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THE EMPLOYMENT EFFECTS OF MERGERS IN A DECLINING INDUSTRY: THE CASE OF SOUTH AFRICAN GOLD MINING

Alberto Behar and James Hodge

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The employment effects of mergers in a declining industry: the case of South African gold mining[#]

Alberto Behar*
James Hodge[+]

An industry in decline provides an appropriate setting for the theory that mergers and acquisitions destroy implicit contracts and allow for the shedding of excess labour. We test this theory using provincial data from the South African gold mining industry, which has been in decline over the last two decades. Our data clearly portray rises in real wages and falling employment after the end of *apartheid* and our econometric results are remarkably consistent with standard labour demand theory. We find evidence of a significant negative effect of mergers/acquisitions on employment of a magnitude similar to that found for Continental Europe. This supports the view that negative employment effects are more likely in rigid labour markets.

JEL Codes: G34 J23 L72

[#] This study is based in part on work performed by G:enesis Analytics (PTY) Ltd as part of a submission requested by the Competition Tribunal on the possible welfare consequences on affected areas of mergers in the South African gold mining industry.

* Corresponding author. Centre for the Study of African Economies and Department of Economics, Oxford; alberto.behar@economics.ox.ac.uk

[+] G:enesis Analytics (PTY) Ltd, Johannesburg

1. INTRODUCTION

Public perception has associated mergers, particularly hostile takeovers, with employment losses (Brown & Medoff, 1988). The welfare loss to workers associated with retrenchments can be pronounced in countries with relatively high unemployment. While it can be argued that measures to mitigate unemployment should address general labour market failings, legislation in the European Union exists specifically to limit cross border merger related employment losses (Osman, 2001). South Africa also has employment legislation for mergers (ILO, 2003). Furthermore, South Africa is special because it is the duty of the competition authorities to consider potential employment losses before approving a merger: the Competition Act (Republic of South Africa, 1998) explicitly lists the promotion of employment as one of its aims.

Given that South Africa has an official unemployment rate of over 25% (Statistics South Africa, 2005),[1] it is no surprise that employment consequences are a major concern. However, even in the United States, which has relatively low unemployment rates, 63% of the public surveyed believe employees are the one group that should be protected from harm in the event of a hostile takeover (Brown & Medoff, 1988).

Despite both public and official concern with potential employment losses, the theoretical justification is ambiguous. If takeovers result in better management and more productive use of assets, workers could benefit in the form of higher wages and/or expanded employment. Critics argue that productivity gains merely result from retrenchments of workers (ILO, 2003). This is consistent with the breach of trust argument advanced by Shleifer & Summers (1988): mergers allow for the breaking of implicit contracts within the acquired firm and hence allow the new ownership to reduce employment levels.

A likely setting for the breach of trust argument, and hence for post-merger employment losses, is an industry in decline. The South African gold mining industry has arguably been in decline since the mid 1980s, and it is therefore an appropriate source for empirical study. The gold industry is of particular importance to policymakers as it has lost two thirds of its labour force since the mid 1980s.

There is little empirical evidence for merger-related employment losses in the United States, but recent studies have found a significant negative effect of mergers on employment in Europe (eg Conyon, Girma, Thompson & Wright, 2002; Gugler & Yurtoglu, 2004). We contribute to the empirical literature by using data that has numerous advantages for accurate estimation. For example, it is not subject to various merger definition issues and output is a homogenous good (kilograms of gold). Furthermore, we argue that the mergers took place largely for exogenous reasons. Our data spans 25 years, so we take explicit account of the non-stationarity of the data.

[1] The rate according to the narrow definition of unemployment was 26.5% in March 2005. Using the expanded definition, which many argue is appropriate for South Africa because it includes discouraged work seekers, unemployment was 40.5%.

To our knowledge, no study attempts to quantify the employment losses from mergers in a developing country. The results from this work could inform what would happen in commodities sectors in other developing countries. In particular, studies of the gold industry are important in both a South African and international context. There was a recent unsuccessful hostile bid by Harmony Gold for Gold Fields, which would have made the combined entity the world's largest gold producer (SABC, 2005). The successful bid by Barrick for Placer Dome effective January 2006 made *it* the world's largest producer (CBC, 2005).

Our main goal is to analyse the effects of mergers, but our data is also of interest because it starkly portrays events in the labor market after the end of *apartheid* and the installment of the first democratic government in 1994. 1995 saw the introduction of new labor legislation, which effectively increased workers' wage bargaining power. Therefore, while real wages were fairly constant leading up to this period, we see sustained rises in wages from 1995 onwards. We also observe a corresponding downward adjustment in employment numbers. Our econometric results produce coefficients that fit standard labor demand theory remarkably well. For example, our coefficient for wages is very similar to the known share of labour in costs for the gold mining industry, as is expected for a Cobb Douglas specification.

Section 2 presents the theoretical and empirical background and section 3 discusses the specifications used to estimate labour demand. Section 4 describes the trends in the South African gold industry, documents the variables used and motivates the need to test for unit roots and cointegration in the presence of structural breaks. Section 5 performs such tests on the data. Section 6 finds statistically significant employment losses of the same magnitude as those found for Continental Europe by Gugler & Yurtoglu (2004), which is notable given that South African labour markets exhibit many Continental European rigidities. Section 7 offers a concluding discussion.

2. THEORETICAL AND EMPIRICAL BACKGROUND

Despite public perceptions of merger induced employment losses, theoretical prescriptions are ambiguous. One possible motivation for merging is to reduce output and raise price, which would reduce employment. This is not a motivation in the gold industry because, despite the producers being large on the global stage, the annual flow of global production is only 2% of the world stock of gold supplied (Borenstein & Farrell, 2006). This means firms are price takers. More generally, any mergers that could meaningfully raise margins are likely to fall foul of competition authorities.

Jensen's (1984) motivations for a takeover – differences in opinion over the value of the assets and the acquirer's belief he can manage the assets better – yield no *a priori* reason for labour to fear employment

losses. If successful, the acquirers will raise the value of the firm and, if anything, improve the standing of employees. Furthermore, immediate losses that may occur in the short run may prevent bigger job losses in the longer term or even lead to employment gains (Conyon et. al., 2002).

Another view is that the gains to shareholders come as a transfer of the firm's surplus from labour to capital instead of an increase in the overall value. For example, Schleifer and Summers (1988) argue that mergers/takeovers allow for a transfer from labour to capital. Specifically, they allow for opportunistic behaviour that reneges on implicit contracts built up within the firm. Such contracts could include implicit employment insurance conditions or seniority based pay.

In the context of a declining industry, firms adjust their desired level of output downward, but the existence of implicit contracts presents adjustment costs in the form of morale and/or reputation costs. A merger would allow for less costly breach of these contracts and a quicker adjustment towards desired employment levels.

Gugler & Yurtoglu (2004) argue that explicit labour market rigidities can also result in slower labour shedding if they make implicit contracts more sustainable. Rigidities often come in the form of insider markets, where insider employees are to some extent protected from cyclical fluctuations and a loss of their own human capital. In terms of rigidities, South Africa's labour market is more similar with that of Europe than the United States. The Amended Labour Relations Act (Republic of South Africa, 2002) defines dismissals planned due to operational requirements as those ranging from ten or more employees if the workforce exceeds 200 to fifty or more if the workforce exceeds 500 – a threshold of at most 10% of the workforce – within the last 12 months. Gugler & Yurtoglu (2004) report that a collective dismissal is one where more than 30 employees are retrenched within 30 days in Germany and more than 20 are dismissed within 90 days in the UK. In the USA, collective dismissal applies in the case of layoff if more than 500 workers are retrenched or 50-499 workers are retrenched if they comprise more than one third of the labour force.

South African firms intending to retrench for operational reasons must consult with employees or their representatives in carrying out the process, providing for example the reasons for the proposed dismissal, the alternatives considered and possible future assistance to those retrenched. While firms ultimately have the right to proceed with retrenchments, the Act allows employees to strike in order to oppose retrenchments (Werksmans Inc., 2006). The conditions for collective dismissal therefore appear to be at least as stringent in South Africa as in Europe.

Empirical evidence that mergers are associated with negative employment effects, controlling for output changes, would be consistent with the breach of implicit contracts and rigid labour market views. Earlier studies on the United States, notably Brown & Medoff (1988); Bhagat, Shleifer & Vishny (1990) and

McGuckin, Nguyen & Reznek (1995) find minimal employment losses and even employment gains. Lichtenberg & Siegel (1991) find some employment losses but conclude these explain a small part of the acquisition premium. This suggests that, although shareholders may gain from reneging on implicit contracts, the opportunity to do so is not a significant motivation for a takeover.

Newer studies have been able to employ superior data, namely establishment level observations across a wide range of industries. Conyon et. al. (2002) find evidence for employment losses in the United Kingdom, with changes being larger for mergers in related industries and in hostile takeovers. McGuckin (2001) finds no evidence that ownership changes are used to cut employment in the United States. Consistent with both these findings, Gugler & Yurtoglu (2004) find almost no effect in the United States but a significantly negative effect in the United Kingdom and Continental Europe. This supports their claim that rigid labour markets may provide more opportunities for breach of contract after a merger. If South African labour market rigidities are similar to those found in Europe, we would expect the employment losses associated with mergers to be similar to those found for Europe and greater than those found in the United States.

3. ESTIMATION APPROACH

Following the general approach found in Conyon et. al. (2002) for example, we estimate a conditional labour demand function in the presence of quadratic adjustment costs and a Cobb Douglas technology.

$$l_{i,t} = \delta_0 + \delta_1 l_{i,t-1} + \delta_2 q_{i,t} + \delta_3 q_{i,t-1} + \delta_4 w_{i,t} + \delta_5 w_{i,t-1} + \delta_6 M_{i,t} + f_i + e_{i,t} \qquad (1.1)$$

l, q and *w* are the logs of employment, gold output and wages[2] while *M* is the merger variable to be described in section 3[3]. A significantly negative estimate of δ_6 would imply an association between mergers and employment losses. δ_0 is a constant, *f* represents potential province-specific effects and *e* is an i.i.d error. Given the small N (=4), large T (=25) dimension of our panel, we do not use dynamic panel estimators, for example the Arellano-Bond (1991) GMM estimator. With these dimensions, the potential bias on the lagged dependent variable, which motivates GMM estimation, are minimal and the estimator itself would be inconsistent. We capture potential province-level fixed effects with dummies, estimate by OLS, and pay more explicit attention to potential non-stationarity of the variables in sections 5 and 6.

[2] Data constraints prevent the use of costs of capital. The bias from this omitted variable is minimized because wage changes have dominated changes in the cost of capital.

[3] Our variable could be expressed as the log(1+M), which bears similar results, but the levels formulation allows for easier interpretation and comparison with other studies.

Provided any non-stationary variables are cointegrated, estimation in ARDL form (1.1) is a legitimate approach (Pesaran & Shin, 1998). After testing for unit roots and cointegration, we estimate (1.1). The long run coefficient on output, for example, can be calculated as $\frac{\delta_2+\delta_3}{1-\delta_1}$. However, we can write (1.1) in conditional equilibrium correction form:

$$\Delta l_{i,t} = \tau_0 + \tau_1 \Delta q_{i,t} + \tau_2 \Delta w_{i,t} + \alpha z_{t-1} + \tau_4 M_{i,t} + f_i + e_{i,t} \qquad (1.2)$$

where

$$z_t = l_t - \beta_1 w_t - \beta_2 q_t \qquad (1.3)$$

(1.2) has an appealing interpretation. α represents correction of disequilibrium, which is potentially created by the employment adjustment costs. As an alternative to estimating the residual z according to the Engle-Granger (1987) 2-step approach, one can estimate the unconstrained ECM (Banerjee, 1998):

$$\Delta l_{i,t} = \gamma_0 + \gamma_1 \Delta q_{i,t} + \gamma_2 \Delta w_{i,t} + \gamma_3 q_{i,t-1} + \gamma_4 w_{i,t-1} + \gamma_5 l_{i,t-1} + \gamma_6 M_{i,t} + f_i + e_{i,t} \qquad (1.4)$$

Treating γ_5 as the error correction term imposes the necessary restriction for identifying the long run coefficients as $-\gamma_3/\gamma_5$ and $-\gamma_4/\gamma_5$. $\gamma_6 = \delta_6$ and consistent estimates of z would lead to the same estimates of the effects of mergers in all 3 specifications. One advantage of (1.4) is potential power gains in single equation cointegration tests (Banerjee, 1998). Finally, should variables be integrated but not cointegrated, then the effects of mergers could still be consistently estimated by dropping z from (1.2) or the lagged variables from (1.4).

4. DATA AND INDUSTRY BACKGROUND

We use annual data from 1980 to 2004 for four provinces, which represent 99% of South African gold output. The four provinces are Gauteng (GP), Mpumalanga (MP), North West (NW) and Free State (FS). We are able to measure output in kilograms, avoiding any issues of output heterogeneity across provinces and the need for deflators over time. We also have average annual wages and employment quantities for each province. These variables are sourced from the Department of Minerals and Energy. The South African Mining Industry produces annual reports of developments in the gold mining industry, including merger and acquisition activity. This is used to identify merger and acquisition activity by province and year. As the focus of the study is the employment effects of mergers and acquisitions, we do not include internal restructurings or the purchases of minority shareholdings in other mines.

For firm level data, the standard approach is to represent merger activity by one or more dummy variables (eg Brown & Medoff, 1988). For provincial data, a slightly different approach is required. We construct a continuous provincial merger variable bounded between zero and unity representing output-weighted merger activity in a given province for that year. If merger k involves two or more mines, whose combined output in kilograms is x_k percent of total gold output for the province, we assign the merger variable a value of x_k. When there is more than one merger in a province in a year, we add the values to get the applicable merger variable. Formally, $M_{i,t} = \sum_k x_{k,i,t}$. Quarterly reports of the South African Chamber of Mines are used to identify the size of the mines (in terms of gold output) involved in any transaction.

We are easily able to account for transactions across provinces by assigning the output-weighted values to each province. Having details on each mine involved in a transaction allows us to control for any divestment activity, which would exaggerate the employment losses after a merger (Conyon et. al., 2002). Because the possible employment and other effects of mergers can not take place instantaneously, mergers effected in the final quarter of a given year are deemed to have taken place the following year.

We turn now to a graphical analysis of the data, which we use to describe the behaviour of the variables and the industry in general. In figure 1, the downward trend in employment is clear. Between 1987 and 2004, 366 000 people or two thirds of the gold labour force, lost their jobs. There are suggestions of particularly big falls in the late 1990s.

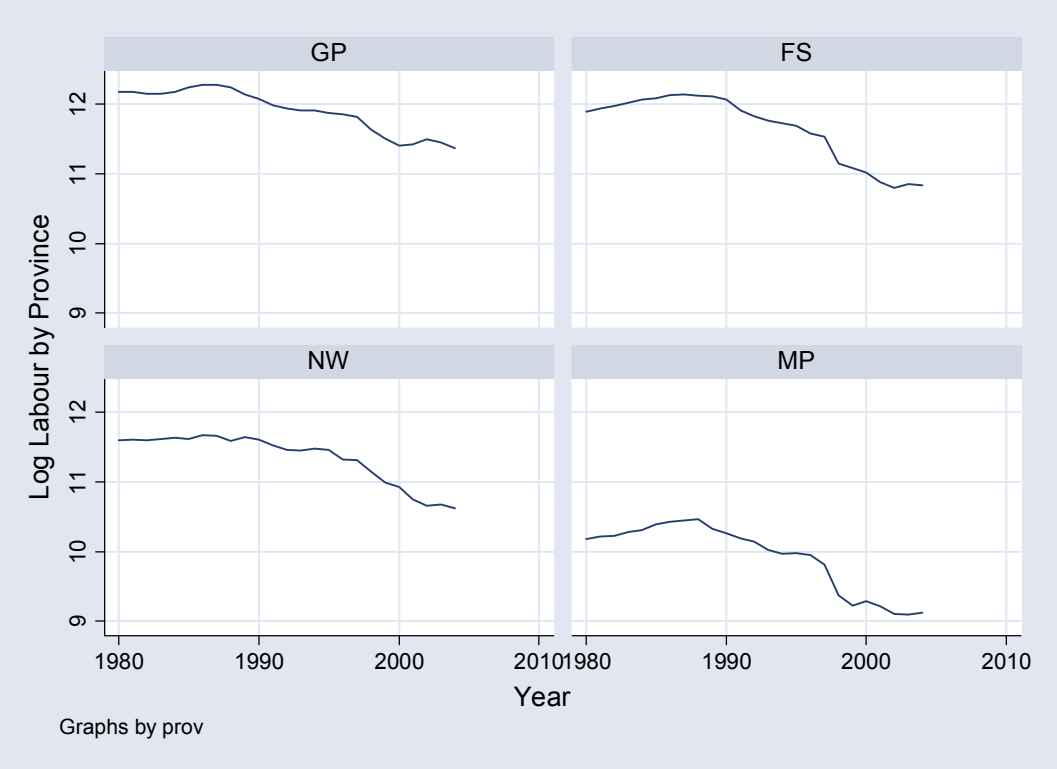

Figure 1: Employment in the gold mining industry, by province, 1980-2004. *Source: Department of Minerals and Energy*

Some of the changes in employment coincide with changes in the other variables. For example, figure 2 shows a period of relatively constant real wages followed by big rises from the mid-1990s onwards. This coincides with the first democratically elected government in 1994 and the passing of the Basic Conditions of Employment Act (Republic of South Africa, 1995), which had the effect of increasing the bargaining power of trade unions. Real wages rose 76% from 1987 to 2002.

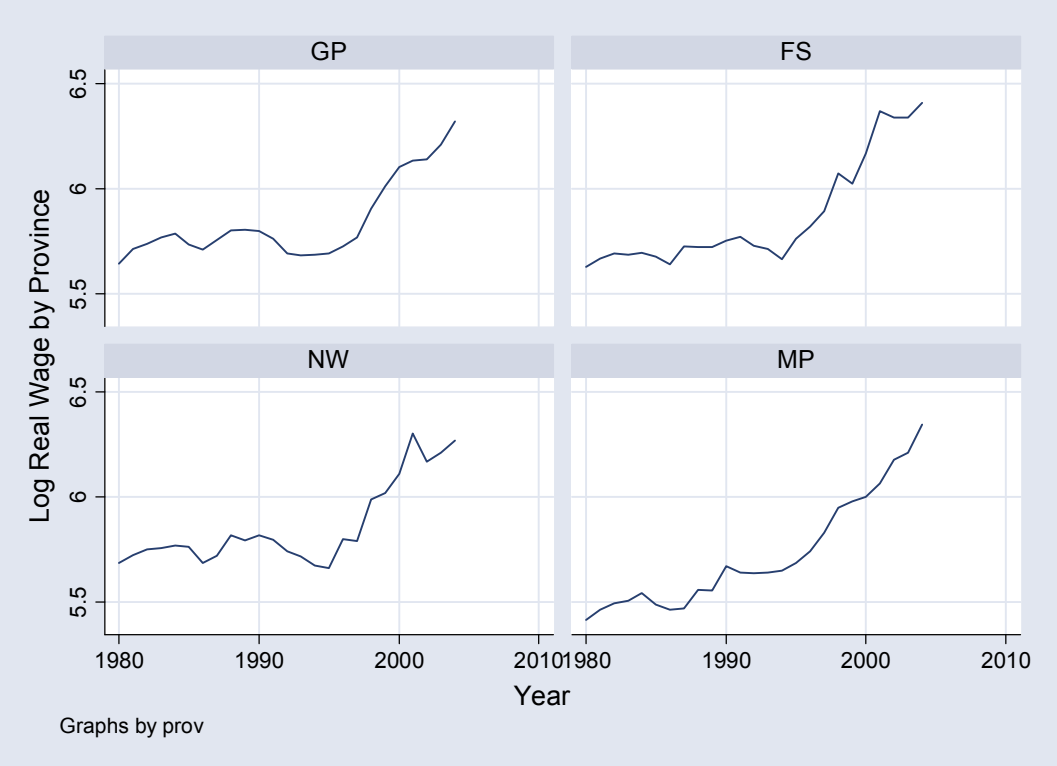

Figure 2: Real wages in the gold mining industry, by province, 1980-2004. *Source: Department of Minerals and Energy*

The gold industry is in decline, as evidenced by the levels of gold output in figure 3. Between 1987 and 2004, gold output fell 45%. In 2004, output was its lowest since 1931 (Business Day 2005). Although there have been recent substantial rises in the dollar gold price, the appreciation of the Rand since 2001 has cancelled much of these gains. Furthermore, a key contributor to the decline of the South African industry is the increasing maturity of the mines, lower yields, and the resulting higher operating costs (Segal & Malherbe, 2000).

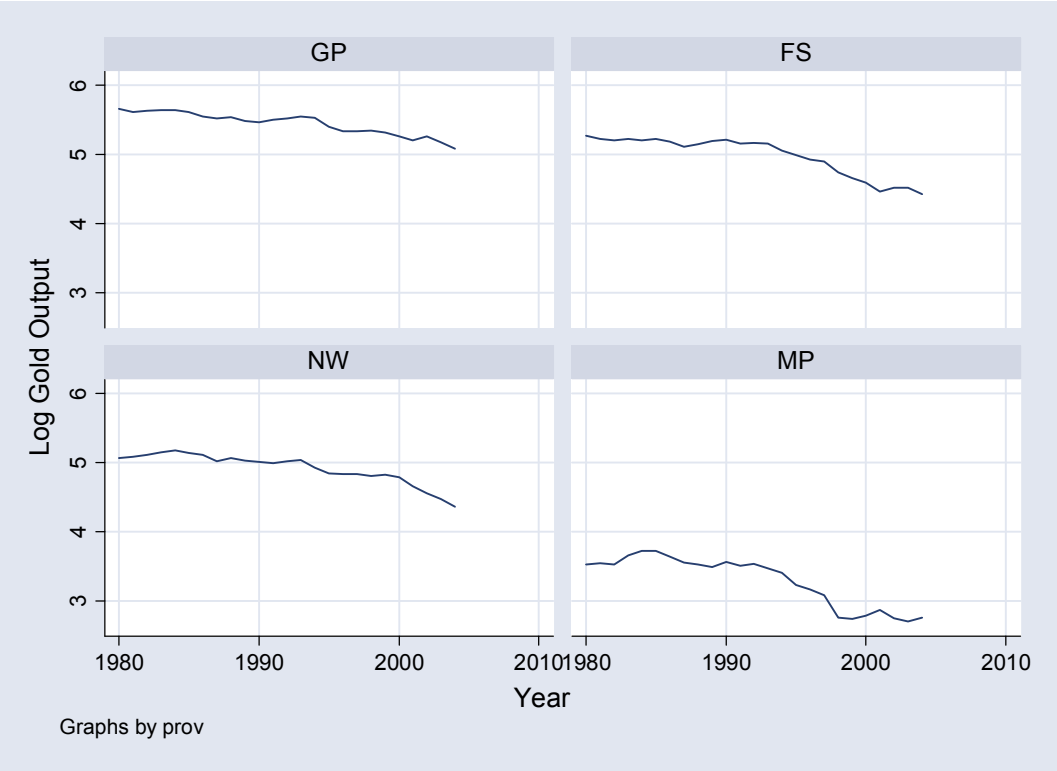

Figure 3: Gold output by province, 1980-2004. *Source: Department of Minerals and Energy*

The fall in gold output and rise in wages provide conventional explanations for the pattern of employment seen in figure 1. For an industry in decline, the optimal level of labour should fall over time. In the presence of adjustment costs, mines may not be able to retrench workers fast enough to achieve the static optimum for each period. It is in this context that the theory advanced by Shleifer & Summers (1988) is appropriate. It therefore remains to be seen whether, controlling for wages and output, merger activity may have accelerated the downward adjustment of the labour force closer to desired levels.

Merger activity in figure 4 occurs predominantly in the 10 years starting in the mid 1990s. Mergers do appear to coincide with periods of pronounced employment falls, especially in Mpumalanga.

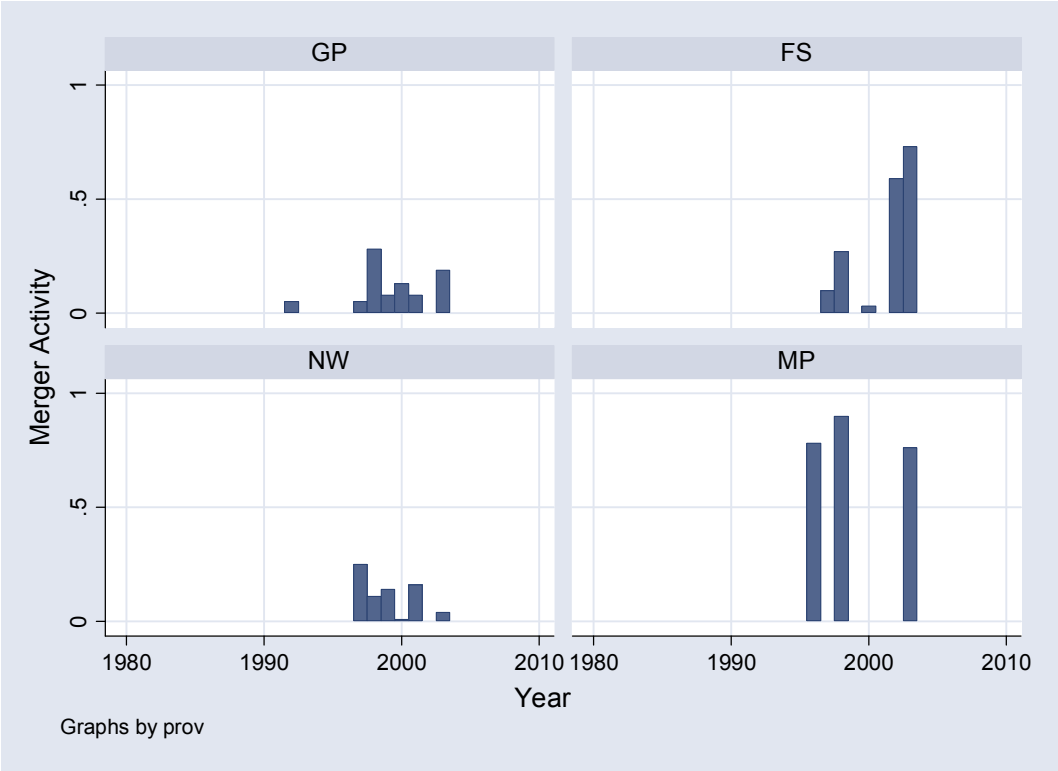

Figure 4: Indicators of merger activity, by province, 1980-2004. *Source: South African Mining Industry. Authors' calculations.*

A potential obstacle to consistent estimates of the merger variable is endogeneity bias. Mergers may occur because some firms may be inefficient and carrying too much labour, or they may take place in times when the industry requires consolidation. This is not necessarily inconsistent with the Schleifer & Summers (1988) view, but may still bias the coefficient estimates.

However, we believe the major source of endogeneity does not exist in our study. Segal and Malherbe (2000) note various reasons why restructurings can be value-enhancing in mining. The reason behind the M&A boom in gold mining and elsewhere is overwhelmingly the opening up of South Africa's capital market and the relaxation of exchange controls. Because of exchange controls, many firms sought diversification in their mining activities as a substitute for geographical diversification. The lifting of exchange controls saw the end of the diversified mining house as firms concentrated on their core capabilities and sought cheaper sources of capital abroad. The timing of the M&A activity and choices of which firms to buy or sell were driven by broader strategic issues and not labour related issues, so we believe the endogeneity problem is limited.

Figures 1-3 suggest the data are strongly trended and/or non-stationary. The wage data in particular exhibit evidence of a structural/trend break. The next section formally tests for unit roots and cointegration.

5. TESTING FOR UNIT ROOTS AND COINTEGRATION

The graphical analysis has suggested employment, wages and output may be integrated. In a panel data setting with a small cross sectional dimension, regressions are potentially spurious if the series for even one province have unit roots. The series should therefore be tested for their order of integration. There is *a priori* no problem with testing each series individually, especially if there are not many series to test. However, the cross-sectional dimension of a panel can sometimes be exploited in so-called panel unit root tests. For reviews of the literature, see for example Banerjee (1999) or Baltagi (2005).

While techniques for exploiting the cross section dimension for unit root tests are growing in sophistication, there are a number of reasons why such tests are not used here. The majority of papers rely on asymptotic theory in both the T and N dimensions. While many papers present finite sample adjustments, critical values are not presented for the cases where $N<10$.[4] This means the critical values, empirical size and power properties are unreliable. In all likelihood, the gains in power are limited for such a small N.

Another difficulty is contemporaneous correlation in the error terms between each series (see for example Jönsson, 2005). This reduces the scope for power gains and affects the size properties of the tests. Because all the provinces are subject to the same macro-economic and gold industry features, cross sample correlation in errors is likely to be a major issue in this application. Finally, the presence of the breaks we have seen in the data is likely to invalidate most tests. There has been work on levels shifts (Im, Lee & Tieslau, 2005) but not on trend breaks / regime shifts. Finally, tests that have a unit root for all N as null generally have the alternative hypothesis that not all series have a unit root rather than that no series have a unit root (Im, Pesaran & Shin, 2003). This is important as it is difficult to be sure that the series are not I(2) by testing their differences for a unit root. While work continues on addressing these and other issues, to our knowledge, none deals with them simultaneously and not for very finite samples.

Therefore, we investigate unit roots in each province individually using the Perron (1989) test to allow for an exogenous structural break and/or regime shift. This is quite plausible as the graphs clearly show the break in the case of wages for example and the sources of shocks are easily identifiable as the exogenous change of government in 1994 and the exogenous factors affecting the gold industry in 1997/1998.

[4] One exception is an early test by Tayor & Sarno (1998)

Focussing on wages first in Table 1 in the Appendix, we choose a model corresponding to model B in Perron (1989), where there is only a break in the trend and not in the intercept. We easily fail to reject the hypothesis of a unit root. In the differenced data, allowing for a break in the mean ("Crash" model A) we convincingly reject the unit root hypothesis and conclude that wages are I(0). Although the breaks are less obvious for the other series, we employ model C (potential trend and levels breaks) for employment and output. We fail to reject a unit root for employment (labour) and reject the unit root on the differenced series, although marginally for province 1. Gold has additional entries for provinces 2 and 4 because it is not obvious whether the biggest break occurred in 1994 or 1997 (only allowing for 1 break is a shortcoming of this test). There are also additional entries because the most appropriate lag selection is not clear. While we fail to reject a unit root for gold in levels, some statistics come close. We reject the hypothesis of a unit root in the differenced data. Although the possibility that gold output is merely trended with small shifts, we choose to model it as I(1).

Tests for cointegration in panels have also been developed (for example Pedroni, 1999) but, for reasons analogous to those for unit root testing, we choose to employ three more conventional time series tests. Results of the Johansen (1991) cointegrating rank tests in Table 2 suggest wages, output and employment are cointegrated, consistent with a static long run labour demand relationship[5]. Assuming only a constant in the cointegrating relationship, the maximum eiegenvalue statistic rejects the hypothesis of no cointegration at at least 10% significance while the trace statistic does so for three of the four provinces. Similarly, assuming a trend in the relationship rejects the hypothesis of no cointegration for all provinces (trace) and three of the four provinces (maximum eigenvalue). The reasonably strong evidence of cointegration, coupled with a strong theoretical interpretation, suggests (1.1) can be estimated without obtaining a spurious correlation.

6. RESULTS

Table 3 presents the results of the pooled OLS estimates. Panels I and II are estimated and presented in ARDL form, with the long run coefficients calculated. This familiar representation reveals the desirable convergence characteristics of a negative coefficient on wages and a positive coefficient on lagged wages. The merger variable is significantly negative. Taken literally, the coefficient suggests that a merger involving 15% of provincial output would reduce employment by approximately 1% in that year. Because it is an industry is in decline, these jobs could eventually be lost slowly over time, so we don't present a long run merger effect nor speculate what the effect would be over multiple periods.

[5] We also tested whether output and employment are cointegrated themselves in a long run production relationship but evidence for this is substantially weaker.

An alternative interpretation of the merger coefficient is that it merely captures the accelerated employment decline in the late 1990s, with which much merger activity happens to coincide. To accommodate this view, we include a dummy to represent the post 1997 period in panel II. While significant, the break dummy fails to unseat the significant merger dummy and is most likely capturing the effects of accelerated wage increases, as evidenced by lower coefficients on the wage variables.

Panel III would give precisely the same coefficients if we didn't lose observations from differencing; it makes clear the appealing interpretation of labour adjusting slowly to the long run equilibrium because of adjustment costs but instantaneously falling when a merger takes place and removes some of these adjustment costs. We also include Ericsson & MacKinnon (2002) critical values for the lagged labour term, which can be interpreted as an informal cointegration test on pooled data in the spirit of Banerjee et. al. (1993) and Banerjee (1998) for individual time series. The ECM formulation finds support for cointegration.

While the estimates in panels I-III have many desirable properties in terms of coefficient signs, the long run coefficients are slightly on the low side. In accordance with standard producer theory, we expect the coefficient on output to be close to unity and on wages to be close to 0.5. The latter is based on the industry-wide phenomenon that labour costs comprise half of total costs (Handley, 2004). Omitting the trend and or break terms would increase the long run wage coefficients, but panel IV presents long run coefficients close to theoretical expectations estimated by the two-step (Engle-Granger, 1987) method[6]. This has the added advantage of allowing us to model the trend term explicitly as part of the cointegrating vector, whereas we have imposed no such restriction on the previous estimates.

From inspection of the long run and impact coefficients in IV, it appears that much of the adjustment to wage changes happens almost instantaneously while only half the adjustment to changes in output occurs within that year. In the context of a declining industry, this suggests firms have excess labour. The significant merger variable is consistent with the view that some of this excess labour can be reduced after a merger. The break term is no longer significant while the merger coefficient is slightly larger.

Various additional steps were taken to gauge robustness. Pesaran & Smith (1995) warn that heterogeneity across the panel may bias the long run coefficients. However, even province specific controls appear unnecessary, as evidenced by the province dummies in regressions I-IV. Also, this panel is very unlikely to have heterogeneous characteristics relative to other panels as it consists entirely of gold mines using the same technology. Nonetheless, the graphical analysis reveals some potential differences in the trends and breaks. Therefore, seemingly unrelated regressions for each of the four provinces were run. The results are

[6] Analysis of the residuals for both the pooled data and each individual series does not find evidence of cointegration, possibly because of power weaknesses relative to other methods.

not reported in the interest of space, but yield an average coefficient on mergers of -0.154. A Wald test finds the merger variables jointly significant at 10%.

Finally, we run Prais-Winston (1954) estimates to allow for potential heteroskedasticity, cross-sectional contemporaneous correlation and panel specific AR(1) errors. These too find the merger dummy significant and of the same order as the results presented. Details are available from the authors on request.

7. CONCLUDING DISCUSSION

While there is both public and official concern over job losses associated with mergers, economic theory is ambiguous. Some theories suggest mergers allow for workers to share in an overall gain in the surplus. The Schleifer & Summers (1988) breach of trust argument falls into the class of model that claims most of the gains to shareholders are a transfer from employees.

Our results consistently show a significant negative effect of mergers on employment. The coefficient values in the labour demand specifications support the view that the presence of adjustment costs delays the adjustment of labour quantities to equilibrium. In the context of a declining industry, the results are consistent with the view that mergers provide an opportunity for firms to reduce labour quantities closer to optimal levels.

The coefficients of -0.071 to -0.079 in panels I-III match the values of -0.067 for related mergers and -0.079 overall found by Gugler & Yurtoglu (2004) for Continental Europe. Given the rigidities similarly observed in South Africa, the results support the view that employment losses are more likely to take place in rigid labour markets. These results suggest an immediate employment effect of mergers but do not account for the gradual labour shedding that would have occurred in a declining industry and we cannot know the firms' counterfactual employment decisions. Perhaps the short term job losses prolong the survival of the firms through increased productivity, although Schelifer and Summers (1988) argue a breach of implicit contracts has a negative dynamic productivity effect.

The empirical evidence suggests a link between the rigidity of labour markets and merger-related job losses. South Africa's extreme unemployment shows the labour market is ill-equipped to absorb those who want work. Sudden large retrenchments are likely to give those who have lost their jobs an even smaller chance of finding another job than if layoffs had been gradual. This is especially so in regions where a gold mine is a major source of employment. In a country with no generous unemployment insurance scheme, immediate retrenchments associated with mergers imply an additional welfare loss for workers relative to gradual retrenchments.

However, awareness of the welfare losses can create policy responses that try to prevent merger-related retrenchments. In addition to standard legislation, the South African competition authorities are tasked with taking measures to reduce employment effects. For example, they imposed limits on the number of permitted retrenchments for certain categories of workers as a condition for approval of the unsuccessful Harmony / Gold Fields merger (Republic of South Africa, 2005).

Insofar as similar legislation exists in Continental Europe, it may explain why estimated employment losses there are lower than for the United Kingdom. Legislative responses to merger-related retrenchments may reduce the scope for breaking implicit contracts after a takeover in the future.

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APPENDIX

series	alpha	s.e	statistic	1%	5%	10%	lags	break	lambda
wage1B	0.8941288	0.0756177	-1.40	-4.57	-3.95	-3.66	1	1994	0.6
wage 2B	0.8759178	0.11247	-1.10	-4.57	-3.95	-3.66	0	1994	0.6
wage3B	0.8303466	0.1286813	-1.32	-4.57	-3.95	-3.66	0	1994	0.6
wage 4B	0.8979273	0.1352595	-0.75	-4.57	-3.95	-3.66	0	1994	0.6
labour1C	0.6113633	0.149699	-2.60	-4.75	-4.18	-3.86	1	1997	0.7
labour2C	0.722431	0.1172868	-2.37	-4.75	-4.18	-3.86	1	1997	0.7
labour3C	0.4783378	0.1802485	-2.89	-4.75	-4.18	-3.86	0	1997	0.7
labour4C	0.702463	0.1282774	-2.32	-4.75	-4.18	-3.86	0	1997	0.7
gold1C	0.1736652	0.2306359	-3.58	-4.88	-4.24	-3.95	1	1994	0.6
gold2C	0.2985576	0.2072495	-3.38	-4.88	-4.24	-3.95	0	1994	0.6
gold2C	0.057388	0.2739325	-3.44	-4.88	-4.24	-3.95	1	1994	0.6
gold2C2	0.4929809	0.1850729	-2.74	-4.75	-4.18	-3.86	0	1997	0.7
gold3C	0.437063	0.1847405	-3.05	-4.88	-4.24	-3.95	1	1994	0.6
gold4C	-0.0850066	0.2825641	-3.84	-4.88	-4.24	-3.95	2	1994	0.6
gold4C	0.2055296	0.2211641	-3.59	-4.88	-4.24	-3.95	1	1994	0.6
gold4C2	0.2991239	0.1842749	-3.80	-4.75	-4.18	-3.86	2	1997	0.7
d_wageA1	-0.0285232	0.2489036	-4.13	-4.45	-3.76	-3.47	1	1994	0.6
d_wageA2	-0.9741759	0.3230853	-6.11	-4.45	-3.76	-3.47	1	1994	0.6
d_wageA3	-0.4099961	0.199273	-7.08	-4.45	-3.76	-3.47	0	1994	0.6
d_wageA4	-0.1916059	0.2221537	-5.36	-4.45	-3.76	-3.47	0	1994	0.6
d_labourA1	0.0407341	0.2687757	-3.57	-4.42	-3.8	-3.51	2	1997	0.7
d_labourA2	0.1166396	0.2236084	-3.95	-4.42	-3.8	-3.51	0	1997	0.7
d_labourA3	-0.0297594	0.2211397	-4.66	-4.42	-3.8	-3.51	0	1997	0.7
d_labourA4	0.0212014	0.2689426	-3.64	-4.42	-3.8	-3.51	1	1997	0.7
d_goldA1	-0.3444838	0.2989538	-4.50	-4.45	-3.76	-3.47	0	1994	0.6
d_goldA2	-0.0666371	0.2185261	-4.88	-4.45	-3.76	-3.47	0	1994	0.6
d_goldA22	0.0867872	0.2163909	-4.22	-4.42	-3.8	-3.51	0	1997	0.7
d_goldA3	0.1369031	0.2178765	-3.96	-4.45	-3.76	-3.47	0	1994	0.6
d_goldA4	0.1187682	0.2249552	-3.92	-4.45	-3.76	-3.47	0	1994	0.6
d_goldA42	0.0867872	0.2163909	-4.22	-4.42	-3.8	-3.51	0	1997	0.7

Table 1: Results of Perron (1989) unit root test. 1,2,3&4 refer to the provinces. A,B & C refer to model adopted. d_ refers to differenced data. Alpha is coefficient on unit root regression. Critical values taken from Perron (1989) based on the timing of the break as a proportion of the sample (lambda).

Province	Maximum Rank	Constant Only		Restricted Trend	
		Trace Statistic	Eigenvalue Statistic	Trace Statistic	Eigenvalue Statistic
1	0	31.82	24.02	54.82	32.3
	1	7.8	7.78	22.52	15
2	0	33.04	23.3	48.21	24.75
	1	9.74	8.48	23.46	16.03
3	0	25.42	19.14	52.05	38.99
	1	6.28	5.94	13.06	7.92
4	0	27.89	19.23	39.56	21.16
	1	8.66	7.97	18.4	11.69
5% critical value	0	29.68	20.97	42.55	25.54
	1	15.41	14.07	25.32	18.96
10% critical value	0	26.79	18.6	39.06	23.11
	1	13.33	12.07	22.76	16.85

Table 2: Johansen rank tests for cointegration. Critical values taken from Osterwald-Lenum (1992). We allow for 2 lags in the VAR.

	I			II		
Dependent variable	Labour			Labour		
	coefficient	t	P>t	coefficient	t	P>t
Labour(-1)	0.765	12.81	.	0.738	12.23	
Gold	0.349	3.09	.	0.356	3.20	
Gold(-1)	-0.193	-1.59	.	-0.203	-1.70	
ΔGold						
Wage	-0.444	-3.80	.	-0.352	-2.83	
Wage(-1)	0.369	2.96	.	0.308	2.43	
ΔWage						
merger	-0.079	-1.90	0.061	-0.071	-1.73	0.087
year	-0.007	-3.34	0.001	-0.006	-2.92	0.005
Break97				-0.059	-1.94	0.055
_Iprov_2	0.013	0.34	0.738	0.004	0.09	0.926
_Iprov_3	-0.055	-1.29	0.201	-0.071	-1.67	0.098
_Iprov_4	-0.136	-0.81	0.418	-0.193	-1.16	0.251
_cons	15.670	3.590	0.001	14.227	3.27	0.002
R^2 adj			0.995			0.995
Long run coefficients						
Gold	0.664			0.585		
Wages	-0.318			-0.167		
year	-0.028			-0.022		
	III			IV		
Dependent variable	ΔLabour			ΔLabour		
	coefficient	t	P>t	coefficient	t	P>t
Labour(-1)	-0.261	-4.32	0.012*			
Gold(-1)	0.152	1.76	.			
Wage(-1)	-0.043	-0.50	.			
ΔGold	0.356	3.20	0.002	0.452	3.9	0.000
ΔWage	-0.352	-2.83	0.006	-0.478	-3.79	0.000
merger	-0.071	-1.73	0.087	-0.088	-1.99	0.050
year	-0.006	-2.91	0.005	-0.003	-1.48	0.143
Break97	-0.059	-1.94	0.055	-0.007	-0.41	0.683
_Iprov_2	0.003	0.09	0.929	-0.030	-1.24	0.218
_Iprov_3	-0.071	-1.67	0.099	-0.001	-0.04	0.966
_Iprov_4	-0.193	-1.15	0.252	-0.002	-0.08	0.937
_cons	14.211	3.26	0.002	0.003	0.17	0.865
Z				-0.142	-2.04	.
R^2 adj			0.476			0.366
Long run coefficients						
Gold	0.584			0.964		
Wages	-0.165			-0.457		
year	-0.022			-0.007		

Table 3: Results of labour demand estimates. I and II are estimates of equation (1.1) where long run coefficients are calculated. III estimates equation (1.4). The coefficient on Labour(-1) is interpreted as the error correction term and long run coefficients are calculated. IV estimates the long run coefficients by regressing employment on output, wages, gold and a trend while Z is the residual from this regression. * p value calculated using program for individual time series supplied with Ericsson & MacKinnon (2002) ; significance suggests cointegration.