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WHAT'S "UP" WITH CONSTRUCTION EMPLOYMENT?

According to the Bureau of Labor Statistics (BLS), employment in the construction industry remains near its most recent cyclical peak despite major contractions in other measures of construction activity. A statistical modeling based on these official estimates suggests that by the end of next year construction employment could fall approximately 250,000. However, previously unpublished data used to prepare the ADP National Employment ReportSM (sponsored by ADP[®], developed and maintained by Macroeconomic Advisers, LLC) suggest that it might already have dropped by approximately 160,000, so that the remaining decline should prove manageable.¹ The largest percentage declines in employment have occurred in medium-sized and large construction companies.

INTRODUCTION

One of the most intriguing empirical puzzles presented of late by the U.S. economy is the apparent disconnect between measures of output and employment. Over the four quarters ended in the first quarter of 2007, real GDP advanced just 1.9%, a pace normally associated, through "Okun's law", with a rising unemployment rate. Yet, the civilian unemployment rate has fallen from 4.8% in February 2006 to 4.5% in June of this year. True, establishment employment has decelerated, but to a growth rate that is still "above-trend." In the spring of 2006, the six-month annualized percent change in establishment employment was 2.1%. By June of this year, it had slipped to 1.3%, but this was still faster than typical projections for growth in the labor force.

In no industry does this disconnect seem more striking than in construction. Typical "straw" commentaries note that starts of private single-family homes, which peaked at 1,837,000 in January of 2006, have since plummeted 36% to 1,170,000 in May of this year. Yet employment in the construction industry peaked at 7,725,000 last September and has fallen a mere 0.6%, to 7,681,000 in June. (See Chart 1 on the following page.) This discrepancy has caught the attention of the press² as well as economists and financial analysts, many of whom: (a) anticipate an eventual large decline in construction employment³; (b) argue that there may already have occurred a substantial decline in the employment of undocumented workers (e.g., illegal immigrants) in the construction industry that has gone unreported to the BLS;⁴ (c) suspect that the official statistics for employment in the construction industry are biased upwards

¹ The ADP National Employment Report is a trademark and service mark of ADP of North America, Inc.

² *Why Haven't Home Construction Jobs Disappeared?* by John Berry (Bloomberg News, July 9, 2007). "The unemployment rate remained at 4.5 percent, unchanged from April and May. The mystery is why the collapse of the bubble in the housing market hasn't been a much greater drag on payroll employment than it has."

³ See, for example, Goldman Sachs US Economic Research, *US Views: It's Taking Longer* (April 6, 2007). "...the fact that residential construction employment is down only 2½% over the past 6 months...is quite surprising given the 10%+ drop in activity measures such as housing completions and houses under construction. If employment had declined in line with activity over the past 6 months, payroll employment growth would probably have been 30k-40k lower per month and the unemployment rate would probably have started to rise."

⁴ For one such discussion see Deutsche Bank, Global Markets Research, *Why Hasn't Homebuilding Employment Dropped?* (July 9, 2007).

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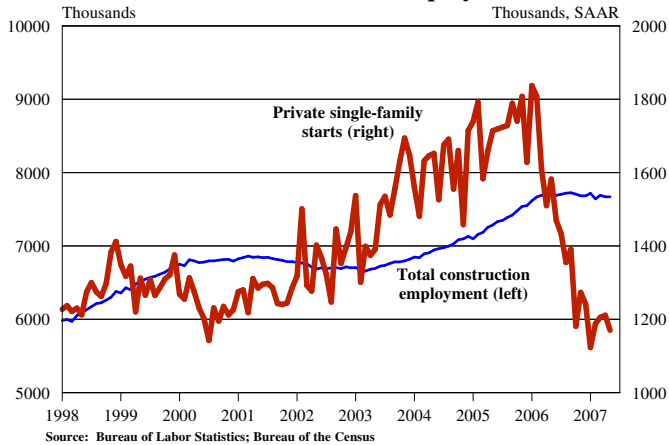
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Chart 1. Single-Family Housing Starts and Total Construction Employment



by a faulty “birth/death adjustment” applied by the BLS.⁵ If the recent birth/death adjustment is biased upward, there could occur a downward revision to recent construction employment when, early next year, the BLS extends its annual benchmarking from March of 2006 to March of 2007.⁶ Such a revision might align construction employment better with other measures of real activity in the industry.

In this *Macro Focus* we examine the disconnect between construction activity and employment in the industry, and use previously unpublished data from the *ADP Report* to conclude that construction employment likely has declined more to date than shown in the official government statistics. Given our modeling of construction

employment and our forecast of construction spending, the analysis suggests that over the next year and a half construction employment might decline approximately 250,000 below recent official estimates, but a smaller 160,000 below the current level suggested by the data from the *ADP Report*. Either figure is consistent with our forecast of a modest rise in the national unemployment rate by early next year.

JUST HOW BIG IS THE DISCONNECT IN CONSTRUCTION EMPLOYMENT?

The question really is whether the recent behavior of productivity in the construction industry is somehow unusual. For several reasons this is best assessed by examining in a longer historical context the recent pattern of total hours worked in construction relative to the total real value of construction spending.⁷ *First*, one wants to account for variations in total labor inputs, not just employment. *Second*, considering real value rather than the number of units allows that workers in the industry may be producing very different kinds of buildings in early 2007 than they were ten, five, or even one year go. *Third*, using the value of construction controls directly for the lag from a housing start, when laborers are first hired onto a project, to the completion of that start, when the last laborers might be let go from the project. And *fourth*, while the value of *new residential* construction has declined sharply over the last year, the values of residential improvements and of nonresidential construction have continued to increase. This has mitigated downward pressure on labor demand in the industry as workers shifted from building new homes to working on other types of construction jobs.

⁵ See, for example, Goldman Sachs US Economic Research, US Daily: *Nonfarm Payrolls: Weaker than Reported?* (May 7, 2007). “The Labor Department’s ‘birth/death model’-which imputes net job creation by new firms in the monthly nonfarm payroll figures-may currently be causing a significant overstatement of employment growth.”

⁶ It is generally recognized that the time-series models on which the birth / death adjustments are based prove least reliable around turning points in the underlying employment data. Hence it is of some interest that in 2006, the birth /death adjustment, not seasonally adjusted, applied by the BLS to its estimate of construction employment, averaged 10,000 per month, up from 7,000 per month in both 2004 and 2005. Similarly, over the first six months of 2007, the adjustment averaged an even higher 17,000 per month, compared to 13,000 per month in the first six months of 2004 - 2006. Suppose, purely for argument’s sake, that after the turning point in construction activity these adjustments should be negative. The cumulative impact on the estimate of employment in the industry would be sizable.

⁷ Note that any errors in the measurement of establishment employment in the construction industry would also be reflected in the corresponding measure of hours.

The quarterly ratio of total hours worked by non-supervisory workers in the construction industry to the structures component of real Gross Domestic Product (GDP) is shown in Chart 2. There are two interesting points to make about this chart. First, the ratio of hours to output does not exhibit much of a trend since the early 1970s, suggesting little secular productivity growth in the industry. Second, there are periodic cycles in the ratio. By early 2007, it rose to a recent high, but that level itself is not entirely unprecedented. Nor does the cycle itself appear especially unusual, as there is clear tendency for the ratio to fall for a while after recessions before then turning up again.

More formally, we can express the long-run (or co-integrating) relationship between construction hours, H_t , and GDP-structures, $GDPS_t$, as:

$$(1) \quad \log H_t = \log GDPS_t + \alpha_0 + \alpha_1 TREND_t + \eta_t$$

where $TREND_t$ is a linear time trend and η_t is an error term. The coefficient $\alpha_1 < 0$ if there are secular productivity gains in the industry.

Ultimately we're interested in explaining employment in the construction industry. Now in principal, one can write employment, E_t , as hours worked divided by the average workweek, W_t . Unfortunately, the available data do not conform precisely to this identity because in the establishment survey hours and the workweek are for non-supervisory workers while employment includes supervisory workers as well. Furthermore, as seen in Chart 3, there has been a steady secular increase in the proportion of construction workers that are supervisory. Hence, given the limitations of the data, a simple tautological relationship between hours, employment, and the workweek must be replaced with:

$$(2) \quad \log H_t = \log E_t + \log W_t + \beta_0 + \beta_1 TREND_t + \varepsilon_t$$

where $\beta_1 < 0$ and ε_t is an error term. Next, substituting (2) into (1) and solving for employment yields the following long-run relationship between employment, output, the workweek, and time:

$$(3) \quad \log(E_t) = \log(GDPS_t / W_t) + \delta_0 + \delta_1 TREND_t + \mu_t$$

where $\delta_0 = \alpha_0 - \beta_0$, $\delta_1 = \alpha_1 - \beta_1$, and $\mu_t = \eta_t - \varepsilon_t$. Note that the coefficient on the time trend can be positive if the secular increase in the ratio of total to non-supervisory hours worked exceeds the rate of productivity growth in the industry. This seems likely given the profile shown in Chart 2.

Chart 2. Non-Supervisory Construction Hours per Dollar of Real Structures GDP

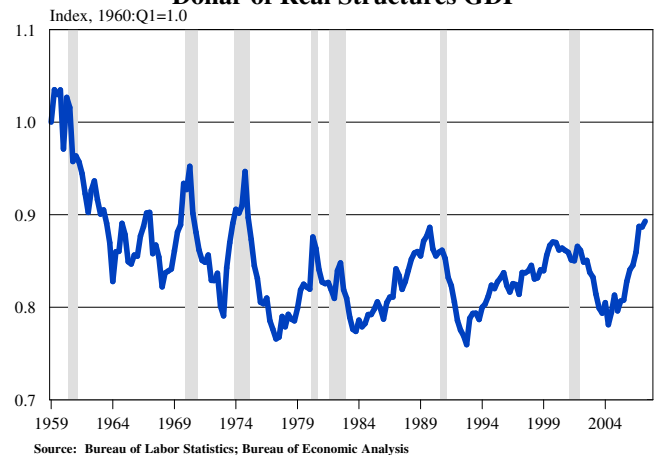
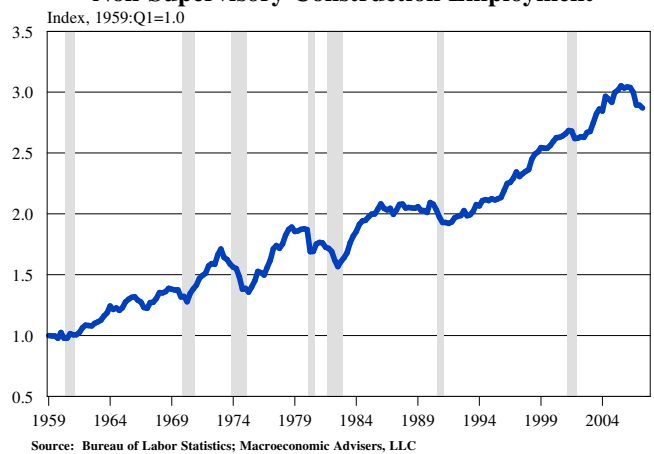


Chart 3. Ratio of Total to Non-Supervisory Construction Employment



We began our empirical investigation by verifying that the variables in (3) were non-stationary and co-integrated, and then estimated the equation using dynamic ordinary least squares (OLS) over the sample 1970:Q1 through 2006:Q1.⁸ The end-point of the sample was chosen so as to utilize only benchmarked revised data on employment and the workweek. Since the coefficient on the logarithmic ratio of output to the workweek was almost exactly equal to unity, we imposed this theoretical restriction on the equation and re-estimated it by OLS. These results were (t-statistics in parentheses):

$$(4) \quad \log(E_t) = \log(GDPS_t / W_t) + 5.517 + 0.000657 * TREND_t + \mu_t$$

(377.9) (4.337)

where μ_t is the estimated error.

Chart 4. Construction Employment Relative to Long-run Standard Error Band

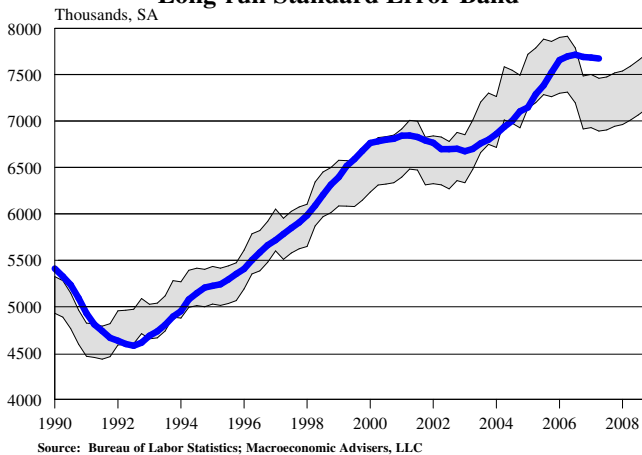


Chart 4 shows actual employment as reported by the BLS against a band that is plus/minus one standard error around the estimated “long-run” value of construction employment predicted by the regression. The band was extended beyond the first quarter of 2007 by assuming a constant workweek in the construction industry and utilizing the Macroeconomic Advisers’ current forecast of GDP-structures through the end of 2008.⁹ Starting in the spring of 2006 — almost immediately beyond the March benchmark for that year — employment started drifting to the top of the rapidly falling confidence band. By the second quarter of this year it was roughly 200,000 above the top of the band, and 500,000 (or 7%) above the point estimate of the long-run value suggested by the equation. In percentage terms such a divergence from “equilibrium” is not unprecedented, but it is one of the largest during the regression sample, and the largest since early 1990.

On the surface, this kind of result seems to suggest the possibility of an imminent sharp drop in construction employment of the startling sort contemplated by some analysts. However, another important question is: how quickly are divergences from equilibrium corrected? To examine this, we next estimated a dynamic equation for the (logarithmic) change in employment by regressing it (using OLS) on the lagged error term implied by (4), the lagged change in employment, the lagged change in the workweek, and the lagged change in GDP-structures. The latter term proved insignificant and so was dropped from the equation, leaving the following results (t-statistics in parentheses):

⁸ In dynamic OLS, leads and lags of the changes in the endogenous, right-hand-side variables are included in the regression to control for bias in the estimated coefficients that arises when co-integrated variable are regressed on each other.

⁹ This is based on a projection that through the end of 2008, private housing starts remain at a cyclical low reached in the third quarter of this year, while the value per unit started and other components of construction (e.g., residential improvements, nonresidential private construction, and state and local government construction) continue to rise modestly. The resulting forecast shows GDP-structures flat for the remainder of his year before then rising a little less than 4% over the four quarters of 2008.

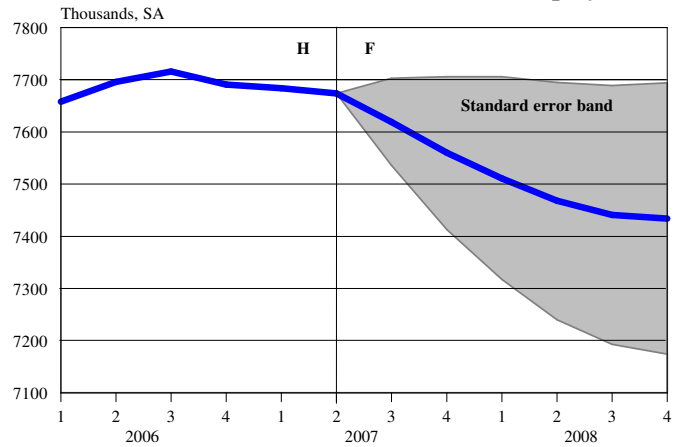
$$(5) \quad \Delta \log(E_t) = 0.0019 - 0.107\mu_{t-1} - 0.237\Delta \log W_{t-1} + 0.576\Delta \log E_{t-1}$$

(2.0)
(3.7)
(2.3)
(7.8)

The sample, again, was 1970:Q1 through 2006:Q1; the R-squared of the regression is 0.55. This equation suggests that, other things equal, roughly 10% of an inherited disequilibrium is eliminated per quarter.

What do equations (4) and (5) together imply about the forecast for construction employment? To answer this, we assumed the workweek remains constant at its second-quarter average, and then ran the Macroeconomic Adviser's forecast of GDP-structures through the model. The results of this experiment are shown in Chart 5. They suggest that, on a quarterly average basis, and based on the official figures, construction employment might fall gradually by 247,000 from June of 2007 through the last quarter of next year, or a little more than 14,000 per month over that span. This certainly would not be pretty, but neither would it be calamitous for the national economy. Indeed, such a decline would be smaller than many commentators suggest is likely. It is disconcerting, however, that a band of one standard error around this kind of forecast (as seen in Chart 5) is so large!

Chart 5. Total National Construction Employment



Source: Bureau of Labor Statistics; Macroeconomic Advisers, LLC

ADDITIONAL INSIGHTS FROM THE ADP NATIONAL EMPLOYMENT REPORT

In the spring of 2006, Automatic Data Processing, Inc., in partnership with Macroeconomic Advisers, LLC, launched the *ADP National Employment Report*. This monthly release presents estimates of payroll employment that can be considered as alternatives to those published by the BLS in the *Employment Situation*. The *ADP Report* is based on a monthly computerized count of employees on almost 400,000 payrolls in the private non-farm sector, covering nearly 23 million workers in all major industries, in all regions of the country, and for companies of all sizes.¹⁰ Unlike the BLS estimates of establishment employment, the estimates shown in the *ADP Report* are not benchmarked every March to the Quarterly Census of Employment and Wages. However, they are scaled to the most recent benchmark level — currently March of 2006 — so that by comparing them to the official government estimates one can quickly assess the cumulative difference between the two series since the last BLS benchmarking.

In its first incarnation, the *ADP National Employment Report* showed estimates only of total employment, but starting in February of this year, the report shows, on a regular basis, some limited detail by industry. In particular, analysts have taken to using the difference between the monthly change in employment in the goods-producing sectors and the monthly change in employment in the manufacturing sector as a proxy for the monthly

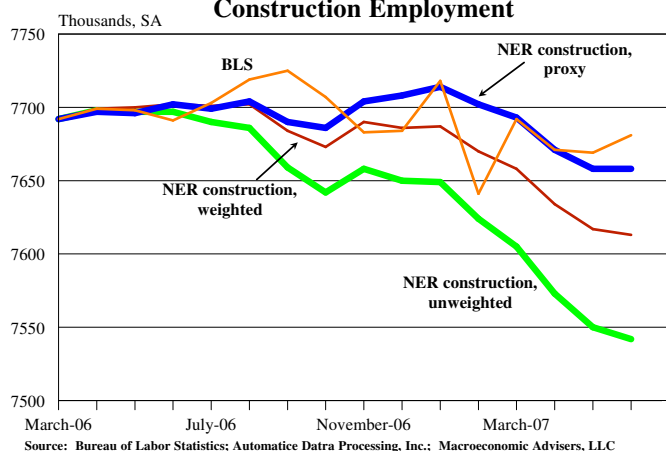
¹⁰ The monthly *ADP Report*, the historical data, and the documentation describing the methodology underlying the estimates are posted on www.adpemploymentreport.com. Note that estimates of employment shown in the *ADP Report* are constructed to reflect changes in national employment, and are not representative of changes in employment at ADP's U.S. business clients.

change of employment in the construction industry.¹¹ What do these data suggest about recent trends in construction employment?

The Proxy for Construction Employment

To answer this, we first computed the monthly growth rates of the proxy for construction employment, and then cumulated them forward from the official estimate of the level of employment in the construction industry as of March 2006. The resulting series is compared to those official estimates in Chart 6. While the monthly profiles are somewhat different, by June of 2007 the cumulative difference between the level of construction employment suggested by the proxy from the *ADP Report* and the estimate from the BLS is a modest 23,000. That doesn't seem to be much of a story!

Chart 6. Estimates of National Construction Employment



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Weighted Separate Estimates of Construction Employment

A proxy, however, is just that: a proxy! In particular, this proxy reflects not only employment in the construction industry, but also employment in mining — including energy where, given recent high prices for oil, there could well have been a significant increase in employment. To circumvent this problem, and only for purposes of this report, ADP has made available to us the separate estimates

of construction employment that are used in the detailed preparation of the *ADP National Employment Report*.¹² These also are shown in Chart 6. They suggest construction employment peaked in August of 2006 at 7,702,000 and since has fallen 89,000 to 7,613,000, 68,000 below the current BLS estimate.

Un-weighted Separate Estimates of Construction Employment

Careful followers of the *ADP National Employment Report* know that the estimate of growth of employment shown in the *ADP Report* is based on a weighted average of detrended “matched-sample growth rates” (*msgr*) of employment by industry¹³, where the weights reflect: (a) the share of total employment in each industry; (b) a separate weighting that reflects the volatility of the data used to develop the *ADP Report* relative to the corresponding data published by the BLS. A bit more technically, consider for any industry the following equation:

$$(6) \quad y_t - \bar{y} = \beta(x_t - \bar{x})$$

Here y_t is the growth rate of employment in the industry as reported by the BLS, x_t is the corresponding *msgr* based on data used to develop the *ADP Report*, and \bar{y} and \bar{x} are the

¹¹ The goods-producing sectors include manufacturing, construction, and mining / natural resources

¹² These estimates are based on a regular computerized count of employment on roughly 21,000 payrolls in the construction industry, in all regions of the country and for all sizes of payrolls. This figure, however, constitutes only a portion of ADP's customers in the industry.

¹³ A monthly “matched-sample growth rate” is based on employment totals collected from the same set of payrolls in each pair of contiguous months.

respective sample means of y_t and x_t . Currently the sample is March of 2000 through March of 2006. It is extended an extra twelve months upon each annual benchmarking of the BLS data. Such regressions are estimated for each industry using only BLS data that has been benchmark-revised — that is, through March of 2006. The predicted values of y_t are then used in the *ADP Report* as estimates of the growth of employment in each industry, and these growth rates are cumulated backwards and forwards around March of 2006. In the regressions, estimates of β are less than unity because the *msgr* of employment by industry that underlie the *ADP National Employment Report* tend to be more volatile than the corresponding benchmarked estimates of growth published by BLS.¹⁴ For example, in the case of the construction industry, the current estimate is $\beta = 0.8$, but with a standard error of 0.17.

Because a common use of the *ADP National Employment Report* by analysts is to predict estimates of employment published by the BLS, the regression-based approach adopted in the *ADP Report* is entirely reasonable. However, a less filtered look at what the data used to develop the *ADP Report* suggest about construction employment can be computed by assuming that $\beta = 1$ instead. Placing more emphasis on the data used in the *ADP Report* after March of 2006 may well make sense if one has reason to suspect that the BLS estimates since then are marred, say, by an unreliable projection of net birth / deaths in the industry. In any event, from the regression estimates cited above, one could not reject a null hypotheses that $\beta = 1$ to begin with! (In an earlier version of the *ADP Report* these weights were all assumed equal to one, but relaxing this restriction improved the correspondence with the BLS estimates.)

Again, only for purposes of this report, ADP has made available the separate “un-weighted” estimate of national construction employment. This is shown in Chart 6 along with the other estimates. Now a story is starting to develop! The un-weighted measure suggests that construction employment peaked at 7,698,000 in April of 2006 and since then has declined by 156,000, to 7,542,000 in June of this year. This is 139,000 below the current estimate from BLS.^{15,16}

Construction Employment by Size of Payroll, and Recent Trends by Size

A unique feature of the *ADP National Employment Report* is that it shows employment by size of payroll which, in most cases, is also the size of the company reporting.¹⁷ In the construction industry, employment is concentrated in small companies. For example, in June of 2007, 62% of workers in the industry were employed by “small” companies hiring few-

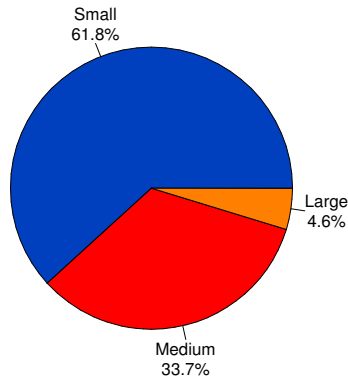
¹⁴ This relative volatility arises in part because the *ADP Report* is based on a slightly different definition of employment than is the BLS estimate. However, it may also be that a computerized count of actual employment records more accurately measures volatile monthly changes in employment than a single line-item response on the BLS survey form.

¹⁵ Careful followers of the *ADP Report* also are aware that statistical routines are used to detect and remove observations that are sharply at odds with the time-series properties of the historical data. Given the recent and unusually rapid contraction in the construction industry, there is the possibility that these routines rejected as outliers some large but legitimate declines in construction employment. If so, estimates of construction employment shown in the *ADP Report* would be biased upward. However, a check of the data revealed no statistical outliers during the recent contraction of construction employment.

¹⁶ We do not believe this difference can be attributable to the failure of the BLS survey to record a decline in the employment of undocumented workers. Both the BLS survey, and certainly ADP payrolls, likely record documented workers. Hence, the data used to prepare the *ADP Report* suggest a bigger decline in documented workers than the data published by the BLS.

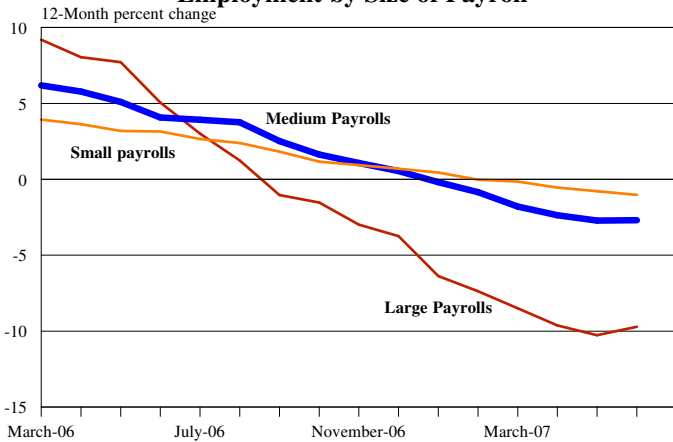
¹⁷ A company may have more than one payroll but in the sample used to prepare the *ADP Report* this occurs only about 5% of the time.

Chart 7. Distribution of Construction Employment by Size of Payroll, June 2007



Source: Automatic Data Processing, Inc.; Macroeconomic Advisers, LLC

Chart 8. Growth of National Construction Employment by Size of Payroll



er than 50 workers, while 34% were employed at “medium” companies with between 50 and 249 employees. (These figures are based on the previously unpublished, un-weighted estimates of employment in the construction industry.) Only 5% of construction workers were employed by “large” companies with more than 250 workers. (See Chart 7.)

Construction employment has decelerated in companies of all sizes. This is shown in Chart 8, which presents the 12-month percent change in employment by size of payroll in the construction industry. In March of 2006, close to the peak of the housing boom, employment on large construction payrolls was growing the fastest — almost 10% — while growth of employment on small payrolls was only half that. Over the twelve months ending in June of this year, employment at large construction companies had fallen by 10%, while employment at small construction companies had declined hardly at all. Indeed, large and medium companies account for more than three quarters of the drop in construction employment since April of 2006. This is part of a larger pattern that is evident in the *ADP National Employment Report*. Namely, employment at small companies tends to grow faster than at large companies, and is less cyclical as well.

A NOTE ON NET BIRTHS/DEATHS IN THE *ADP NATIONAL EMPLOYMENT REPORT*

Some analysts using the *ADP National Employment Report* state that the estimates of employment shown in the *ADP Report* do not include an adjustment for net births and deaths, so that by comparing them to the BLS estimates one can infer something about the reasonableness (or unreasonableness!) of the birth / death adjustment applied by the BLS to its data.¹⁸

While it is true that estimates of employment in the *ADP Report* are not based on an explicit time series modeling (and out-of-sample prediction) of net birth/deaths, they do in fact reflect the historical average rate of net births/deaths. To see this, rewrite expression (6) as:

$$(7) \quad y_t = \beta x_t + (1 - \beta) \bar{x} + [\bar{y} - \bar{x}]$$

The term in square brackets is the difference in the sample means of the growth of employment reported by the BLS and the corresponding *msg*r computed with the data used to pre-

¹⁸ See, for example, Northern Trust Global Economic Research, Daily Global Commentary: *Will the Real Private Nonfarm Payrolls Please Stand Up?* (May 31, 2007). "...also curious to see how the ADP estimate of private nonfarm payrolls, which does not include a birth/death adjustment (our emphasis) compared..."

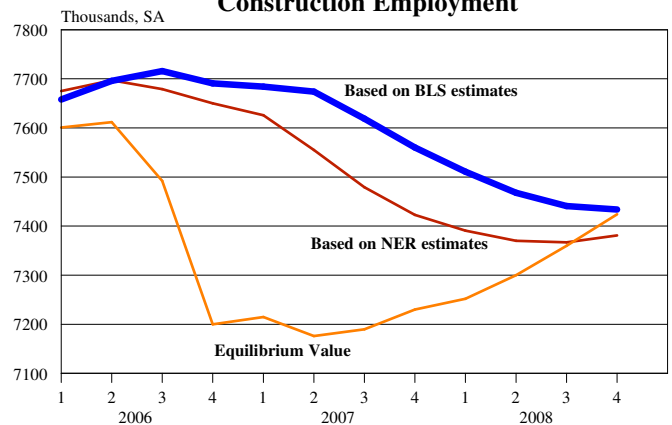
pare the *ADP Report*. This difference arises in part because the BLS estimates reflect net births and deaths, while the *msg* used in the preparation of the *ADP Report* do not.¹⁹ Since in the *ADP Report* this average historical difference is extrapolated beyond March of 2006, the effect is to assume the historical average rate of net births/deaths estimated during the period for which there are benchmarked estimates from the BLS. Hence, if the true rate of net births/deaths in the industry has, since March 2006, fallen below the historical average, estimates of construction employment shown in the *ADP National Employment Report* could also be overstating actual employment. Put somewhat differently: it may be incorrect to ascribe any difference between the estimates of employment shown in the *ADP Report* and those published by the BLS to the birth/death adjustment, and estimates of construction employment shown in the *ADP National Employment Report* are not necessarily immune to the same kind of downward revision to which the BLS estimates might be subject.

CONCLUDING REMARKS

An alternative estimate, based on previously unpublished data used to develop the *ADP National Employment Report*, suggests that employment in the construction industry has already declined 156,000 from a recent peak, and is now 139,000 below the government’s official estimates. Hence, it would not surprise us if, upon its next annual benchmarking, the BLS revises its estimates of construction employment towards those currently shown in the *ADP National Employment Report*. This is especially true if it turns out that the net birth/death adjustment applied by the BLS to construction employment since the last annual benchmarking proves to be too high relative to the average historical experience.

Going forward, what is the likely path of construction employment? Chart 5 suggested one possibility. Suppose, however, that since March of 2006, the un-weighted data on construction employment used to develop the *ADP Report* is the relevant series. Chart 9 presents the corresponding history and forecast (based on the model estimated earlier), along with history/forecast based on the official estimates of construction employment; it also depicts, for reference, the “equilibrium” value of employment based on the model and the Macroeconomic Advisers’ forecast of GDP-structures. The main conclusions drawn from this picture are as follows. *First*, the estimated short-run dynamics imply a relatively smooth and drawn out adjustment of actual employment towards an equilibrium value that dropped very sharply during 2006. Hence, arguments that because construction spending activity has declined precipitously, so too should have employment, appear misplaced. *Second*, the short-run dynamics even suggest some penchant for actual employment to “under-shoot” the equilibrium value as the latter recovers in 2008. *Third*, the previously unpublished data used to develop the *ADP National Employment Report* suggest that the adjustment of construction employment may be further along than indicated by the official statistics published by the Bureau of Labor Statistics. From the most recently available month-

Chart 9. Forecasts of National Construction Employment



Source: Automatic Data Processing, Inc; Macroeconomic Advisers, LLC

¹⁹ Another reason is that ADP customers are not representative, tending to be healthy, dynamic, and growing businesses.

ly figures, the forecast based on official estimates of employment imply a further decline of 247,000 from June of this year through the fourth quarter of 2008, while based on the un-weighted construction data from *ADP Report*, the pending decline is a lesser 161,000. Furthermore, this forecast suggests that the decline in construction employment will be essentially done by the spring of 2008.

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