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The Wage Curve: A Review

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ABSTRACT

In The Wage Curve, David G. Blanchflower and Andrew J. Oswald argue that there is a fundamental negative relation between wages and the unemployment rate in a worker's local labor market. Blanchflower and Oswald use large-scale micro data sets to estimate this relation for the United States, Britain, and 10 other countries. I review their empirical methods and findings, and provide some further evidence on the nature of the wage curve relationship in the United States. I conclude that there is a strong statistical correlation between rates of pay and local unemployment, although the interpretation of this correlation remains unresolved.

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In The Wage Curve, David Blanchflower and Andrew Oswald set out to establish no less than an empirical "law" of economics.[1] In their own words, the book is "...principally an examination of the role that local unemployment plays in pay determination -- where causality is to be thought of as running from the amount of joblessness to the level of wages." (Blanchflower and Oswald (1995, p. 3)). As readers who have followed the trail of research leading to this long-awaited volume will know, Blanchflower and Oswald's conclusion is that wages are lower in labor markets with higher unemployment. Indeed, they argue that the negative relationship between wages and unemployment -- the "wage curve" of their title -- is virtually identical across countries, and stable over time. They back up their conclusions with what is surely a record achievement in economics writing: 104 tables and 117 figures in just under 400 pages.[2]

Blanchflower and Oswald's work falls in the middle ground between micro- and macroeconomics. Macroeconomic questions provide the primary motivation for The Wage Curve, while microeconomic methods provide the tools. Their explicit focus on local labor markets builds on earlier studies of inter-regional migration and labor market equilibrium (John Harris and Michael Todaro (1970), Robert Hall (1970), Jennifer Roback (1982)). Their estimation methods are closely related to those used in recent studies of the cyclical variability of real wages (e.g. Mark Bils (1985), Gary Solon, Robert Barsky, and Jonathan Parker (1994)). And their findings are largely consistent with existing research on the short-run responses of wages and employment to local labor market shocks (e.g. Timothy Bartik (1991), Olivier Jean Blanchard and

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[1]David G. Blanchflower and Andrew J. Oswald, The Wage Curve. Cambridge, Massachusetts and London: MIT Press, 1995. Pp. xii, 471. ISBN 0-262-02375-X.

[2]The book also includes an 80 page appendix on the various data files.

Lawrence Katz (1992)). Despite these links to the previous literature, however, Blanchflower and Oswald interpret the existence of a stable relation between wages and contemporaneous unemployment as a new and potentially revolutionary finding.

My hunch is that most readers of The Wage Curve will accept Blanchflower and Oswald's conclusion that wages are negative correlated with the local unemployment rate (at least, once permanent location effects are taken into account). Even skeptics will probably suspend disbelief after the first 50 or 60 tables of the book. Of deeper interest to many readers will be the interpretation of this correlation. Is it a mis-specified version of the Phillips curve? Is it a labor supply function? Or is it, as the authors argue, an equilibrium locus of wages and unemployment rates that essentially replaces the market-level labor supply function? If it is the latter, then The Wage Curve may be a truly important book, for it will have isolated the missing link that has long evaded macro modelers: a relatively elastic quasi-labor supply function that can be combined with a simple labor demand function to construct a model of the aggregate labor market. Such quasi-supply functions lie at the heart of recently developed "structural" unemployment models, featured in the work of Richard Layard and Stephen Nickell (1986), Layard, Nickell, and Richard Jackman (1991), Assar Lindbeck (1993), and Edmund Phelps (1992, 1994).[3]

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[3]The "structural unemployment" term is due to Phelps (1994): see Michael Woodford (1992, 1994) for a useful overview of this class of models.

I. What is 'the wage curve'?

The substance of The Wage Curve revolves around a microeconometric wage function of the kind routinely used by labor economists to study such issues as the returns to education or male-female wage gaps. The "twist" is that Blanchflower and Oswald augment the conventional list of individual-specific wage determinants (gender, race, education, age) with a measure of the unemployment rate in an individual's local labor market. In most of their specifications the local labor market is defined by geographic location, such as city, state, or region. In their analysis of U.S. data, however, Blanchflower and Oswald assign individuals to both a place (state or region) and an industry, and include unemployment rates for the location and the industry.

There are several precursors to the idea that local unemployment rates affect wages. One relevant literature starts from the hypothesis that different locations or industries differ in the long run probability of unemployment. As noted by Adam Smith, any predictable component of the "constancy of employment" will require a compensating differential (see John Abowd and Orley Ashenfelter (1978) for an elegant formulation). Harris and Todaro (1970) used this idea to explain the persistence of high unemployment in the urban areas of less-developed countries, while Hall (1970, 1972) applied it to patterns of wages and unemployment across major U.S. cities. Blanchflower and Oswald point out two potential difficulties for this simple compensating differentials theory of wages and unemployment. First, it is not altogether clear that in the U.S. at least, different regions (states, cities) actually have permanently higher or lower unemployment rates.[4] Second (and related to the first), depending on which years are used in the analysis, researchers have not always found a statistically significant and positive association between wages and "long-run" unemployment rates. Perhaps more fundamentally, however, the compensating differentials theory pertains to the expected unemployment rate in a local market, while the wage curve relation that occupies Blanchflower and Oswald's attention concerns contemporaneous unemployment.

Another strand of research that is relevant to Blanchflower and Oswald's work is the literature on the cyclicality of real wages. Macroeconomists generally agree that average real wages are relatively stable over the business cycle (see Solon, Barsky, and Parker (1994) for a summary). Nevertheless, the measured stability of average wages may be masked by changes in the composition of the work force over the business cycle (Alan Stockman (1983)). A series of papers over the past decade have used repeated wage observations for the same individuals to measure the cyclicality of real wages, purged of compositional effects. Estimates from four of these papers are summarized in Table 1. Each of the studies regresses the year-to-year change in wages for a sample of individuals on the corresponding change in the aggregate unemployment rate. There is a remarkable degree of consistency across the studies: in each case, a 10 percent increase in unemployment is

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[4] John Pencavel (1994) notes that city-specific unemployment rates are highly positively correlated over time in Britain, but at best weakly correlated over time in the U.S. Blanchard and Katz (1992) make a similar observation about the correlation of state-specific unemployment rates over time.

estimated to reduce male wages by just under a 1 percent.[5] A "typical" peak-to-trough change in unemployment of 2.5 percentage points is therefore associated with about a 3.5 percent change in men's wages. Evidence from Solon, Barsky, and Parker (1994) suggests that the cyclical variability of women's wages is about one-half as large.

Blanchflower and Oswald's empirical specification can be thought of as a variant on the one used by the studies in Table 1. There are two critical differences. First, Blanchflower and Oswald use repeated cross-sections, rather than panel data, and therefore do not control for changes in the unmeasured characteristics of the individuals who actually work at different points in the business cycle.[6] Solon, Barsky, and Parker (1984) conclude that the use of wage data from a series of cross-sections, rather than from panel data, may lead to up to a 50 percent attenuation in the measured elasticity of real wages with respect to aggregate unemployment. Second, Blanchflower and Oswald use the local, rather than the aggregate unemployment rate. If the relation between real wages and local unemployment is non-linear (as Blanchflower and Oswald's findings suggest), then studies such as those in Table 1 may suffer from aggregation bias.[7] Nevertheless, Blanchflower and Oswald's estimates of the wage curve elasticity turn out to be similar to the estimates in Table 1. Thus, one can view <u>The Wage Curve</u> as providing new

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[5]It should be pointed out that three of the papers use the same data (wages for male household heads taken from annual earnings and hours information collected in the Panel Study of Income Dynamics).

[6]See Solon, Barsky, and Parker (1994, pp. 11-14 for a careful discussion of the issues involved here.

[7]Such a possibility was raised by Richard Lipsey (1960) in his famous article on the Phillips curve. Lipsey argued that aggregation biases could account for counter-cyclical "loops" around the Phillips curve.

evidence on the cyclicality of real wages that is roughly consistent with the existing micro-based studies.

II. Major findings

A sampling of Blanchflower and Oswald's major findings is presented in Table 2. The table contains estimated elasticities of wages with respect to the local unemployment rate from models of the form:

$$(1) \quad \log w_{irt} = a \log U_{rt} + b X_{irt} + d_r + f_t + e_{irt} ,$$

where w_{irt} is the wage rate for person i observed in local labor market r in period t, U_{rt} is the unemployment rate in labor market r in period t, X_{irt} is a set of measured characteristics of individual i (such as gender, age, and education), d_r and f_t are unrestricted intercepts for different labor markets and time periods, and e_{irt} is an error term. The estimates in columns 1-4 are based on U.S. annual earnings data for 1963-1987 from the March Current Population Survey (CPS). The estimates in columns 5 and 6 are based on British weekly earnings data for 1973 to 1990 from the General Household Survey (GHS).

Blanchflower and Oswald present a wide range of evidence on the appropriate functional form of the relation between wages and local unemployment rates. Based on specifications that include higher-order polynomials of the local unemployment rate, and others that include dummy variables for different ranges of unemployment, they conclude that log wages are a monotonically decreasing and convex function of local unemployment. For most purposes, they argue that the wage curve relation is well-approximated by a simple log-linear function (as is assumed in equation (1)).

Much of the empirical analysis in The Wage Curve is based on the "brute force" estimation of equation (1) using pooled cross-sections of micro data. The authors take some pride in the fact that the overall samples involved in these exercises are large: 1.5 million observations in the case of the pooled March CPS data for the U.S.; and 175,000 observations in the case of the GHS data for Britain. Careful consideration of equation (1), however, shows that the actual "degrees of freedom" involved in the estimation of the wage curve elasticity is far less than the number of individual wage observations. Indeed, the relevant dimension for the estimation of the unemployment coefficient is the number of regional labor markets times the number of time periods. Blanchflower and Oswald's studies of the wage curve in the U.S. and Britain use 200-500 "observations" on local labor markets in different years. For some of the other countries studied in The Wage Curve, however, the number of regions and/or time periods is low, leading the authors to measure unemployment by location and gender (in the case of Germany, Italy, and the Netherlands).

The realization that the unemployment variable in equation (1) has no "i" subscript has a second important implication. Specifically, individuals in the same labor market may share some common component of variance that is not entirely attributable either to their measured characteristics (X_{irt}) or to the local unemployment rate. In this case, the error components e_{irt} in equation (1) will be positively correlated across people from the same local market, and the conventional formula for the estimated standard error of the unemployment effect will be significantly downward biased (Brent Moulton (1986, 1990)). This means that most of the wage curve elasticities reported by Blanchflower and Oswald are far less precisely estimated than their t-ratios would suggest.

Blanchflower and Oswald are aware of this difficulty and use a very simple aggregation procedure to study it. Taking averages over all the individuals in market r in period t, equation (1) implies:

$$(2) \quad \log w_{rt} = a \log U_{rt} + b X_{rt} + d_r + f_t + e_{rt} ,$$

where $\log w_{rt}$ represents the average log wage in the market and X_{rt} is a similar average of the observed characteristics for all individuals in that market. Equation (2) can be estimated using region-by-year "cell means". Assuming that there is no correlation in the unobserved determinants of wages across markets, the residuals in equation (2) are uncorrelated across observations, and conventional standard error formulas are valid. Notice that the coefficients obtained by this procedure should in principle equal the ones obtained by "brute force" estimation on the micro samples: all that should differ are the sampling errors.[8] A minor difficulty with Blanchflower and Oswald's aggregate estimation method is that it is awkward to implement with both a regional unemployment rate and an industry unemployment rate (since in this case the appropriate cells are region*industry*year aggregates). For this reason, Blanchflower and Oswald apply their aggregate estimation methods separately to region*year cells, and to industry*year cells.

[8]Blanchflower and Oswald's aggregate method can lead to very imprecise estimates of the coefficients for the individual control variables. An alternative "two-step" procedure would be to estimate equation (1) including unrestricted region*year dummies, and then in a second stage model, regress the region*year dummies on year effects, regional effects, and the regional unemployment rate. This procedure uses the micro-level data to estimate the coefficients of the individual-level variables, but leads to standard errors in the second stage that fully account for the presence of correlations across people in the same market.

A final aspect of the specification of equation (1) is the presence of year and labor market dummies. As it turns out, this is a crucial issue in the estimation of the U.S. wage curve, but less important for other countries. When market dummies are excluded, the implicit assumption underlying the specification is that wages respond to the "transitory" and "permanent" components of local unemployment with the same elasticity. The addition of market-specific fixed effects allows the permanent component of wages to have an arbitrary correlation with the permanent component of unemployment, and uses only the deviations of wages and unemployment from their average values to estimate the wage curve elasticity. For the U.S. data this matters, since average levels of unemployment across states are weakly positively correlated with average wages, whereas "transitory" wages and unemployment rates are strongly negatively correlated. Thus, the U.S. wage curve elasticity tends to be small in magnitude (or even positive in some subsamples) unless locational dummies are included, as they are in all the models reported in Table 2. For the British data, the addition of region dummies rarely affects the estimated wage curve elasticities, perhaps reflecting the greater degree of "permanence" in the geographic patterns of British unemployment noted by Pencavel (1994).

As shown by the estimates in columns 1, 2, and 5 of Table 2, Blanchflower and Oswald's micro-level equations with region and time dummies give elasticities of wages with respect to local unemployment of about -0.10 -- very close to the micro-level estimates in Table 1. The estimated elasticities are similar for the U.S. and Britain, and also tend to be similar when comparable procedures are applied to micro data sets for other countries, including Australia, Canada, South Korea, and many Western European countries. Perhaps surprisingly, Blanchflower and Oswald also find that the regional unemployment elasticity for the U.S. is similar whether or not the industry unemployment rates is also included in the estimating equation (e.g., compare columns 1 and 2 of Table 2).[9]

A comparison of the estimated wage curve elasticities for the U.S. based on microdata and cell-level data (e.g. columns 1 and 3) reveals two important facts. First, the estimated standard error of the wage curve elasticity is much larger in the (appropriate) cell-level estimation. As expected on a priori grounds, micro-level estimation methods (with no correction for a market-level error component) significantly overstate the precision of the wage curve elasticity. A general rule seems to be that micro-level estimates overstate the t-ratio of the wage curve elasticity by a factor of 2: a conclusion that is of little importance for the U.S. and U.K. analysis in The Wage Curve, but is more troublesome for Blanchflower and Oswald's analysis of smaller data sets from other countries. A second and unexpected finding is that the estimated U.S. wage curve elasticities are smaller using cell-level data (compare columns 3 and 4 with columns 1 and 2). Indeed, based on the cell-level industry data (column 4) there is no evidence of a wage curve in the U.S.![10] The British data tend to be better behaved: the cell-level and micro estimates of the wage curve elasticity are fairly close.

A troubling feature of Blanchflower and Oswald's wage curves for the U.S. is that they describe annual, rather than hourly, earnings. Apart from a

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[9]This is potentially a puzzle, because an overall increase in unemployment in all markets has a much larger effect on wages in the specification in column 2 than in the specification in column 1.

[10]Blanchflower and Oswald give no explanation for the large discrepancy between the micro-level and cell-level wage curve elasticities. Their discussion of the cell-level estimates (page 170) leaves readers with the mistaken impression that there is a potential bias in the micro-level wage curve elasticities.

limited set of estimates for a single 1987 cross-section (Tables 4.11 and 4.18), Blanchflower and Oswald use annual earnings as a wage measure throughout their core U.S. chapters. Since annual earnings are the product of annual hours and hourly wages, and annual hours are highly correlated with contemporaneous unemployment rates, one may ask whether Blanchflower and Oswald have discovered a "wage curve" or only an "hours curve" for the United States.[11] To get some evidence on this important question, I used annual earnings and annual hours data from the March CPS for 1979, 1982, 1985, 1988, and 1991 to estimate the wage curve and "hours curve" elasticities in Table 3.

The analysis in Table 3 uses state-by-year data for 5 years and 51 states on three dependent variables: log hourly earnings; log annual hours; and log annual earnings. I use two different measures of each dependent variable: a simple average of the appropriate variable for all workers in the state; and a regression-adjusted average that controls for the observable characteristics of workers in each state (using a set of year-specific regression coefficients). Like most of Blanchflower and Oswald's U.S. specifications, the models in Table 3 control for state effects and year effects. Focus for the moment on the estimates in row 1 of Table 3, which pertain to all workers. These estimates reveal that the elasticity of annual earnings with respect to state unemployment rates reflects both a modest elasticity of average hourly wages with respect to unemployment (-0.07 to -0.08), and a slightly larger elasticity of annual hours with respect to

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[11]This is less of a problem for their studies of other countries, which typically rely on weekly earnings.

unemployment (-0.11 to -0.12).[12] The implied elasticity of annual earnings is approximately -0.20: about twice as big as estimates reported by Blanchflower and Oswald. I am unsure of the source(s) of this discrepancy: experiments with minor changes in the sample period and the specification did not lead to much change in the estimates in Table 3. Perhaps a safe conclusion is that wage curve elasticities are not quite as robust as one is led to believe by the discussion in The Wage Curve.[13]

Surprisingly, however, the elasticity of hourly earnings in the first row in Table 3 is just under -0.10: very similar to the majority of the wage curve elasticities in Blanchflower and Oswald's book. If the elasticity of hourly wages with respect to local unemployment rates is about 0.1, then one would expect a much larger elasticity of annual earnings, since there is an essentially mechanical correlation between unemployment and average hours of work.[14] In their U.S. chapters, Blanchflower and Oswald argue that the wage curve elasticity is the same for hourly, weekly, and annual earnings.

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[12]Since log(annual earnings) = log(annual hours) + log(hourly wage), the elasticity of annual hours with respect to unemployment is the sum of the elasticities of annual hours and hourly wages with respect to unemployment.

[13]Conceptually, the estimates in Table 3 are comparable to Blanchflower and Oswald's estimates based on regional cell means (like the one shown in column 3 of Table 2). As noted earlier it is unclear why Blanchflower and Oswald's estimates from this procedure are so small in magnitude.

[14]Note that (in steady state) the unemployment rate is a measure of the fraction of annual weeks spent in the labor force but not employed. Thus weeks of work equals LF(1-U), where LF represents weeks in the labor force and U is the "retrospective" unemployment rate. If E denotes annual earnings, w denotes average hourly wages, and h denotes hours per week, then

$$\log(E) = \log(w) + \log(h) + \log(LF) - U ,$$

and the derivative of log annual earnings with respect to unemployment is the sum of four effects: the derivative of hourly wages with respect to unemployment (the "pure" wage curve effect); the derivative of hours per week with respect to unemployment; the derivative of labor force participation with respect to unemployment; and a purely mechanical -1 term.

Conceptually, this is extremely unlikely, and as shown in Table 3, it is also empirically suspect. A major weakness of The Wage Curve is the authors' failure to consider this point more carefully.

Another disappointing feature of The Wage Curve is the absence of any discussion about the potential effects of selection bias on the slope of the wage curve. Economists have argued for the past decade that composition bias is a potentially important factor in understanding how measured wages respond to changes in unemployment. It seems likely that similar composition biases affect the measured elasticity of wages with respect to local unemployment rates.[15] Blanchflower and Oswald could have easily used their March CPS data sets to give some indication of the likely magnitude of such biases in the U.S. labor market. In particular, consecutive March surveys can be matched to form two-year panels, permitting a comparison of the effects of local unemployment on the average changes in wages for individuals who work in the same market in two consecutive years, versus the effects on the changes in average wages for all workers in the market. This exercise should be a top priority for any further work on the wage curve.

a. Variation in the slope of the wage curve

One of the questions that probably occurs to most economists when they encounter a specification like equation (1) is whether a change in contemporaneous unemployment has the same effect on wages of different kinds of workers, or in different industries or sectors. Blanchflower and Oswald

[15]Note that the extent of composition bias is likely to vary by whether the wage measure is based on earnings in a short period (such as a week or month) or earnings over a longer period, such as a year.

present a variety of evidence on this issue from the U.S., Britain, Canada, and Australia, which I have attempted to summarize in Table 4.[16].

There are several informal hypotheses in the labor economics literature that might shed light on the relative slope of the wage curve across groups. One of these is the notion that wages in internal labor markets are isolated from cyclical shocks. According to this view, wages of more senior workers are less likely to vary with current labor market conditions, whereas the wages of recent hires are more closely linked to external market forces.[17] A second and related idea is that better-educated workers have greater levels of firm-specific human capital (Walter Oi (1963)). The presence of firm-specific capital introduces a wedge between the level of productivity at the current employer and outside opportunity wages, and might allow employers to "smooth" wages over the business cycle.[18] If this notion is correct, then wages of better-educated workers may be less responsive to local unemployment rates. A third idea, associated with H. Gregg Lewis (1963), is that unionized wages tend to be less sensitive to business cycle conditions -- in part because, in North America at least, union wages are set in multi-year contracts. Finally, Lawrence Katz and Alan Krueger (1991) have argued that public sector wages --

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[16]One distracting feature of The Wage Curve is the authors' lack of consistency across specifications and data sets in designating different groups. For example, in their two main U.S. tables, they divide workers into very different age and education categories. For this reason, and for international comparability, somewhat ambiguous category labels are needed in Table 4. Blanchflower and Oswald's analysis for South Korea is based on industry unemployment and is not necessarily comparable to the regional wage curve elasticities in Table 4.

[17]This idea can be formalized in a variety of ways. See Paul Beaudry and John DiNardo (1991) for one example.

[18]Technically, of course, employers should smooth total earnings rather than the hourly wage rate (John Abowd and David Card (1987)).

especially the wages of federal workers -- are likely to be relatively insensitive to local labor market conditions.[19]

When the wage is measured by annual earnings (as in most of Blanchflower and Oswald's work for the U.S.) differences in the cyclical sensitivity of hours may also contribute to differences across groups in the estimated wage curve elasticity. To illustrate the potential importance of this phenomenon, rows 2-5 of Table 3 present estimated elasticities of hourly wages, annual hours, and annual earnings for various subgroups of U.S. workers, using 1979-1991 CPS data. With these estimates it is possible to calculate differences across groups in the fraction of the elasticity of annual earnings that is attributable to the cyclical variability of hourly wages as opposed to the cyclicality of hours.

There are several consistent patterns that emerge from Tables 3 and 4. For example, the wages of men are uniformly more responsive to local unemployment rates than the wages of women. As shown in row 2 of Table 3, the hourly wages of U.S. men vary more with local unemployment than the hourly wages of women, and their annual hours are also more cyclically variable. Thus, men's total annual earnings are considerably more elastic with respect to local unemployment than women's. Similarly, hourly, weekly, and annual wages of younger workers vary more with local unemployment rates than the wages of older workers. Patterns by education are less clearcut. For the most part, annual earnings of high-education workers appear to be less variable than those of low-education workers. The evidence for Britain differs between the two data sets used by Blanchflower and Oswald, however,

[19]Some observers might also argue that public sector wages are set by political as well as market forces, and are therefore unlikely to fully reflect current labor market conditions.

and in Australia more-educated workers have a significantly higher wage elasticity.

With respect to union-nonunion differences, the two U.S. data sets give slightly different answers: the 1987 cross-section shows about equally variable union and nonunion weekly wages, while the 1983-88 data on annual earnings show more elasticity in the nonunion sector.[20] In Britain, union member's wages appear to be totally unresponsive to local unemployment. Public sector wages are less variable with respect to local unemployment in the United States, but the differences in Britain are slight. Finally, the estimates in row 5 of Table 3 present some crude evidence on the question of whether the wages of new-hires are more responsive to local unemployment rates than the wages of workers with continuing seniority. The hourly wages of recent job switchers appear to vary more with local unemployment, but even the wages of those who maintain a stable employment relation over the year vary significantly with cyclical conditions. Some related evidence on this issue is presented by Blanchflower and Oswald for South Korea, using industry rather than regional unemployment rates. There, they find that the wage curve elasticity is monotonically decreasing with job tenure, with relatively high unemployment elasticities for new hires (those with one year or less of seniority).

In principle, one could imagine using the patterns of variation in the slope of the wage curve across sectors and types of workers as a means of choosing between competing theories of the wage curve. Although they present a wide range of wage curve estimates for different subgroups of workers,

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[20]It should be noted that there is slippage in the identification of union status in U.S. data on annual earnings, since union status refers to the survey week in March of each year, while earnings are for the previous year.

Blanchflower and Oswald don't pursue any kind of formal testing (see section IV for more on their theoretical models and insights). Several cuts at the data also remain unexplored. For example, they don't estimate wage curves for self-employed workers, although such an exercise would be feasible with their U.S. data and might be helpful in distinguishing between theories. Furthermore, they concentrate almost exclusively on the effect of the overall unemployment rate.[21] An interesting question is whether the wages of a specific group of workers are more strongly related to the group's unemployment rate, or to a summary measure of market conditions like the overall unemployment rate. If the correct specification of the wage curve uses a group-specific unemployment rate, then one simple explanation for the differences in the wage curve slopes in Tables 3 and 4 is that group-specific unemployment rates are related to the overall unemployment rate with different elasticities.[22] Another explanation for differences in the slope of the wage curve across groups is differences in the extent of cyclical composition bias. As noted earlier, this entire topic remains unexplored in The Wage Curve.

III. What the 'wage curve' is not

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[21]One exception is a consideration of the hypothesis that a change in the average duration of unemployment has a differential effect on wages (see Table 6.22).

[22]Specifically, suppose the correct specification of the wage curve is

$$\log (w_{ijrt}) = a \log U_{jrt} + X_{ijrt}b + \ldots$$

where w_{ijrt} is the wage of the ith person in group j in labor market r and period t, and U_{jrt} is the unemployment rate of the group in market r. Suppose further that

$$\log U_{jrt} = d_{jt} + e_j \log U_{rt},$$

where U_{rt} is the overall unemployment rate in market r. Then the wage curve elasticity for group j using the aggregate unemployment rate is $a{*}e_j$.

Before turning to the theoretical models that Blanchflower and Oswald offer for the existence of a stable relation between local unemployment and wages, it is useful to lay out their conclusions as to what the wage curve is not. Specifically, Blanchflower and Oswald argue that the wage curve is neither a Phillips curve, nor a labor supply function. For many readers, these arguments may be the most problematic aspect of their work.

a. Not the Phillips curve

The Phillips curve relationship is one of the most durable -- and controversial -- hypotheses in post-World War II economics. Based on patterns of aggregate labor market data for the U.K. spanning almost 100 years, Alban Phillips (1958) postulated the existence of negative relation between the rate of change of wages and the contemporaneous unemployment rate.[23] Lipsey (1960) showed that such an aggregate relation could be derived from a model describing wage adjustments at the individual market level. While this idea bears a superficial resemblance to the wage curve, Lipsey's specification implies that unemployment determines the rate of change of wages, whereas Blanchflower and Oswald's specification (equation (1)) implies that unemployment determines the level of wages (adjusted for permanent market-specific differentials).

Blanchflower and Oswald test between these competing specifications by estimating an augmented version of equation (2):

(3) $\log w_{rt} = a \log U_{rt} + b X_{rt} + \lambda \log w_{rt-1} + d_r + f_t + e_{rt}$.

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[23]Phillips (1958) was careful to abstract from differences in the rate of price inflation.

They argue that a test of $\lambda = 0$ versus the alternative of $\lambda = 1$ is an appropriate test of the "wage curve" versus the Phillips curve. Because of technical problems associated with the presence of both a lagged dependent variable and a regional fixed effect in (3), and possible serial correlation in the market error term e_{rt}, a "better" test might be to consider a first-differenced version of equation (2):

$$(4) \quad \Delta \log w_{rt} = a_1 \log U_{rt} + a_2 \log U_{rt-1} + b_1 X_{rt} + b_2 X_{rt-1} + g_t + \Delta e_{rt} ,$$

where g_t is a renormalized time effect, and first-differencing within markets has eliminated the region fixed effects. The wage curve hypothesis implies that $a_2 = -a_1$, while the Phillips curve hypothesis implies that $a_2 = 0$. Blanchflower and Oswald base all their inferences on (3), whereas I believe that (4) is a more appropriate statistical framework for testing between the wage curve and the Phillips curve.

For what they are worth, Blanchflower and Oswald's empirical results based on the estimation of equation (3) on U.S. and U.K. data are strongly supportive of the wage curve, rather than the Phillips curve. Estimates of the coefficient λ from equation (8) are generally close to zero and statistically insignificant (see their Tables 4.27 and 6.20, for example). From this evidence, Blanchflower and Oswald conclude that the Phillips curve is dead, and that the proper specification of the relation between unemployment and wages expresses the level of wages as a function of the level of unemployment. Nevertheless, I suspect that reports of the death of the Phillips curve are premature. More evidence on the dynamic relation between wages and unemployment will probably be required before economists disavow Phillips' hypothesis.

b. Not a labor supply function

At least since the publication of Robert Lucas and Leonard Rapping's (1969) famous study of aggregate labor markets, some economists have argued that variation in unemployment should be interpreted as labor supply behavior. Since short run changes in employment and unemployment are approximately mirror images, a finding that wages rise with contemporaneous reductions in unemployment may simply reflect movements along an upward-sloping labor supply function. In order to test this interpretation, Blanchflower and Oswald estimate a series of augmented versions of the regionally-aggregated wage curve (equation (2)). Specifically, they include either the employment-population rate in the region, or the regional labor force participation rate, as an additional explanatory variable. If the wage curve is actually an inverted labor supply function, they argue that either actual employment, or "notional employment" (i.e., employment plus unemployment) should do a better job of explaining local variation in wage levels than the unemployment rate.

Their empirical analysis shows that once regional fixed effects are taken into account, local participation rates or local employment rates have no significant effect on wages, while local unemployment rates continue to exert a systematic effect on wages. Blanchflower and Oswald's results for both the U.S. and Britain strongly support the view that it is local unemployment, rather than local employment or the size of the local labor force, that effects wages. To the extent that one believes the labor supply function should express the total quantity of labor as a function of wages, these findings seem to be inconsistent with a labor supply interpretation.

As Blanchflower and Oswald point out, another aspect of their empirical findings is inconsistent with conventional beliefs about labor supply.

Specifically, the results in Tables 3 and 4 show that the wage curve is much steeper for younger workers. Under a labor supply interpretation, the slope of the wage curve is related to the inverse market supply elasticity. Most analysts would probably expect a higher supply elasticity for younger workers, implying a flatter wage curve for these workers. On the other hand, the fact that the wage curve is flatter for women is consistent with the conventional view that the labor supply of women is more elastic than that of men.

IV. Theoretical Interpretations

Having rejected both the Phillips curve and labor supply as potential explanations for the wage curve, Blanchflower and Oswald argue that it represents something new. Rather than laying out a single theoretical explanation, however, they present a series of three alternative models that are consistent with a stable negative relationship between real wages and local unemployment rates: a model of regionally-based implicit contracts; an efficiency wage model; and a bargaining model. Curiously, they choose to present these models before the core empirical chapters of their book, although it seems clear that the models were derived after most of the data analysis was completed, and after considerable introspection about the nature of the wage curve relation. It is almost as if the theoretical models are placed in the third chapter to ward off charges of "measurement before theory" -- although the authors readily admit their crime in the preface.

Blanchflower and Oswald's first model posits a set of spatially isolated employers, each of which offers a standard Azariadis-Baily-Gordon wage/employment contract to potential employees. In this model, places differ in their amenity values, and these differences generate differences in wages and expected employment/unemployment rates across locations. Under the critical assumption that the unemployment benefit paid to workers in periods of low demand is constant across regions, Blanchflower and Oswald show that regions with higher amenity values will offer contracts with lower wages, lower expected employment probabilities, and higher unemployment.[24] Thus wages and unemployment rates will be negatively correlated across regions.

Two aspects of this model are especially relevant in light of Blanchflower and Oswald's empirical work. First, the contractual model is fundamentally one of wages and employment: unemployment is residually determined and only indirectly correlated with wages. Having dismissed the labor supply explanation precisely because it posits a relation between wages and employment, rather than between wages and unemployment, I find it hard to understand the authors' enthusiasm for the contracting model! Second, the relation between wages and unemployment generated by the contractual model is attributable to permanent region characteristics (amenity values). Wages are negatively related to permanent unemployment rates, although they may be positively or negatively related to unemployment rates in any particular period. In fact, the empirical findings for the U.S. suggest that almost the opposite is true: wages are (weakly) positively correlated with permanent unemployment rates, but strongly negatively correlated with contemporaneous unemployment rates. Again, it seems to me that the contracting model falls short.

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[24]The intuition for this result is as follows. If a higher wage is paid to employed workers in a low-amenity region, but the level of the unemployment benefits is constant across regions, then the optimal contract will lead to a higher level of contractual employment (for each realization of the demand shock) in the low-amenity region, in order to offset partially the higher income risk in this region.

Blanchflower and Oswald's second model is a version of the Carl Shapiro and Joseph Stiglitz's (1984) efficiency wage model. As in the contracting model, they assume that employers in different regions offer pay packages of equal expected utility. In the efficiency wage model, however, firms must offer a net wage that exceeds the value of unemployment; otherwise employees will shirk. Since the penalty for shirking is greater if it takes a longer time to find a new job, firms can offer a lower wage premium if unemployment rates are higher. Thus, within regions, there is a negatively-sloped wage curve representing the locus of wages and contemporaneous unemployment rates that satisfy a no-shirking constraint. Across regions with different amenity values, however, Blanchflower and Oswald argue that there is likely to be a positive long-run association between expected wages and expected unemployment, as in the Harris-Todaro framework. The differing implications of the efficiency wage model for the correlation of wages with contemporaneous and permanent unemployment is an attractive feature of this class of model.

A fundamental property of the efficiency wage model is that wages of a given group of workers are related to the group-specific unemployment rate. Higher unemployment for unskilled workers, for example, should have no effect on the wages of skilled workers, once their own unemployment is taken into account. The absence of any empirical evidence on such questions, noted earlier, is disappointing. It is also somewhat disappointing that Blanchflower and Oswald did not give more thought to developing the implications of an efficiency wage model for differences in the slope of the wage curve across different groups of workers. As it stands, I suspect that many readers will find the efficiency wage model a leading contender for explaining the wage curve, yet they will come away from the book with no real evidence in favor of the model, other than the wage curve itself.

The third model presented by Blanchflower and Oswald is a conventional union bargaining model, similar to one studied by George de Menil (1971), and in an earlier book by Oswald and Alan Carruth (1989). This model generates a wage equation of the form:

$$w = a + s(\pi/n),$$

where w is the negotiated wage, a is an "alternative" wage available to workers in the event of a dispute, π/n represents the level of profits per worker, and s is a relative bargaining power parameter (perhaps depending on relative discount rates). Blanchflower and Oswald assume that unemployment affects wages by lowering the alternative wage a. In the bargaining model, then, the wage curve arises because higher unemployment lowers workers' threat point. This model may be less attractive as a formal underpinning for the wage curve in countries where the level of unionization is low (such as the U.S.), or in countries where union wage negotiations occur at a national level (such as Sweden). It is also slightly puzzling that the slope of the wage curve is lower for union than nonunion workers -- especially in Britain.

Unlike the other theoretical models, Blanchflower and Oswald present some direct empirical evidence on the bargaining model, based on estimates of the wage curve across 19 U.S. manufacturing industries. Specifically, they estimate an industry-aggregated wage equation that includes the industry unemployment rate, controls for the characteristics of workers in the industry, and a measure of profits per employee in the industry. The results suggest that profits exert a reasonably large positive effect on annual earnings of employees in an industry, controlling for permanent industry effects and year-effects.[25] As noted earlier, it is unfortunate that the authors use annual earnings as a wage measure, rather than a standardized time wage, since critics might argue that employee hours and profits are related for reasons other than bargaining. Nevertheless, the findings may stimulate more work on the issue of whether wages are affected by relatively short-run changes in employer profitability.

V. Conclusions

There is a "wage curve". The wages of individuals who work in labor markets with higher unemployment are lower than those of similar workers in markets with lower unemployment. Furthermore, the tendency for the wage curve to show up for different kinds of workers, in different economies, and at different times, suggests that the wage curve may be close to an "empirical law of economics". Even if the question of why local unemployment rates affect pay remains unsettled, as I believe it does, the existence of a wage curve relation is an important addition to our knowledge about the modern labor market. One can imagine future research that uses the negative correlation between unemployment and wages as a means to study other phenomena. One can also imagine a growing body of work that follows The Wage Curve's lead in using the diverse experiences of local labor markets as an "intermediate-level" laboratory for economic research -- part way between the individualistic focus of traditional microeconometric research, and the aggregate focus of traditional macroeconometrics. More than any other lesson, this may be the long-run contribution of The Wage Curve.

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[25]A similar conclusion is reached by Carruth and Oswald, who analyze aggregate time-series data for the U.K.

A book with the ambitious agenda of The Wage Curve is bound to garner champions and critics. Many readers will be stimulated by the conclusion that the wage curve is "something new": a surrogate supply function that can be combined with a simple demand curve to yield interesting models of the labor market; a challenge to orthodox theories of supply and demand. Others will find the book mildly infuriating: slightly oversold in parts, and too quick to jump to strong conclusions. Much of the book is carefully considered, revealing the insights that can only come from years of tedious research. Other parts are more hastily conceived. The authors have taken to heart the advice to "let the data speak". Indeed, with data sets from a dozen countries, and some 200 tables and graphs, readers run the risk of permanent deafness. Nevertheless, most economists will be able to pick up the book and read it. Despite some obvious glitches in organization, it is generally well written, and the level of analysis is relatively non-technical.

Does anyone need to read it? Certainly those who have followed the authors' previous articles on the wage curve will find some repetition of the themes that Blanchflower and Oswald have been developing for close to a decade. But there is much that is new here, as well. A very careful analysis of over 25 years worth of U.S. data forms the core of the book, and is new. Similarly, much of the detailed analysis of British data is new and worthwhile reading. Applied economists who are interested in the issues of unemployment and wage determination will find the book an excellent investment.

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Table 1: Elasticity of Real Wages With Respect to Aggregate Unemployment: First-Differenced Panel Data Estimates

Author	Data Set	Elasticity (standard error)
Bils (1985)	NLS Young Men (whites) 1966-1980 10 changes	-0.089 (0.019)
Rayack (1987)	PSID Males (whites) 1968-80 12 changes	-0.081 (0.016)
Blank (1990)	PSID Males (whites) 1969-82 13 changes pairwise balanced	-0.081 (0.043)
Solon, Barsky & Parker (1994)	PSID Males 1967-1987 20 changes	-0.085 (0.022)

Note: Blank (1990) regresses change in real wages on percentage change in real GNP. Her estimate is transformed to unemployment elasticity using an estimated "Okun" coefficient of 0.30.

Table 2: Summary of Estimated Wage Curve Elasticities for United States and United Kingdom

	U.S. (CPS data)				U.K. (GHS data)	
	Micro estimates		Cell Means		Micro Estimates	Cell Means
	(1)	(2)	(3)	(4)	(5)	(6)
1. Regional Unemployment	-0.102 (0.004)	-0.109 (0.003)	-0.048 (0.009)	--	-0.082 (0.013)	-0.102 (0.028)
2. Industry Unemployment	--	-0.099 (0.004)	--	-0.017 (0.012)	--	--
Source Table:	4.5	4.5	4.26	4.30	6.14	6.20

Notes: Standard errors in parentheses. Entries are elasticities of wages with respect to unemployment rate indicated in row heading.

Table 3: Elasticities of Wages, Hours, and Earnings with Repsect to State Unemployment Rates

	Hourly Wage		Annual Hours		Annual Earnings	
	Actual (1)	Adjusted (2)	Actual (3)	Adjusted (4)	Actual (5)	Adjusted (6)
1. All	-0.07	-0.08	-0.11	-0.12	-0.18	-0.20
	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
2. <u>By Gender:</u>						
a. Women	-0.06	-0.06	-0.08	-0.09	-0.14	-0.16
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
b. Men	-0.08	-0.09	-0.13	-0.15	-0.21	-0.24
	(0.02)	(0.02)	(0.01)	(0.01)	(0.03)	(0.02)
3. <u>By Education:</u>						
a. < 12 years	-0.04	-0.06	-0.14	-0.19	-0.18	-0.25
	(0.03)	(0.02)	(0.04)	(0.03)	(0.05)	(0.04)
b. 12-15 years	-0.09	-0.09	-0.13	-0.13	-0.22	-0.23
	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
c. 16+ years	-0.01	-0.05	-0.02	-0.06	-0.03	-0.12
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
4. <u>By Age:</u>						
a. Age 16-29	-0.12	-0.13	-0.16	-0.18	-0.28	-0.31
	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.03)
b. Age 30-44	-0.06	-0.05	-0.10	-0.10	-0.16	-0.15
	(0.02)	(0.02)	(0.01)	(0.01)	(0.03)	(0.03)
c. Age 45-65	-0.03	-0.03	-0.06	-0.07	-0.09	-0.10
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
5. <u>By Number of Employers Last Year:</u>						
a. One	-0.07	-0.07	-0.10	-0.11	-0.16	-0.18
	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
b. Two or more	-0.14	-0.14	-0.20	-0.21	-0.34	-0.35
	(0.03)	(0.03)	(0.02)	(0.02)	(0.04)	(0.04)

Notes: Standard errors in parentheses. Table entries are elasticities of variables indicated in column headings with respect to state unemployment rate. Estimates are based on 51 state observations for 1979, 1982, 1985, 1988, and 1991. Unadjusted data are means of log hourly wages, log annual hours, and log annual earnings for each state-year cell. Adjusted data are means of regression-adjusted wages, hours, and earnings. All models include state and year dummies.

Table 4: Summary of Estimated Wage Curve Elasticities By Type of Worker and Sector, for United States, United Kingdom, Canada, and Australia

		By Gender:		By Education:		By Age:		By Union Status:		By Sector:	
	All (1)	Males (2)	Females (3)	Low (4)	High (5)	Young (6)	Old (7)	Union (8)	Nonunion (9)	Private (10)	Public (11)
1. U.S. 1963-87 March CPS (annual earnings) Table 4.17	-0.098 (0.004)	-0.119 (0.005)	-0.064 (0.006)	-0.155 (0.008)	-0.064 (0.006)	-0.192 (0.008)	-0.063 (0.008)	--	--	--	--
2. U.S. 1987 monthly CPS (weekly earnings) Table 4.18	-0.112 (0.007)	-0.121 (0.009)	-0.106 (0.011)	-0.131 (0.010)	-0.079 (0.011)	-0.120 (0.008)	-0.106 (0.015)	-0.108 (0.013)	-0.107 (0.008)	--	--
3. U.S. 1983-88 March CPS (annual earnings) Table 4.19	-0.114 (0.023)	--	--	--	--	--	--	-0.070 (0.045)	-0.119 (0.025)	--	--
4. U.S. 1963-87 March CPS (annual earnings) Page 160	--	--	--	--	--	--	--	--	--	-0.100 (0.004)	-0.047 (0.008)
5. U.K. 1983-89 BSAS (weekly earnings) Table 6.7	-0.123 (0.023)	-0.216 (0.028)	-0.040 (0.046)	-0.167 (0.041)	-0.008 (0.050)	-0.213 (0.051)	-0.098 (0.053)	-0.014 (0.035)	-0.188 (0.032)	-0.156 (0.030)	-0.138 (0.048)
6. U.K. 1973-90 GHSS (weekly earnings) Table 6.15	-0.082 (0.013)	-0.094 (0.015)	-0.074 (0.023)	-0.065 (0.018)	-0.053 (0.040)	-0.133 (0.026)	-0.070 (0.026)	--	--	--	--
7. Canada 1972-87 SCF (annual earnings) Table 8.4	-0.095 (0.016)	--	--	-0.223 (0.046)	-0.065 (0.040)	-0.169 (0.049)	-0.095 (0.028)	--	--	--	--
8. Australia 1986 (weekly earnings) Table 8.7	-0.195 (0.034)	-0.210 (0.035)	-0.200 (0.072)	-0.130 (0.060)	-0.307 (0.087)	-0.139 (0.069)	-0.201 (0.104)	--	--	--	--

Notes: Standard errors in parentheses. All entries represent the elasticity of wages with respect to the regional unemployment rate.