows inclusion of a few of these. Other desirable variables (such as head of household and number of children under sixteen years) exist in the person, migrant or the household files, but merger of these files reduces the observations tremendously and undesirably, thus dropping the attempt. Several variables such as sources of financial support; from persons in or outside ones household, charity, savings, odd jobs, pension and disability allowances or study bursaries, are tried in the specification but eliminated because of the multicollinearity problem. This LFS includes no question on child support.

The variables afforded and tried are thus, whether an individual gets support through activities such as begging, doing work on a personal farm plot or catch fish for food. Preference for persons with a past work record is capture using a dummy variable[10]. No question addresses the rural-urban impact on wages and job availability. The closest one gets is use of the nine provincial dummies. Western Cape is used as the comparison province. Difference in wages due to varying occupations, is accommodated for, with the domestic worker group utilised as the comparison occupation. Description of the occupation variables included appears in the appendix.

The final list of variable afforded from the LFS, used in the labour participation and wage equations are listed in Table D-1 in the appendix, with a summarised qualification and some measures of central tendency, respectively.

4.4 The results

Table 4-2 The average weekly wage/schooling profile

Schooling level	Private sector	Public sector	Self employed
None	212.44	535.67	179.73
Primary school (Grade* 1-7)	250.22	542.46	218.77
Middle school (Grade 7-9)	331.28	642.90	308.09
High school (Grade 10-12)	662.08	1094.56	951.25
*Matric separately (Grade 12)**	*811.44*	*1195.34*	*1353.67*

[10] Unfortunately the variable also end up eliminated on grounds of multicollinearity.

NTCs	1413.00	1339.16	1845.84******
C/Dip no Gr12	1253.87	1347.00	1105.16*****
C/Dip wz Gr12	1537.87	1436.52	1657.73
Bachelor's +	2693.22	1994.41	3128.05
Honours	3462.13	2164.53	2564.09***
Master's, plus	4432.00	3261.76	3707.23***

Source: Own computation, utilising data from Labour force survey of September 2004.
**A grade -new education ranking system in South Africa- equals minus two in the old standard system.*
***Included separately to emphasis the impact of course completion (earning a certificate).*
**** Figure computes from less than twenty observations*
***** Figure computes from less than thirty observations*
****** Figure computes from less than forty observations*

The immediate aspect captured in the table above, is the generally acknowledged positive relationship between wages and school level accomplished. Completion of the Grade 12 (Matric[11], national exams) has also a considerable remuneration advantage –the so called "college effect", over the compounded high school average wage, in all sectors. This matric completion wage impact is also registered by Bhorat (2000:19).

In certificate/diploma offering course, joined before completing grade 12 there is a distinct preference for workers with a manual touch (NTCs) as compared with those offering certificates in clerical work. While government compensates workers with no tertiary education better than the private sector, the latter sector's remunerations are superior for workers with some tertiary academic qualifications. Compensations for every additional tertiary qualification are more drastic (more gentle) in the private sector (in the public sector).

The average weekly wage/schooling profile for the self employed depicts a generally greater impact (compared to the government sector) due to acquiring some tertiary academic qualification, as from a grade 12 (matric) certificate. Earnings in the private sector exceed those to the self-employed at higher (honours plus) levels of education. The public sector is a better remunerator for education achievements below grade 12. The results from estimation of wage functions are shown next. Results from the labour participation equation are shown in the appendix.

Specification for the labour participation model

Heckman Procedure: 1st Stage

[11] The name used in South Africa to refer to the pre-tertiary national exams. It is the equivalent of a school leaver's certificate.

probit lb_part primary&sec ntcs cdipn12 cdipw12 ddplus hons m_etc age age_sqrd males ncape ecape fstate kzn nwest gaut mpuma limpo whites q21efarm q21gctch q21hbeg L_union, nolog robust

Specification of the wage equation

Heckman procedure: 2nd Stage

reg lrwkly_wagew mills primary&sec ntcs cdipn12 cdipw12 ddplus hons m_etc age age_sqrd absenteeism tenure ten_sqrd agri comm_svc cons fin man min trans whsal perm_contr males L_union rgwk20_49 rgwk50etc whites ncape ecape fstate kzn nwest gaut mpuma limpo legis profl techn clerks svcs sklag craft pmoper elemt policy_reg if sekita==1[12], robust

Table 4-2 The wage equations for the joint sample

PART-A				**PART-B** *Altonji and Pierret (1996)*		
Joint sample		Robust			Robust	
lrwkly_wagew	Coef.	Std. Err.	t	Coef.	Std. Err.	t
mills	-0.42343	0.201036	-2.11	-0.42704	0.200881	-2.13
primary&sec	0.33427	0.034757	9.62	0.342036	0.035574	9.61
NTCs	0.838208	0.129875	6.45	0.84878	0.130876	6.49
C/dip no Gr12	0.644646	0.134179	4.8	0.657446	0.136018	4.83
C/dip wz Gr12	0.797283	0.074033	10.77	0.826904	0.080782	10.24
Bachelor's +	0.950575	0.101407	9.37	0.986724	0.107417	9.19
Honour's	0.939979	0.160635	5.85	0.993529	0.166977	5.95
Master's, plus	1.126553	0.180371	6.25	1.165918	0.187019	6.23
age	-0.00019	0.011657	-0.02	-0.00031	0.011648	-0.03
age_sqrd	-0.00013	0.000105	-1.24	-0.00013	0.000105	-1.23
absenteeism	-0.00283	0.002449	-1.16	-0.00903	0.003277	-2.76
abs_ten				0.000228	6.95E-05	3.28
sch_ten				-0.00026	0.000258	-1
tenure	0.001081	0.000882	1.23	0.001594	0.000923	1.73
ten_sqrd	6.34E-06	7.56E-06	0.84	5.87E-06	7.54E-06	0.78
perm_contr	0.248656	0.02285	10.88	0.249951	0.022862	10.93
males	0.362073	0.044169	8.2	0.362723	0.044135	8.22
L_union	(dropped)			(dropped)		
20_49workers	0.294982	0.028278	10.43	0.294589	0.028266	10.42
>=50workers	0.437419	0.028385	15.41	0.438231	0.028395	15.43
whites	0.8063	0.088683	9.09	0.803873	0.088564	9.08
policy_reg	(dropped)			(dropped)		
_cons	9.90592	0.415883	23.82	9.894487	0.415834	23.79

[12] The if condtion is changed from if lb_part==1, to 'if sekita==1', then to 'if sekita ==2 and finally to if sekita==3', to account for the public, private and self-employed sectors, respectively. Lb_part refers to the joint sample.

R-squared	*47.78*		*47.82*
Obs	*14488*		*14488*

The quality of the model(s) (in Tables 4-2, 4-3 and 4-5, and a few others only shown in the appendix) is depicted by several statistics. The labour participation model is shown to pass the normality test[13]. The IMR (with its non-linear quality) is thus justified as the identifying variable in the second stage wage regressions. The R-squared; -a measure of goodness of fit- got from running the wage equations, ranges between 52.9 and 44.89 per cent. This is okay for estimations based on cross-section data. There is no need to worry about heteroscedasticity since estimations utilise heteroscedasticity-robust standard errors. Serial correlation is not a likely problem when cross-section data is at use. The Stata modeller automatically drops variables that exhibit serious multicollinearity; for instance membership to a labour union and that of the policy regime switch in 1994[14]. A test for no omitted variables is generally significant for all sectors, and across evaluation methodology.

Regarding executing a Chow test to establish whether the coefficients estimated from the different samples are significantly the same, Gould's, (1999) response to the 'frequently asked questions' (FAQ) advises that a researcher goes ahead with the Stata *test* command, without having to pool the data, when robust variance estimates have been conducted. The results are then referred to as a Ward test (and not a Chow test) since it is a Ward test that utilises differences in variance estimates of the variance-covariance matrix, left behind from robust variance estimations. A Chow test does not. Abiding by the above recommendation, the Ward test results (in the appendix) confirm that the coefficients to the schooling credentials are significantly different from zero, either at the five per cent or at a one per cent levels, across wage estimations.

The above Part A model[15] (in table 4-2) is a wage equation estimated using the entire sample of the employed, without accommodating for sectoral heterogeneity. The produce in it ignores the possibility that schooling has a role beyond that of bestowing skills to participants. That is, is

[13] See results in the appendix.
[14] Correlation tests do not reveal the source of serious multicollinearity to these two variables. What is yielded are only dots.
[15] The results in table 4-2 are mere abstracts. The output that accommodates for the full specification is given in the appendix.

ignores the informational role of schooling. Part A differs from Part B in that the latter include two additional product variables; one between absenteeism and tenure, and the other a product of schooling and tenure, in accordance with the Altonji and Pierret (1996) methodology. Part B thus brings on board the informational role that education has in unveiling a worker's innate attributes. The coefficient to the schooling-tenure variable is expected to be significant and negative, to portray the dwindling emphasis on certificated credentials over time. Emphasis is expected to continue shifting to actual productivity, as depicted by a significant and positive coefficient to the absenteeism-tenure variable.

Estimations in both Parts A and B are however similar since they utilise the very *same sample*. The analysis thus undertaken here is based on the same sample but differing specification/ideologies.

In Part A, use of the sub-sample of only the employed, ignoring the unemployed and in-active, in an economy where about 26 per cent of the labour force have no jobs, biases estimations of returns to schooling downwards (by 42.34 per cent). This sample selection bias is slightly further negated (to 42.7 per cent), in the –Altonji and Pierret (1996) methodology- accommodating specification (Part B).

The results in Part A show that all schooling credentials have a significantly greater influence on the determination of wages, than not schooling at all. Thus time spent schooling increases wages by increasing a worker's productivity (Weiss, 1995). Overlooking the primary/secondary and NTCs qualifications, one observes the general convexity pattern in the marginal returns to schooling, widely depicted of the South African labour market (Keswell and Poswell, 2004; Bhorat, 2000; Hofmeyer, 2000). It is evident (in Part B) that accommodation for the informational role of education, slightly but significantly (see also the Ward test results in the appendix) improves the marginal returns to schooling at all credential levels. This result means that all differences in wages are not only associated with the skills acquired, but some extra reward is towards a worker's revelation that she possesses desirable, productivity boosting but innate attributes. Confirmation of screening also accounts for the convexity remuneration pattern: the ratio of remunerations to persons who attempt further studies and succeed, to that of workers that do not pursue further studies, increases with schooling (Weiss, 1995). Thus ignoring the informational role of education

biases estimations of marginal returns to education downwards. However, much as the measure of goodness of fit improves in Part B –something likely to arise due to inclusion of more variables- the standard errors to the credentials are more huge.

Absenteeism (a proxy for reduction in productivity) has an insignificant influence on wage determination when the informational role of education is ignored, but a significant one when accommodated. Tenure is an insignificant determinant of wages in both specifications. Insignificancy of tenure partly highlights the possibility that workers generally acquire no specific human capital while in employment. The specification in B also shows that worker-absenteeism is observed over time in employment, as captured by the product variable between absenteeism and tenure.

In the analysis that follows, a similar specification to that in part A above is used, but estimations are done using different sub-samples to depict different theories.

Table 4-3 The wage equations for the self-employed, the public and private sectors

Not A

	Self_empl	Robust		**Govt**	Robust		**Private**	Robust	
lrwkly_wagew	Coef.	Std. Err.	t	Coef.	Std. Err.	t	Coef.	Std. Err.	t
mills	-1.15009	0.489913	-2.35	0.057862	0.677468	0.09	-0.54997	0.238821	-2.3
Primary&sec	0.391331	0.075557	5.18	0.310897	0.195691	1.59	0.275049	0.039872	6.9
NTCs	0.929026	0.245511	3.78	0.1985	0.348952	0.57	0.809221	0.153374	5.28
C/dip no Gr12	0.238217	0.304321	0.78	0.783008	0.358919	2.18	0.625539	0.15824	3.95
C/dip wz Gr12	0.866692	0.165051	5.25	0.962631	0.27006	3.56	0.558765	0.09219	6.06
Bachelor's +	0.934765	0.205642	4.55	1.240086	0.349962	3.54	0.748459	0.135861	5.51
Honour's	0.829722	0.425158	1.95	1.573088	0.431536	3.65	0.609557	0.186837	3.26
Master's, plus	0.802027	0.361625	2.22	1.570925	0.463446	3.39	1.378052	0.262261	5.25
age	-0.01501	0.027239	-0.55	-0.02358	0.041788	-0.56	-0.01134	0.014129	-0.8
age_sqrd	-7E-05	0.000233	-0.3	0.000226	0.000396	0.57	-3.4E-05	0.000129	-0.27
absenteeism	-0.01481	0.005284	-2.8	0.014899	0.010005	1.49	0.001156	0.002815	0.41
tenure	-0.0175	0.010431	-1.68	0.008034	0.004465	1.8	0.001645	0.000953	1.73
ten_sqrd	0.000268	0.000144	1.87	-2.9E-05	3.85E-05	-0.76	1.76E-06	7.96E-06	0.22
perm_contr	0.056254	0.390698	0.14	0.620784	0.089148	6.96	0.24444	0.024369	10.03
males	0.310001	0.105618	2.94	0.378899	0.149694	2.53	0.281029	0.052575	5.35
L_union	(dropped)			(dropped)			(dropped)		
20_49workers	0.529085	0.221321	2.39	0.150925	0.10444	1.45	0.292479	0.030232	9.67
>=50workers	0.545337	0.243267	2.24	0.460519	0.093156	4.94	0.378445	0.031076	12.18

whites	0.731448	0.194232	3.77	0.595041	0.263217	2.26	0.668381	0.111863	5.98
policy_reg	(dropped)			(dropped)			(dropped)		
_cons	12.30307	1.036189	11.87	9.005785	1.497551	6.01	10.33467	0.497197	20.79
R-squared	*0.4489*			*0.5274*			*0.4931*		
Obs	*2866*			*898*			*10399*		

The significant mills coefficients signify that use of sub-samples that ignores the unemployed and the in-active- in wage determinations, embraces a bias; a negative one for the self-employed and the private sectors. This impact is however more negative (about double) in case of the self-employed. Sample selection has an insignificant influence towards estimation of a wage equation for the public sector. The public sector being the biggest employer in South Africa's labour market, may be depicting a picture close to that in the entire market, hence the insignificant influence on wages due to use of the its sub-sample. Possibly, the tinnier the proportion of the labour force involved and thus the more disaggregated the sub-sample, the more dynamic the specific sub-sample characteristic become.

According to Riley (1979), the effectiveness of education as a screening device is embedded in its power to accurately signal worker productivity. Evidence contrary to a prior expectation is captured by the estimation of the earnings function for the public sector mimicking the data better than is the case for the self employed or private sectors (in Table 4-3). An R^2 of 49.31 (52.7) and 44.89 per cent is yielded for the private, (government) and self employed sectors respectively. One would have expected that remunerations in the private sector would rely more on economic factor, and hence mimic the data better than the public sector.

With the self employed having no need to signal their productivity (thus forming the unscreened sample), their schooling yielded coefficients are taken to entirely signify schooling's role in accumulating productivity boosting skills; i.e. as per human capital theory. The employed in the private sector have, and those in the public sector *may* have however the need to signal their positive work attributes (and so constituting the screened group). The innate attributes are expected to account for the excess in elasticity above those recorded for the self employed, to support the WSH. While a positively significant result for credentials of the screened group but an insignificant one for the non-screened; self-employed, depicts the SSH.

The results (in Table 4-3)[16] support the WSH, SSH and the human capital theory, at some credential level. (The summary of these results appears in Table 4-4 below). The WSH is supported for persons with Master's academic credentials and beyond, in the private sector. While in the public sector, the range over which the WSH is exercised is wider and sets in at credential levels much lower than the masters. Screening is practise even at the mandatory education level; for those with in the public sector. The practise of weak screening however stretches to include the master's and beyond qualifications, excluding only the honour's degree. According to Psacharopoulos (1979:183), the above pattern may accrue to milder screening in the public sector (as compared to the private sector) where deviations between a worker's wage and her true marginal productivity, are rampant and may last an entire career. The rampancy of deviations is captured by the marginal returns to workers in the public sector exceeding those in any other sector. Wage determinations in the private sector are believed to consider economic factors more and thus to habit tinnier deviations between worker productivity and remuneration.

The SSH is supported at the honour's degree, and for holders of a certificate or a diplomas obtained after grade 12, in both the South Africa's private and public sectors. As per author's personal observation, acquisition of an honour's degree elicits a high academic success rating for the holder from fellow South African. Practically illustrating the worth of this qualification, to this date, many lecturers at tertiary institutions in South Africa –unlike in other countries- have *just* an honour's degree. (This is but likely to change over time as the South African economy gets more exposure and credential competition, from skilled persons from the rest of the world). Secondly, unlike in other African countries that adapted the British (colonial master) education system, an honour's degree (the prerequisite to joining studies for a masters) is *only* classified a postgraduate qualification, in South Africa. The above illustrations may partially assist in explaining the worth of the honour's credential in South Africa, and why this credential is being utilised entirely as a strong screen for a worker's attributes, in both the private and public sectors.

The certificate or diploma without grade 12, credential also serving as a strong screening device remains a mystery. This qualification is however, a big achievement since it constitutes the top

[16] This is just an abstract. Results with the full specification are shown in the appendix.

most category immediately below persons with grade 12 and a tertiary qualification; the latter makes up the top 8.4 per cent most educated persons in South Africa's labour force (Statssa, 2003:42). This category is capable of executing a lot of the clerical work[17] in both the private and public sectors.

Education is utilised entirely for its productivity boosting quality (as per the human capital theory), at certificate levels lower than the honour's degree, except for those with certificates/diplomas but grade 12. This support for the human capital theory is only evident in the private sector. The government sector utilises academic credentials only as weak or strong screening devices. This result may suggest that in the public sector, there exists rampant payment of workers' beyond their actual and positive contribution towards production.

Table 4-4 The per sector utilisation of schooling credentials in S. Africa's labour market

	Private sector	**Public sector**	**Self-employed**
Wolpin (1977) methodology	*Credentials*	*Credentials*	*Credentials*
Screening hypotheses			
Weak screening	-Master's, plus	-C/Dip wz Gr12 -Bachelor's, plus -Master's, plus	-N/A
Strong screening	-C/Dip no Gr12 -Honour's	-C/Dip no Gr12 -Honour's	-N/A
Human capital theory	-Primary & secondary -NTCs -C/Dip wz Gr12 -Bachelor's, plus	N/A	-Primary & secondary -NTCs -C/Dip no Gr12 -C/Dip wz Gr12 -Bachelor's plus -Honour's -Master's, plus

Source: Own tabulations from the regression results

[17] 40 per cent of workers in government do clerical work, another 50 per cent are at the level of cleaners. The remaining 10 per cent constitutes managers and senior managers; in a ratio of 8 and 2 per cent respectively. This was announced on TV by the Public Services (National) Ministry.

Screening is considered more relevant for worker categories whose output is hard to measure after they have been absorbed in a firm's work force (Jovanovic, 1982; Riley, 1979a), but for whom firm's aggregate remuneration responsibilities are huge. In this study, it is hypothesized that screening is applied at the beyond societies mandatory e4ducation level. As illustrate above, some tertiary qualification constitute such a worker group. (The ages of these graduates and post graduates at matriculation, happen to tarry with the age-bracket most gorged by HIV/AIDS). It is thus also such worker-groups whose innate abilities employers would most seek for. The private sector however sieves further this bigger group, by raising its screening set-in point. Other possible grounds of screening; such as gender, race, contract type are analysed next.

Absenteeism (a proxy for reduction in productivity) is correctly signed in all sectors, but only significant for the self-employed. Tenure is an insignificant contributor to a worker's wage, in all sectors according to this specification. Absence of a significant and positive wage-tenure relationship may imply that better job matching is not attained over time. Secondly, that there is no motivation for workers to offer more effort over time while in employment. Thirdly, that no firm-specific learning (acquisition of specific human capital, through OJT or by-doing) takes place while in employment in all sector (Weiss, 1995). The second and third factors may partly explain existence of rampant job mobility for the more educated, in South Africa's labour market faced with plenty of unemployment.

Gender and population group are in literature, among the other possible venues for screening. The bias in favour of men (similar to that got by Bhorat, 2000) is here shown to be 31, 37 and 28 per cent, for the self-employed, the public and the private sectors. The racial bias in favour of the previously advantaged whites is substantial, and unabated. The result of wages that are superior for the whites is similar to that recorded by Bhorat's (2000:6) but contrary to Schultz and Mwabu's (1998) findings. This racial bias is but lower in the public sector (59.5 per cent) –champions of the AA policy- as compared to the private sector (66.8 per cent) or the self employed (73.1 per cent).

The discrepancy in wages on grounds of employment security status is more pronounced in the public sector. Wages of holders of permanent contracts exceed those of other contract types by 62.0 per cent in the government, but by 24.4 per cent in the private sector. This contract variable is

as expected, insignificant in explaining wage determination among the self-employed. It may also capture the short life-span of SMEs in the South African market.

One outstanding characteristic attributed often to returns to education in South Africa is convexity (Keswell and Poswell, 2004). Hofmeyer[18]'s (2000: 6) results capture the same quality. Such a pattern is to some extent mimicked in the government sector –if the NTCs credentials are excluded[19]- but does not seem to be sector traverse, when the tertiary qualification is disaggregated in detail. (See Table 4-3 above). A zigzag trend is exhibited in case of the private sector, while that for the self-employed climaxes at the bachelor's plus level, hence not conforming to convexity.

According to Schultz and Mwabu (1998:681 & 685), the ultimate influence on returns to education due to union wage effects is equivocal. It is not predictable to precision levels by available theory. Michaud and Vencatachellum (2001) show that being a member of a union yields a wage premium for African workers. In this study, trade union membership is unfortunately, automatically dropped by the modeller (STATA) from wage regressions across sectors, on ground of severe multicollinearity. The distortion in wages due to labour unions is thus missed.

Size of the business (20-49 regular workers) has also a positive impact on wages, in both the self-employed and private sectors but not in the public sector. Generally, government is not likely to be employing less than fifty workers at most work points where the LFS is conducted. Employment of more than 50 workers has however a significant positive impact on wages in the three sectors. The impact of business size is however greater for the self-employed.

The degree of screening is further tested using the Altonji and Pierret (1996) methodology. Two additional product variables are included in the specification, but the analysis sub-samples are retained. The schooling-tenure product variable should manifest an independent (insignificant) relationship with years of tenure. While that between absenteeism (a reduction in productivity capturing variable) and tenure should exhibit a positive relationship. There is no evidence of post-employment learning about workers' true and sustained productivities (whatever the sector) as per

[18] Has a somewhat similar specification.
[19] The below NTCs categories do not actually constitute a sequential, ascending education credentials pattern.

this methodology. The results in Table 4-3 are further compared with those in Table 4-5, with the discussion offered after latter table.

Specification of the wage equations to accommodate for the Altonji and Pierret (1996)…. methodology

reg lrwkly_wagew mills primary&sec ntcs cdipn12 cdipw12 ddplus hons m_etc age age_sqrd absenteeism abs_ten sch_ten tenure ten_sqrd agri comm_svc cons fin man min trans whsal perm_contr males L_union rgwk20_49 rgwk50etc whites ncape ecape fstate kzn nwest gaut mpuma limpo legis profl techn clerks svcs sklag craft pmoper elemt policy_reg if sekita==1[20], robust

Table 4-5 The wage equations: accommodating the Altonji and Pierret (1996) methodology

	Self_empl	Robust		**Govt**	Robust		**Private**	Robust	
lrwkly_wagew	Coef.	Std. Err.	t	Coef.	Std. Err.	t	Coef.	Std. Err.	t
mills	-1.14939	0.490095	-2.35	0.184931	0.696123	0.27	-0.54948	0.239201	-2.3
Primary&sec	0.387601	0.076351	5.08	0.321867	0.199304	1.61	0.277183	0.041642	6.66
NTCs	0.924656	0.245936	3.76	0.225692	0.359369	0.63	0.811807	0.155592	5.22
C/dip no Gr12	0.234717	0.304727	0.77	0.816421	0.37613	2.17	0.628216	0.161631	3.89
C/dip wz Gr12	0.863932	0.165397	5.22	1.047603	0.305727	3.43	0.565767	0.10832	5.22
Bachelor's +	0.932187	0.206054	4.52	1.330444	0.40312	3.3	0.75916	0.152043	4.99
Honour's	0.827525	0.425683	1.94	1.714039	0.489563	3.5	0.623089	0.206382	3.02
Master's, plus	0.799324	0.361754	2.21	1.699905	0.539933	3.15	1.386777	0.276777	5.01
age	-0.01497	0.02725	-0.55	-0.01683	0.04251	-0.4	-0.01126	0.014157	-0.8
age_sqrd	-7E-05	0.000233	-0.3	0.000169	0.000402	0.42	-3.5E-05	0.00013	-0.27
absenteeism	-0.01514	0.005333	-2.84	-0.01116	0.01927	-0.58	-0.00285	0.004037	-0.71
abs_ten	0.000712	0.000536	1.33	0.000566	0.000344	1.65	0.000114	7.62E-05	1.5
sch_ten	0.00255	0.006634	0.38	-0.00023	0.000625	-0.37	-5.4E-05	0.000331	-0.16
tenure	-0.01804	0.01073	-1.68	0.008912	0.004501	1.98	0.001808	0.001018	1.78
ten_sqrd	0.000251	0.000145	1.73	-3E-05	3.75E-05	-0.79	1.54E-06	7.96E-06	0.19
perm_contr	0.055509	0.392026	0.14	0.624691	0.089597	6.97	0.244504	0.024389	10.03
males	0.310236	0.105661	2.94	0.412888	0.151769	2.72	0.282255	0.052623	5.36
L_union	(dropped)			(dropped)			(dropped)		
20_49workers	0.528525	0.221659	2.38	0.144146	0.104413	1.38	0.292065	0.030224	9.66
>=50workers	0.545255	0.245376	2.22	0.461138	0.093254	4.94	0.378041	0.031096	12.16
whites	0.731764	0.194305	3.77	0.636719	0.272034	2.34	0.668529	0.112058	5.97
policy_reg	(dropped)			(dropped)			(dropped)		
_cons	12.32046	1.036793	11.88	8.70036	1.53321	5.67	10.32676	0.499297	20.68
R-squared	*0.4489*			*0.529*			*0.4932*		
Obs	*2866*			*898*			*10399*		

[20] The if condtion is changed from if lb_part==1, to 'if sekita==1', then to 'if sekita ==2 and finally to if sekita==3', to account for the public, private and self-employed sectors, respectively. Lb_part refers to the joint sample.

The first precise observation is that wage equations of sectors that fall within the screened category –private and public sectors- fit the data better than the non-screening; self-employed, across specifications.

Inclusion of two product variable as per the Altonji and Pierret (1996), introduces some noticeable changes in the coefficients to a lot of variable, and to the model fit in some sectors. The two variable are however insignificant across sectors, but the absenteeism-tenure one was significant for the joint sample (in Table 4-2). The results are nevertheless discussed.

While the modification yields a better fit for the private and public sectors, that of the non-screening private sector remains unchanged. The coefficients to all schooling variable –whether significant or not- are slightly raised (reduced) for the self-employed (private and public sectors). However, the significancy/insignificany statuses for all these credentials do not change. A pattern, similar to that attributed to the schooling credentials above, is recorded also regarding the impact of sample selection. The tenure variable for the public sector becomes significant. Thus some specific skills acquisition may be taking place in the public sector.

In no specification, whatever the sample, are the age and related variables significant. This may follow from the fact that race over shadowed aspects like age in the apartheid set up, and neither is age being over weighted in times trying to address apartheid. However, Keswell and Poswell, (2004:839, 840 and 841) record significant age and age squared variable, for the all inclusive worker, South African sample.

Results from the mid-to-early earnings ratios are discussed next.

Table 4-6 Mid-to-early career earnings ratios: by education level and economic sector

Education level	LFS groupings	Private sector	Public sector
Qualification			
NONE	0	1.45	*

PRIMARY&SEC	1-13	1.67	1.53
NTCs	14-16	2.84	1.29
C/DIP NO GR12	17&18	2.56	1.02
C/DIP WZ GR12	19&20	3.72	1.67
BACHELOR'S +	21&22	1.94	1.36
HONOUR'S	23	1.57	1.20
MASTER'S, PLUS	24	1.64	2.41

Source: Own computation, utilising data from Labour force survey of September 2004.

The mid and early career earnings age between36-45, and 25 years or less, respectively

**There are no workers with no schooling in the public sector for ages 25 and below.*

Psacharopoulos (1979:181) distinguishes between the WSH and the SSH by comparing the trends between the initial and eventual[21] wage offers for the more educated and less educated. The SSH is expected to be empirically supported if the wedge between the pay for the more educated and the less educated, is maintained (not more divergent) after a firm has observed the true productivities of both worker categories. The WSH entails adjustment of the initial wage gap, in realisation of a worker's true productivity over time.

The results in Table 4-5 generally indicate that for every education qualification accomplished, the wedge in both the private and public (competitive) sectors mid-to-early age-earnings profile, changes. A worker's wage is increased as she attains tenure. However this increase is not consistent. Generally, there is an increase as one progresses from the bottom academic ranks, followed by a decrease, in the private sector. This inconsistence firstly eliminates speculation that education is used entirely for its informational role (thus rejecting the SSH). But it supports the WSH which manifests that a worker's true productivity is monitored while in employment, and remunerated accordingly. However, this inconsistence on the other hand is either evidence that the rate of return to schooling (generally) decreases with level of education, or it puts to doubt the assumption that the education-bestowed skills increase with levels of education.[22] The private sector's mid-to early earnings ratio however generally exceeds that of the public sector.

[21] i.e. the pay after the worker has been observed for some considerable time while in employment with a specified firm.

[22] The results in this table are reported as derived from the computations. They should however be taken lightly since some computations involved very few observation; in the denominator, numerator or both.

The results from the competing/private sector, and those from the non-competing/public interest ensuring sector, both support the WSH, according to the Psacharopoulos (1979) methodology. This result means that wages are adjusted to cater for the observed individual worker productivities along years in employment in both sectors.

4.5 Summary of the findings and policy implications

The empirics (above) reveal that the debate between human capital theory and the screening ones, in explaining the relationship between wages and schooling, is: methodology, sector and credential sensitive. Proof of (weak) screening then implies that the coefficients to the education credentials captures the dual effect of: the skills bestowing role of education, and that of disclosing a person's inner, production related, characteristics. The two aspects are not affected by other variable specified in the model. Confirmation of screening also accounts for the convexity remuneration pattern (see results for the joint sample, in Table 4-2): the ratio of remunerations to persons who attempt further studies and succeed, to that of workers that do not pursue further studies, increases with credential levels.

Human capital accumulation is shown to be utilised as both a means of augmenting the stock of a worker's production skills, as well as a tool for the employer to have a more accurate guess at a worker's inborn and desirable work-related attributes (i.e. weak screening) in both the private and public sectors, as per the Wolpin (1977) and Psacharopoulos (1979) methodologies. The credential levels at which weak screening is shown to be practised, in the private sector, are at the master's and beyond. In the public sector the scope of weak screening stretches much lower to include certificates or diplomas attained after grade twelve, according to the Wolpin (1977) methodology. Use of human capital accumulation entirely as a discloser of a worker's intrinsic, high productivity related qualities, (i.e. strong screening) is supported at the same credential level; honour's and certificates or diplomas attained without grade twelve, in both the private and public sector, basing on the Wolpin (1977) method. Accumulation of human capital is utilised entirely for the skills it bestows (as per the human capital theory), for holders of qualifications lower than an honour's degree (excluding certificates or diplomas attained without grade twelve), in the private sector. There is no evidence in support of the human capital theory on its own, in the public sector, as per

the Wolpin (1979) methodology. The Altonji and Pierret (1996) methodology confirm no post-employment screening whatever the sector.

From the above, it is thus clear that that it is not only the private sector that screens, but that the public sector also does. It is equally established that screening is conducted for workers with credentials much beyond the mandatory education qualification in the private sector, but that it includes even the mandatory level in the public sector. The private sector, whose profitability and survival objectives are threatened, raise the education qualification level at which screening sets in.

Despite the potential importance of distinguishing the human capital role of education from the screening one, minimal attempt has been made in past studies, to disentangle the two, in explanations of the wage/education in South Africa. A portion of the returns attributed to education, is actually the signal's worth of education. There is thus the need to distinguish the two. While the productivity boosting power of education has benefits to both the individual and society, the benefits associated with signalling are enjoyed entirely by an individual. With possibilities of the signal being inaccurate, returns to the signal may be unproductive.

The implication of (weak) screening is firstly that differences in wages are partly a reward to skills acquired at school, but also for the worker's signalling her desirable innate qualities. Secondly, that amid information asymmetry, high ability workers end up accumulating human capital beyond stocks actually required to execute the jobs they are engaged in. They are thus described as being 'overeducated'. The overeducation venture is an attempt by the more able persons, to overcome the information asymmetry disadvantage[23] by signalling their desirable inner qualities to employers, and thus distinguish themselves from less able workers. Employers thus favour the more educated as a way to reduce their labour-related costs, such as sickness, absenteeism, shirking, or labour turnover (Weiss, 1995). Employers base their inferences regarding workers' inner attributes on individual academic credentials.

The screening outcome is however not optimal. It entails a much wider wage gap between persons that have exposed themselves as more able, and those that have not. The wage gap increases

[23] In which case they would have to earn a wage rate equal to the weighted average productivity, for both the more and the less able.

with difference in credentials. The more able that attain the higher screening target in the private sector happen to constitute a small portion of the entire labour force (see Table C-1 some where among the appendices) thus satisfying what Riley (2001:441) considers the necessary and sufficient condition for a screening equilibrium. These few end up earning exaggeratedly more than they would under perfect information. (Compare Figs 3-3 and 3-4, as well as see the marginal returns to holders of master's plus credentials, versus the rest in the private sector, in Table 4-3 as an example).

The public (private) sector is shown to screen mildly (more emphatically)[24], such that deviations between a wage and a worker's true productivity are rampant (minimal) and may (do not) last an entire career as one moves through the carrier ladder. The fact that weak screening sets in at much lower levels in the government sector, reduces this inequality effect, *but* discourages acquisition of skills to a levels that require minimal monitoring and supervision (Chatterji, *et al.,* 2003:195). While it may be alleged that signalling is unproductive, the contrary may actually be true if it is inversely related with monitoring costs as Chatterji *et al.,* (2003) argues. Absorption of employees that have signalled may actually improve production, since they are aware of what they want and how to achieve it, and can direct the masses of employees say in the public sector.

Rampant existence of screening in the public sector partly pinpoints the very low minimum education level at which workers are recruited into employment. Thus any one with credentials above matric (Grade twelve) appears to signal (possesses credentials above the necessary) if employed in the public sector. Employment in the public sector thus generally provides a haven for the relatively less efficient production scenario. Absence of evidence that human capital accumulation is used at any credential level, entirely for its skills bestowing quality in the public sector, but that it widely serves also as a screening device, from as early as at the society mandated education level, is revelation of rampant existence of, non-optimal credential-employment allocation and thus wage-productivity relationships. Government is possibly faced with a trade-off between tying to increase the absorption rate on one hand, and the unsatisfactory public service delivery rate resulting from the low minimum education level of new employees.

[24] See the coefficients to schooling in Table 4-3

If government is to improve productivity in the public sector, then it has to address the job skills-requirements and the appropriate qualification to execute the job. In the absence of such measures, government shall continue to outsource a lot of its work to the private sector, and at exorbitant prices.

Screening also wastage of production time when schooling to acquire credential levels in exceed of what would have been necessary if government policies that work towards perfect information are enforced. The higher screening, set-in credential level in the private sector, is *but* just a business instinct, counter mechanism to information asymmetries sustaining policies and the associated threatened regarding profitability and survival in business.

The sustained influence of apartheid on South African rendered the outcome more undesirable. The results above capture the perpetuated preference for the previously advantage workers: the whites. These previously advantaged persons also happen to be the more educated, thus amplifying the state of wage inequality. Given AA, the whites may seek employment mainly in the private sector. The private and public sectors may end up with workers of differing education qualifications, and duplicating racial and wage-inequality inclination from apartheid. Jobs requiring high skills may still have to be outsourced to the private sector, and at heavy costs to government.

Presence of education screening also implies a deviation between private and social returns to human capital accumulation. With screening confirmed, the coefficients to the schooling credentials more accurately approximate private returns than social returns to education. The marginal benefits from schooling that accrue to an individual end up in excess of the expected value of schooling on productivity. With individual and society, returns to accumulation of human capital diverging, self-funding of human capital accumulation; schooling or OJT, gets justified. This may be implemented through offer of loans and not hand-outs (subsidies) to persons who pursue studies beyond the necessary/mandatory level.

With screening being based on, and preferring those with better, education qualifications, existence of information asymmetries and labour heterogeneity –to *some* degree- accounts for skills biased (un)employment and greater income inequality. Employers, such as those in the private sector,

recruit individuals with high qualifications, to avoid the less skilled and those with undesirable innate qualities. (Persons who stay longer in school signal that they benefit more from each additional unit of schooling, value the future and the associated earnings more, and do enjoy learning (Chatterji, *et al.,* 2003:191)). Screening thus entails some form of discrimination against the disadvantaged, but logical and thus reasonable discrimination. Emphasis only of globalisation/trade liberalisation (Bell and Cattaneo, 1997; Bhorat 1999 and Nattrass, 1998) and skills-leaning technological changes (Fedderke *at al.*,1999 and Edwards, 2001 and 2004) as *the* causes of skills biased unemployment crumples on grounds that bias persists despite demystification of technology (e.g. computer use in the developed countries. (Svizzero and Tisdell, 2002:166-7)). Persistent within-group (gender, race, industry, etc) inequalities and unemployment are better explained by differences in innate qualities. This screening aspect has so far been eluded in explanations of (un)employment or specifically skills biased (un)employment, and greater income inequality, in South Africa.

Screening is an attempt to reduce information asymmetry. It affords a better pay for the more able workers and better profits for employers, as well as institutes a remuneration system that account for the differing education qualifications and innate abilities. And as G. J. Stigler (1962) says, 'The information a man possesses on the labour market is capital: it yields a higher wage rate than on average would be received in its absence'. Education serves to separate the less productive from the more productive. However, with education influencing productivity, information asymmetry provokes over education, and yields greater income inequality. Proof of screening thus signifies that amid information asymmetries, market mechanism may not be the right basis for determining the socially desirable levels of investment in education. The market mechanism in this case yields inefficient outcomes. The odds in the local market (such as scarcity of skilled labour required to direct the masses of low skilled workers and thus improve public sector productivity) have thus to be assessed and addressed through appropriate government policy.

Screening has also some advantages worth mentioning. It may improve matching between workers and jobs (as one would assume is the case in the private sector). With better matching of skills and job, the social returns may exceed the individual returns. The fact that this study highlights the

need to analyse the match between credentials and jobs, in itself works towards improvement of the social returns.

Caveats have however to be put to the above results. Firstly, the methodologies used: the Wolpin (1977) and the Psachaloupos (1979) one, only indirectly capture signalling by distinguishing between situations where screening is or is not practised. Results from such methods are considered inconclusive since they include an education measure, but not a measure of the signal or actual productivity. However, an absenteeism, and product variables with it, utilised in the Altonji and Pierret (1996) methodology, proxy reduction in productivity, and thus try to remedy flaws in the earlier mentioned methods.

However, the quality of the proxy to (reduction in) productivity; absenteeism, is not very neat. The absenteeism variable is used correctively, without accounting for acceptable angles such as maternity and educational leaves. Despite this flaw, the variable is considered a suitable measure of reduction in productivity given the times. Secondly, this study has addressed the issue of self-selection[25], to enable generalised the outcome to the entire labour force in South Africa. However, most studies of returns to education in South Africa did not account for sample selection[26]. This renders comparison of the results impractical.

Absence of data has also disenabled inclusion of variables such as education quality and family background. With sorting confirmed, the coefficient to schooling appropriates the private, but not the social, rate of return to education. Such omissions (as illustrated by Hertz, 2003) are likely to manifest into an upward bias in the estimation of returns to education.

4.7 Selected references

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[25] Most estimations of wage equations in South Africa have not addressed sample selection either (Michaud, P. C. and Vencatachellum, 2001:3).
[26] Exceptions include (among others) Hofmeyer (1999); and Michaud and Vencatachellum (2001).

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Appendix

Industries

1 = Agriculture, hunting and forestry
2 = Mining
3 = Manufacturing
4 = Electricity, gas and water
5 = Construction
6 = Wholesale and retail trade
7 = Transport, storage and communication
8 = Finance and business services
9 = Community, social and personal services

Occupations

1 = Legislators, senior officials and managers
2 = Professionals
3 = Technical and associate professionals
4 = Clerks
5 = Service workers and shop and market sales workers
6 = Skilled agricultural and fishery workers
7 = Craft and related trades workers
8 = Plant and machine operators and assemblers
9 = Elementary Occupation
10 = Domestic workers

Table D-1 The variables in the labour participation, wage, skills training and contract equations

Variable	Description	Mean	Std. Dev
obs	41718 total observations at use	21955.36	12501.97
adj_hi	adjust hour input	0.135122	0.341857
age	Years one has lived so far	35.11307	11.82977
age_sqrd	age*age	1372.868	936.9667
age15_29	between 15 and 29 years	0.382617	0.486032
age30_45	between 30 and 45 years	0.415912	0.492884
age46_59	between 56 and 59 years	0.172324	0.377666
age60pls	60 years and above	0.029148	0.168224
agriculture	agriculture industry	0.090776	0.287294
C/dip no Gr12	certifcates & diplomas but no Gr12	0.005945	0.076873
C/dip wz Gr12	certificate & diploma got after Gr12	0.052136	0.222303
clerks	clerks	0.044178	0.205492
club/ngo_sec	Club and NGO sector	0.006065	0.07764
comm_svc	community service	0.105087	0.306669

construction	construction industry	0.038329	0.191991
contr_type	contract type	0.712259	1.044334
coop_sec	cooperative sector	0.005657	0.075001
craft	craft workers	0.07299	0.260123
csea_contr	causal and seasonal contract	0.038928	0.193426
bachelor's, +	bachelors and c/dips above	0.018242	0.133825
dom_worker	dmestic workers	0.051728	0.221481
ecape	estern cape	0.118702	0.323441
elemt	elementary wokers	0.153267	0.360249
finance	finance industry	0.035021	0.183835
fixp_contr	fixed period contract	0.020639	0.142173
fstate	free state province	0.077305	0.267078
gauteng	gauteng province	0.12364	0.329174
honour's	honour's degree	0.003931	0.062576
electricity	electricity gas and water	0.003739	0.061037
kzn	Kwa Zulu Natal province	0.244667	0.429895
legislation	Legislation, senior officials and managers	0.029532	0.169293
limpopo	Limpopo province	0.089554	0.285545
males	1 if man 0 if woman	0.489645	0.499899
manufacturing	manufacturing industry	0.070257	0.255584
L_union	labour union member	0.132197	0.338709
mining	mining industry	0.018937	0.136303
master's,plus	master's degree and beyond	0.002325	0.048164
mpumalang	mpumalang province	0.078288	0.268627
ntcs	trade certificate got without Gr12	0.006999	0.08337
nwest	north west ptovince	0.087324	0.282313
ojt	On-the-job training dummy	0.097104	0.296103
whites	1 if white, 0 if of other race	0.069179	0.253761
perm_contr	permanent contract	0.326646	0.468992
pmoper	plant and machine operator	0.051153	0.220312
primary&sec	Primary and secondary credentials	0.833909	0.372167
private_sec	private sector	0.37322	0.483666
profl	professionals	0.030059	0.243343
ncape	nothern cape	0.067285	0.250518
public_sec	public sector	0.092358	0.289534
Credentials	academic certificates	9.959442	4.88196
none	no schooling	0.076514	0.265822
1_19workers	1-19number of regular workers	0.339566	0.473568
20_49workers	20-49 number of regular workers	0.083921	0.277272
>=50workers	50 or more regular workers	0.131023	0.337429
hr_input	hour input into work	25.29659	25.44225
adj_hri	capable of adjust hour worked	0.135122	0.341857
wk_indp	work independently	0.031761	0.175365
sch_sqrd	schooling*schooling	2.461072	5.549452
sch_ten	schooling*tenure	59.17673	173.4849
sekita	the five different sectors	1.140371	1.127107
self_empl	self employed	0.08301	0.2759
skld_agric	skill agriculture	0.025696	0.15823
svcs	service sector	0.0681	0.251921
techn	Technical and associate professionals	0.048492	0.214807

temp_contr	temporary contract	0.062875	0.24274
ten_sqrd	tenure*tenure	7313.346	22584.47
tenure	years worked in current firm	39.14186	76.03551
trans	transport industry	0.021214	0.144098
wcape	western cape	0.113237	0.316886
wholesale	wholesale industry	0.114771	0.318749
lrwkly_wagew	log of weekly wage	11.24303	1.579579
lb_part	labour participation	0.561364	0.496226
policy_reg	1 if 1994 and after, 0 before 1994	0.892061	0.310307

Specification of the labour participation model and generation of the IMR

Heckman Procedure: 1st Stage

```
probit lb_part primary&sec ntcs cdipn12 cdipw12 ddplus hons m_etc age
age_sqrd males ncape ecape fstate kzn nwest gaut mpuma limpo whites
q21efarm q21gctch q21hbeg L_union policy_reg,nolog robust

predict phat, xb
gen mills = exp(-.5*phat*phat)/(sqrt(2*3.141592654)*normprob(phat))
```

```
Probit regression                               Number of obs   =      33121
                                                Wald chi2(19)   =    4141.27
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -20134.043               Pseudo R2       =     0.1160
```

lb_part		Robust				
lb_part	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
primary&sec	-0.031	0.028694	-1.08	0.28	-0.08724	0.02524
ntcs	0.144895	0.103019	1.41	0.16	-0.05702	0.346807
c/dip no 12	0.205718	0.112766	1.82	0.068	-0.0153	0.426735
c/dip wz 12	0.449313	0.05158	8.71	0	0.348218	0.550407
Bachelor's	0.700848	0.093115	7.53	0	0.518346	0.883351
Honour's	0.898062	0.241128	3.72	0	0.42546	1.370664
m_etc	0.8369	0.292606	2.86	0.004	0.263403	1.410397
age	0.076655	0.003485	22	0	0.069825	0.083485
age_sqrd	-0.00058	4.52E-05	-12.86	0	-0.00067	-0.00049
males	0.309974	0.014641	21.17	0	0.281279	0.33867
ncape	-0.37515	0.036565	-10.26	0	-0.44682	-0.30349
ecape	-0.48881	0.031488	-15.52	0	-0.55052	-0.42709
fstate	-0.41579	0.035221	-11.81	0	-0.48483	-0.34676
kzn	-0.53171	0.027438	-19.38	0	-0.58549	-0.47793
nwest	-0.72696	0.034149	-21.29	0	-0.79389	-0.66003
gaut	-0.40521	0.031227	-12.98	0	-0.46641	-0.344
mpuma	-0.35565	0.034385	-10.34	0	-0.42304	-0.28826

limpo	-0.64819	0.033252	-19.49	0	-0.71336	-0.58301
whites	0.845529	0.039679	21.31	0	0.76776	0.923298
_cons	-1.71461	0.073001	-23.49	0	-1.85769	-1.57153

Table D-3 The Skewness/Kurtosis tests for Normality

```
sktest lb_part primary&sec ntcs cdipn12 cdipw12 ddplus hons m_etc age
age_sqrd males ncape ecape fstate kzn nwest gaut mpuma limpo whites
q21efarm q21gctch q21hbeg L_union policy_reg,
```

				------- joint ------	
Variable	Pr(Skewness)	Pr(Kurtosis)	adj	chi2(2)	Prob>chi2
lb_part	0	.		.	.
primary&sec	0	0		.	.
ntcs	0	0		.	.
cdipn12	0	0		.	.
cdipw12	0	0		.	.
ddplus	0	0		.	.
hons	0	0		.	.
m_etc	0	0		.	.
age	0	0.036		.	.
age_sqrd	0	0		.	.
males	0.001	.		.	.
ncape	0	0		.	.
ecape	0	0		.	.
fstate	0	0		.	.
kzn	0	0		.	.
nwest	0	0		.	.
gaut	0	0		.	.
mpuma	0	0		.	.
limpo	0	0		.	.
whites	0	0		.	.
q21efarm	0	0		.	.
q21gctch	0	0		.	.
q21hbeg	0	0		.	.
L_union	0	0		.	.
policy_reg	0	0		.	.

Specificaions for the wage equation(s)

Heckman procedure: 2nd Stage

```
reg lrwkly_wagew mills primary&sec ntcs cdipn12 cdipw12 ddplus hons m_etc age
age_sqrd abseteeism tenure ten_sqrd agri comm_svc cons fin man min trans
whsal perm_contr males L_union rgwk20_49 rgwk50etc whites ncape ecape fstate
```

```
kzn nwest gaut mpuma limpo legis profl techn clerks svcs sklag craft pmoper
elemt policy_reg if lb_part==1[27],robust
```

Joint estimation for all the employed including NGO & coops

Linear regression — Number of obs = 14488
F(43, 14444) = 324.47
Prob > F = 0.0000
R-squared = 0.4778
Root MSE = 1.135

lrwkly_wagew	Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
mills	-0.42343	0.201036	-2.11	0.035	-0.81749	-0.02937
primary&sec	0.33427	0.034757	9.62	0	0.266142	0.402399
ntcs	0.838208	0.129875	6.45	0	0.583638	1.092779
cdipn12	0.644646	0.134179	4.8	0	0.381638	0.907653
cdipw12	0.797283	0.074033	10.77	0	0.652169	0.942398
ddplus	0.950575	0.101407	9.37	0	0.751805	1.149345
hons	0.939979	0.160635	5.85	0	0.625114	1.254844
m_etc	1.126553	0.180371	6.25	0	0.773002	1.480103
age	-0.00019	0.011657	-0.02	0.987	-0.02304	0.022661
age_sqrd	-0.00013	0.000105	-1.24	0.216	-0.00034	7.59E-05
absenteeism	-0.00283	0.002449	-1.16	0.248	-0.00763	0.001971
tenure	0.001081	0.000882	1.23	0.22	-0.00065	0.00281
ten_sqrd	6.34E-06	7.56E-06	0.84	0.402	-8.47E-06	2.11E-05
agri	-0.24546	0.060908	-4.03	0	-0.36485	-0.12608
comm_svc	0.372235	0.068458	5.44	0	0.238048	0.506421
cons	0.411648	0.06932	5.94	0	0.275772	0.547524
fin	0.640413	0.071108	9.01	0	0.501033	0.779794
man	0.394425	0.067472	5.85	0	0.262172	0.526679
min	0.521421	0.104348	5	0	0.316886	0.725956
trans	0.691618	0.078235	8.84	0	0.538267	0.844969
whsal	0.326399	0.062291	5.24	0	0.2043	0.448497
perm_contr	0.248656	0.02285	10.88	0	0.203868	0.293444
males	0.362073	0.044169	8.2	0	0.275496	0.44865
L_union	(dropped)					
rgwk20_49	0.294982	0.028278	10.43	0	0.239553	0.35041
rgwk50etc	0.437419	0.028385	15.41	0	0.381781	0.493057
whites	0.8063	0.088683	9.09	0	0.63247	0.98013
ncape	-0.72329	0.05953	-12.15	0	-0.83998	-0.60661

[27] The if condtion is changed from 'if lb_part==1', to 'if sekita ==1,2 and 3', when estimating for the public, private and self-employed sectors, respectively.

ecape	0.165971	0.066645	2.49	0.013	0.035338	0.296604
fstate	-0.09522	0.064809	-1.47	0.142	-0.22225	0.031817
kzn	0.133213	0.070953	1.88	0.06	-0.00586	0.272289
nwest	0.421132	0.097428	4.32	0	0.230161	0.612102
gaut	1.194686	0.059242	20.17	0	1.078563	1.310808
mpuma	0.209636	0.056127	3.74	0	0.099619	0.319653
limpo	0.440449	0.085624	5.14	0	0.272616	0.608283
legis	1.283705	0.084542	15.18	0	1.117993	1.449417
profl	0.566243	0.060309	9.39	0	0.44803	0.684456
techn	0.655323	0.084178	7.79	0	0.490324	0.820321
clerks	0.524492	0.077183	6.8	0	0.373203	0.675781
svcs	0.147384	0.073415	2.01	0.045	0.00348	0.291287
sklag	0.582083	0.124413	4.68	0	0.338218	0.825947
craft	0.113538	0.075802	1.5	0.134	-0.03504	0.26212
pmoper	0.202421	0.077464	2.61	0.009	0.050582	0.35426
elemt	-0.12602	0.064715	-1.95	0.052	-0.25287	0.000832
policy_reg	(dropped)					
_cons	9.90592	0.415883	23.82	0	9.090736	10.7211

. estat ovtest

Ramsey RESET test using powers of the fitted values of lrwkly_wagew
Ho: model has no omitted variables
F(3, 14441) = 14.95
Prob > F = 0.0000

. test primary&sec = ntcs = cdipn12 = cdipw12 = ddplus = hons = m_etc

(1) primary&sec - ntcs = 0
(2) primary&sec - cdipn12 = 0
(3) primary&sec - cdipw12 = 0
(4) primary&sec - ddplus = 0
(5) primary&sec - hons = 0
(6) primary&sec - m_etc = 0

F(6, 14444) = 12.05
Prob > F = 0.0000

Specificaions for the wage equation(s): The Altonji and Pierret (1996)…..

Heckman procedure: 2nd Stage

```
reg lrwkly_wagew mills primary&sec ntcs cdipn12 cdipw12 ddplus hons
m_etc age age_sqrd abseteeism abs_ten sch_ten tenure ten_sqrd agri
comm_svc cons fin man min trans whsal perm_contr males L_union
rgwk20_49 rgwk50etc whites ncape ecape fstate kzn nwest gaut mpuma
```

```
limpo legis profl techn clerks svcs sklag craft pmoper elemt policy_reg
if lb_part==1[28],robust
```

Joint estimation for all the employed including NGO & coops: Altonji and Pierret (1996)

Linear regression Number of obs = 14488
F(45, 14442) = 310.13
Prob > F = 0.0000
R-squared = 0.4782
Root MSE = 1.1347

Joint sample		Robust				
lrwkly_wagew	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
mills	-0.42704	0.200881	-2.13	0.034	-0.82079	-0.03329
primary&sec	0.342036	0.035574	9.61	0	0.272306	0.411765
ntcs	0.84878	0.130876	6.49	0	0.592246	1.105314
cdipn12	0.657446	0.136018	4.83	0	0.390833	0.924059
cdipw12	0.826904	0.080782	10.24	0	0.668561	0.985247
ddplus	0.986724	0.107417	9.19	0	0.776172	1.197276
hons	0.993529	0.166977	5.95	0	0.666232	1.320826
m_etc	1.165918	0.187019	6.23	0	0.799336	1.5325
age	-0.00031	0.011648	-0.03	0.979	-0.02314	0.022519
age_sqrd	-0.00013	0.000105	-1.23	0.219	-0.00033	7.67E-05
absenteeism	-0.00903	0.003277	-2.76	0.006	-0.01545	-0.00261
abs_ten	0.000228	6.95E-05	3.28	0.001	9.17E-05	0.000364
sch_ten	-0.00026	0.000258	-1	0.319	-0.00076	0.000248
tenure	0.001594	0.000923	1.73	0.084	-0.00021	0.003404
ten_sqrd	5.87E-06	7.54E-06	0.78	0.436	-8.91E-06	2.07E-05
agri	-0.2445	0.060853	-4.02	0	-0.36378	-0.12522
comm_svc	0.373997	0.068367	5.47	0	0.239989	0.508005
cons	0.413003	0.069259	5.96	0	0.277246	0.54876
fin	0.641726	0.071042	9.03	0	0.502474	0.780978
man	0.395837	0.067404	5.87	0	0.263716	0.527959
min	0.529493	0.104077	5.09	0	0.325489	0.733497
trans	0.694959	0.07818	8.89	0	0.541716	0.848202
whsal	0.329248	0.062219	5.29	0	0.20729	0.451205
perm_contr	0.249951	0.022862	10.93	0	0.20514	0.294763
males	0.362723	0.044135	8.22	0	0.276212	0.449233
L_union	(dropped)					
rgwk20_49	0.294589	0.028266	10.42	0	0.239184	0.349994
rgwk50etc	0.438231	0.028395	15.43	0	0.382573	0.493888

[28] The if condtion is changed from 'if lb_part==1', to 'if sekita ==1,2 and 3', when estimating for the public, private and self-employed sectors, respectively.

whites	0.803873	0.088564	9.08	0	0.630277	0.977469
ncape	-0.72259	0.05948	-12.15	0	-0.83918	-0.606
ecape	0.1661	0.066557	2.5	0.013	0.035641	0.296559
fstate	-0.09477	0.064751	-1.46	0.143	-0.22169	0.032149
kzn	0.134072	0.070863	1.89	0.059	-0.00483	0.272973
nwest	0.422864	0.097305	4.35	0	0.232133	0.613595
gaut	1.195499	0.059167	20.21	0	1.079524	1.311473
mpuma	0.211016	0.056052	3.76	0	0.101148	0.320885
limpo	0.444043	0.085521	5.19	0	0.276411	0.611676
legis	1.280925	0.084499	15.16	0	1.115297	1.446554
profl	0.56624	0.060425	9.37	0	0.4478	0.684681
techn	0.657432	0.084151	7.81	0	0.492484	0.822379
clerks	0.526111	0.077139	6.82	0	0.374908	0.677313
svcs	0.14702	0.073349	2	0.045	0.003247	0.290793
sklag	0.582454	0.124233	4.69	0	0.33894	0.825967
craft	0.112926	0.075764	1.49	0.136	-0.03558	0.261433
pmoper	0.201675	0.077424	2.6	0.009	0.049914	0.353436
elemt	-0.12604	0.064666	-1.95	0.051	-0.25279	0.000714
policy_reg	(dropped)					
_cons	9.894487	0.415834	23.79	0	9.079399	10.70957

Ward test that the schooling credentials for the joint sample are insignificant

test primary&sec = ntcs = cdipn12 = cdipw12 = ddplus = hons = m_etc

(1) primary&sec - ntcs = 0
(2) primary&sec - cdipn12 = 0
(3) primary&sec - cdipw12 = 0
(4) primary&sec - ddplus = 0
(5) primary&sec - hons = 0
(6) primary&sec - m_etc = 0

F(6, 14442) = 11.35
Prob > F = 0.0000

Self empl estimation

Linear regression Number of obs = 2866
F(42, 2822) = .
Prob > F = .
R-squared = 0.4489
Root MSE = 1.2489

Not Altonji and Pierret (1996)

	Self_empl	Robust				
lrwkly_wagew	Coef.	Std. Err.	t	P>t	[95%	Interval]

					Conf.	
mills	-1.150094	0.489913	-2.35	0.019	-2.11072	-0.18947
primary&sec	0.3913309	0.075557	5.18	0	0.243179	0.539483
ntcs	0.9290257	0.245511	3.78	0	0.447627	1.410425
cdipn12	0.2382167	0.304321	0.78	0.434	-0.3585	0.834932
cdipw12	0.8666918	0.165051	5.25	0	0.543059	1.190324
ddplus	0.934765	0.205642	4.55	0	0.531541	1.337989
hons	0.8297215	0.425158	1.95	0.051	-0.00393	1.663374
m_etc	0.8020272	0.361625	2.22	0.027	0.092951	1.511103
age	-0.015014	0.027239	-0.55	0.582	-0.06843	0.038397
age_sqrd	-6.99E-05	0.000233	-0.3	0.764	-0.00053	0.000387
absenteeism	-0.014807	0.005284	-2.8	0.005	-0.02517	-0.00445
tenure	-0.017498	0.010431	-1.68	0.094	-0.03795	0.002956
ten_sqrd	0.0002684	0.000144	1.87	0.062	-1.3E-05	0.00055
agri	0.4863135	0.309139	1.57	0.116	-0.11985	1.092474
comm_svc	0.7411735	0.293636	2.52	0.012	0.16541	1.316937
cons	0.9113858	0.283056	3.22	0.001	0.356368	1.466404
fin	1.08822	0.292908	3.72	0	0.513884	1.662556
man	0.6107414	0.283843	2.15	0.032	0.054181	1.167302
min	0.6050233	0.339016	1.78	0.074	-0.05972	1.269768
trans	1.160051	0.29573	3.92	0	0.580183	1.73992
whsal	0.9505247	0.268747	3.54	0	0.423564	1.477485
perm_contr	0.0562541	0.390698	0.14	0.886	-0.70983	0.822336
males	0.310001	0.105618	2.94	0.003	0.102906	0.517097
L_union	(dropped)					
rgwk20_49	0.5290853	0.221321	2.39	0.017	0.095119	0.963052
rgwk50etc	0.5453371	0.243267	2.24	0.025	0.068337	1.022337
whites	0.7314481	0.194232	3.77	0	0.350597	1.112299
ncape	-0.700979	0.189405	-3.7	0	-1.07237	-0.32959
ecape	-0.040234	0.179617	-0.22	0.823	-0.39243	0.311959
fstate	-0.230408	0.173488	-1.33	0.184	-0.57058	0.109769
kzn	-0.10397	0.182816	-0.57	0.57	-0.46244	0.254497
nwest	0.2935318	0.234791	1.25	0.211	-0.16685	0.753912
gaut	1.168621	0.160836	7.27	0	0.853253	1.483988
mpuma	-0.161024	0.156826	-1.03	0.305	-0.46853	0.146481
limpo	0.3371572	0.209333	1.61	0.107	-0.0733	0.747619
legis	-0.540863	0.336491	-1.61	0.108	-1.20066	0.11893
profl	-0.304707	0.225626	-1.35	0.177	-0.74712	0.137703
techn	-1.10979	0.354304	-3.13	0.002	-1.80451	-0.41507
clerks	-1.070561	0.3924	-2.73	0.006	-1.83998	-0.30114
svcs	-1.525888	0.326647	-4.67	0	-2.16638	-0.8854
sklag	-0.637771	0.400754	-1.59	0.112	-1.42357	0.14803
craft	-1.478492	0.330312	-4.48	0	-2.12617	-0.83081
pmoper	-1.320303	0.360908	-3.66	0	-2.02797	-0.61263
elemt	-1.925192	0.318197	-6.05	0	-2.54911	-1.30127
policy_reg	(dropped)					
_cons	12.30307	1.036189	11.87	0	10.2713	14.33483

. estat ovtest

Ramsey RESET test using powers of the fitted values of lrwkly_wagew
Ho: model has no omitted variables
F(3, 2819) = 3.66
Prob > F = 0.0119

. test primary&sec = ntcs = cdipn12 = cdipw12 = ddplus = hons = m_etc

(1) primary&sec - ntcs = 0
(2) primary&sec - cdipn12 = 0
(3) primary&sec - cdipw12 = 0
(4) primary&sec - ddplus = 0
(5) primary&sec - hons = 0
(6) primary&sec - m_etc = 0

F(6, 2822) = 2.63
Prob > F = 0.0151

Self empl estimation: Altonji and Pierret (1996)

Linear regression Number of obs = 2866
F(44, 2820) = .
Prob > F = .
R-squared = 0.4489
Root MSE = 1.2492

Self_empl		Robust				
lrwkly_wagew	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
mills	-1.14939	0.490095	-2.35	0.019	-2.11037	-0.1884
primary&sec	0.387601	0.076351	5.08	0	0.237891	0.537311
ntcs	0.924656	0.245936	3.76	0	0.442424	1.406889
cdipn12	0.234717	0.304727	0.77	0.441	-0.36279	0.832226
cdipw12	0.863932	0.165397	5.22	0	0.539622	1.188243
ddplus	0.932187	0.206054	4.52	0	0.528156	1.336218
hons	0.827525	0.425683	1.94	0.052	-0.00716	1.662208
m_etc	0.799324	0.361754	2.21	0.027	0.089995	1.508653
age	-0.01497	0.02725	-0.55	0.583	-0.0684	0.03846
age_sqrd	-7E-05	0.000233	-0.3	0.763	-0.00053	0.000387
absenteeism	-0.01514	0.005333	-2.84	0.005	-0.0256	-0.00468
abs_ten	0.000712	0.000536	1.33	0.184	-0.00034	0.001762
sch_ten	0.00255	0.006634	0.38	0.701	-0.01046	0.015557
tenure	-0.01804	0.01073	-1.68	0.093	-0.03908	0.003004
ten_sqrd	0.000251	0.000145	1.73	0.084	-3.4E-05	0.000535
agri	0.494222	0.310571	1.59	0.112	-0.11475	1.103191

comm_svc	0.750605	0.294876	2.55	0.011	0.17241	1.3288
cons	0.919526	0.28433	3.23	0.001	0.362011	1.477041
fin	1.098934	0.294437	3.73	0	0.521601	1.676267
man	0.617539	0.285005	2.17	0.03	0.058699	1.176379
min	0.603957	0.340115	1.78	0.076	-0.06294	1.270857
trans	1.169232	0.297063	3.94	0	0.58675	1.751715
whsal	0.959663	0.270165	3.55	0	0.429922	1.489404
perm_contr	0.055509	0.392026	0.14	0.887	-0.71318	0.824195
males	0.310236	0.105661	2.94	0.003	0.103056	0.517416
L_union	(dropped)					
rgwk20_49	0.528525	0.221659	2.38	0.017	0.093895	0.963155
rgwk50etc	0.545255	0.245376	2.22	0.026	0.06412	1.02639
whites	0.731764	0.194305	3.77	0	0.35077	1.112758
ncape	-0.70146	0.189499	-3.7	0	-1.07303	-0.32989
ecape	-0.0409	0.179733	-0.23	0.82	-0.39332	0.311518
fstate	-0.23096	0.173561	-1.33	0.183	-0.57128	0.109355
kzn	-0.1042	0.182901	-0.57	0.569	-0.46283	0.254435
nwest	0.292954	0.234882	1.25	0.212	-0.1676	0.753512
gaut	1.167491	0.160906	7.26	0	0.851986	1.482995
mpuma	-0.16211	0.156871	-1.03	0.302	-0.4697	0.145489
limpo	0.336543	0.209412	1.61	0.108	-0.07407	0.747158
legis	-0.56532	0.333446	-1.7	0.09	-1.21914	0.088503
profl	-0.31843	0.221789	-1.44	0.151	-0.75331	0.116459
techn	-1.13514	0.351825	-3.23	0.001	-1.825	-0.44528
clerks	-1.10189	0.395022	-2.79	0.005	-1.87645	-0.32733
svcs	-1.55027	0.32424	-4.78	0	-2.18604	-0.9145
sklag	-0.66079	0.398272	-1.66	0.097	-1.44172	0.120147
craft	-1.50079	0.328125	-4.57	0	-2.14418	-0.8574
pmoper	-1.3468	0.360408	-3.74	0	-2.05348	-0.64011
elemt	-1.9498	0.315585	-6.18	0	-2.5686	-1.331
policy_reg	(dropped)					
_cons	12.32046	1.036793	11.88	0	10.28751	14.35341

Ward test that the schooling credentials for the self-employed are insignificant

test primary&sec = ntcs = cdipn12 = cdipw12 = ddplus = hons = m_etc

(1) primary&sec - ntcs = 0
(2) primary&sec - cdipn12 = 0
(3) primary&sec - cdipw12 = 0
(4) primary&sec - ddplus = 0
(5) primary&sec - hons = 0
(6) primary&sec - m_etc = 0

F(6, 2820) = 2.63
Prob > F = 0.0151

Govt estimation

Linear regression Number of obs = 898
F(43, 854) = 27.86
Prob > F = 0.0000
R-squared = 0.5274
Root MSE = 1.1239

lrwkly_wagew	**Govt** Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
mills	0.057862	0.677468	0.09	0.932	-1.27184	1.387559
primary&sec	0.310897	0.195691	1.59	0.112	-0.07319	0.694989
ntcs	0.1985	0.348952	0.57	0.57	-0.4864	0.883405
cdipn12	0.783008	0.358919	2.18	0.029	0.078541	1.487475
cdipw12	0.962631	0.27006	3.56	0	0.432572	1.49269
ddplus	1.240086	0.349962	3.54	0	0.5532	1.926973
hons	1.573088	0.431536	3.65	0	0.726092	2.420084
m_etc	1.570925	0.463446	3.39	0.001	0.661298	2.480551
age	-0.02358	0.041788	-0.56	0.573	-0.1056	0.058441
age_sqrd	0.000226	0.000396	0.57	0.569	-0.00055	0.001004
absenteeism	0.014899	0.010005	1.49	0.137	-0.00474	0.034537
tenure	0.008034	0.004465	1.8	0.072	-0.00073	0.016797
ten_sqrd	-2.9E-05	3.85E-05	-0.76	0.446	-0.0001	4.62E-05
agri	-0.82886	0.378069	-2.19	0.029	-1.57091	-0.0868
comm_svc	-0.51758	0.223613	-2.31	0.021	-0.95647	-0.07868
cons	-0.9113	0.285255	-3.19	0.001	-1.47119	-0.35142
fin	-0.13059	0.32817	-0.4	0.691	-0.7747	0.513525
man	-0.54839	0.365326	-1.5	0.134	-1.26544	0.168648
min	-2.20367	0.350418	-6.29	0	-2.89145	-1.51588
trans	-0.10512	0.279176	-0.38	0.707	-0.65307	0.442829
whsal	-0.37102	0.327476	-1.13	0.258	-1.01377	0.271736
perm_contr	0.620784	0.089148	6.96	0	0.44581	0.795757
males	0.378899	0.149694	2.53	0.012	0.085087	0.672711
L_union	(dropped)					
rgwk20_49	0.150925	0.10444	1.45	0.149	-0.05406	0.355914
rgwk50etc	0.460519	0.093156	4.94	0	0.277677	0.643361
whites	0.595041	0.263217	2.26	0.024	0.078412	1.111669
ncape	-0.31438	0.207749	-1.51	0.131	-0.72214	0.093377
ecape	0.664816	0.232653	2.86	0.004	0.208178	1.121454
fstate	0.486782	0.231294	2.1	0.036	0.032811	0.940752
kzn	0.44523	0.243992	1.82	0.068	-0.03366	0.924124
nwest	0.809757	0.330325	2.45	0.014	0.161412	1.458101
gaut	1.335892	0.215039	6.21	0	0.913825	1.75796
mpuma	0.559286	0.238552	2.34	0.019	0.091068	1.027503
limpo	0.759996	0.287527	2.64	0.008	0.195654	1.324337
legis	2.422301	0.573543	4.22	0	1.296583	3.54802
profl	0.956546	0.284172	3.37	0.001	0.398789	1.514302
techn	1.873373	0.548239	3.42	0.001	0.797318	2.949427

clerks	1.609067	0.547634	2.94	0.003	0.534201	2.683933
svcs	1.341013	0.549075	2.44	0.015	0.263319	2.418707
sklag	0.786458	0.979597	0.8	0.422	-1.13624	2.709158
craft	1.395014	0.556813	2.51	0.012	0.302133	2.487896
pmoper	1.653298	0.568027	2.91	0.004	0.538405	2.768191
elemt	1.064523	0.539401	1.97	0.049	0.005816	2.12323
policy_reg	(dropped)					
_cons	9.005785	1.497551	6.01	0	6.066474	11.9451

estat ovtest

Ramsey RESET test using powers of the fitted values of lrwkly_wagew
Ho: model has no omitted variables
F(3, 851) = 2.04
Prob > F = 0.**10**64

. test primary&sec = ntcs = cdipn12 = cdipw12 = ddplus = hons = m_etc

(1) primary&sec - ntcs = 0
(2) primary&sec - cdipn12 = 0
(3) primary&sec - cdipw12 = 0
(4) primary&sec - ddplus = 0
(5) primary&sec - hons = 0
(6) primary&sec - m_etc = 0

F(6, 854) = 2.67
Prob > F = 0.

Govt estimation: Altonji and Pierret (1996)

Linear regression Number of obs = 898
F(45, 852) = 26.56
Prob > F = 0.0000
R-squared = 0.5290
Root MSE = 1.1233

Govt lrwkly_wagew	Coef.	Robust Std. Err.	t	P>t	[95% Conf.	Interval]
mills	0.184931	0.696123	0.27	0.791	-1.18139	1.551247
primary&sec	0.321867	0.199304	1.61	0.107	-0.06932	0.713052
ntcs	0.225692	0.359369	0.63	0.53	-0.47966	0.931043
cdipn12	0.816421	0.37613	2.17	0.03	0.078171	1.554671
cdipw12	1.047603	0.305727	3.43	0.001	0.447536	1.64767
ddplus	1.330444	0.40312	3.3	0.001	0.539219	2.12167

hons	1.714039	0.489563	3.5	0	0.753149	2.67493
m_etc	1.699905	0.539933	3.15	0.002	0.64015	2.759661
age	-0.01683	0.04251	-0.4	0.692	-0.10027	0.066606
age_sqrd	0.000169	0.000402	0.42	0.675	-0.00062	0.000957
absenteeism	-0.01116	0.01927	-0.58	0.563	-0.04898	0.026663
abs_ten	0.000566	0.000344	1.65	0.1	-0.00011	0.001241
sch_ten	-0.00023	0.000625	-0.37	0.709	-0.00146	0.000994
tenure	0.008912	0.004501	1.98	0.048	7.89E-05	0.017746
ten_sqrd	-3E-05	3.75E-05	-0.79	0.431	-0.0001	4.41E-05
agri	-0.84202	0.378678	-2.22	0.026	-1.58527	-0.09877
comm_svc	-0.53229	0.218979	-2.43	0.015	-0.9621	-0.10249
cons	-0.9179	0.281915	-3.26	0.001	-1.47123	-0.36457
fin	-0.15408	0.323962	-0.48	0.634	-0.78994	0.481776
man	-0.56473	0.361232	-1.56	0.118	-1.27374	0.144281
min	-2.22352	0.349484	-6.36	0	-2.90947	-1.53757
trans	-0.12016	0.275503	-0.44	0.663	-0.66091	0.42058
whsal	-0.37853	0.325793	-1.16	0.246	-1.01798	0.260926
perm_contr	0.624691	0.089597	6.97	0	0.448834	0.800548
males	0.412888	0.151769	2.72	0.007	0.115003	0.710773
L_union	(dropped)					
rgwk20_49	0.144146	0.104413	1.38	0.168	-0.06079	0.349082
rgwk50etc	0.461138	0.093254	4.94	0	0.278103	0.644173
whites	0.636719	0.272034	2.34	0.019	0.102784	1.170655
ncape	-0.33687	0.209741	-1.61	0.109	-0.74854	0.074801
ecape	0.63969	0.23657	2.7	0.007	0.175362	1.104018
fstate	0.453651	0.231798	1.96	0.051	-0.00131	0.908614
kzn	0.408007	0.247174	1.65	0.099	-0.07714	0.893149
nwest	0.756303	0.338011	2.24	0.026	0.092871	1.419734
gaut	1.317135	0.217757	6.05	0	0.889733	1.744538
mpuma	0.526495	0.24199	2.18	0.03	0.051528	1.001462
limpo	0.716427	0.292313	2.45	0.014	0.142689	1.290166
legis	2.425306	0.566955	4.28	0	1.312513	3.538099
profl	0.966762	0.280553	3.45	0.001	0.416106	1.517418
techn	1.893878	0.53995	3.51	0	0.83409	2.953666
clerks	1.623697	0.540316	3.01	0.003	0.563191	2.684204
svcs	1.359753	0.541051	2.51	0.012	0.297805	2.421701
sklag	0.82113	0.978956	0.84	0.402	-1.10032	2.742578
craft	1.398046	0.550849	2.54	0.011	0.316866	2.479226
pmoper	1.692848	0.560981	3.02	0.003	0.591782	2.793914
elemt	1.088567	0.531554	2.05	0.041	0.045259	2.131876
policy_reg	(dropped)					
_cons	8.70036	1.53321	5.67	0	5.691049	11.70967

Ward test that the schooling credentials for the public sector are insignificant

test primary&sec = ntcs = cdipn12 = cdipw12 = ddplus = hons = m_etc

(1) primary&sec - ntcs = 0
(2) primary&sec - cdipn12 = 0
(3) primary&sec - cdipw12 = 0

(4) primary&sec - ddplus = 0
(5) primary&sec - hons = 0
(6) primary&sec - m_etc = 0

F(6,   852) =   2.36
Prob > F =   0.0286

Private sector estimation

Linear regression Number of obs = 10399
F(43, 10355) = 248.74
Prob > F = 0.0000
R-squared = 0.4931
Root MSE = 1.0851

	Private	Robust				
lrwkly_wagew	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
mills	-0.54997	0.238821	-2.3	0.021	-1.0181	-0.08183
primary&sec	0.275049	0.039872	6.9	0	0.196893	0.353205
ntcs	0.809221	0.153374	5.28	0	0.508578	1.109863
cdipn12	0.625539	0.15824	3.95	0	0.315358	0.93572
cdipw12	0.558765	0.09219	6.06	0	0.378054	0.739476
ddplus	0.748459	0.135861	5.51	0	0.482146	1.014773
hons	0.609557	0.186837	3.26	0.001	0.243321	0.975793
m_etc	1.378052	0.262261	5.25	0	0.863971	1.892134
age	-0.01134	0.014129	-0.8	0.422	-0.03904	0.016351
age_sqrd	-3.4E-05	0.000129	-0.27	0.79	-0.00029	0.000219
absenteeism	0.001156	0.002815	0.41	0.681	-0.00436	0.006673
tenure	0.001645	0.000953	1.73	0.084	-0.00022	0.003514
ten_sqrd	1.76E-06	7.96E-06	0.22	0.825	-1.4E-05	1.74E-05
agri	-0.19748	0.062774	-3.15	0.002	-0.32053	-0.07443
comm_svc	0.542487	0.081747	6.64	0	0.382247	0.702727
cons	0.515211	0.073792	6.98	0	0.370565	0.659857
fin	0.760808	0.076335	9.97	0	0.611177	0.910439
man	0.593536	0.071122	8.35	0	0.454124	0.732948
min	0.703058	0.106978	6.57	0	0.493362	0.912755
trans	0.804138	0.086757	9.27	0	0.634078	0.974197
whsal	0.389164	0.068628	5.67	0	0.254639	0.523689
perm_contr	0.24444	0.024369	10.03	0	0.196673	0.292208
males	0.281029	0.052575	5.35	0	0.177972	0.384086
L_union	(dropped)					
rgwk20_49	0.292479	0.030232	9.67	0	0.233218	0.35174
rgwk50etc	0.378445	0.031076	12.18	0	0.317531	0.43936
whites	0.668381	0.111863	5.98	0	0.449108	0.887653
ncape	-0.74213	0.068093	-10.9	0	-0.8756	-0.60865
ecape	0.183754	0.078099	2.35	0.019	0.030665	0.336842

fstate	-0.13581	0.074828	-1.81	0.07	-0.28249	0.01087
kzn	0.158261	0.083798	1.89	0.059	-0.006	0.322521
nwest	0.479629	0.114593	4.19	0	0.255005	0.704253
gaut	1.165945	0.068576	17	0	1.031522	1.300367
mpuma	0.277837	0.0642	4.33	0	0.151992	0.403681
limpo	0.476135	0.101814	4.68	0	0.276561	0.67571
legis	1.243724	0.099708	12.47	0	1.048278	1.439171
profl	0.656679	0.071951	9.13	0	0.51564	0.797717
techn	0.638554	0.096506	6.62	0	0.449383	0.827725
clerks	0.481516	0.082269	5.85	0	0.320253	0.64278
svcs	0.087453	0.079951	1.09	0.274	-0.06927	0.244173
sklag	0.245813	0.12943	1.9	0.058	-0.00789	0.499519
craft	0.038622	0.080876	0.48	0.633	-0.11991	0.197155
pmoper	0.119989	0.081119	1.48	0.139	-0.03902	0.278999
elemt	-0.1425	0.066748	-2.13	0.033	-0.27334	-0.01166
policy_reg	(dropped)					
_cons	10.33467	0.497197	20.79	0	9.36007	11.30927

. estat ovtest

Ramsey RESET test using powers of the fitted values of lrwkly_wagew
Ho: model has no omitted variables
F(3, 10352) = 3.82
Prob > F = 0.0095

. test primary&sec = ntcs = cdipn12 = cdipw12 = ddplus = hons = m_etc

(1) primary&sec - ntcs = 0
(2) primary&sec - cdipn12 = 0
(3) primary&sec - cdipw12 = 0
(4) primary&sec - ddplus = 0
(5) primary&sec - hons = 0
(6) primary&sec - m_etc = 0

F(6, 10355) = 6.48
Prob > F = 0.0000

Private sector estimation: Altonji and Pierret (1996)

Linear regression Number of obs = 10399
F(45, 10353) = 237.68
Prob > F = 0.0000
R-squared = 0.4932
Root MSE = 1.0851

Private Robust

lrwkly_wagew	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
mills	-0.54948	0.239201	-2.3	0.022	-1.01836	-0.0806
primary&sec	0.277183	0.041642	6.66	0	0.195558	0.358809
ntcs	0.811807	0.155592	5.22	0	0.506817	1.116797
cdipn12	0.628216	0.161631	3.89	0	0.311387	0.945045
cdipw12	0.565767	0.10832	5.22	0	0.353439	0.778095
ddplus	0.75916	0.152043	4.99	0	0.461125	1.057194
hons	0.623089	0.206382	3.02	0.003	0.218541	1.027637
m_etc	1.386777	0.276777	5.01	0	0.84424	1.929314
age	-0.01126	0.014157	-0.8	0.426	-0.03901	0.01649
age_sqrd	-3.5E-05	0.00013	-0.27	0.786	-0.00029	0.000219
absenteeism	-0.00285	0.004037	-0.71	0.479	-0.01077	0.005058
abs_ten	0.000114	7.62E-05	1.5	0.134	-3.5E-05	0.000264
sch_ten	-5.4E-05	0.000331	-0.16	0.87	-0.0007	0.000594
tenure	0.001808	0.001018	1.78	0.076	-0.00019	0.003803
ten_sqrd	1.54E-06	7.96E-06	0.19	0.847	-1.4E-05	1.71E-05
agri	-0.19628	0.062761	-3.13	0.002	-0.31931	-0.07326
comm_svc	0.542861	0.081731	6.64	0	0.382653	0.703069
cons	0.515365	0.073779	6.99	0	0.370744	0.659987
fin	0.761416	0.076341	9.97	0	0.611773	0.911058
man	0.593962	0.071113	8.35	0	0.454567	0.733357
min	0.707242	0.106899	6.62	0	0.497699	0.916785
trans	0.805993	0.086732	9.29	0	0.635981	0.976004
whsal	0.3901	0.068607	5.69	0	0.255616	0.524583
perm_contr	0.244504	0.024389	10.03	0	0.196697	0.29231
males	0.282255	0.052623	5.36	0	0.179105	0.385406
L_union	(dropped)					
rgwk20_49	0.292065	0.030224	9.66	0	0.23282	0.35131
rgwk50etc	0.378041	0.031096	12.16	0	0.317087	0.438995
whites	0.668529	0.112058	5.97	0	0.448873	0.888185
ncape	-0.74241	0.068143	-10.89	0	-0.87598	-0.60884
ecape	0.182874	0.078184	2.34	0.019	0.029618	0.336129
fstate	-0.13604	0.074857	-1.82	0.069	-0.28278	0.01069
kzn	0.157652	0.083902	1.88	0.06	-0.00681	0.322116
nwest	0.479401	0.114719	4.18	0	0.25453	0.704273
gaut	1.165731	0.068646	16.98	0	1.031172	1.30029
mpuma	0.277024	0.064223	4.31	0	0.151134	0.402914
limpo	0.476321	0.101886	4.68	0	0.276605	0.676038
legis	1.242733	0.09973	12.46	0	1.047244	1.438223
profl	0.656017	0.071865	9.13	0	0.515148	0.796886
techn	0.638669	0.096504	6.62	0	0.449502	0.827836
clerks	0.482087	0.08227	5.86	0	0.320823	0.643352
svcs	0.086634	0.079935	1.08	0.278	-0.07005	0.243321
sklag	0.245869	0.129437	1.9	0.058	-0.00785	0.499591
craft	0.037917	0.080865	0.47	0.639	-0.12059	0.196429
pmoper	0.11891	0.081114	1.47	0.143	-0.04009	0.277909
elemt	-0.14336	0.066733	-2.15	0.032	-0.27417	-0.01255
policy_reg	(dropped)					

_cons	10.32676	0.499297	20.68	0	9.348046	11.30548

Ward test that the schooling credentials for the private sector are insignificant

test primary&sec = ntcs = cdipn12 = cdipw12 = ddplus = hons = m_etc

(1) primary&sec - ntcs = 0
(2) primary&sec - cdipn12 = 0
(3) primary&sec - cdipw12 = 0
(4) primary&sec - ddplus = 0
(5) primary&sec - hons = 0
(6) primary&sec - m_etc = 0

F(6, 10353) = 5.54
Prob > F = 0.0000

Table D-7 The Ramsey RESET tests (for no omitted variable)

Test	**Private sector**		**Public Sector**		**Self employment**	
Estat ovtest	*Ho: Model has no omitted variables*					
	F(3, 10350)	Prob>F	F(3, 849)	Prob>F	F(3, 2817)	Prob>F
	3.88	0.0000	2.16	0.0917	3.68	0.0117
	Joint sample					
Estat ovtest	*Ho: Model has no omitted variables*					
	F(3, 14439)	Prob>F				
	14.67	0.0000				

Table A?. Test for normality and heteroskedasticity

	Private sector		**Public Sector**		**Self employment**	
	Wolpin estimations					
	(JB)/F-stat	Probability				
Normality	(JB)584.65	0.0000	448.3939	0.0000	94.5726	0.0000
Heteroskedasticity*	F-stat17.1	0.0000	5.401396	0.0000	1.06662	0.3770
	Altonji and Pierret (1996) & Pierret estimations					
Normality	585.4413	0.0000	457.1185	0.0000	94.91008	0.0000
Heteroskedasticity**	2.900131	0.0000	1.623127	0.0000	0.727437	0.9932

**White test, with no cross terms*

***White test with cross trems*