

Employment dynamics and earnings mobility during an economic recession

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Abstract

This paper examines the extent and nature of employment dynamics and earnings mobility during South Africa's most recent recession. Using matched individual-level panel data from the 2008 and 2010/2011 waves of the National Income Dynamics Study, the paper shows that there was considerable churning in the labour market during this time. In line with the decline in aggregate employment over this period, the paper shows that only two-thirds of individuals maintained employment across both waves, with workers who were initially at the bottom of the earnings distribution being the most likely to exit employment. Workers who were geographically mobile were more likely to be employed in both waves, while workers employed in private households, agriculture and construction in 2008 were the most likely to leave employment during the recession.

Individuals who retained employment, either in the same job or by moving to another job, were substantially more likely to experience upward than downward real earnings mobility. The paper thus goes on to examine the correlates of earnings mobility in a multivariate context, by estimating the predictors of transitions out of, or persistence in, various real earnings categories, conditional on the level of earnings in 2008. Regression analysis shows that highly educated workers living in urban areas were the most likely to get ahead, and stay ahead. In contrast, part-time workers and those employed in agriculture, manufacturing or construction were the most vulnerable to persistently low, or falling, earnings. Finally, the paper attempts to identify instruments for the endogenous selection into the initial earnings category.

JEL codes: J31, C23, J62

Keywords: earnings; mobility; dynamics; transitions

1. Introduction

This study examines the extent and nature of employment dynamics and earnings mobility from 2008 to 2010, during South Africa's most recent recession. Access to, and position in, the labour market is a key factor that contributes to the well-being of individuals and households, and therefore it is crucial to understand the dynamics of labour markets.

A worker's long-term welfare is affected by their ability to gain and maintain employment, their position in the earnings distribution at a point in time, and also by whether they move upwards or downwards in the distribution over time. Therefore an assessment of employment dynamics and earnings mobility provides a means of evaluating the ability of the labour market to provide long-term economic security. This study particularly aims to evaluate the performance of the South African labour market during an economic downturn, using a relatively new data source, the National Income Dynamics Study.

The remainder of the paper is structured as follows. The next section reviews the economic context in South Africa, with respect to employment and earnings, during the period of the study. Section 3 describes the data that are used in the study, and considers the degree of panel attrition. In section 4, transitions out of employment are presented, disaggregated by the worker's initial level of earnings and job type. Section 5 presents the findings on earnings mobility amongst the employed, both graphically and using transition matrices. In section 6, transitions amongst earnings categories are estimated in a multivariate context, by considering the probability of becoming, or remaining, low paid. The worker's initial pay state is treated both exogenously and endogenously in the models. Finally, section 7 summarises the key findings and concludes.

2. Context and review

Most empirical studies of earnings mobility have been conducted on developed countries, due to the reliance of such studies on the availability of panel data. Despite the differing labour markets and time periods studied, some common themes emerge. In the US, it has been shown that there is lower mobility amongst older and less educated workers, while the probability of earnings persistence has increased over time, especially in the lower quintiles (Gottschalk, 1982 and 1997; Buchinsky and Hunt, 1999). In a number of European countries, which have lower earnings inequality and more regulated labour markets than the US, there is nonetheless a similarly high degree of immobility amongst low-wage workers. Studies conducted using annual data for Britain from the 1990s, within a context of rising earnings inequality, find a high degree of immobility, and that there is a cycle of low wages and unemployment. Workers are fairly immobile both within earnings deciles and within states of non-employment, with women slightly more mobile than men (Dickens, 2000). Movements between employment states are important, as excluding individuals who exit employment from the analysis results in an under-estimation of the degree of low-pay persistence. Having more education, or belonging to a union, increases the likelihood that a worker will move up the earnings distribution (Stewart and Swaffield, 2000). Similarly, in Italy, roughly 50 percent of low-paid workers persist in this category across the two-year panel, while there is also evidence of a low-pay/no-pay cycle and of a positive effect of education on mobility (Cappellari, 2000). In a study at the aggregate level for three Latin American countries, individuals in lower earnings quintiles experience greater mobility than do individuals who start higher up the earnings distribution (Fields *et al*, 2007).

Empirical evidence on wage mobility in South Africa is limited. Cichello *et al* (2001; 2005) analyse earnings dynamics amongst Africans in KwaZulu-Natal between 1993 and 1998, using the KwaZulu-Natal Income Dynamics Study (KIDS) data, and find that African workers experienced large and progressive wage gains. Transitions between the informal and formal sector are strongly associated with upward mobility, but education levels and demographic characteristics are not found to account for changes in earnings. Using data from the rotating panel of the Labour Force Survey for 2001 to 2004, Vermaak (2011) finds that transitions out of employment for low-wage workers are more likely than transitions into higher earnings categories. For those low-wage workers who remain employed, earnings mobility is much more likely to be upward than downward. However, earnings gains are smaller for women, workers with less education and those employed in the informal sector. This paper therefore aims to add to this small literature, using the first two waves of data collected as part of the National Income Dynamics Study (NIDS).

There are two advantages to using the NIDS data to study employment and earnings dynamics. First, because this is the first national panel in South Africa that tracks the individual, it is possible to assess properly the nature of individuals' employment and earnings over time, as has been done for other countries. Second, the 2008 to 2010/2011 period over which the first two waves of NIDS data were collected corresponds to South Africa's most recent economic recession, which was accompanied by a contraction of employment (Verick, 2012). In contrast, the preceding part of the decade was a period of strong economic growth, during which formal sector employment increased (Hodge, 2009) and earnings improved (Vermaak, 2011). Therefore an assessment of employment and earnings mobility between the first two waves of NIDS provides insight into the extent to which the South African economy shed jobs, the types of jobs that were shed, and the nature and extent of wage growth, during the economic downturn.

3. Data and definitions

The study uses data from the first two waves of the National Income Dynamics Study (NIDS), South Africa's first national household panel study that tracks the individual. The Wave 1 data were collected during 2008, while Wave 2 took place in 2010/2011. The key variables of interest are the individual's employment status and earnings. Individuals are classified as employed if they do any kind of work, either paid or unpaid. The employment categories consist of regular work, self-employment, casual work, subsistence work and unpaid help. In Wave 2 of the NIDS panel, there are some concerns about the labour force classifications of the non-employed (Cichello *et al*, 2012). As a result, when considering transitions out of employment in Wave 2, the non-employed are grouped together rather than separated into unemployed and not economically active.

Amongst the employed, earnings are calculated as the individual's net monthly income from all their sources of employment, in Rands. Data for Wave 1 were collected throughout 2008, while data for Wave 2 were collected between May 2010 and September 2011. Therefore the study converts nominal values into real monthly earnings, at January 2008 prices, using South Africa's monthly CPI value for all items (Statistics South Africa, 2013). For the purposes of comparison and analysis, real monthly earnings are then classified into six categories: those earning below R300 per month, R300 to R799 per month, R800 to R1499 per month, R1500 to R2999 per month, R3000 to R5999 per month, and those earning R6000 per month or more. In Wave 1, each of these six categories contains between 14 and twenty percent of all workers, with the modal category being those earning R800 to R1499 per month.

National panel data have been previously been available in South Africa in the form of the Labour Force Survey panel (2001 to 2004) and the quarterly Labour Force Survey panel (2008 onwards). However, both of these data sources are rotating panels of dwelling places, meaning that no attempt is made to track individuals or households that leave their place of dwelling. If low earning workers are more likely to leave their place of residence in search of work in other locations, either looking for higher wages or because low-wage work is more vulnerable to unemployment, then attrition from a panel that does not track such individuals may be non-random. As a result, rates of transition into and out of low-wage work that are estimated using those individuals who remain in the panel may not be truly representative of all low-wage workers.

In contrast, the NIDS panel attempts to track individuals and households that change their place of residence. Nonetheless, of all of those who were sampled in Wave 1, only 78 percent were successfully re-interviewed in Wave 2. Therefore, there remains a possibility of bias resulting from non-random attrition that is correlated with difference types of work or with earnings. This section therefore considers the nature of sample attrition.

Table 1 presents a transition matrix comparing individuals' labour market states between the two waves, at the level of the sample. Of all individuals aged 18 to 57 in Wave 1 (that is, those who were of working age in both waves), 24.19 percent attrited, while more than 75 percent were successfully re-interviewed in Wave 2. The probability of attrition was highest amongst those who were employed in Wave 1, although the attrition rate was above twenty percent for all initial labour market states.

Table 1. Transition matrix of labour market status between W1 and W2 (percentages)

Wave 1 labour market status	Wave 2 employment status					Total
	NEA	Non-searching	Searching	Employed	Attrited	
NEA	58.88	3.59	6.10	10.53	20.91	100
Non-searching	40.87	7.28	12.21	18.37	21.28	100
Searching	31.62	5.89	16.04	22.91	23.54	100
Employed	20.86	2.90	4.68	43.95	27.61	100
Total	37.54	3.85	7.21	27.21	24.19	100

Source: NIDS 2008 and 2010/11

Notes: The data are unweighted. Sample includes those aged 18 or older in Wave 1.

The NIDS dataset contains panel weights which compute the probability of being re-interviewed in Wave 2, based on the individual's Wave 1 characteristics (Brown *et al*, 2012). These weights can be used to reduce the effects of attrition. However, if workers in a particular category continue to be more likely to attrite after the application of these weights, then non-random attrition that is associated with individual or job characteristics, and which may bias the estimation of employment or earnings transitions, remains a concern. Table 2 presents the probability of attrition, estimated using a probit model, controlling simply for the individual's level of earnings in Wave 1.

Table 2. Probability of attrition between W1 and W2, by monthly earnings in W1

Dependent variable = 1 if attrited in Wave 2; 0 otherwise	Unweighted	Using panel weights
<R300	-0.417*** (0.105)	0.679* (0.400)
R300-R799	-0.274*** (0.095)	-0.398 (0.375)
R800-R1499	-0.188** (0.094)	-0.490 (0.354)
R1500-R2999	-0.036 (0.106)	0.465 (0.436)
R3000-R5999	-0.283** (0.120)	0.092 (0.492)
Intercept	-0.397*** (0.089)	-3.337*** (0.331)
Sample	5 662	
Population		10 479 576

Source: NIDS 2008 and 2010/11

Notes: Sample includes those aged 18 or older who were employed in Wave 1. Significance levels are indicated as *** p<0.01, ** p<0.05, * p<0.1.

In the first column, the estimates are presented at the level of the sample, that is, without using the panel weights. The probability of attrition is significantly lower for all earnings categories below R1500, and for those earning between R3000 and R6000, than it is for those workers earning above R6000 per month. Thus, amongst those employed in Wave 1, attrition from the panel is non-randomly related to earnings, with higher earning workers being more likely to attrite. Once the panel weights are applied to the data, only those earning less than R300 are more likely to attrite than those earning above R6000 per month in Wave 1, although this result is only significant at the ten percent level. Therefore, to a very large degree, the panel weights are successful in lessening the non-random attrition by earnings level.¹ The remainder of this study therefore uses the panel weights provided with the NIDS dataset in order to reduce the effects of attrition.

4. Employment transitions

This section assesses the extent and nature of transitions out of employment between the first two waves of NIDS, in order to provide insight into the extent to which the South African economy shed jobs, and the types of jobs that were shed, during the recession. Table 3 presents transitions between job types and non-employment from Wave 1 to Wave 2, based on the worker's main job (the job that earns the highest income). Almost 75 percent of those who are employed in regular work remain in the same job type across the two waves. In contrast, less than half of those in other job types remain in the same category; instead, they are much more likely to exit employment altogether than to remain in their current job category or move to another category. Therefore it is clear that non-regular work was the most vulnerable to employment losses during the recession.² Almost 80 percent of those who are not employed in Wave 1 persist in this state in Wave 2.

¹ These results are robust to the inclusion of other control variables.

² The figures here include those who gave up their jobs voluntarily.

Table 3. Transition matrix of employment by job type between W1 and W2 (percentages)

Wave 1 job type	Wave 2 job type						Total
	Regular work	Self-employed	Casual work	Subsistence work	Unpaid help	Not employed	
Regular work	74.51 (1.222)	3.138 (.5734)	3.066 (.4907)	.0437 (.0393)	.0815 (.0493)	19.16 (1.058)	100
Self-employed	15.93 (2.308)	30.27 (2.866)	4.013 (1.163)	.1292 (.1293)	.4849 (.2864)	49.17 (3.035)	100
Casual work	30.58 (3.406)	10.06 (2.363)	5.419 (1.421)	.3687 (.3684)	.7583 (.5351)	52.81 (3.631)	100
Subsistence work	6.736 (1.546)	2.339 (.8099)	1.434 (.599)	2.806 (1.119)	0 (0)	86.68 (2.071)	100
Unpaid help	14.36 (5.464)	1.172 (1.184)	1.645 (1.654)	.5355 (.5444)	0 (0)	82.28 (5.952)	100
Not employed	12.6 (.6759)	3.358 (.3981)	3.196 (.3137)	1.21 (.1929)	.6905 (.1964)	78.94 (.8214)	100
Total	32.28 (.7351)	5.295 (.3702)	3.239 (.2488)	.7971 (.1144)	.4667 (.1125)	57.92 (.7587)	100

Source: NIDS 2008 and 2010/11

Notes: Standard errors are in parentheses. The data are weighted. The samples consist of those aged 18 or older in Wave 1.

Table 4 below presents transitions based on the initial wage category of the employed. It is clear that transitions out of employment are common for low-wage workers: workers earning below any of the thresholds are substantially more likely not to be employed in the next period than higher paid workers. In particular, more than 70 percent of workers earning less than R300 per month in Wave 1 were no longer employed in Wave 2. In contrast, workers at the top of the earnings distribution were largely protected from job loss, with only 8.5 percent of those in the top earnings category exiting employment between Waves 1 and 2.³

³ Having longer tenure at a firm offers some protection against exiting employment. Disaggregating Table 4 by length of tenure, workers with tenure of two years or more in Wave 1 are substantially less likely to leave employment than those with less than two years tenure, from all but the top earnings category. (The estimates are available from the author upon request.) However, data on tenure are only available for those employed in regular work.

Table 4. Transition matrix of employment and monthly earnings between W1 and W2 (percentages)

Wave 1 employment and earnings status	Wave 2 employment status		
	Not employed	Employed	Total
Not employed	78.94 (.8214)	21.06 (.8214)	100
<R300	70.64 (2.197)	29.36 (2.197)	100
R300-R799	44.8 (2.482)	55.2 (2.482)	100
R800-R1499	32.26 (2.323)	67.74 (2.323)	100
R1500-R2999	22.65 (2.39)	77.35 (2.39)	100
R3000-R5999	9.059 (1.596)	90.94 (1.596)	100
>=R6000	8.506 (2.128)	91.49 (2.128)	100
Total	58.00 (.7605)	42.00 (.7605)	100

Source: NIDS 2008 and 2010/11

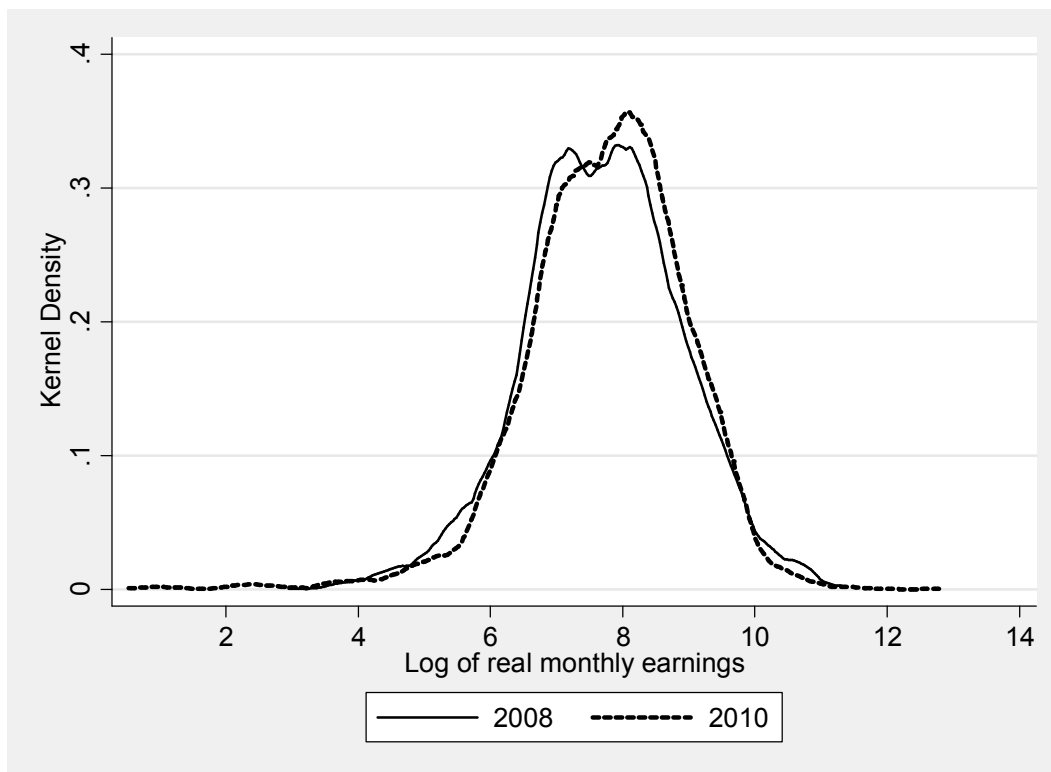
Notes: Standard errors are in parentheses. The data are weighted. The samples consist of those aged 18 or older in Wave 1.

5. Earnings transitions

Having examined transitions into and out of employment, this section analyses earnings mobility amongst those who are employed in both waves. The kernel density plot in Figure 1 shows the distributions of the natural logarithm of real monthly earnings for workers in Waves 1 and 2.⁴ Between logged earnings values of four and ten on the horizontal axis (corresponding to roughly R50 and R22 000 per month), an improvement in earnings is visible by the extent of the rightward shift of the distribution over time. Thus it appears that, on aggregate, most of those who retained employment during the recession experienced gains in earnings. However, a slight contraction of earnings is evident at the top of the distribution.

⁴ Figure A1 in the appendix presents the distributions before adjusting for inflation. Since CPI inflation was fairly moderate over this period, the general pattern is very similar for nominal earnings, although it exhibits a slightly larger change in earnings.

Figure 1. Kernel density plots of the natural logarithm of real monthly earnings, W1 and W2



Source: NIDS 2008 and 2010/11

Notes: The data are weighted. The samples consist of those aged 18 or older in Wave 1 who are employed in both waves. Earnings values are in January 2008 prices.

In Table 5, estimates of transition probabilities are displayed for each of the earnings categories described in Section 3. There is a large degree of persistence in earnings at or above R6000 per month, but a large amount of mobility from all of the earnings categories below this level. The degree of earnings persistence increases consistently as the level of earnings increases, from 21 percent in the lowest earnings category to 70 percent in the top category. Consistent with the evidence of a rightward shift of the earnings distribution over time, there is substantially more evidence of upward earnings mobility than downward mobility. For example, workers in the two bottom earnings categories are more likely to experience transitions into the earnings categories above than they are to remain in their current earnings category. The transition matrix thus confirms the evidence of Figure 1, that many of those who retained employment during the recession experienced real gains in earnings. However, the proportions of workers that experienced downward wage mobility are not insubstantial: more than ten percent of workers in each earnings category of R800 per month or more in Wave 1 moved into a lower category in Wave 2.

Table 5. Transition matrix of real monthly earnings category between W1 and W2 (percentages)

Wave 1 earnings	Wave 2 earnings						Total
	<R300	R300-R799	R800-R1499	R1500-R2999	R3000-R5999	>=R6000	
<R300	21.04 (3.32)	28.83 (4.011)	27.79 (4.597)	13.76 (2.64)	5.738 (2.02)	2.844 (1.381)	100
R300-R799	8.013 (1.589)	30.81 (2.891)	37.25 (3.173)	17.68 (2.717)	5.387 (1.54)	.8575 (.4382)	100
R800-R1499	4.403 (1.098)	13.45 (1.972)	37.11 (3.004)	32.37 (3.105)	9.726 (2.094)	2.94 (1.219)	100
R1500-R2999	1.552 (.9745)	5.66 (1.477)	10.93 (1.919)	42.49 (3.281)	31.26 (3.225)	8.113 (1.757)	100
R3000-R5999	.9316 (.48)	2.446 (.8346)	6.609 (1.828)	14.84 (2.301)	51.79 (3.493)	23.38 (2.745)	100
>=R6000	1.32 (.7142)	0 (0)	1.705 (.8753)	6.419 (2.005)	20.32 (3.068)	70.24 (3.543)	100
Total	4.285 (.4863)	10.46 (.7634)	18.15 (1.07)	22.93 (1.248)	23.63 (1.355)	20.55 (1.311)	100

Source: NIDS 2008 and 2010/11

Notes: Standard errors are in parentheses. The data are weighted. The samples consist of those aged 18 or older in Wave 1 who are employed in both waves.

Disaggregating Table 5 by job type in Wave 1 suggests that there are notable differences in wage mobility amongst different categories of workers. Self-employed workers exhibit more volatile earnings than regular workers, but are also more likely to experience upward mobility at the top end of the distribution. In contrast, casual workers experience a large degree of persistence in the lower earnings categories, and downward mobility from the upper earnings categories. Amongst regular workers, there is more upward earnings mobility amongst those who remained in the same job in both waves than amongst those who changed jobs.⁵ Although the sample size of those who were employed in regular work in both waves but changed their job is small (225 individuals), this suggests that for most individuals over this period, job mobility was not a route to higher earnings.

6. Multivariate estimation of earnings transitions

The previous section suggests that earnings persistence is greatest at the top of the distribution, while wage gains are greatest for those workers in the middle of the distribution, particularly amongst regular workers. However, it is necessary to use a multivariate model to assess the relative roles played by various covariates in transitions between earnings categories. This section conducts a multivariate estimation of transition probabilities, assessing whether workers remain in or are pulled into low-wage work, following Stewart and Swaffield (1999).

Consider the earnings transitions for a sample of individuals, $i = 1, \dots, N$, between time $t-1$ and t . Define an indicator variable $d_{it} = 1$ if individual i is low paid at time t (that is, if real monthly earnings w_{it} lie below some threshold, λ). Then the probability of being in an initial state of low pay can be estimated as

$$P[d_{it-1} = 1] = \Phi(v'_{it-1}\beta)$$

⁵ The estimates are available from the author upon request.

where Φ is the standard normal cumulative distribution function and v_{it-1} is a vector of individual covariates.

Suppose now that the process by which an individual's earnings are determined at time t depends on individual covariates z_{it} , a sub-vector of v_{it} , and on whether or not the person was low paid at time $t-1$, such that

$$\begin{aligned} h_1(w_{it}) &= z'_{it}\eta_1 + \varepsilon_{1i} \text{ if } d_{it-1} = 1 \\ h_2(w_{it}) &= z'_{it}\eta_2 + \varepsilon_{2i} \text{ if } d_{it-1} = 0 \end{aligned}$$

Then the probability that an individual is low paid in both time periods is given by

$$P[d_{it-1} = 1, d_{it} = 1] = \Phi_2(v'_{it-1}\beta, z'_{it}\gamma_1; \rho_1)$$

where Φ_2 is the bivariate normal cumulative distribution function, γ_1 is the vector of probit coefficients derived from η_1 , and ρ_1 is the correlation between ε_1 and the residuals of the earnings function at time $t-1$. Similarly, the probability that an individual is high paid at $t-1$ but low paid at time t is given by

$$P[d_{it-1} = 0, d_{it} = 1] = \Phi_2(-v'_{it-1}\beta, z'_{it}\gamma_2; -\rho_2)$$

The elements of γ_1 therefore capture the effect of individual covariates on the persistence of low pay, while the elements of γ_2 capture the effect of the same covariates on the probability of falling from high pay into low pay (Cappellari, 2000).

Then the conditional probability of an individual being low paid at time t , normalised on the probability of the state of low pay at time $t-1$, is given by

$$\begin{aligned} P[d_{it} = 1 | d_{it-1} = 1] &= \frac{\Phi_2(v'_{it-1}\beta, z'_{it}\gamma_1; \rho_1)}{\Phi_2(v'_{it-1}\beta)} \\ P[d_{it} = 1 | d_{it-1} = 0] &= \frac{\Phi_2(-v'_{it-1}\beta, z'_{it}\gamma_2; -\rho_2)}{\Phi_2(-v'_{it-1}\beta)} \end{aligned}$$

Therefore, in the special case when $\rho_j = 0$ (that is, when the initial state of low pay is exogenous) the transition probability parameters can be estimated consistently using a univariate probit model, as

$$\begin{aligned} P[d_{it} = 1 | d_{it-1} = 1] &= \Phi_2(z'_{it}\gamma_1) \\ P[d_{it} = 1 | d_{it-1} = 0] &= \Phi_2(z'_{it}\gamma_2) \end{aligned}$$

However, such a special case requires that the observed persistence of low pay, γ_1 , depends only on the observed variables z_{it} . As the estimation is conditional on the state of low pay at time $t-1$, any correlation between unobservable characteristics over time will thus result in a sample selection bias (Stewart and Swaffield, 1999). In order to estimate the conditional probability in the case where $\rho_j \neq 0$, it is necessary to identify instruments for the endogenous selection into the initial low pay state. The elements of v_{it-1} that do not appear in z_{it} can be used as such instruments, and typically take the form of various parental background indicators. Instruments used in the literature include the education and occupation of the worker's parents (Cappellari, 2000) and the socioeconomic status of the worker's parents when the worker was 14 years old (Stewart and Swaffield, 1999; Cappellari and Jenkins, 2008).

In this study, the probability of being low paid in Wave 2, conditional on the initial low pay state, is estimated using a probit model, initially by assuming that the pay state in Wave 1 is exogenous. The effects of the covariates are displayed in Table 6, for the R800, R1500 and R3000 per month wage thresholds. The sample here is restricted to those who are employed in regular work, as some of the covariates are not available for other types of employment. Estimates including casual and self-employed workers, with a restricted set of covariates, are presented in Table A1 of the appendix. The first three columns of Table 6 present the effects of the covariates on the probability of being low paid in Wave 2, conditional on the worker being low paid in Wave 1 (that is, the probability of the persistence of low pay), while the final three columns present the effects conditional on the worker being paid more than the threshold in Wave 2 (that is, the probability of falling from high pay⁶ into low pay). Since, for workers who are low paid in Wave 1, the probability of a transition out of poverty is the converse of the probability of remaining poor, the coefficients in the first three columns also indicate which covariates are associated with exiting poverty.⁷

Table 6. Probability of being low paid in Wave 2, conditional on exogenous low pay state in Wave 1

	Probability of being low paid in Wave 2					
	Low paid in Wave 1			High paid in Wave 1		
	R800	R1500	R3000	R800	R1500	R3000
Age	0.019 (0.012)	-0.015 (0.010)	-0.010 (0.010)	-0.014 (0.007)	-0.022* (0.011)	-0.022 (0.013)
Male	-0.355 (0.218)	-0.349 (0.181)	-0.391* (0.168)	-0.170 (0.172)	-0.018 (0.199)	0.402 (0.217)
African	-0.640 (0.488)	-0.220 (0.279)	0.279 (0.282)	0.168 (0.211)	0.421 (0.224)	0.432 (0.243)
Grade 1-7	-0.170 (0.281)	-0.332 (0.339)	0.448 (0.455)	-0.499 (0.314)	-0.104 (0.387)	-1.363** (0.520)
Grade 8-11	-0.263 (0.306)	-0.214 (0.362)	0.336 (0.429)	-0.421 (0.282)	-0.752* (0.357)	-1.572*** (0.461)
Matric	-0.364 (0.401)	-0.934* (0.401)	-0.025 (0.453)	-0.785* (0.309)	-0.973* (0.391)	-2.173*** (0.479)
Diploma/ degree	-0.494 (0.615)	-0.782 (0.419)	-0.168 (0.473)	-0.832* (0.334)	-0.854* (0.400)	-1.836*** (0.471)
Married	0.029 (0.224)	-0.283 (0.188)	0.076 (0.193)	-0.107 (0.162)	-0.280 (0.208)	-0.383 (0.214)
Urban	-0.473 (0.256)	-0.464* (0.185)	-0.501* (0.208)	-0.217 (0.164)	-0.445* (0.187)	-0.312 (0.263)
Hours worked	0.025* (0.011)	-0.007 (0.007)	0.020* (0.008)	0.007 (0.007)	0.020* (0.010)	0.008 (0.011)
Full-time	-1.169** (0.420)	0.313 (0.307)	-0.826* (0.335)	-0.302 (0.280)	-0.531 (0.378)	-0.534 (0.389)
Tenure	-0.014 (0.013)	0.015 (0.012)	-0.001 (0.012)	-0.001 (0.010)	0.016 (0.011)	0.009 (0.012)
Semi-skilled	-0.112 (0.267)	-0.440* (0.217)	-0.778*** (0.212)	-0.176 (0.226)	-0.277 (0.247)	0.271 (0.354)
Skilled	-0.537 (0.474)	-0.728* (0.327)	-1.022*** (0.279)	-0.313 (0.341)	-0.561 (0.320)	-0.321 (0.372)

⁶ While a worker who earns more than R800 per month would hardly be considered as highly paid, this paper uses the ‘low pay, high pay’ nomenclature that is common throughout the literature, in which a high (low) paid worker is one who earns more (less) than a given threshold.

⁷ A negative coefficient in the first three columns indicates a characteristic that makes it less likely that the individual will persist in poverty, and thus more likely that they will transition out of poverty.

Agriculture	-0.271 (0.376)	0.129 (0.329)	2.189*** (0.448)	0.060 (0.355)	-0.767 (0.478)	-0.473 (0.752)
Mining		-0.757 (0.480)	-0.743 (0.445)	-0.542 (0.382)	-0.826 (0.468)	-1.811** (0.682)
Manufacturing	-0.226 (0.390)	-0.227 (0.313)	0.279 (0.334)	-0.408 (0.326)	-0.128 (0.422)	-0.718 (0.659)
Construction	0.062 (0.454)	-0.156 (0.355)	0.947* (0.449)	-0.738 (0.498)	-0.530 (0.538)	-1.575 (0.815)
Retail	0.058 (0.373)	-0.123 (0.307)	-0.013 (0.337)	-0.771* (0.313)	-0.339 (0.406)	-0.326 (0.639)
Transport	0.279 (0.694)	0.079 (0.584)	0.314 (0.478)	-0.000 (0.392)	-0.138 (0.460)	-0.832 (0.692)
Financial services	0.166 (0.467)	-0.177 (0.402)	-0.160 (0.370)		-0.997* (0.486)	-1.203 (0.635)
Community Services	-0.447 (0.367)	-0.442 (0.326)	-0.475 (0.318)	-0.551 (0.314)	-0.608 (0.412)	-0.930 (0.616)
Province controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.371 (0.817)	3.416*** (0.751)	2.301** (0.864)	0.120 (0.656)	0.324 (0.773)	2.000 (1.073)
Sample	315	749	1 091	1 183	867	525
Population	514 640	1 369 049	2 458 777	3 334 235	3 069 049	1 979 321
Prob>F	0.001	0.000	0.000	0.000	0.000	0.000

Source: NIDS 2008 and 2010/11

Notes: Coefficients are estimated from a probit model, with standard errors in parentheses. The data are weighted. The samples consist of those aged 18 or older in Wave 1 who are employed in regular work in both waves. The reference category for the industry dummies is private households. Significance levels are indicated as *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Partly as a result of relatively small sample sizes, many of the variables do not have a significant effect on the probability of remaining below the earnings threshold, or of transitioning below the threshold. Part-time work is significantly associated with persistence in the lowest earnings category, while high levels of education and working in the retail sector provide protection against falling into low earnings. For the R1500 and R3000 earnings thresholds, workers are less likely to remain low paid if they are male, located in urban areas and in semi-skilled or skilled jobs, while they are more likely to remain low paid if they are employed in agriculture (compared to private households). Education, and working in the mining or financial services industries, offers protection against transitioning into a lower earnings category.

The transition matrix displayed as Table 4 shows that transitions out of employment are common for low-wage workers: workers earning below any of the thresholds are substantially more likely to not be employed in the next period than higher paid workers. Therefore, the final part of this section considers the sensitivity of the multivariate transition probability estimates to transitions out of employment. In order to do so, the probability of being low paid at time t , conditional on the initial state, is compared to the probability of being low paid or not employed at time t , conditional on the initial state. The justification for the examination of the latter probability here follows Stewart and Swaffield (1999), in that, for most individuals who are low paid, becoming unemployed or moving out of the labour force is not expected to raise welfare.⁸

⁸ In contrast, Sloane and Theodossiou (1996) use a multinomial logit model to estimate the probability of an individual being in a low paying job, a high paying job or out of employment. However, the use of this model requires the assumption of the independence of irrelevant alternatives, which is unlikely to be valid in this case.

Table 7 compares the effects of the covariates on the probability of being low paid, to the marginal effects on the probability of being low paid or not employed, in Wave 2. Including those workers who exit employment produces few significant differences to the results. At the lowest threshold, a number of variables become significant: the probability of remaining poor or exiting employment is significantly lower amongst workers who are younger, male, African, have some secondary education, and have longer job tenure, although mostly only at a five percent significant level.⁹ At all thresholds, male workers are significantly less likely than females to remain poor or exit employment. This illustrates that females face a significantly higher risk of exiting employment than males, particularly from within the lower wage categories.

Table 7. Probability of being low paid or not employed in Wave 2, conditional on exogenous low pay state in Wave 1

	Probability of being low paid in Wave 2					
	Probability of being low paid in Wave 2			Probability of being low paid or not employed in Wave 2		
	Low paid in Wave 1			Low paid in Wave 1		
	R800	R1500	R3000	R800	R1500	R3000
Age	0.019 (0.012)	-0.015 (0.010)	-0.010 (0.010)	0.018* (0.008)	-0.010 (0.008)	-0.007 (0.008)
Male	-0.355 (0.218)	-0.349 (0.181)	-0.391* (0.168)	-0.399* (0.193)	-0.385* (0.153)	-0.348* (0.151)
African	-0.640 (0.488)	-0.220 (0.279)	0.279 (0.282)	-0.766* (0.376)	-0.254 (0.262)	0.307 (0.251)
Grade 1-7	-0.170 (0.281)	-0.332 (0.339)	0.448 (0.455)	-0.250 (0.228)	-0.237 (0.315)	0.412 (0.405)
Grade 8-11	-0.263 (0.306)	-0.214 (0.362)	0.336 (0.429)	-0.620* (0.258)	-0.257 (0.335)	0.280 (0.384)
Matric	-0.364 (0.401)	-0.934* (0.401)	-0.025 (0.453)	-0.498 (0.325)	-0.862* (0.366)	-0.074 (0.401)
Diploma/ degree	-0.494 (0.615)	-0.782 (0.419)	-0.168 (0.473)	0.187 (0.434)	-0.757* (0.381)	-0.283 (0.420)
Married	0.029 (0.224)	-0.283 (0.188)	0.076 (0.193)	-0.143 (0.188)	-0.265 (0.167)	0.047 (0.176)
Urban	-0.473 (0.256)	-0.464* (0.185)	-0.501* (0.208)	-0.302 (0.209)	-0.341* (0.173)	-0.334 (0.190)
Hours worked	0.025* (0.011)	-0.007 (0.007)	0.020* (0.008)	0.011 (0.009)	-0.001 (0.007)	0.020** (0.008)
Full-time	-1.169** (0.420)	0.313 (0.307)	-0.826* (0.335)	-0.710* (0.347)	-0.020 (0.278)	-0.835** (0.303)
Tenure	-0.014 (0.013)	0.015 (0.012)	-0.001 (0.012)	-0.034** (0.011)	0.003 (0.010)	-0.006 (0.010)
Semi-skilled	-0.112 (0.267)	-0.440* (0.217)	-0.778*** (0.212)	-0.171 (0.233)	-0.278 (0.191)	-0.827*** (0.200)
Skilled	-0.537 (0.474)	-0.728* (0.327)	-1.022*** (0.279)	-0.258 (0.407)	-0.259 (0.280)	-0.782** (0.249)
Agriculture	-0.271 (0.376)	0.129 (0.329)	2.189*** (0.448)	-0.231 (0.305)	0.060 (0.298)	2.272*** (0.413)
Mining		-0.757 (0.480)	-0.743 (0.445)	-0.398 (0.737)	-0.148 (0.534)	-0.362 (0.425)
Manufacturing	-0.226	-0.227	0.279	-0.242	-0.287	0.273

⁹ The increase in significance may be partly due to the increase in sample size that occurs when those who exit employment are included.

Construction	(0.390) 0.062	(0.313) -0.156	(0.334) 0.947*	(0.336) 0.496	(0.278) 0.107	(0.311) 0.963*
Retail	(0.454) 0.058	(0.355) -0.123	(0.449) -0.013	(0.419) -0.151	(0.350) -0.221	(0.403) -0.010
Transport	(0.373) 0.279	(0.307) 0.079	(0.337) 0.314	(0.324) 0.062	(0.263) -0.232	(0.312) 0.099
Financial services	(0.467) 0.166	(0.402) -0.177	(0.370) -0.160	(0.392) -0.541	(0.357) -0.120	(0.349) -0.124
Community Services	(0.367) -0.447	(0.326) -0.442	(0.318) -0.475	(0.339) -0.491	(0.288) -0.435	(0.292) -0.402
Province controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	(0.817) 0.371	(0.751) 3.416***	(0.864) 2.301**	(0.639) 1.436*	(0.656) 3.250***	(0.764) 2.409**
Sample	315	749	1 091	485	1 089	1 518
Population	514 640	1 369 049	2 458 777	825 838	2 055 492	3 371 536
Prob>F	0.001	0.000	0.000	0.000	0.000	0.000

Source: NIDS 2008 and 2010/11

Notes: Coefficients are estimated from a probit model, with standard errors in parentheses. The data are weighted. The samples consist of those aged 18 or older who are employed who are employed in regular work in Wave 1. Significance levels are indicated as *** p<0.01, ** p<0.05, * p<0.1.

Finally, Table 8 presents the transition probabilities in the case where ρ_j is not assumed to be zero; that is, allowing for endogenous selection into the initial low pay state. In order to do so, it is necessary to identify instruments for this selection, which are usually parental background indicators in the literature. In NIDS, there are several possible instruments: respondents are asked to rank their household economic wellbeing when they were 15 years old, and are also asked about the education and occupation of their parents. The exclusion restrictions used in Table 8 are the education of the worker's mother and father, in the form of two dummy variables that are equal to one if the worker's mother or father, respectively, is known to have completed matric.¹⁰ Table 8 reproduces the estimates for the probability of remaining in low pay from Table 6, in which the state of pay in Wave 1 was treated as exogenous, and compares these to the estimates allowing for endogenous selection into the initial low pay state.

Table 8. Probability of being low paid in Wave 2, conditional being low paid in Wave 1, with exogenous and endogenous selection of initial pay state

	R800		R1500		R3000	
	Exogenous	Endogenous	Exogenous	Endogenous	Exogenous	Endogenous
Age	0.019 (0.012)	0.010 (0.015)	-0.015 (0.010)	-0.012 (0.009)	-0.010 (0.010)	-0.012 (0.010)
Male	-0.355 (0.218)	-0.564** (0.186)	-0.349 (0.181)	-0.602*** (0.168)	-0.391* (0.168)	-0.469** (0.172)
African	-0.640 (0.488)	-0.379 (0.528)	-0.220 (0.279)	0.038 (0.222)	0.279 (0.282)	0.410 (0.295)
Grade 1-7	-0.170 (0.281)	-0.065 (0.297)	-0.332 (0.339)	-0.283 (0.278)	0.448 (0.455)	0.459 (0.455)
Grade 8-11	-0.263 (0.306)	-0.400 (0.270)	-0.214 (0.362)	-0.407 (0.309)	0.336 (0.429)	0.266 (0.452)
Matric	-0.364 (0.401)	-0.597 (0.348)	-0.934* (0.401)	-1.036** (0.340)	-0.025 (0.453)	-0.174 (0.495)

¹⁰ Sensitivity analysis suggests that these variables better explain the worker's pay state in Wave 1 than the economic wellbeing of the household at age 15 alone, or the combination of wellbeing and parental education.

Diploma/ degree	-0.494 (0.615)	-1.145* (0.578)	-0.782 (0.419)	-1.348*** (0.366)	-0.168 (0.473)	-0.400 (0.552)
Married	0.029 (0.224)	-0.133 (0.279)	-0.283 (0.188)	-0.340* (0.157)	0.076 (0.193)	-0.010 (0.191)
Urban	-0.473 (0.256)	-0.541** (0.207)	-0.464* (0.185)	-0.599*** (0.152)	-0.501* (0.208)	-0.581** (0.211)
Hours worked	0.025* (0.011)	0.027** (0.010)	-0.007 (0.007)	0.002 (0.008)	0.020* (0.008)	0.024** (0.008)
Full-time	-1.169** (0.420)	-1.364*** (0.367)	0.313 (0.307)	-0.123 (0.358)	-0.826* (0.335)	-0.955** (0.333)
Tenure	-0.014 (0.013)	-0.013 (0.012)	0.015 (0.012)	-0.006 (0.013)	-0.001 (0.012)	-0.007 (0.012)
Semi-skilled	-0.112 (0.267)	-0.438 (0.251)	-0.440* (0.217)	-0.586** (0.200)	-0.778*** (0.212)	-0.785*** (0.208)
Skilled	-0.537 (0.474)	-0.792* (0.385)	-0.728* (0.327)	-1.034*** (0.277)	-1.022*** (0.279)	-1.131*** (0.281)
Agriculture	-0.271 (0.376)	0.054 (0.355)	0.129 (0.329)	0.292 (0.311)	2.189*** (0.448)	1.997*** (0.530)
Mining			-0.757 (0.480)	-1.205** (0.381)	-0.743 (0.445)	-1.002* (0.493)
Manufacturing	-0.226 (0.390)	0.033 (0.310)	-0.227 (0.313)	-0.327 (0.261)	0.279 (0.334)	0.176 (0.351)
Construction	0.062 (0.454)	0.296 (0.363)	-0.156 (0.355)	-0.090 (0.299)	0.947* (0.449)	0.774 (0.498)
Retail	0.058 (0.373)	0.128 (0.322)	-0.123 (0.307)	-0.283 (0.276)	-0.013 (0.337)	-0.114 (0.345)
Transport	0.279 (0.694)	0.198 (0.664)	0.079 (0.584)	-0.304 (0.457)	0.314 (0.478)	0.198 (0.487)
Financial services	0.166 (0.467)	0.213 (0.376)	-0.177 (0.402)	-0.475 (0.334)	-0.160 (0.370)	-0.321 (0.386)
Community Services	-0.447 (0.367)	-0.330 (0.305)	-0.442 (0.326)	-0.617* (0.256)	-0.475 (0.318)	-0.636 (0.345)
Province controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.371 (0.817)	0.053 (0.795)	3.416*** (0.751)	2.932*** (0.758)	2.301** (0.864)	2.363** (0.860)
Rho		0.685 (0.597)		0.817 (0.255)		0.403 (0.324)
Sample	315	1 616	749	1 616	1 091	1 616
Population	514 640	4 438 098	1 369 049	4 438 098	2 458 777	4 438 098
Prob>F	0.001	0.000	0.000	0.000	0.000	0.000

Source: NIDS 2008 and 2010/11

Notes: Coefficients are estimated from a probit model, with standard errors in parentheses. Models labelled 'Endogenous' also contain a selection equation for the initial pay state. The data are weighted. The samples consist of those aged 18 or older in Wave 1 who are employed in both waves. Significance levels are indicated as *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In studies conducted using British and Italian panel data, the correlation between the residuals of the earnings functions at time t and $t-1$ is consistently found to be negative and significant, indicating that there is a significant inverse relationship between the level of earnings at time t and the change in earnings from time $t-1$ to t . This correlation, which exists for both the persistence of low pay and the probability of falling into low pay, and across a variety of low pay thresholds, is found to range between -0.386 and -0.658 (Stewart and Swaffield, 1999; Cappellari, 2000). As a result, the estimation of transition probabilities using a univariate probit, rather than an endogenous switching model, is found to overestimate the effects of the covariates on both the probability of remaining in low paid work and of a transition from high pay to low pay. However, unlike in the literature, the

estimates of the correlation here (displayed in Table 8 as ρ), are found to be positive but insignificant. As a result, the estimated coefficients are mostly somewhat larger in absolute value, but similar in significance, when allowing for endogenous selection into the initial pay state. The most notable changes are an increase in the significance of the protection against the persistence of low pay that is experienced by workers who are male, live in urban areas, have high levels of education and work in skilled occupations.

7. Discussion

This study examines the extent and nature of employment dynamics and earnings mobility during South Africa's most recent recession, using matched individual-level panel data from the first two waves of the National Income Dynamics Study. The paper shows that there was considerable churning in the labour market during this time. In line with the decline in aggregate employment over this period, only two-thirds of individuals maintained employment across both waves. Workers who were initially at the bottom of the earnings distribution, and those employed in non-regular work (mainly casual work and self-employment) were the most likely to exit employment.

Amongst individuals who were employed in both waves, there was substantially more evidence of upward earnings mobility than downward mobility. For example, workers in the two bottom earnings categories were more likely to experience transitions into the earnings categories above than to remain in their initial earnings category. This was especially the case for regular workers; in contrast, casual workers experienced a large degree of persistence in the lower earnings categories, and downward mobility from the upper earnings categories.

In a multivariate context, the characteristics that offer protection against persisting in a low-paid category are being male, located in urban areas and working full-time in a semi-skilled or skilled job. High levels of education, and working in the mining or financial services industries, offers protection against transitioning into a lower earnings category. Workers are more likely to remain low paid if they are employed in agriculture, but those in the retail sector are less likely to fall into low earnings (compared to private households).

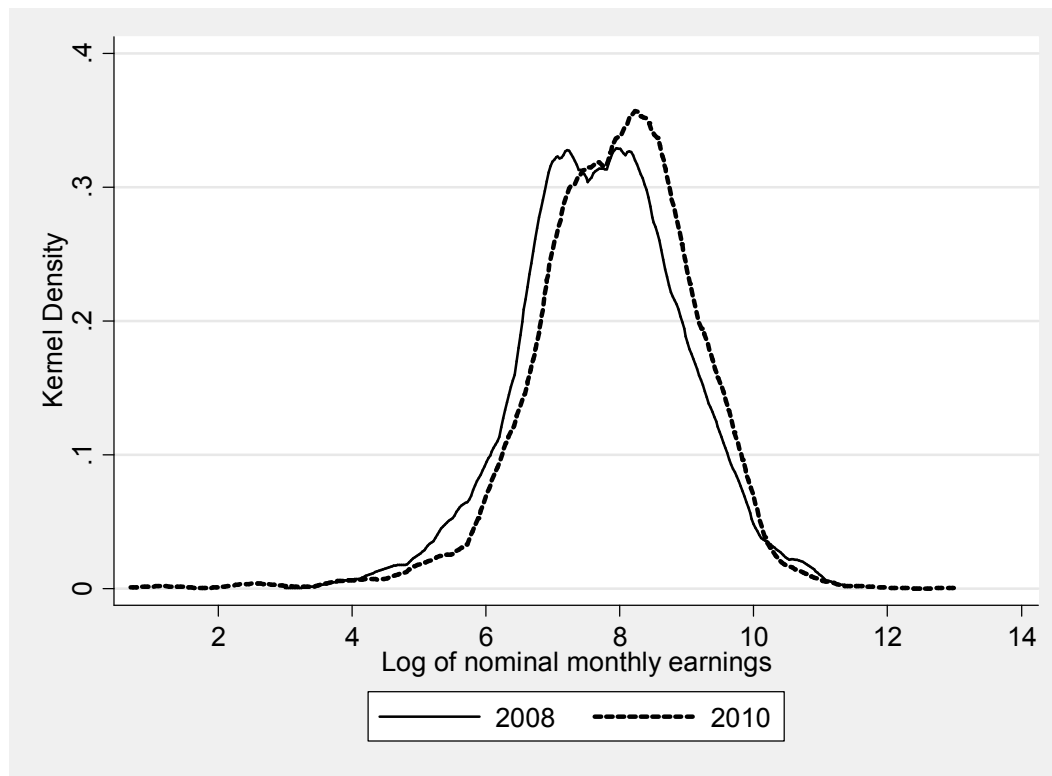
Based on the results presented here, there does not appear to be a significant relationship between the level of earnings in Wave 1 and the change in earnings from Wave 1 to Wave 2. Rather than the negative correlation found in the literature, which suggests regression to the mean, the correlation here is positive, suggesting path dependence, although not to a significant degree. However, it is not clear whether this is because this lack of significance is because the initial pay state is truly exogenous to the probability of transition, or because the variables available to instrument for the initial pay state perform poorly in the analysis. As subsequent waves of data are collected, and more earnings transitions are observed, the estimates are likely to become more robust, and it may be possible to disentangle such effects.

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Appendix

Figure A1. Kernel density plots of the natural logarithm of nominal monthly earnings, 2008 and 2010



Source: NIDS 2008 and 2010/11

Notes: The data are weighted. The samples consist of those aged 18 or older in Wave 1 who are employed in both waves.

Table A1. Probability of being low paid in Wave 2, conditional on exogenous low pay state in Wave 1 (regular, casual and self-employed workers)

	Probability of being low paid in Wave 2					
	Low paid in Wave 1			High paid in Wave 1		
	R800	R1500	R3000	R800	R1500	R3000
Age	0.009 (0.009)	-0.002 (0.008)	-0.020** (0.008)	-0.004 (0.006)	-0.007 (0.009)	-0.022* (0.011)
Male	-0.314 (0.170)	-0.514*** (0.148)	-0.257 (0.153)	-0.185 (0.132)	0.075 (0.174)	0.539** (0.207)
African	0.078 (0.292)	-0.120 (0.231)	0.054 (0.246)	0.335* (0.170)	0.465* (0.190)	0.206 (0.236)
Grade 1-7	-0.190 (0.226)	-0.202 (0.299)	0.295 (0.393)	-0.525 (0.291)	-0.210 (0.378)	-0.963 (0.536)
Grade 8-11	-0.154 (0.241)	-0.306 (0.311)	-0.025 (0.380)	-0.604* (0.266)	-0.652 (0.340)	-1.433** (0.483)
Matric	-0.863** (0.309)	-1.039** (0.348)	-0.557 (0.403)	-0.866** (0.290)	-0.851* (0.366)	-1.860*** (0.497)
Diploma/ degree	-0.727 (0.399)	-0.904* (0.354)	-0.792 (0.411)	-0.781* (0.310)	-0.884* (0.375)	-1.616*** (0.481)
Married	-0.233 (0.180)	-0.207 (0.164)	0.041 (0.165)	-0.132 (0.143)	-0.401* (0.185)	-0.317 (0.211)
Urban	-0.606*** (0.172)	-0.576*** (0.147)	-0.439** (0.168)	-0.381** (0.140)	-0.375* (0.169)	-0.489* (0.237)
Hours worked	0.014 (0.009)	-0.003 (0.006)	0.017* (0.008)	0.003 (0.006)	0.012 (0.008)	0.003 (0.010)
Full-time	-0.725 (0.376)	0.354 (0.263)	-0.751* (0.312)	-0.306 (0.259)	-0.565 (0.330)	-0.370 (0.371)
Regular work	-0.216 (0.270)	-0.967** (0.317)	-1.023** (0.359)	-0.458 (0.385)	-0.731* (0.366)	-0.536 (0.446)
Casual work	0.147 (0.321)	-0.446 (0.372)	-0.226 (0.432)	0.141 (0.428)	-0.652 (0.530)	
Semi-skilled	-0.082 (0.165)	-0.296 (0.153)	-0.668*** (0.171)	-0.258 (0.149)	-0.228 (0.215)	0.080 (0.315)
Skilled	-0.702 (0.391)	-0.876*** (0.259)	-1.064*** (0.243)	-0.559* (0.245)	-0.551 (0.283)	-0.585 (0.349)
Province controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.428 (0.667)	3.266*** (0.689)	3.817*** (0.807)	-0.182 (0.648)	0.546 (0.767)	2.273* (0.941)
Sample	504	1036	1425	1499	967	575
Population	921 511	2 058 535	3 291 002	45 653 44	3 428 319	2 192 116
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000

Source: NIDS 2008 and 2010/11

Notes: Coefficients are estimated from a probit model, with standard errors in parentheses. The data are weighted. The samples consist of those aged 18 or older in Wave 1 who are employed in both waves. The reference category for the job type is self-employment. Significance levels are indicated as *** p<0.01, ** p<0.05, * p<0.1.