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Abstract

It is commonly claimed that the South African labor market is unusually inflexible owing to the strength of the country's unions and the system of centralized collective bargaining. One sign of labor market inflexibility is low responsiveness of wages to local unemployment. Analyzing data from the South African Living Standards Survey, the authors find that the elasticity of wages with respect to local unemployment rates in South Africa in 1993 was about –0.1. The similarity of this elasticity to that found in other countries, including the United States and the United Kingdom, is surprising given South Africa's national unemployment rate of over 30%. The wage curve elasticity persists over a much wider range of unemployment rates in South Africa than in OECD countries, implying that unemployment in South Africa can have a large impact on wages.

KEYWORDS: wage responsiveness to unemployment, South Africa

HOW FLEXIBLE ARE WAGES IN RESPONSE TO LOCAL UNEMPLOYMENT IN SOUTH AFRICA?

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It is commonly claimed that the South African labor market is unusually inflexible owing to the strength of the country's unions and the system of centralized collective bargaining. One sign of labor market inflexibility is low responsiveness of wages to local unemployment. Analyzing data from the South African Living Standards Survey, the authors find that the elasticity of wages with respect to local unemployment rates in South Africa in 1993 was about –0.1. The similarity of this elasticity to that found in other countries, including the United States and the United Kingdom, is surprising given South Africa's national unemployment rate of over 30%. The wage curve elasticity persists over a much wider range of unemployment rates in South Africa than in OECD countries, implying that unemployment in South Africa can have a large impact on wages.

South Africa has very high unemployment. Depending on the definition used, the national unemployment rate in March 2003 was 31% or 42% (StatsSA 2003). This high unemployment may well be the result of a rapidly growing labor force, on the one hand, and declining formal employment, on the other: the labor market may lack the flexibility to cope with this divergence (Lewis 2002; Moll 1993; Boccara and Moll 1997; Fallon and Lucas 1998).

Indeed, there are reasons to expect that the South African labor market is unusually inflexible. Based on surveys of company officials, the World Economic Forum's 1999 *Global Competitiveness Report* (Tables 7.02–7.05, 7.09) ranked South Africa at the bottom of its 59-nation comparison on the extent to which labor regulations respecting wages, hours, and dismissals favored flexibility. The trade union movement is apparently powerful and allied with the government. Moreover, there is an institutional framework—the Bargaining Coun-

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The SALDRU data used in this paper can be made available by the authors. Contact Geeta Kingdon, Department of Economics, University of Oxford, Oxford, OX1 3UQ. Tel: 44 1865 271065; Fax: 44 1865 271094; email: geeta.kingdon@economics.ox.ac.uk.

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cils and the Wage Boards—to set minimum wages in parts of the formal sector. However, recent research, examining the union–non-union and bargaining council–non-bargaining council wage differentials, has found this source of inflexibility to be minor: these studies estimate the union premium to be similar to that found in other countries, including the United States and the United Kingdom (Schultz and Mwabu 1998; Butcher and Rouse 2001).

Another potential test of labor market inflexibility is the responsiveness of wages to local labor market conditions. Our purpose is to measure this responsiveness by examining the spatial relationship between wages and unemployment. The estimated elasticity of the wage with respect to the local unemployment rate can then be compared with the elasticities found in other countries.

There is accumulating evidence of a negative relationship between local unemployment and wages in various economies. This relationship has been called the "wage curve" (illustrated as *WC* in Figure 1) and claimed as an empirical "law" of economics by Blanchflower and Oswald (1994). Using mesoeconomic analysis,[1] Blanchflower and Oswald presented an impressive array of evidence in favor of the wage curve from the United States, United Kingdom, and some other OECD countries. The evidence showed that, *ceteris paribus*, wages were negatively related to contemporaneous unemployment, and that the unemployment elasticity of the wage was approximately –0.1, so that a 10% increase in unemployment led to a 1% decrease in wages.[2] Carruth and Oswald (1987) and Blanchflower and Oswald (1990) provided theoretical models of the labor market consistent with the wage curve. In a searching review article, Card (1995) did not contest the validity of the wage curve, taking issue instead only with the interpretation of the results and the robustness of the elasticity.

In developing countries, by contrast, the relationship between wages and unemployment has generally been analyzed in the context of probabilistic models of migration. (Harris and Todaro [1970] is generally credited with having been the first important entry in a vast literature, mainly theoretical.) Unemployment is viewed as the equilibrating variable in a labor market characterized by segmentation and wage inflexibility: high urban wages attract high urban unemployment. The presumption is that unemployment is a function of the wage and not vice-versa. There has been little testing of either causal relationship in developing countries using microeconomic datasets. There are two notable exceptions. Hoddinott (1996), contrary to the prediction of probabilistic migration models, found evidence of a wage curve in urban Cote d'Ivoire, with an elasticity similar to those in OECD economies, and Van der Meulen Rodgers and Nataraj (1999) adduced evidence of a long-run wage curve in Taiwan.

The object of this paper is to test for the wage curve relationship in a developing country with very high unemployment. We use data from South Africa, where the average unemployment rate exceeds 30%—several times the typical OECD unemployment rate and twice that in urban Cote d'Ivoire. If a wage curve can be shown to exist in South Africa, this will throw further doubt on the importance in practice of probabilistic models of migration (which imply a positive association) in developing countries (Banerjee 1983). If a wage curve is found, an important question will be whether wages are as flexible at the high South African unemployment rate as in other countries.

There are two further reasons why the finding of a wage curve in South Africa would be of interest. First, when unemployment is very high, its definition itself becomes an issue. In these conditions, the proportion of people actively searching for work is likely to depend on the number desiring work. If many unemployed people

[1]Applying microeconomic data and methods to macroeconomic questions.

[2]This finding is now corroborated by evidence from a large number of OECD countries.

stop actively searching for work because they become discouraged, then it may be misleading to measure the unemployment rate by considering as unemployed only those who actively looked for work, that is, by the "narrow" definition. The wage curve can help us choose among alternative definitions of unemployment by showing which measure of the unemployment rate is more important in explaining wages. If, as an ILO report on the South African labor market suggested (Standing, Sender, and Weeks 1996:104), those desiring work but not actively seeking it (included in the "broad" definition of unemployment) are outside the labor force, we would expect the wage curve to be steeper for narrow than for broad unemployment.

Second, the wage curve can have implications for poverty: a negative relationship may mean that high unemployment in a locality has not only a direct effect on poverty among its households but also an indirect effect via the lower wages of their employed members.

Unemployment and Wages: Theory

Two main varieties of explanation for a negatively sloped wage curve $W = f(U, \ldots)$ have been suggested in the literature. One is the incentive wage hypothesis that profit-maximizing firms choose to set the wage above the competitive level in order to influence the behavior of their employees. This is normally presented along the lines of the Shapiro-Stiglitz (1984) efficiency wage model, to which imperfect monitoring and the need to prevent shirking are central. Workers have little incentive to put in effort if the cost of shirking is low. Firms respond by raising the wage above the market level so as to increase the cost of job loss. If local unemployment is high, the difficulties of finding work are great and workers are afraid of dismissal. This acts as a disciplining device, so that it is not necessary for firms to pay such high efficiency wages. The profit-maximizing efficiency wage is therefore inversely related to the unemployment rate. This wage curve has been termed the "no-shirking" curve since it shows the wage just high enough to deter workers from shirking. Another incentive wage mechanism concerns firms' training costs, which depend on the rate of labor turnover (Stiglitz 1974). Firms raise wages above the competitive level to discourage voluntary quits. However, high local unemployment increases workers' expected costs of quitting, so decreasing the profit-maximizing wage and giving rise to a negatively sloped wage curve.

The second hypothesis to explain the wage curve draws on the union bargaining model. High local unemployment frightens workers and weakens their bargaining power in negotiations over rent-sharing. If trade unions worry about their unemployed as well as their employed members, then negotiating unions may place greater weight on employment and less on wage objectives where local unemployment is high and the chances of finding employment consequently low. The wage curve accordingly has a negative unemployment elasticity.

Labor economists have used the notion of compensating differentials to hypothesize that wages and unemployment are positively correlated across space. In fact, this hypothesis was developed in an African context and formalized in a model by Harris and Todaro (1970): high wages in a locality attract more workers to it until unemployment rises sufficiently to equalize the "expected wage" across localities. The relationship, representing $U = g(W, \ldots)$, $g' > 0$, is depicted by the curve HT in Figure 1. However, that is not what researchers have found in other countries: the negative wage curve, interpreted as $W = f(U, \ldots)$, $f' < 0$, is depicted by WC in the figure. The two relationships are not mutually incompatible. The HT relationship may indeed prevail in the long run, but labor may not be sufficiently mobile for HT to be observed in the short run. The long-run effect can be set aside by the inclusion of locality dummy variables in the wage equation, so permitting the short-run wage curve WC to be isolated (Blanchflower and Oswald 1994:93; Hoddinott 1996:1613–14).

What would be the shape of the wage curve if wages were entirely market-deter-

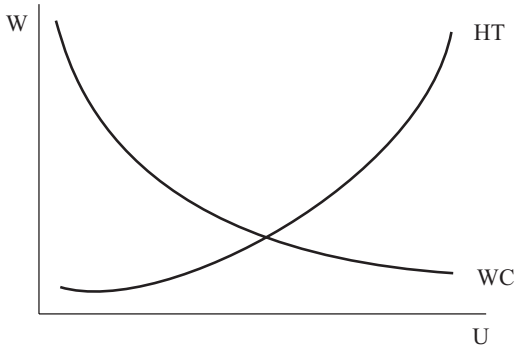

Figure 1. Schematic Representation of the "Wage Curve."

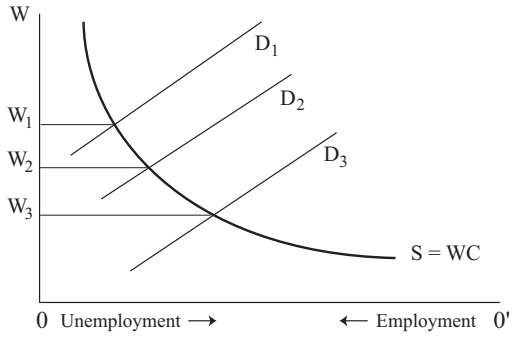

Figure 2. The Wage Curve When Wages Are Assumed to Be Market-Determined and Labor Is Assumed to Be Immobile.

mined? This question is relevant to our hypothesis tests, some of which compare non-market with market outcomes. If labor is perfectly mobile, a single market wage is established in equilibrium (apart from compensating differences for local amenities). However, the (voluntary) unemployment rate is also invariant (apart from differences arising from local tastes). The outcome is likely to be a wage blob rather than a curve. If labor is perfectly immobile, as is assumed in Figure 2, local labor demand curves differ in relation to local labor supply, causing market-clearing wages to differ across labor markets (W_1, W_2, and W_3 in the figure). In response, voluntary (shirk) unemployment may vary inversely with the wage: in market equilibrium a conventional wage curve can result. Imperfect mobility of labor tends to reduce, but does not eliminate, the wage differences between W_1, W_2, and W_3, and voluntary unemployment can again generate a negatively sloped wage curve.

Despite the presumption in the literature that the negative wage curve relationship should be interpreted as $W = f(U, \ldots)$, that is, that the direction of causation is from unemployment to wages, it is possible that a negatively sloped wage curve represents the effect of the wage on involuntary unemployment. In Figure 3 the supply curve S can be downward-sloping (shirk unemployment) or upward-sloping (search unemployment), but for clarity it is assumed to be vertical, that is, there is a fixed amount of voluntary unemployment. The three different local demand curves would produce market-clearing wages W_1, W_2, and W_3. However, assume that incentive wage determination, or institutional wage determination, or bargaining (conducted at a non-local level or based on comparisons) raises the wage above the market equilibrium in localities where the latter is low. The lower the market-clearing wage, the greater the gap. This can then generate a downward-sloping ($cd > ab$) wage curve WC based on involuntary unemployment, as shown in the figure. We call this the intervention-premium interpretation of the negative relationship $U = f(W, \ldots)$.

The South African Context

In the apartheid years, the organizational power of African workers and their freedom of movement were heavily curtailed. Permanent urban settlement of rural people was prevented and even temporary labor migration was regulated to keep supply in line with demand. In particular, the residents of the so-called “homelands”—accounting for over half of the African population—faced limited employment opportunities and had negligible bargaining

power. Knight (1982) argued that there was much disguised unemployment in the homelands that reflected the above-market wage in the formal sector (governed by incentive wage and institutional wage determination) and the consequent rationing of formal sector jobs.[3] By 1993—the year of our survey—the influx control regulations had been repealed, all workers were free to organize, and trade unions were generally recognized.

Trade unions play a role in wage determination in South Africa. Their impact was explored by Schultz and Mwabu (1998) using the 1993 data set and by Butcher and Rouse (2001) using 1995 October Household Survey data. In both of these studies, African unionized workers were found to receive a wage about 18–20% higher than that received by African non-union workers with the same observed characteristics. Although firm-level bargaining occurs as well, minimum wage floors are set in many industries via the agency of Bargaining Councils (BCs) or Wage Boards (WBs).[4] BCs are formed if enough employers in a particular sector and area get together and negotiate. The minimum wage agreements reached through collective bargaining within BCs are usually extended to employers in the industry and area who are not parties to the negotiations. Where BCs operate, workers enjoy minimum wages and the union-nonunion distinction is less important: Butcher and Rouse (2001) estimated that coverage by a BC agreement raises African wages by about 10%.

WB determinations cover some of the industries not organized in BCs or, if a BC exists, some parts of the country not covered by the BC. In 1993, 26% of the formal sector employees were covered by BCs or WB determinations, another 31% (in mining and the public services) were also subject to minimum wages, and 54% of the formal sector employees were unionized. The commercial agriculture and domestic service sectors were effectively outside these institutions at the time of the 1993 survey.[5] Although BCs and WBs may limit wage flexibility, it should be noted that most of these institutions are sub-national and impose local rather than national wage minima. For instance, in 1996, if the highest minimum wage for laborers in the clothing industry is set equal to 100, minimum wages in that industry ranged from 97–100 (BCs in the main metropolitan areas) to 69–76 (BCs in particular non-metropolitan areas) to 30–36 (WBs in particular undeveloped, labor-surplus areas).

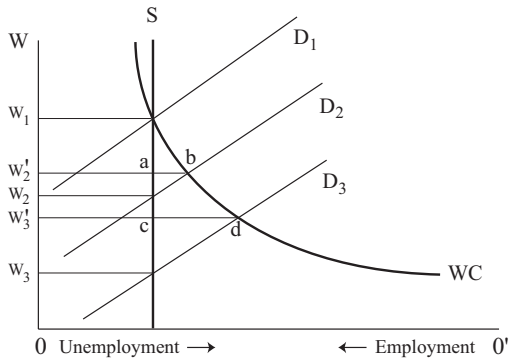

Figure 3. Market-Clearing Wages with Different Local Demand Curves.

Data, Model, and Tests

The data for this study come from the South African Living Standards Survey, collected jointly by the World Bank and the South African Labor and Development Research Unit (SALDRU) at the University

[3]Kingdon and Knight (2004) found that much of unemployment in contemporary South Africa is involuntary.

[4]Bargaining Councils were previously known as "Industrial Councils."

[5]The data sources are Central Statistical Service (1994:2.92, 2.146, 5.3, 5.4) and Standing, Sender, and Weeks (1996:145).

of Cape Town in the second half of 1993. This integrated household survey, patterned on the World Bank's LSMS surveys, produced cross-section data on 8,848 households in 360 clusters. The sample was stratified by province, and used a two-stage self-weighting design in which clusters were selected with probability proportional to size, and an equal number of households were selected from each cluster. The data contain detailed information on sample adults' labor force participation, employment status, earnings (wages as well as housing and transport subsidy, bonuses, and in-kind payments), hours worked in the past week, job-search activity, occupation, industry, and employer type. Moreover, data are also available on food prices by cluster and on a number of individual and household demographic characteristics.

There is no *a priori* guidance about what geographical boundaries are appropriate for dividing up the country into "local" labor markets for the purposes of wage curve analysis. In the United States, a meaningful and convenient definition of the "local" labor market may be the state: variations in state labor laws probably lead to "different" state labor markets, data are routinely collected stratified by state, and there are more than 50 states. In South Africa, at the time of the survey, new labor market boundaries were probably emerging as a result of the abolition of apartheid laws such as the Group Areas Act and the Influx Control Act, which previously limited the mobility of many Africans. Thus, it is not clear what geographical boundaries constituted meaningful "local" labor markets in 1993.

Our decision was governed by the data. There are only 14 provinces by the old definition and only 9 by the new definition. Given that our dataset is a cross-section, the number of province-level unemployment rate observations available is too small for precise inferences to be drawn. Both district and cluster boundaries are available, but the use of the cluster is preferable because the number of clusters in the dataset (360) is about double the number of districts (187).[6] There is a danger that the geographical unit chosen will contain heterogeneous labor market conditions. However, the choice of the cluster as the unit (representing an average population of 21,000, corresponding to a town or a city) is likely to ensure that each cluster forms, or is part of, a single local labor market.[7]

For the link between local unemployment and local wages to be meaningful, it is important that a worker living in a particular local labor market also work in that local labor market. The fact that the local labor market as defined for the wage is potentially broader than that as defined for unemployment introduces a potential source of error. Unfortunately, there is no information in the dataset on distance to work to enable us to determine whether an individual works in the cluster of residence.[8]

The cluster-level "broad" unemployment rate has been calculated as follows: in each cluster, let the "broad" labor force partici-

[6]While cluster characteristics and cluster prices are available in the dataset, there is no information on district characteristics and district prices except by aggregation of cluster characteristics. Furthermore, the district unit aggregates rural and urban areas—several districts have both rural and urban clusters in them—which may represent very different types of labor market. Clusters, being smaller geographical units, are likely to represent more homogeneous labor markets.

[7]It need not matter that the cluster may be smaller than, and only part of, the local labor market: it can nevertheless be a representative sample drawn from that labor market. There are, on average, 50 (43) broad (narrow) labor force participants per cluster. We experimented to see whether the results were sensitive to cluster sample size. Restricting the sample to workers living in clusters with 20+ (or 40+) sampled workers made little difference to the estimated wage curve elasticities. As a further robustness test, we used a cluster unemployment rate calculated without the individual's contribution to it. Again, this made little difference to the estimated coefficients and the wage curve elasticity.

[8]But if we arbitrarily regard only those who work within 30 (and 60) minutes' traveling distance from home as working within the cluster, the estimated wage curve elasticity is larger than (roughly equal to) that for the whole sample.

pants comprise all employed persons and all unemployed persons, that is, those persons who did not work but were either looking for work in the past week or did not actively look for work in the past week because they believed there were "no jobs or work available." In accordance with these definitions, the "broad" unemployment rate (UnempRateB) is the ratio of the number of unemployed persons to labor force participants.[9] Broad unemployment includes the narrowly unemployed (those who searched for work in the past week) and discouraged workers (those desiring work but not actively searching in the past week). The narrow unemployment rate (UnempRateN) excludes non-searching workers from both the numerator and the denominator. It is thus the ratio of narrowly unemployed persons to persons who either worked or looked for work in the past week. While the narrow definition is the official one, in Kingdon and Knight (2006) we argued that non-searchers' failure to engage in active search reflects their perception that the benefits of search are low in relation to the costs, rather than any lack of desire for employment. Accordingly, we conduct our wage curve analysis using both measures.

For the purposes of estimating the wage function, we include in our analysis persons aged 16–64 who resided in the cluster in which their household was situated (a criterion that excludes seasonal migrants), in wage employment, and for whom wages, hours worked, cluster food prices, and cluster characteristics are available. This yields a sample of 6,498 individuals.[10]

The wage function estimated is of the form

$$\ln W_{ir} = \alpha + \beta X_{ir} + \gamma U_r + D_r + \varepsilon_{ir}, \quad (1)$$

where W_{ir} is the hourly wage rate for person i observed in the local labor market r, U_r is the unemployment rate in labor market r, D_r is a vector of province dummies, X_{ir} is a set of measured characteristics of individual i such as gender, education, marital status, race, region (that is, urban/rural and homeland), occupation, and potential experience, and ε_{ir} is an error term. The logarithm of the unemployment rate is not used on the right-hand side of the wage function because in some 7% of clusters the computed unemployment rate was zero.[11] In order to allow for the potential endogeneity of unemployment in the wage equation, we shall also conduct an instrumental variable estimation.

Figures 4 and 5 present a first look at the cluster-level data and help to check whether the shape of the wage curve is sensitive to outliers. It seems that the cubic form apparent in the simple correlation between wages and unemployment in Figure 4 occurs because of a few outliers. Figure 5 constrains both UnempRateB and wage to lie within two standard deviations of their respective mean values at the cluster level. It shows that when the few outlying observations are removed, the relationship is first downward-sloping and then approximately flat at very high rates of unemployment. However, we have not as yet controlled for other influences on the wage, and, in order not to impose a particular form on the unemployment-wage relationship *a priori*, we experiment with specifications contain-

[9]An individual-specific cluster unemployment rate was also calculated without the index individual's contribution to the cluster unemployment rate, that is, taking the index individual out of both the numerator and the denominator of the calculation. Using this rate made virtually no difference to the wage curve results.

[10]Of all "resident" persons aged 16–64 who reported working in the past week in wage employment (n = 8,118), earnings information is missing or incomplete for 941 individuals and hours worked information is missing for 144. Moreover, information on cluster food prices is missing for one cluster, leading to the loss of 53 wage employee observations. Finally, cluster characteristics are missing for 36 clusters altogether, which leads to the loss of a further 482 observations.

[11]Experimentation with imputing alternative small positive values to the zero unemployment rate observations showed that the estimated wage unemployment elasticity was quite sensitive to the choice of value imputed.

Figure 4. Unconstrained Cluster Data.

ing quadratic, cubic, and quartic terms of U_r.

Some specification issues bear discussion. The inclusion of regional fixed effects in the wage equation is generally preferred because it allows the permanent component of the wage to have a correlation with the permanent component of unemployment, and uses only the deviations of unemployment and wage from their average values to estimate the wage curve elasticity. Card emphasized this as the reason why the inclusion of region dummies was an important issue in Blanchflower and Oswald's estimation of the U.S. wage curve.[12] However, given institutional features that prevented free movement of people until recently in South Africa, we expect a large degree of "permanence" in the geographical pattern of unemployment in South Africa and do not expect regional dummies to have a strong effect on the wage curve elasticity. Since our dataset is a cross-section, only a single value for the cluster

[12]Card (1995) stated that for the United States the inclusion of the state fixed effects matters because average levels of unemployment across states are weakly *positively* correlated with average wages, whereas "transitory" wages and unemployment rates are strongly *negatively* correlated. As a result, the U.S. wage curve elasticity tends to be only weakly negative (sometimes even positive) unless location dummies are included. In the U.K. data, the addition of region dummies does not affect the estimated wage curve elasticities, perhaps reflecting the greater degree of "permanence" in the geographic patterns of U.K. unemployment, as noted by Pencavel (1994). Region dummies may have had an important effect on the U.S. wage curve elasticity also because there were no regional price deflators available.

Figure 5. *U* and Wage within Two Standard Deviations of Their Means.

unemployment rate is available, so it is not possible to use cluster dummies. However, nine province dummies are available, and these are used as crude regional fixed effects.

Since the cost of living can vary substantially across regions, a specification that uses price-deflated wages is preferable. In the SALDRU data, price information by cluster is available only for food. A price index is created by weighting cluster food prices by their weight in the Consumer Price Index and assuming that non-food prices are uniform across the country. This index is then used to deflate wages. Deflating wages by an index of food prices only (that is, assuming that non-food prices vary across clusters as much as food prices do) would over-correct for regional price variations, since food prices tend to vary more across regions than do the prices of other commodities.[13]

Turning to hypothesis testing, the explanations for the wage curve are best tested by estimating the unemployment elasticity of the wage for particular subgroups. We compare the wage curves of those workers for whom a theory appears particularly apposite and of other workers. The shirking theory might apply more to workers whose performance is more difficult to monitor or for whom the threat of dismissal is more credible. These might, for instance, be workers in discretionary jobs or workers in

[13]For example, Kanbur and Grootaert (1994) found that in Cote d'Ivoire, non-food prices were roughly uniform across the country but food prices varied substantially.

whom the firm has not invested heavily. By contrast, the labor turnover theory appears most relevant to workers in whom the firm has invested heavily. Thus alternative versions of the incentive wage theory make different predictions. The bargaining theory is more likely to apply to unionized workers who engage in local bargaining and less likely to apply to workers subject to non-local wage determination or to workers without organization or power. The wage curve of the relevant group should be downward-sloping, whereas that of the residual group need not be. Unfortunately, the prediction for the residual group is ambiguous. If the wage is market-determined, the wage curve tends toward the vertical, whereas if the wage is governed by non-local bargaining, the wage curve tends toward the horizontal.

It is also possible to make predictions about the steepness of the wage curve. A lower risk of dismissal requires a higher wage rate to prevent shirking. This wage premium is dependent on unemployment: the higher the unemployment, the greater the expected cost of becoming unemployed, and thus the smaller the required premium (Blanchflower and Oswald 1994:76–77). Thus, the more secure workers feel in their jobs (for instance, due to firm-specific training), the higher the required wage, and the steeper the wage curve. The same form of argument applies also to quitting (greater investment in firm-specific capital) and striking (more powerful local collective action). In each case, a higher wage is required to compensate for the additional cost that workers can impose on the employer; in each case this compensation falls as rising unemployment reduces expected income in the alternative state.

Finally, what if efficiency wage behavior, institutional wage-setting, or non-local bargaining raises the wage above the competitive level in low-wage areas, so generating involuntary unemployment and a negative function $U=f(W, \ldots)$? We would expect the wage curve to be flatter, that is, the market distortion to be stronger, in the case of workers with characteristics that make them less prone to market wage determination. In South Africa these are uneducated workers, unionized workers, production workers, and workers employed in the public sector.

Empirical Results

In line with much of the parallel literature on other countries, we begin with OLS specifications. Later in this section, the cluster unemployment rate is treated as endogenous. Table 1 presents two different specifications of the OLS wage function, one with and the other without the squared term of U_r, defined both broadly and narrowly. Robust rather than raw t-values are reported, in order to take account of the fact that the regression errors may be correlated across individual workers within each cluster (See Moulton 1990). The results are similar for all races and for Africans, and our discussion focuses on the former. There is no statistically significant relationship between narrowly measured unemployment and wages, but there is a statistically significant quadratic relationship between broadly measured unemployment and wages.[14]

The usual Mincer-type relationships are found between wages and productive characteristics: for example, wages increase with experience but at a decreasing rate.[15]

[14]The quartic U variable was statistically insignificant in all experiments. Though the cubic term of UnempRateB was significant at the 1% level, this turned out to be due to the influence of outliers. Upon exclusion of the very few wage workers (29 out of 6,498) who lived in clusters with an UnempRateB of ≥80% (more than three standard deviations above the mean of UnempRateB at the individual level), the cubic term became statistically insignificant. This confirms that the quadratic shape of the wage curve seen in Figure 5 is robust with respect to the control for other factors that influence the wage, such as personal traits, occupation, employer type, and region of residence. The results shown in the tables are for all observations, including outliers.

[15]Experimentation with cubic and quartic terms in experience showed that their inclusion made virtually no difference to the estimated wage curve elasticity.

Marginal returns to education increase with years of education, a result similar to Moll's (1996b) finding that the returns to primary education are very low in South Africa. Each of the race groups Africans, Coloureds, and Indians are found to have earned statistically significantly lower wages than their white counterparts even after we introduce many controls, and the wage disadvantage is greatest for Africans.

Service occupations are the base category: workers in professional, clerical, and production occupations received higher wages, but farming workers and laborers received statistically significantly lower wages than service workers.[16] Male, urban, and married workers received statistically significantly higher wages than their female, rural, and unmarried counterparts. Homeland workers received statistically significantly higher wages than non-homeland workers, although their raw, unstandardized hourly wages were much lower. This standardized wage premium could be interpreted as a compensating differential for working in low-amenity homeland areas.

As expected *a priori*, public sector and union workers were statistically significantly better paid than private sector and nonunion workers. Province dummies are important, signaling that there is statistically significant regional variation in pay levels. Finally, cluster variables are statistically significant influences on wages. Lack of a tarred road in the cluster and greater distance to various facilities (such as a post office, bank, restaurant, or phone) reduced wages.

The *ceteris paribus* elasticity of wage with respect to the local unemployment rate estimated from these and similar models is presented in Table 2. The first row provides basic evidence on the wage curve in South Africa as a whole. Using the quadratic specifications in Table 1 as the basis, the broad unemployment elasticity of the wage evaluated at the mean is –0.108. In other words, a doubling of broad unemployment generated an 11% reduction in wages. However, the narrow unemployment elasticity of the wage was close to zero.

The remaining rows of Table 2 provide further estimates of the wage-unemployment elasticity (WUE) under a number of alternative specifications. It shows that departures from the basic specification make little difference to the estimated WUE of about –0.11 using broad unemployment, and of about zero using narrow unemployment, that is, the departures are not statistically significant.[17] For instance, we see that whether or not the equation is corrected for sample selectivity, and whether or not wages are deflated, makes no notable differences to the WUE using broad unemployment.

[16]Inclusion of workers' occupation, sector of work (public), union membership, and location etc. here (as in many standard earnings functions) carries no presumption that these factors are necessarily exogenous. The estimated wage curve elasticity is highly robust with respect to the exclusion of these variables (Table 2).

[17]The full set of regressions underlying Table 2 is available from the authors on request. The exclusion restrictions for identifying the lambda term in the selectivity-corrected wage equation in the last row of Table 2 were household non-earned income, number of dependents, and number of other workers within the household. The selectivity term was well identified but selectivity-correction made only a small difference to the size of the wage curve elasticity.

Choice of too large a unit of analysis—most unlikely to be true of the cluster—may dilute the effect of local unemployment on wages. Experimentation with the district (as opposed to cluster) unemployment rate showed that the point estimate of the coefficient on the district broad unemployment rate (DUnempRateB) was lower but insignificantly different from the point estimate of the coefficient on the cluster broad unemployment rate (UnempRateB). However, the coefficient was imprecise and insignificant at the 5% level. This is not surprising, since the standard error of DUnempRateB was much higher (than that of the cluster UnempRateB) because of fewer observations. The estimated wage curve elasticity using DUnempRateB was –0.06 (t-values: –1.70 on DUnempRateB and 1.67 on the square of DUnempRateB). The use of the province also produces a negative elasticity (–0.126), but it is very imprecisely determined due to the small number of provinces. The main result is robust with respect to the choice of unit.

Table 1. Wage Functions, South Africa, 1993.

	Narrow Unemployment				*Broad Unemployment*				
	Linear		*Quadratic*		*Linear*		*Quadratic*		
Indep. Var.	*Coeff.*	*Robust t*	*Coeff.*	*Robust t*	*Coeff.*	*Robust t*	*Coeff.*	*Robust t*	*Variable Means*
				A. All Races					
Constant	0.415	3.3	0.416	3.3	0.409	3.3	0.429	3.5	—
EXP	0.035	9.7	0.035	9.6	0.035	9.7	0.035	9.5	22.83
EXP^2	–0.001	–8.1	–0.001	–8.1	–0.001	–8.1	–0.001	–7.9	669.00
EDYRS	0.003	0.3	0.003	0.3	0.004	0.3	0.004	0.4	7.95
EDYRS^2	0.004	5.4	0.004	5.4	0.004	5.3	0.004	5.4	79.83
AFRICAN	–0.653	–8.4	–0.637	–7.8	–0.611	–7.6	–0.526	–6.0	0.65
COLORED	–0.466	–6.5	–0.451	–5.9	–0.439	–6.2	–0.352	–4.4	0.11
INDIAN	–0.475	–5.9	–0.459	–5.5	–0.456	–5.8	–0.384	–4.7	0.05
MALE	0.344	14.7	0.345	14.7	0.343	14.8	0.340	14.9	0.58
MARRIED	0.144	5.6	0.143	5.6	0.138	5.4	0.139	5.4	0.73
PROFSNL	0.722	15.7	0.720	15.8	0.720	15.7	0.711	15.8	0.18
CLERICAL	0.298	8.6	0.298	8.6	0.302	8.8	0.303	8.9	0.19
FARM	–0.576	–5.0	–0.577	–5.0	–0.578	–5.0	–0.556	–4.9	0.04
PRODUCTION	0.218	5.5	0.219	5.5	0.223	5.7	0.232	6.0	0.20
LABORER	–0.076	–1.5	–0.076	–1.5	–0.072	–1.4	–0.077	–1.6	0.23
URBAN	0.310	3.6	0.323	3.9	0.334	4.0	0.386	5.1	0.64
PUBLIC	0.170	5.7	0.170	5.7	0.172	5.8	0.173	5.9	0.24
UNION	0.285	8.3	0.287	8.3	0.285	8.4	0.278	8.5	0.26
WCAPE	–0.149	–2.5	–0.148	–2.4	–0.149	–2.5	–0.159	–2.5	0.13
NCAPE	–0.275	–1.4	–0.278	–1.4	–0.250	–1.4	–0.267	–1.5	0.01
ECAPE	–0.189	–2.5	–0.210	–2.6	–0.160	–2.1	–0.198	–2.7	0.07
NATAL	–0.169	–3.0	–0.175	–3.1	–0.172	–3.1	–0.185	–3.4	0.19
OFS	–0.411	–4.0	–0.417	–4.2	–0.418	–4.2	–0.410	–4.3	0.09
ETRANSVAAL	–0.076	–0.7	–0.080	–0.7	–0.083	–0.7	–0.081	–0.7	0.08
NTRANSVAAL	–0.166	–2.4	–0.173	–2.4	–0.169	–2.3	–0.194	–2.7	0.06
NWPROV	–0.018	–0.2	–0.030	–0.3	–0.032	–0.3	–0.049	–0.5	0.10
DISTANCE	0.000	–2.2	0.000	–2.2	0.000	–2.0	0.000	–2.1	68.62
TARROAD	0.221	2.8	0.219	2.8	0.210	2.8	0.185	2.7	0.40
HOMELAND	0.264	3.9	0.276	4.1	0.301	4.4	0.330	5.0	0.26
UNEMPRATEB	0.116	0.6	–0.247	–0.5	–0.165	–1.2	–1.305	–3.3	0.233 b, 0.107 n†
UNEMPRATEB^2	—	—	0.878	0.9	—	—	1.803	3.5	
Adj. R^2	0.5884		0.5886		0.5887		0.5918		
Dep. Var.	Mean = 1.56101, SD= 1.1113								
N	6,498								

†b = broad, n = narrow. The base category for occupation is "service" and for province is PWV/Gauteng. Other reference categories are white, rural, female, and unmarried.

EXP = potential experience; EXP^2 = square of EXP; EDYRS = years of education; EDYRS^2 = square of EDYRS; AFRICAN, COLORED, and INDIAN are race dummies (base category is WHITE); MALE and MARRIED are gender and marital status dummies (base categories are FEMALE and NON-MARRIED); PROFSNL, CLERICAL, FARM, PRODUCTION, and LABORER are occupation dummies for professional workers, clerical workers, farm workers, production workers, and laborers, respectively (base category is SERVICE workers); URBAN and HOMELAND are region dummies and PUBLIC and UNION are dummies for public sector workers and unionized workers; TARROAD and DISTANCE are cluster characteristics (whether the cluster has tarred roads, and distance from cluster to various facilities such as a

An interesting question is whether the South African labor market should be analyzed as a whole or whether it is so segmented by race that separate racial analyses should be conducted. Under apartheid, the races were indeed segmented in

Table 1. Wage Functions, South Africa, 1993. (continued)

	Narrow Unemployment				*Broad Unemployment*				
	Linear		*Quadratic*		*Linear*		*Quadratic*		
Indep. Var.	*Coeff.*	*Robust t*	*Coeff.*	*Robust t*	*Coeff.*	*Robust t*	*Coeff.*	*Robust t*	*Variable Means*
				B. Africans					
Constant	–0.293	–2.6	–0.259	–2.3	–0.258	–2.3	–0.123	–1.1	—
EXP	0.031	7.0	0.031	7.0	0.031	7.1	0.031	7.2	24.54
EXP^2	0.000	–5.9	0.000	–5.9	0.000	–5.9	0.000	–5.9	750.49
EDYRS	0.013	1.0	0.012	0.9	0.013	1.0	0.013	1.0	6.82
EDYRS^2	0.004	3.9	0.004	3.9	0.004	3.9	0.004	4.1	62.17
AFRICAN	—	—	—	—	—	—	—	—	—
COLORED	—	—	—	—	—	—	—	—	—
INDIAN	—	—	—	—	—	—	—	—	—
MALE	0.328	10.0	0.330	10.0	0.327	10.1	0.322	10.2	0.59
MARRIED	0.142	4.6	0.141	4.6	0.136	4.4	0.135	4.4	0.72
PROFSNL	0.790	12.8	0.791	12.8	0.788	12.7	0.784	12.8	0.10
CLERICAL	0.299	6.7	0.299	6.8	0.304	7.0	0.311	7.2	0.16
FARM	–0.478	–4.1	–0.480	–4.2	–0.484	–4.2	–0.464	–4.1	0.06
PRODUCTION	0.243	5.3	0.243	5.3	0.247	5.4	0.253	5.7	0.19
LABORER	0.005	0.1	0.006	0.1	0.010	0.2	0.006	0.1	0.28
URBAN	0.285	3.4	0.302	3.7	0.307	3.8	0.362	4.7	0.48
PUBLIC	0.256	6.9	0.256	6.9	0.259	7.0	0.266	7.1	0.23
UNION	0.373	8.4	0.376	8.6	0.372	8.5	0.359	8.6	0.26
WCAPE	–0.065	–0.5	–0.069	–0.6	–0.052	–0.5	–0.053	–0.5	0.03
NCAPE	–0.019	–0.1	–0.019	–0.1	–0.033	–0.2	–0.050	–0.3	0.01
ECAPE	–0.238	–2.7	–0.275	–2.9	–0.207	–2.3	–0.261	–3.1	0.09
NATAL	–0.239	–3.2	–0.257	–3.4	–0.245	–3.3	–0.272	–3.8	0.18
ORANGEFREEST	–0.452	–4.0	–0.471	–4.3	–0.468	–4.2	–0.476	–4.5	0.13
ETRANSVAAL	–0.133	–1.0	–0.146	–1.1	–0.140	–1.0	–0.153	–1.2	0.11
NTRANSVAAL	–0.240	–2.5	–0.263	–2.7	–0.249	–2.6	–0.302	–3.2	0.08
NWPROV	–0.097	–1.0	–0.127	–1.2	–0.120	–1.2	–0.160	–1.6	0.14
DISTANCE	0.000	–2.4	0.000	–2.4	0.000	–2.3	0.000	–2.4	79.89
TARROAD	0.294	3.1	0.287	3.1	0.278	3.0	0.235	3.0	0.17
HOMELAND	0.286	4.1	0.308	4.4	0.318	4.4	0.363	5.1	0.40
UNEMPRATEB	0.190	1.1	–0.343	–0.7	–0.116	–0.8	–1.356	–2.9	0.306 b, 0.127 n[†]
UNEMPRATEB^2	—	—	1.223	1.1	—	—	1.836	3.2	
Adj. R^2	0.4912		0.4918		0.4911		0.4962		
Dep. Var.	Mean = 1.1965, SD = 0.994								
N	4,250								

bank, post office, restaurant, and market); UNEMPRATEB = broadly measured unemployment rate; UNEMPRATEB^2 = square of UNEMPRATEB. The remaining variables are province dummies, the reference province being PWV or Gauteng.

Standard errors reported are robust (rather than raw), that is, they take account of the fact that regression errors may be correlated across individual workers within a cluster. The effect of correcting standard errors is to raise them substantially, reducing the size of the t-values. For example, the raw t-value of the variable UNEMPRATEB (broad) was –2.35 (that is, apparently significant at the 1% level), but the robust t-value is –1.17, which is statistically insignificant. Similarly, the raw t-values of UNEMPRATEB and UNEMPRATEB^2 (broad) were –7.43 and 7.07, but the robust t-values are less than half that size (–3.27 and 3.46, respectively).

the labor market (see, for instance, Knight and McGrath 1986), but by 1993 many of the former restrictions on inter-racial competition were remnants of the past. A Chow test indicates that the wage functions for Africans and non-Africans were significantly

Table 2. Wage Unemployment Elasticity.

	A. All Races						B. Africans					
	Narrow Unemployment			*Broad Unemployment*			*Narrow Unemployment*			*Broad Unemployment*		
Specification	*Coeff.*	*Robust t*	*Elasticity*	*Coeff.*	*Robust t*	*Elasticity*	*Coeff.*	*Robust t*	*Elasticity*	*Coeff.*	*Robust t*	*Elasticity*
Basic specification												
Unemployment rate	–0.247	–0.52	–0.006	–1.305	–3.27	–0.108[†]	–0.343	–0.7	–0.004	–1.356	–2.9	–0.072[†]
(Unemployment rate)^2	0.878	0.89		1.803	3.46		1.223	1.1		1.836	3.2	
Exclude province dummies												
Unemployment rate	–0.003	–0.01	0.007	–1.360	–3.47	–0.119	0.299–	0.6–	0.038	–1.267	–2.8	–0.073
(Unemployment rate)^2	0.298	0.34		1.822	3.59		0.004	0.0		1.685	3.0	
Exclude cluster variables												
Unemployment rate	–0.351	–0.58	–0.014	–1.461	–3.18	–0.131	–0.571	–1.0	–0.020	–1.744	–3.1	–0.109
(Unemployment rate)^2	1.008	1.03		1.928	3.37		1.596	1.5		2.249	3.3	
Exclude occupation dummies												
Unemployment rate	–0.352	–0.68	–0.014	–1.488	–3.31	–0.121	–0.295	–0.5	0.000	–1.411	–2.8	–0.065
(Unemployment rate)^2	1.030	0.95		2.074	3.53		1.168	1.0		1.962	3.1	
Exclude "public" and "union" dummies												
Unemployment rate	–0.111	–0.22	0.002	–1.391	–3.36	–0.113	–0.110	–0.2	0.011	–1.485	–3.0	–0.071
(Unemployment rate)^2	0.614	0.60		1.945	3.55		0.775	0.7		2.047	3.3	
Include only those workers who worked ≥35 hours in past week (N = 5,699)												
Unemployment rate	–0.413	–0.89	–0.027	–1.280	–3.05	–0.122	–0.555	–1.1	–0.031	–1.279	–2.7	–0.092
(Unemployment rate)^2	0.759	0.80		1.629	3.03		1.243	1.2		1.623	2.8	
Include industry dummies												
Unemployment rate	–0.600	–1.37	–0.033	–1.208	–2.80	–0.107	–0.734	–1.5	–0.039	–1.269	–2.5	–0.082
(Unemployment rate)^2	1.363	1.53		1.606	2.90		1.684	1.7		1.635	2.6	
Use nominal wages												
Unemployment rate	–0.252	–0.54	–0.007	–1.278	–3.24	–0.107	–0.341	–0.7	–0.005	–1.322	–2.9	–0.071
(Unemployment rate)^2	0.853	0.88		1.759	3.42		1.188	1.1		1.781	3.1	
Correction for selectivity												
Unemployment rate	–0.106	–0.23	0.005	–1.147	–3.02	–0.082	–0.354	–0.7	–0.005	–1.351	–2.9	–0.073
(Unemployment rate)^2	0.724	0.76		1.705	3.20		1.244	1.2		1.818	3.1	

Note: Because of a high degree of racial homogeneity of enumeration clusters in South Africa, the cluster unemployment rate is virtually the same as the race-specific cluster unemployment rate.

Using African cluster unemployment rate, the estimated wage curve elasticity with the basic specification is –0.074.

[†]As a robustness check, the standard error around the elasticity was calculated using the bootstrapping technique. In 500 replications, using the basic specification and the broad unemployment rate, the *mean* wage curve elasticity for "all races" was –0.1086 and the s.e. was 0.0184. For the African group, mean elasticity in 500 replications was –0.0721 and s.e. 0.0236.

different (F-value = 4.94), although this was also true of various other divisions within the labor market, such as public-private, urban-rural, and union-nonunion. We conducted the entire analysis both for the sample of employees as a whole and for Africans, who comprised 65% of that sample. The results are generally similar, and in no instance would our interpretation or conclusion differ. In Table 2 we present the results not only for all employees but also separately for African employees, in order to test robustness. The WUE for broad unemployment is –0.072 in the African case, which is not statistically significantly different from the WUE of 0.108 for all employees. Moreover, the African results are equally robust (WUE within the range –0.065 to –0.109).

These findings shed new light on the ongoing debate about the appropriate definition of unemployment in South Africa. The ILO Report (Standing, Sender, and Weeks 1996) argued that the broad measure exaggerates unemployment by including in the labor supply persons who did not actively look for work in the past week. The results here show that broadly measured unemployment has a greater impact on wages than narrowly measured unemployment.[18] In other words, discouraged workers are taken into account by wage-setters and their numbers in a locality do influence local wage determination. These appear to be persuasive grounds for retaining the broad definition as the more appropriate concept of unemployment in South Africa.

In order to throw light on the mechanisms underlying South Africa's wage curve, in Table 3 (both for all races and for Africans) we present the broad unemployment elasticities of wage for different groups of workers, disaggregated by ownership (private/public), union membership, age, education, experience, gender, and type of locality.[19] In South Africa, the pay of many public sector workers is set centrally.[20] We would expect workers whose wages are negotiated centrally to have a flatter wage curve than workers who engage in local level bargaining.

Consistent with that hypothesis, Table 3 shows that the wage curve was substantially flatter for public-sector than for private-sector workers. A comparison of union and non-union workers shows that unionized workers' wages did not respond negatively to the local unemployment rate at all (the elasticity is positive but the coefficients are not statistically significant).[21] The bargaining hypothesis implies that the wage curve exists if local bargaining takes place but not if bargaining is national or regional: non-local bargaining insulates workers' pay from local labor market conditions. In South Africa, much union bargaining is non-local and unionized workers are in a better position to ensure that Bargaining Council non-local wage agreements are implemented by recalcitrant employers who were not party to the Bargaining Council wage negotiations. Thus, the results for unionized workers (proxying bargained wages) are as expected.

Because education and training are normally complementary, and because edu-

[18]Although it is possible that discouraged workers are a proxy for demand-side factors that depress the wage, the most plausible demand-side factors—location and remoteness—are already controlled by means of the province, region, and cluster-characteristics variables.

[19]When we estimate wage equations for different worker groups in Table 3, selectivity issues arise because some of the subsamples are potentially non-random. However, given the unavailability of variables that could plausibly predict choice and also be excluded from the corresponding wage equations, it was not possible to fit selectivity-corrected wage functions for each worker group.

[20]But not in all cases; for example, provincial administrations and local governments set their own wages, and these take account of local labor market conditions.

[21]Union membership information is available only for regular wage workers and not for casual wage workers. We have assumed that none of the casual workers are unionized. However, if some are unionized, as is likely, then the true WUE for non-union workers should be greater (that is, a bigger negative) than the reported figure.

Table 3. Wage Unemployment Elasticity, by Worker Group.

	All Races			*Africans*		
Worker Group	*Coeff. of UnempRateB and Unemp RateB²*	*Robust t-Value*	*Elasticity*	*Coeff. of UnempRateB and Unemp RateB²*	*Robust t-Value*	*Elasticity*
All	–1.305 1.803	–3.3*** 3.5***	–0.108	–1.356 1.836	–2.9*** 3.2***	–0.072
Public	–0.832 1.008	–1.6 1.5	–0.081	–0.669 0.809	–1.0 1.0	–0.030
Private	–1.634 2.231	–3.6*** 3.7***	–0.141	–1.472 2.031	–3.0*** 3.2***	–0.087
Union	–0.369 0.976	–0.8 1.4	0.022	–0.030 0.762	–0.1 1.0	0.119
Non-Union	–1.123 1.469	–2.4*** 2.5***	–0.102	–1.380 1.705	–2.7*** 2.6***	–0.099
Urban⁺	–0.999 0.840	–2.3** 1.1	–0.135	–0.499	–2.4**	–0.156
Rural	–1.293 1.530	–1.9* 2.2**	–0.122	–1.077 1.284	–1.6 1.9*	–0.093
Younger	–1.507 2.066	–3.4*** 3.6***	–0.130	–1.664 2.207	–3.3*** 3.5***	–0.106
Older	–0.857 1.168	–2.0** 1.9*	–0.069	–0.822 1.143	–1.7* 1.7*	–0.029
Low Education	–1.412 1.856	–3.1*** 3.0***	–0.117	–1.281 1.732	–2.6*** 2.7***	–0.078
High Education	–1.312 1.924	–2.9*** 3.3***	–0.112	–0.951 1.414	–2.2** 2.5***	–0.002
Low Experience	–1.570 2.206	–3.6*** 3.7***	–0.132	–1.907 2.570	–3.7*** 3.8***	–0.109
High Experience	–0.796 1.031	–1.9* 1.7*	–0.069	–0.720 0.951	–1.5 1.5	–0.039
Male	–2.021 2.893	–4.2*** 4.5***	–0.161	–1.996 2.822	–3.6*** 4.0***	–0.103
Female	–0.136 0.087	–0.4 0.2	–0.023	–0.365 0.330	–0.9 0.6	–0.049
Homelands	0.149 –0.023	0.2 –0.0	0.052	0.261 –0.102	0.4 –0.1	0.072
Non-Homelands	–1.847 2.567	–3.4*** 2.6***	–0.166	–2.469 3.286	–3.5*** 2.8***	–0.211

Notes: High education workers are those with at least 10 years' schooling; high experience workers are those with atleast 25 years' experience; and older workers are those at least 40 years of age. The robust t-statistics refer to the coefficients of U_r and U_r^2.

⁺Signifies that the wage curve relationship was linear rather than quadratic. For example, in the case of urban workers, the relationship between cluster unemployment and wage was decidedly linear: in a specification with both U_r and its square (U_r^2), neither was statistically significant.

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

cated workers are likely to be in discretionary jobs, education can serve as a proxy for both firm-specific skills and difficulty of monitoring. The same is likely to be true for age, length of employment experience, and more skill-intensive and responsible occupations. Table 3 suggests that the wages of older, more experienced, and more

educated workers were less sensitive to local unemployment than were those of younger, less experienced, and less educated workers. These former characteristics are liable to encourage efficiency wage setting so as to avoid shirking, whereas the latter are more likely to produce market wage setting. The results are thus in line with one version of the incentive wage rationalization of the wage curve.

Women have a flatter wage curve than men, and the female wage curve elasticity is not statistically significant. If gender-specific unemployment rates are used—presuming low substitutability between men's and women's jobs—the WUE is in fact a bigger negative for women than for men.[22] This could be because female wage workers are less unionized than men: the unionization rate is only 18.6% among women, compared with 31.3% among men. Table 3 also shows that whereas a highly statistically significant negative elasticity is obtained for non-homeland areas, "homeland" wages are not negatively related to unemployment in South Africa.

In summary, the fact that younger, less experienced, less educated, non-unionized, and private sector workers tend to have steeper wage curves suggests that the free-market tendency (proxied by youth, low skill, and weak organization) is toward a vertical wage curve, and that non-local bargaining (proxied by union membership and public sector) is toward a horizontal wage curve. The elasticities for older, experienced, and educated workers are consistent with the efficiency wage rationalization of the wage curve, and the elasticity for private sector workers with the bargaining explanation. However, these results are no more than suggestive of the forces that might be shaping the wage curve.

Table 1 showed that South Africa apparently has a U-shaped wage curve, with the minimum point occurring at a broad cluster unemployment rate of 36%. Does South Africa importantly differ from other countries with respect to the nature of the wage-unemployment relationship? In their analysis of wage curves in the United Kingdom and United States, Blanchflower and Oswald (1994) did find that a substantial part of the wage curve sloped upward, and they said that this "might, in principle, reflect Harris-Todaro forces, although such an interpretation would be highly speculative" (p. 106). They suggested that the upward-sloping part of the wage curve in the United Kingdom and United States rests on small numbers of observations in the high unemployment portion of the curves and on wage functions in which it was not possible to control fully for regional and industry fixed effects (Blanchflower and Oswald 1993:245). They also argued that since the upward-sloping part occurs at very high rates of unemployment that are not observed in the actual data, one could reasonably ignore that part of the wage curve. However, one cannot dismiss the upward-sloping part in the South African wage curve, because an appreciable minority (27%) of wage employees in the country live in clusters in which the broad unemployment rate is greater than 36%.

To explore further the nature of this rising tail, we sought to divide the country into low- and high-unemployment regions. We expected unemployment to be quite different in rural and urban parts of the country. However, the rural-urban division does not capture labor market segmentation well, and the clearest labor market fault-line occurs between "homeland" and non-homeland areas (Table 4). Broadly measured unemployment is catastrophically high in the (former) homeland regions, and it is much lower in non-homeland regions. Consequently, we fitted separate wage functions for the two regions.[23] A

[22]Using gender-specific unemployment rates, the WUE is –0.05 for men and –0.09 for women. However, computing these implies that only about half the number of labor force participants are available for each gender in a cluster, and sample sizes become too small for reliable estimates of cluster unemployment rates.

[23]Not reported but available from the authors.

Table 4. Unemployment Rates, by Region and Alternative Definition.

Region	*Unemployment Rate (%) (a)*		*Average of the Cluster-Level Unemployment Rate for Waged Workers (%) (b)*	
	Narrow Definition	*Broad Definition*	*Narrow Definition*	*Broad Definition*
	All Races			
Homeland	18.6	48.5	14.9	39.8
Non-Homeland	10.7	20.7	9.2	17.5
Rural	14.0	40.8	9.3	28.2
Urban	12.5	23.9	11.5	20.6
All South Africa	13.1	31.2	10.7	23.3
	Africans			
Homeland	18.6	48.5	14.9	39.8
Non-Homeland	13.5	28.6	11.2	24.5
Rural	14.8	42.5	9.9	29.8
Urban	17.0	34.5	15.6	31.3
All South Africa	15.8	39.1	12.7	30.6

Notes: The unemployment rate in column (a) is the actual unemployment rate for the area, calculated from the sample of narrow and broad labor force participants in the area. The rates in column (b) differ a good deal from those in column (a). This is because they do not represent the unemployment rate. The cluster unemployment rate was first assigned to each labor force participant. Then we took the subsample of labor force participants who are wage workers, and column (b) reports the average of their cluster unemployment rates. The reason the average of cluster broad unemployment rates (averaged across wage workers) is much smaller than the corresponding actual broad unemployment rate is that more wage workers (than unemployed and self-employed people) live in low-unemployment clusters. Thus, their (lower) cluster unemployment rates have a greater influence in the calculated average of the cluster unemployment rates.

Source: Authors' calculations from SALDRU 1993 data.

Chow test rejected the pooling of the two samples.

"Homeland" South Africa—with its very high unemployment rates—exhibits no negative relationship between local unemployment and wages: the estimated elasticity is positive but the coefficients are not statistically significant (Table 3). At the very high levels of unemployment found in homeland areas, relatively small changes in unemployment do not appear to affect wages. This may be because the high levels of unemployment reflect long unemployment duration (rather than high inflow into unemployment) and the obsolescence of human capital and skills of the long-term unemployed mean that they provide less competition for jobs, so that their presence in the labor force exerts little downward pressure on wages.

Non-homeland South Africa, by contrast, displays a statistically significant convex relationship between unemployment and wage, with a WUE of –0.166 for all races (Table 5). The minimum point occurs again at a high broad unemployment rate of 36%. Since the vast majority (87%) of the non-homeland workers live in clusters that have an unemployment rate below 36%, the downward-sloping part of the wage curve is the more relevant. The corresponding figures for Africans are not too different, their minimum point occurring at a broad unemployment rate of 38%. Since the majority (80%) of non-homeland African workers live in clusters with unemployment rates below 38%, the downward-sloping part of the wage curve is again the more relevant.

The wage curve elasticities estimated for different groups of African workers in non-homelands are presented from the second

Table 5. Wage Unemployment Elasticity in Non-Homeland Areas, by Worker Group.

	All Races			*Africans*		
Worker Group	*N (mean UnempRateB)*	*Elasticity*	*Robust t*	*N (mean UnempRateB)*	*Elasticity*	*Robust t*
All	4,808 (0.1755)	–0.166	–3.36*** 2.64***	2,564 (0.2458)	–0.211	–3.49*** 2.81***
Public	1,015 (0.1723)	–0.063	–0.36 –0.18	425 (0.3040)	–0.173	–0.00 –0.51
Private	3,793 (0.1763)	–0.202	–3.86*** 3.18***	2,139 (0.2328)	–0.214	–3.69*** 3.08***
Union	1,309 (0.1939)	–0.034	0.32 –1.05	746 (0.2422)	–0.048	0.09 –0.44
Non-Union	3,499 (0.1686)	–0.138	–2.79*** 2.30**	1,818 (0.2456)	–0.186	–3.18*** 2.52***
Urban	3,811 (0.1923)	–0.122	–1.84* 0.62	1,724 (0.3041)	–0.179	0.31 –1.47
Rural	997 (0.1112)	–0.328	–3.59*** 3.79***	840 (0.1226)	–0.334	–3.00*** 3.03***
Younger	3,202 (0.1687)	–0.183	–3.35*** 2.52***	1,561 (0.2327)	–0.255	–4.07*** 3.21***
Older	1,606 (0.1890)	–0.130	–2.77*** 2.35***	1,003 (0.2631)	–0.152	–2.23** 1.71*
Low Education	3,214 (0.2042)	–0.193	–3.31*** 2.63***	1,914 (0.2310)	–0.180	–3.29*** 2.83***
High Education	1,594 (0.1176)	–0.092	–1.75* 1.00	650 (0.2847)	–0.157	–2.05** 1.44
Low Experience	3,002 (0.1637)	–0.167	–2.95*** 2.06**	1,358 (0.2374)	–0.280	–3.86*** 2.96***
High Experience	1,806 (0.1950)	–0.135	–3.14*** 2.82***	1,206 (0.2527)	–0.133	–2.39*** 1.99**
Male	2,837 (0.1713)	–0.237	–4.44*** 3.95***	1,595 (0.2291)	–0.279	–4.17*** 3.83***
Female	1,971 (0.1814)	–0.037	–0.18 –0.31	969 (0.2702)	–0.157	–1.03 0.11
African	2,564 (0.2458)	–0.211	–3.49*** 2.81***			
Non-African	2,244 (0.0965)	–0.181 2.23**	–3.95***			

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

Notes: High education workers are those with at least 10 years' schooling; high experience workers are those with at least 25 years' experience; and older workers are those at least 40 years of age. The t-statistics reported are the robust t-values on the coefficients of U_r and U_r^2.

row onward in Table 5. The elasticities show that the results are quite similar to those for South Africa as a whole in Table 3, and bear the same interpretations. There is, however, one new interesting result. In non-homeland rural areas, with their low unemployment rates (see column 1), wages were twice as responsive to unemployment as in urban areas. This is likely to be because wages tended to be less determined by bargaining in rural non-homelands—home of South African commercial agricul-

Table 6. Wage Unemployment Elasticity over a Range of Unemployment Rates.

Wage Curve Elasticity at Assumed Unemployment Rates Panel A			*Mean of Wage Curve Elasticity across Workers Panel B*		
Unemployment Rate (%)	*Non-Homelands*	*All South Africa*	*Unemployment Rate Band (%)*	*Non-Homelands*	*All South Africa*
		All Races			
5	–0.079	–0.056	0–5	–0.023	–0.016
10	–0.133	–0.094	5–10	—	—
15	–0.161	–0.115	10–15	–0.152	–0.108
20	–0.164	–0.117	15–20	–0.165	–0.117
25	–0.141	–0.101	20–25	–0.155	–0.111
30	–0.092	–0.067	25–30	–0.119	–0.086
35	–0.017	–0.015	30–35	–0.051	–0.039
40	0.083	0.048	35–40	0.035	0.022
Mean U_r	–0.166	–0.108			
		Africans			
5	–0.107	–0.057	0–5	–0.031	–0.017
10	–0.181	–0.097	5–10	—	—
15	–0.222	–0.119	10–15	–0.208	–0.114
20	–0.231	–0.123	15–20	–0.228	–0.124
25	–0.207	–0.109	20–25	–0.222	–0.119
30	–0.149	–0.078	25–30	–0.181	–0.095
35	–0.059	–0.029	30–35	–0.099	–0.049
40	0.064	0.037	35–40	0.006	0.012
Mean U_r	–0.211	–0.072			

Notes: For Panel B, a wage curve elasticity was first calculated separately for each individual worker at the cluster unemployment rate facing that worker, and then averaged across all workers living in clusters of a given unemployment rate band. The results are quite similar to those reported in Panel A, except at very low unemployment rates. Cells in the 5–10% unemployment rate band in Panel B are empty because there were no wage workers living in clusters with unemployment rates between 5% and 10%. The last row under each race reports the elasticity calculated at the mean broad unemployment rate.

ture—since in these regions employers were smaller, there was little unionization of agricultural workers, and the dominant rural industry (farming) was not covered by a Bargaining Council in 1993.[24]

We are interested not only in the shape of the wage curve but also in the size of the wage curve elasticity over a range of unemployment. Table 6 presents elasticities calculated in two different ways: at the mean unemployment rate, and the mean of the WUE calculated separately for each individual worker at the cluster unemployment rate facing that worker. However, the results are very similar, especially at unemployment rates above 10%. In non-homelands, the African unemployment rate can be tripled from 10% to 30% without reducing the wage curve elasticity below about –0.15. For South Africa as a whole, minimum elasticity over the same range is –0.08. The wage-unemployment elasticity is robust over a wide range of unemployment

[24]Wage curves by industry in non-homeland areas (not reported) show that in all sectors except the two smallest (electricity and restaurant/entertainment), there was a large negative wage curve elasticity. The elasticity was high (a large negative) in the agriculture, fishing, and forestry industry, where there is little institutional wage determination. The elasticity was also high in transport and construction sectors, where the large majority of workers are non-unionized. The elasticity was low (small negative) in educational, legal, medical, and armed forces sectors, where public sector workers are concentrated and centralized bargaining is likely to determine wages.

Table 7. Wage Unemployment Elasticity, Using Individual and Aggregate Data, All South Africa and Non-Homelands.

	All South Africa			*Non-Homelands*		
Specification	*Coeff.*	*t-Value*	*Elasticity*	*Coeff.*	*t-Value*	*Elasticity*
All Races						
Individual Data	–1.3053	–3.27***	–0.108	–1.8467	–3.36***	–0.166
	1.8033	3.46***		2.5671	2.64***	
Aggregate Data	–0.5994	–1.33	–0.067	–1.4386	–2.97***	–0.165
	0.5936	1.19		1.5330	1.93*	
N						
Individuals		6,498			4,808	
Clusters		324			178	
Africans						
Individual Data	–1.3559	–2.94***	–0.072	–2.4685	–3.49***	–0.211
	1.8357	3.15***		3.2857	2.81***	
Aggregate Data	–1.0183	–2.12**	–0.102	–1.8290	–3.11***	–0.228
	0.9817	1.86*		1.8267	1.84*	
N						
Individuals		4,250			2,564	
Clusters		269			123	

Notes: The unemployment rate for a region (for example, non-homeland) calculated from all individual labor force participants in that region differs somewhat from the average of the cluster unemployment rates averaged across all clusters in that region. See note in Table 4.

*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

for Africans, and a similar robustness can be seen for all races.

Until now, both the dependent variable and all the independent variables except the unemployment rate and cluster characteristics have been measured at the individual level, whereas unemployment has been measured at the aggregate, that is, cluster, level. The fact that the unemployment variable U_r in equation (1) has no i subscript has an important implication. It is reasonable to expect that individuals living in the same locality may share some common unobservable characteristics that would lead the regression disturbances to be correlated within the cluster. Following Moulton (1990), it can be shown that even small levels of such correlation can cause conventional standard errors of U_r to be appreciably downward-biased, resulting in spurious findings of statistical significance of U_r. All the regressions reported thus far show t-values based on standard errors corrected for this possible source of bias. However, as a further test of the robustness of the wage curve elasticity, we estimate a model using cluster means of characteristics instead of individual observations. Making the level of aggregation the same on both sides of the wage function eliminates the downward bias on the standard errors. Wage functions using cluster-level means of hourly wages and individual traits were estimated, and the elasticities computed from these regressions are contained in Table 7. Again, none of the relevant coefficients is statistically significant in the homeland equations. The table shows that when aggregate data are introduced, the estimated WUE rises from about –0.072 to about –0.102 for all South Africa. However, for non-homeland areas, the elasticity is virtually unaffected, at about –0.22.

A further issue of importance is potential simultaneity bias: wages and local unemployment may be jointly determined. A

correction for the simultaneity bias in U_r requires plausible instruments. The instruments most often used in the literature are lagged local unemployment rates, but, given our cross-section data, these are not available to us. However, if wages do influence unemployment, the effect is expected to be positive (the higher the institutionally determined wage is above the market-clearing level, the higher is unemployment).[25] In that case, any negative effect of unemployment on wages is likely to be underestimated in OLS estimation of the wage curve, that is, the OLS estimate of the negative wage-unemployment elasticity is expected to be closer to zero than is the true negative elasticity. Thus, even if the strategy below for correcting for simultaneity bias is unconvincing, our OLS estimate gives us a *lower bound* on the South African wage curve elasticity. Since despite bias toward zero, our OLS estimate of the wage curve elasticity is sizable in magnitude (–0.108 for all races and –0.072 for Africans) and is highly statistically significant, it appears that wages are about as responsive to local unemployment rates in South Africa as they are in the OECD countries for which wage curves have been estimated; in fact, they may well be more so.

A number of those cluster characteristics that are statistically insignificant in the wage equation are used as instruments for the cluster unemployment rate, including whether the community has roads that become impassible at certain times of the year, whether it has any public transport passing by it, and distance to nearest transport. *A priori* it is expected that road conditions and availability of transport will affect the cost of job-search and thus the local unemployment rate, but should not affect wages other than through their impact on unemployment. The instrumental variables for U_r were generally statistically insignificant in the wage equation when local unemployment rate was included, but are well correlated with unemployment.[26] The standard tests proposed by Bound et al. (1995)—the test of overidentifying restrictions, the F-test of joint significance of instruments in the first stage regression, and partial R-squares of the regression of the endogenous variable on the identifying instruments, reported in Table 8—all indicate that the instruments are of high quality.[27] Table 8 shows that in both cases (non-homeland and all South Africa) the WUE for Africans estimated from the 2SLS model is larger (a bigger negative coefficient) than that from the corresponding OLS model. This is consistent with the existence of an even steeper wage curve than previously reported in Tables 3 and 5. However, the 2SLS results are based on non-significant coefficients.

Conclusion

The wage curve has been the subject of intensive discussion and research, primarily using OECD data, in which unemployment rates are typically 5–12% (Blanchflower and Oswald 1994:297). The robustness of the wage curve, both across countries and across ranges of unemployment rates, has become an interesting question. In this paper we look for a wage curve in South Africa, where the average unemployment rate is very high. We test for the wage curve relationship $W = f(U, \ldots), f' < 0$, which contrasts with the conventional assumption about labor market behavior in developing countries, $U = g(W, \ldots), g' > 0$. We find no evidence of the positive association implied by the latter hypothesized relationship.[28] The negative relationship we find is

[25]The one exception would be the intervention-premium interpretation referred to earlier.

[26]The full set of results, including first stage estimates, are available from the authors upon request.

[27]Angrist, Imbens, and Rubin (1996) showed that two conditions must be fulfilled for the identification of causal effects using instrumental variables: the correlation of the instrument of U with the error term in the wage equation should be zero, and the covariance of U and the instrument of U should differ from zero at a statistically significant level. The test results reported in Table 8 show that both conditions are fulfilled.

[28]We estimated an equation $U = g(W, \ldots)$ (not reported). The relevant coefficient was negative but statistically insignificant.

Table 8. Wage Unemployment Elasticity, Estimated from OLS and TSLS Regressions, All South Africa and Non-Homelands.

		All South Africa			*Non-Homelands*		
Specification		*Coeff.*	*Robust t*	*Elasticity*	*Coeff.*	*Robust t*	*Elasticity*
All Races							
OLS	*Ur*	–1.3053	–3.27***	–0.108	–1.8467	–3.36***	–0.166
	Ur^2	1.8033	3.46***		2.5671	2.64***	
2SLS	*Ur*	–1.3650	–0.47	–0.229	–4.0832	–1.09	–0.610
	Ur^2	0.8263	0.19		1.7333	0.21	
Partial R^2:	*Ur*		0.2214			0.2169	
	Ur^2		0.1467			0.1749	
F-Statistic:	*Ur*		54.66			80.88	
	Ur^2		46.83			65.47	
P-Value Overid Test:			0.5765			0.9507	
N			6,498			4,808	
Africans							
OLS	*Ur*	–1.3559	–2.94***	–0.072	–2.4685	–3.49***	–0.211
	Ur^2	1.8357	3.15***		3.2857	2.81***	
2SLS	*Ur*	–1.3095	–0.54	–0.152	1.7004	0.43	–0.325
	Ur^2	1.3292	0.50		–6.1484	–0.90	
Partial R^2:	*Ur*		0.1016			0.0737	
	Ur^2		0.0612			0.0466	
F-Statistic:	*Ur*		54.14			14.66	
	Ur^2		68.41			18.25	
P-Value Overid Test:			0.3283			0.8487	
N			4,250			2,564	

Notes: As in all tables except Table 1, only the quadratic specification is used, since the squared term of U_r is statistically significant, both for "all races" and for Africans. The partial R^2 of U_r is the adjusted R^2 in the regression of UnempRateB on the identifying instruments. The partial R^2 of U_r^2 is the adjusted R^2 in the regression of UnempRateB^2 on the identifying instruments. F-statistic U_r is the F-statistic of the joint significance of the identifying instruments in the first-stage regression of UnempRateB, and F-statistic U_r^2 is the equivalent in the regression of UnempRateB^2. The last row under each race shows the p-value of the F-statistic of the test of overidentifying restrictions.

robust with respect to the inclusion or exclusion of the regional dummy variables that might standardize for a long-run positive reverse relationship. Even as applied to the mid-1990s, after the relaxation of controls on mobility, the Harris-Todaro model appears not to be relevant to South Africa. This finding presents a further challenge to one of the best accepted theoretical models of the way the labor market operates in developing countries with high unemployment.

South Africa has one of the most interesting labor markets in the world. Its powerful labor market institutions and strong labor unions would lead one to expect less flexible responses of wages to local unemployment than in OECD countries. Yet we find that the South African wage curve elasticity is no weaker than in OECD countries, and that it is robust over a wide range of unemployment. Tripling unemployment from 10% to 30% reduces wages by approximately 20%. The wage curve was subjected to a range of robustness tests—allowing for possible endogeneity, dividing the workers into high/low unemployment rate areas, dividing the sample into different

groups of workers, and allowing for the correlation of errors across individuals within regions—but none of these reduced the wage curve elasticity below about –0.08 over the range of unemployment between 10% and 30%.[29] At rates of unemployment above 30–35%, the wage unemployment elasticity falls to zero. The South African labor market displays considerable wage-flexibility in response to local labor market conditions across this large country.

Our estimates of the elasticity of the wage curve for various subgroups generally correspond to those in other studies. Like Blanchflower and Oswald (1994:148–67, 258, 261, 342, 349–51) and Hoddinott (1996:1618–19) for other countries, we found that younger, less experienced, less educated, non-unionized, and private sector workers tended to have steeper wage curves. This suggests that the free-market tendency (proxied by youth, low skill, and weak organization) is toward a vertical wage curve (with the wage very responsive to unemployment), and that non-local bargaining (proxied by union membership and the public sector) is toward a horizontal wage curve (with non-responsive wage). The elasticities for older, experienced, and educated workers are consistent with the efficiency wage rationalization of the wage curve, and the elasticity for private sector workers is consistent with the local bargaining explanation. It also appears that unions, often bargaining at the non-local level, limit the impact of local unemployment on wages in South Africa.

This study helps inform the important debate about the relevant definition of unemployment in South Africa. The South African government has adopted the narrow concept as the official definition and has de-emphasized estimates of broad unemployment (StatsSA 1998). Yet, our analysis indicates that the broad definition of unemployment is the appropriate one for labor market analysis in South Africa, since local wage determination takes discouraged workers into account as genuine labor force participants. Although even the narrow estimate of unemployment is high and justifies policy priority, the alliance between the ruling party and the trade union movement (representing the employed) might well lead to a playing down of the unemployment issue. Our argument in favor of the broad measure of unemployment therefore has policy relevance. Moreover, it is clear that unemployment contributes to poverty both directly and indirectly through its effect on the wage level.

Over the decade 1990–2000 the South African labor force grew by 3.4% per annum, whereas formal sector employment fell by 1.2% per annum. The pace of divergence between the rise in the labor force and the fall in formal sector employment is remarkable, with the gap between supply and demand growing by 4.6% per annum over the 1990s. The downward adjustments in the market-clearing wage that would be required by this divergence would put great sociopolitical strain on any labor market, however flexible it might be in response to marginal changes. In fact, formal sector real wages rose by 3.3% per annum (StatsSA 2002:7.21, 8.20). This descriptive evidence suggests that, over time, there is a positive relationship between wages and unemployment. By contrast, our evidence of a wage curve suggests that, across space, there is a *negative* relationship between unemployment and wages. This apparent contradiction would be consistent with an exogenous rise in the wage curve over time, possibly associated with increased bargaining power or greater job security. This could generate a new equilibrium higher up the aggregate labor demand curve, involving a higher wage and more unemployment.

[29]As we note elsewhere, our two-stage results—which suggest higher elasticity levels than do the results from our OLS analysis—are not statistically significant.

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