Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania: Reply

By DAVID CARD AND ALAN B. KRUEGER*

Replication and reanalysis are important endeavors in economics, especially when new findings run counter to conventional wisdom. In their Comment on our 1994 *American Economic Review* article, David Neumark and William Wascher (2000) challenge our conclusion that the April 1992 increase in the New Jersey minimum wage led to no loss of employment in the fast-food industry. Using data drawn from payroll records for a set of restaurants initially assembled by Richard Berman of the Employment Policies Institute (EPI) and later supplemented by their own data-collection efforts, Neumark and Wascher (hereafter, NW) conclude that "... the New Jersey minimum-wage increase led to a relative decline in fast-food employment in New Jersey" compared to Pennsylvania.[1] They attribute the discrepancies between their findings and ours to problems in our fast-food restaurant data set. Specifically, they argue that our use of employment data derived from telephone surveys, rather than from payroll records, led us to draw faulty inferences about the effect of the New Jersey minimum wage.

In this paper we attempt to reconcile the contrasting findings by analyzing administrative employment data from a new representative sample of fast-food employers in New Jersey and Pennsylvania, and by reanalyzing NW's data. Most importantly, we use the Bureau of Labor Statistics's (BLS's) employer-reported ES-202 data file to examine employment growth of fast-food restaurants in a set of major chains in New Jersey and nearby counties of Pennsylvania.[2] We draw two samples from the ES-202 files: a longitudinal file that tracks a fixed sample of establishments between 1992 and 1993, and a series of repeated cross sections from the end of 1991 through 1997. Because the BLS data are derived from unemployment-insurance (UI) payroll-tax records, the employment measures are free of the kinds of survey errors that NW allege affected our earlier results. In addition, because the ES-202 data include information for all covered employers in a fixed group of restaurant chains, there is no reason to doubt the representativeness of the BLS sample.

A comparison of fast-food employment growth in New Jersey and Pennsylvania over the period of our original study confirms the key findings in our 1994 paper, and calls into question the representativeness of the sample assembled by Berman, Neumark, and Wascher. Consistent with our original sample, the BLS fast-food data set indicates slightly faster employment growth in New Jersey than in the Pennsylvania border counties over the time period that we initially examined, although in most specifications the differential is small and statistically insignificant. We also use the BLS

* Card: Department of Economics, Evans Hall, University of California, Berkeley, CA 94720, and National Bureau of Economic Research; Krueger: Department of Economics, Princeton University, Princeton, NJ 08544, and National Bureau of Economic Research. The analysis in Sections I, II, and III, subsection E, of this paper is based on confidential Bureau of Labor Statistics (BLS) ES-202 data. The authors thank the BLS staff for assistance with these data. Although the BLS data are confidential, persons employed by an eligible organization may apply to BLS for restricted access to ES-202 data for statistical research purposes. Data from our 1994 paper are available via anonymous FTP from the minimum directory of irs.princeton.edu. All opinions and analysis in this paper reflect the views of the authors and not the U.S. government. We thank seminar participants at Princeton University, the National Bureau of Economic Research, the University of Pennsylvania, the University of California-Berkeley, the Kennedy School (Harvard University), and Larry Katz and John Kennan for helpful comments, and the Princeton University Industrial Relations Section for research support.

[1] In the March 1995 version of their paper, NW relied exclusively on 71 observations collected by EPI. Subsequent versions have also included information from their supplemental data collection.

[2] The ES-202 data are also known as the Business Establishment List.

data to examine longer-run effects of the New Jersey minimum-wage increase, and to study the effect of the 1996 increase in the federal minimum wage, which was binding in Pennsylvania but not in New Jersey, where the state minimum wage already exceeded the new federal standard. Our analysis of this new policy intervention provides further evidence that modest changes in the minimum wage have little systematic effect on employment.

In light of these results we go on to reexamine the Berman-Neumark-Wascher (BNW) sample and evaluate NW's contention that the rise in the New Jersey minimum wage caused employment to fall in the state's fast-food industry. Our reanalysis leads to four main conclusions. First, the pattern of employment growth in the BNW sample of fast-food restaurants across chains and geographic areas *within* New Jersey is remarkably consistent with our original survey data. In both data sets employment grew faster in areas of New Jersey where wages were forced up more by the 1992 minimum-wage increase. The differences between the BNW sample and ours are attributable to differences in the BNW sample of Pennsylvania restaurants, which unlike the more comprehensive BLS sample, and our original sample, shows a *rise* in fast-food employment in the state. Second, the differential employment trend in the BNW Pennsylvania sample is driven by data for restaurants from a single Burger King franchisee who provided all the Pennsylvania data in the original Berman sample.

Third, the employment trends measured in the BNW sample are significantly different for restaurants that reported their payroll data on a weekly, biweekly, or monthly basis. Establishments that reported on a biweekly basis had faster growth than those that reported on a monthly or weekly basis. We suspect that the different reporting bases matter because the BNW employment measure is based on payroll hours (rather than actual numbers of employees) and because weekly, biweekly, and monthly averages of payroll hours were differentially affected by seasonal factors, including the Thanksgiving holiday and a major winter storm in December 1992. Regardless of the explanation, a higher fraction of Pennsylvania restaurants reported their data in biweekly intervals, leading to a faster measured employment growth in that state. Once the employment changes are adjusted for the reporting bases, the BNW sample shows virtually identical growth in New Jersey and eastern Pennsylvania. Finally, a reanalysis of publicly available BLS data on employment trends in the two states shows no effect of the minimum wage on employment in the eating and drinking industry.

Based on all the evidence now available, including the BLS ES-202 sample, our earlier sample, publicly available BLS data, and the BNW sample, we conclude that the increase in the New Jersey minimum wage in April 1992 had little or no systematic effect on total fast-food employment in the state, although there may have been individual restaurants where employment rose or fell in response to the higher minimum wage.

I. Analysis of Representative BLS Fast-Food Restaurant Sample

A. *Description of BLS ES-202 Data*

On April 1, 1992, the New Jersey state minimum wage increased from \$4.25 to \$5.05 per hour, while the minimum wage in Pennsylvania remained at \$4.25. To examine the effect of the New Jersey minimum-wage increase using representative payroll data, we applied to the BLS for permission to analyze their ES-202 data. The ES-202 database consists of employment records reported quarterly by employers to their state employment security agencies for unemployment-insurance tax purposes. The first question on the New Jersey UI tax form requests the "Number of covered workers employed during the pay period which includes the 12th day of each month."[3] The BLS maintains these data as part of the Covered Employment

[3] The first question on the Pennsylvania form requests the "Total covered employees in pay period incl. 12th of month." Employers are asked to report employment for each month of the quarter. A copy of these forms is available from the authors on request. Other points to note about the ES-202 data include: they are not restricted to employers with any minimum number of employees, or to employees who have earned any minimum pay in the pay period; there is no information on hours of work; the pay period may vary across employers, or within employers for different workers; employees on vacation or sick leave should be included if they are paid while absent from work.

and Wages Program. We analyze two types of samples from the ES-202 file: a longitudinal file and a series of repeated cross sections.

The longitudinal sample consists of restaurants belonging to a set of the largest fast-food chains.[4] Restaurants in the sampled chains employed 13 percent of all employees in the eating and drinking industry in New Jersey and eastern Pennsylvania in 1992. There is considerable overlap between the restaurants in the BLS sample and those in our original sample.[5] Our sample of fast-food restaurants from the ES-202 data was drawn as follows. We first selected all records for all establishments in the eating and drinking industry (SIC 5812) in New Jersey and eastern Pennsylvania in the first quarter of 1991, first quarter of 1994, and fourth quarter of 1996. Then restaurants in the sampled chains were identified from this universe by separately searching for the chains' names, or variants of their names, in the legal name, trade name, and unit description fields of the ES-202 file. If the name of an included chain was mentioned in any of these text fields the record was then visually examined to ensure that it belonged in the sample of included restaurant. In addition, records for *all* eating and drinking establishments from these quarters were visually inspected to identify any fast-food restaurants in the relevant chains that were missed by the computerized name search. If a restaurant in one of the relevant fast-food chains was discovered that was not identified by the initial name search, the computerized name-search algorithm was amended to include that restaurant.

The original Card-Krueger (CK) sample contained data on restaurants in 7 counties of Pennsylvania (Bucks, Chester, Lackawanna, Lehigh, Luzerne, Montgomery, and Northampton). Because this is a somewhat idiosyncratic group—with some counties located right on the New Jersey border and others off the border—we decided to expand the sample to include 7 additional counties: Berks, Carbon, Delaware, Monroe, Philadelphia, Pike, and Wayne. In the results that follow, we present estimates for both our original 7 counties and for the larger set of 14 counties. The map in Figure 1 indicates the location of the restaurants in our initial survey, the original 7 counties in Pennsylvania, and the additional 7 counties in Pennsylvania.

Once restaurants in the relevant chains and counties were identified, we merged quarterly records for these restaurants for the period from the first quarter of 1992 to the fourth quarter of 1994 to create a longitudinal file.[6] To mirror the CK sample, only establishments with nonzero employment in February or March of 1992—the months covered by wave 1 of our survey—were included in the longitudinal analysis file. The final longitudinal sample contains 687 establishments. A total of 16 (2.3 percent) of these establishments had zero or missing employment in November or December of 1992, the months covered by wave 2 of our original survey. These establishments either closed or could not be tracked because their reporting information changed. In 1992, less than 1 percent of establishments had imputed employment data (that is, cases where the state filled in an estimate of employment because the establishment failed to report it).

A potential limitation of the BLS longitudinal sample for the present paper should be noted. The ES-202 data pertain to "reporting units" that may be either single establishment units or multiestablishment units. The BLS encouraged employers to report their data at the county level or below in the early 1990's. Some employers were in the process of switching to a county-level reporting basis during our sample period. Consequently, some restaurants that remained open were difficult to track because they changed their reporting identifiers. Fortunately, most of the restaurants that were in this situation could be tracked by searching addresses and other characteristics of the stores. All of the

[4] For confidentiality reasons, BLS has requested that we not reveal the identity or number of these chains. We can report, however, that there are fewer than 10 chains in the sample.

[5] We reached this conclusion by comparing the distribution of restaurants by three-digit zip code and chain in the two data sets.

[6] Additionally, to ensure that the sample consisted exclusively of restaurants (as opposed to, e.g., headquarters or monitoring posts), the authors restricted the sample to establishments with an average of five or more employees in February and March 1994, and average monthly payroll per employee below $3,000 in 1992:Q1 and 1992:Q4. These restrictions eliminated 17 observations from the original sample of 704 observations.

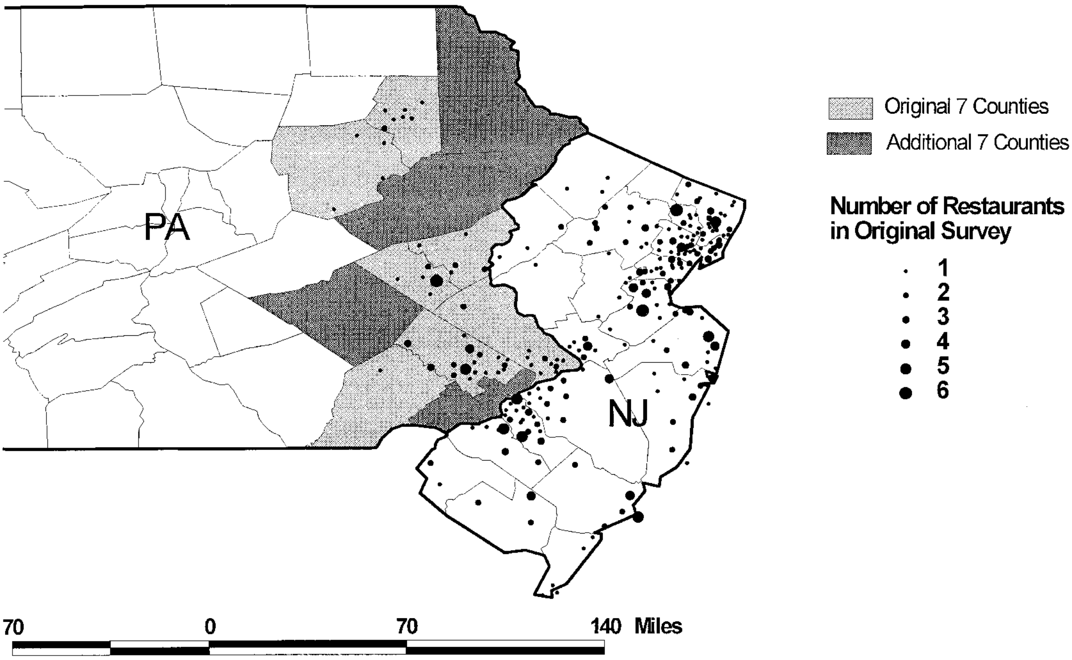

FIGURE 1. AREAS OF NEW JERSEY AND PENNSYLVANIA COVERED BY ORIGINAL SURVEY AND BLS DATA

restaurants that were not linked to subsequent months' data were assumed closed and assigned zero employment for these months, even though some of these restaurants may not have closed. This is probably a more common occurrence for New Jersey than Pennsylvania: 0.4 percent of the Pennsylvania restaurants had zero or missing employment at the end of 1992, as compared to 3.4 percent of New Jersey restaurants. In our original survey, 1.3 percent of Pennsylvania restaurants and 2.7 percent of New Jersey restaurants were temporarily or permanently closed at the end of 1992.[7]

Also note that because firms are allowed to report on more than one unit in a county in the BLS data, some of the records reflect an aggregation of data for multiple establishments. We address both of these issues in the analysis below. Importantly, however, these problems do not affect the repeated cross-sectional files that we also analyze.

[7] An interviewer visited all of the nonresponding stores in both states to determine if they were closed in our original survey.

To draw the repeated cross-sectional file, the final name-search algorithm described above was applied each quarter between 1991:Q4 and 1997:Q3. Again, data were selected for the same chains in New Jersey and the 14 counties in eastern Pennsylvania. Every month's data from the sampled quarters was selected. The cross-sectional sample probably provides the cleanest estimates of the effect of the minimum-wage increase because it incorporates *births* as well as deaths of restaurants, and because possible problems caused by changes in reporting units over time are minimized.

B. *Summary Statistics and Differences-in-Differences*

Table 1 reports basic employment summary statistics for New Jersey and for the Pennsylvania counties, before and after the April 1992 increase in New Jersey's minimum wage. Panel A is based on the longitudinal BLS sample of fast-food restaurants. In the first row, the "before" period pertains to *average* employment in February and March of 1992, and the "after" pertains to *average* employment in November

TABLE 1—DESCRIPTIVE STATISTICS FOR FAST-FOOD RESTAURANTS DRAWN FROM BLS ES-202 DATA AND CARD-KRUEGER SURVEY

	Means with standard deviations in parentheses:								
	New Jersey			7 Pennsylvania counties			14 Pennsylvania counties		
	Before	After	Change	Before	After	Change	Before	After	Change
A. *BLS ES-202 Data*									
February–March 1992 to November–December 1992	37.2 (19.9)	37.6 (21.0)	0.41 (9.82)	42.5 (23.2)	42.4 (23.5)	−0.12 (10.94)	44.8 (53.7)	44.3 (59.9)	−0.53 (12.32)
February 1992 to November 1992	37.2 (19.9)	37.8 (20.9)	0.57 (10.12)	42.7 (23.8)	42.2 (23.2)	−0.54 (12.82)	44.9 (53.6)	44.4 (60.4)	−0.58 (13.83)
March 1992 to March 1993	37.2 (20.1)	34.8 (20.0)	−2.48 (13.99)	42.3 (22.8)	37.5 (18.6)	−4.80 (22.74)	44.7 (54.0)	40.7 (54.5)	−4.0 (18.1)
B. *Card-Krueger Survey Data*									
February 1992 to November 1992	29.8 (12.5)	30.0 (13.0)	0.19 (9.82)	33.1 (14.7)	30.9 (10.6)	−2.23 (11.98)	NA	NA	NA

Notes: Sample sizes for the first two rows are 437 for New Jersey, 127 for Pennsylvania 7 counties, and 250 for Pennsylvania 14 counties; sample sizes for third row are 436, 127, and 250, respectively; sample sizes for the last row are 309 for New Jersey and 75 for Pennsylvania. The 7 Pennsylvania counties used in the middle columns are the same counties used in Card and Krueger (1994); these 7 counties are a subset of the 14 counties in the last three columns (see text). The unit of observation for the BLS data is the "reporting unit," which in some cases includes multiple establishments. The unit of observation in the Card-Krueger data is the individual restaurant.

and December of 1992.[8] The second row reports employment figures for February and November, which were the most common survey months in our original telephone survey. The third row shows data for the 12-month interval from March 1992 to March 1993. Finally, for comparison, panel B of Table 1 reports the corresponding employment statistics calculated from the CK survey. Note that for comparability with BLS data, we have calculated total employment for restaurants in our original survey by adding together the number of full-time, part-time, and managerial workers.[9]

Several conclusions are apparent from the means in Table 1. First, the BLS data indicate a slight rise in employment in New Jersey's fast-food restaurants over the period we studied, and a slight decline in employment in Pennsylvania's restaurants over the same period. Our telephone survey data indicate a net gain in New Jersey relative to Pennsylvania of 2.4 workers per restaurant, whereas the BLS data in row 2 indicate a smaller net gain of 1.1 workers between February and November of 1992. Second, between March 1992 and March 1993, the BLS data indicate that both New Jersey and Pennsylvania experienced a decline in average employment, with the decline being larger in Pennsylvania. Third, the average employment level in the BLS data is somewhat greater than the average level in our data, probably because some of the observations in the BLS data pertain to multiple establishments. Fourth, our data and the BLS data both suggest that average restaurant size was initially larger in Pennsylvania than in New Jersey. By contrast, the BNW data set indicates that "full-time equivalent employment" was initially greater in New Jersey than in Pennsylvania (see Section III below). Finally, the BLS data indicate that the results for the 7 Pennsylvania counties that we used in our initial sample and the wider set of 14 counties are generally similar.

Neumark and Wascher (2000) and others have emphasized the fact that the dispersion in full-time employment changes in our data set is greater than the dispersion in changes in total hours worked in the BNW data. Interestingly, the BLS payroll data display roughly the same standard deviation of employment changes as was found in our original sample. For example, in New Jersey the standard deviation of the

[8] In one case, employment was zero in March 1992, so the February figure was used.

[9] This approach differs from Card and Krueger (1994), which weights part-time workers by 0.5 to derive full-time equivalent employment.

change in employment across reporting units between February and November of 1992 was 10.12 in the BLS data, which slightly exceeds the standard deviation calculated from our survey data (9.82) over approximately the same months. One problem with this comparison is that some of the BLS reporting units combine two or more restaurants that may have been broken out over time, whereas the unit of observation in our original survey was the individual restaurant. To address this issue, we restricted the BLS sample to reporting units that initially had fewer than 40 employees: these smaller reporting units are almost certainly individual restaurants. The standard deviation of employment changes for this truncated BLS sample is 9.0 for New Jersey and 6.8 for Pennsylvania; these figures compare to 8.0 and 8.8, respectively, if we likewise truncate our survey data.

More generally, the criticism that our telephone survey was flawed because of the substantial dispersion in measured employment growth in our sample strikes us as off the mark for three reasons. First, reporting errors in employment data collected from a telephone survey are not terribly surprising. Dispersion in our data is not out of line with measures based on other establishment-level employment surveys (e.g., Steven J. Davis et al., 1996).[10] Second, employment changes are the *dependent variable* in our analysis. As long as the measurement error process is the same for restaurants in New Jersey and Pennsylvania, estimates of the difference in employment growth based on our data will be unbiased. We know of no reason to suspect that the New Jersey and Pennsylvania managers who responded to our survey would misreport employment data in a systematically different way. Moreover, all of our telephone interviews were conducted by a single professional interviewer. Third, any comparison of the standard deviation of full-time equivalent employment changes is potentially sensitive to the way data on hours, or combinations of part-time and full-time employees, are scaled. For example, in their analysis NW convert weekly payroll hours data into a measure of employment by dividing by 35, but a smaller divisor would obviously lead to larger dispersion of employment in their data. The standard deviation of *proportionate* changes in employment is invariant to scaling and is fairly similar in all three data sets: 0.29 in the BLS data, 0.35 in BNW's data, and 0.39 in our earlier survey data.[11]

C. *Regression-Adjusted Models*

Panels A and B of Table 2 present basic regression estimates using the BLS ES-202 longitudinal sample of fast-food restaurants. The models presented in this table essentially parallel the main specifications in Card and Krueger (1994). The dependent variable in the first two columns is the change in the number of employees, while the dependent variable in the last two columns is the proportionate change in the number of employees. Following Card and Krueger (1994), the denominator of the proportionate change is the average of first- and second-period employment. Employment changes are measured between February–March 1992 and November–December 1992. Columns (1) and (3) include as the only regressor a dummy variable indicating whether the restaurant is located in New Jersey or eastern Pennsylvania. These estimates correspond to the difference-in-differences estimates that can be derived from row 1 of Table 1. The models in columns (2) and (4) add a set of additional control variables: dummy variables for the identity of the restaurant chain, and a dummy variable indicating whether the reporting unit was a subunit of a multiunit employer.[12]

The regression results in panel A of Table

[10] Although Neumark and Wascher (2000 footnote 9) argue that variability in employment growth should be smaller for fast-food restaurants in a small geographic area than in a sample such as Davis et al.'s set of manufacturing establishments, it should be noted that gross employment flows are considerably higher in the retail trade sector than in the manufacturing sector (see Julia Lane et al., 1996).

[11] The proportionate employment change was calculated as the change in employment divided by the initial level of employment. We use total number of full-time and part-time workers in our data for comparability to the BLS data. Neumark and Wascher (2000) show that some other ways of measuring the proportionate change of employment (e.g., using average employment in the denominator) and some sample restrictions (e.g., eliminating closed stores from the sample) increases the dispersion in our data relative to theirs.

[12] Observations that are not reported as subunits of multiunit establishments are either part of a multiunit reporting

TABLE 2—BASIC REGRESSION RESULTS; BLS ES-202 FAST-FOOD DATA AND CARD-KRUEGER SURVEY DATA

	Dependent variable:			
	Change in levels		Proportionate change	
Explanatory variables	(1)	(2)	(3)	(4)
A. *All of New Jersey and 7 Pennsylvania Counties, BLS Data*				
New Jersey indicator	0.536	0.225	0.007	0.009
	(1.017)	(1.029)	(0.029)	(0.029)
Chain dummies and subunit dummy variable	No	Yes	No	Yes
Standard error of regression	10.09	9.99	0.286	0.281
R^2	0.001	0.029	0.000	0.046
B. *All of New Jersey and 14 Pennsylvania Counties, BLS Data*				
New Jersey indicator	0.946	0.272	0.045	0.032
	(0.856)	(0.859)	(0.024)	(0.024)
Chain dummies and subunit dummy variable	No	Yes	No	Yes
Standard error of regression	10.80	10.63	0.303	0.294
R^2	0.002	0.042	0.005	0.071
C. *Original Card-Krueger Survey Data*				
New Jersey indicator	2.411	2.488	0.029	0.030
	(1.323)	(1.323)	(0.050)	(0.049)
Chain and company-ownership dummies	No	Yes	No	Yes
Standard error of regression	10.28	10.25	0.385	0.382
R^2	0.009	0.025	0.001	0.024

Notes: Each regression also includes a constant. Sample size is 564 for panel A, 687 for panel B, and 384 for panel C. Subunit dummy variable equals one if the reporting unit is a subunit of a multiunit employer. For comparability with the BLS data, employment in the CK sample is measured by the total number of full- and part-time employees. Standard errors are in parentheses.

2, which are based on the employment changes for restaurants in the same geographic region surveyed in our earlier work, indicate small, positive coefficients on the New Jersey dummy variable.[13] Each of the estimates is individually statistically insignificant, however. We interpret these estimates as indicating that New Jersey's employment growth in the fast-food industry over this period was essentially the same as it was for the same set of restaurant chains in the 7 Pennsylvania counties.

In panel B, regression results are presented using the wider set of 14 Pennsylvania counties as the comparison group. These results also indicate somewhat faster employment growth in New Jersey following the increase in the state's minimum wage. Only in the proportionate change specifications without covariates, however, is the difference in growth rates between New Jersey and Pennsylvania restaurants close to being statistically significant.

For comparison, panel C contains the corresponding estimates from our original sample. These estimates differ (slightly) from those reported in our original paper because we now measure employment as the unweighted sum of full-time workers, part-time workers, and managerial workers to be comparable to the BLS data. The estimates based on our sample are qualitatively similar to those based on the BLS data, with positive coefficients on the New Jersey dummy variable. In addition, in both data sets the inclusion of additional explanatory variables does not add very much to the explanatory power of the model.

D. *Specification Tests*

The BLS data analyzed in Tables 1 and 2 suggest that the New Jersey minimum-wage increase had either no effect, or a small positive

firm or the only restaurant owned by a particular reporting unit.

[13] Because, in principle, the BLS sample contains the population of fast-food restaurants in the designated chains, an argument could be made that the OLS standard errors understate the precision of the estimates. Nonetheless, throughout the paper we rely on conventional tests of statistical significance.

TABLE 3—SENSITIVITY OF NEW JERSEY EMPLOYMENT GROWTH DIFFERENTIAL TO SPECIFICATION CHANGES; BLS ES-202 FAST-FOOD RESTAURANT SAMPLE

Specification and sample	Change in levels (1)	Proportionate change (2)	Sample size
A. New Jersey and 7 Pennsylvania Counties			
1. Basic specification	0.225	0.009	564
	(1.029)	(0.029)	
2. Excluding closed stores	0.909	0.031	549
	(0.950)	(0.024)	
3. Excluding closed stores unless imputation code = 9	0.640	0.022	553
	(0.973)	(0.025)	
4. Drop large outlier	0.251	0.009	563
	(0.970)	(0.028)	
5. Proportionate change with initial employment in base	—	−0.001	564
		(0.032)	
6. Excluding New Jersey shore	0.032	0.008	480
	(1.092)	(0.030)	
7. March 1992 to March 1993 employment change	2.345	0.007	563
	(1.678)	(0.035)	
8. February 1992 to November 1992 employment change	1.05	0.013	564
	(1.10)	(0.032)	
B. New Jersey and 14 Pennsylvania Counties			
1. Basic specification	0.272	0.032	687
	(1.029)	(0.024)	
2. Excluding closed stores	0.639	0.055	671
	(0.776)	(0.021)	
3. Excluding closed stores unless imputation code = 9	0.338	0.044	675
	(0.787)	(0.021)	
4. Drop large outliers	0.72	0.032	685
	(0.78)	(0.023)	
5. Proportionate change with initial employment in base	—	0.020	687
		(0.024)	
6. Excluding New Jersey shore	0.069	0.030	603
	(0.924)	(0.025)	
7. March 1992 to March 1993 employment change	1.196	0.009	686
	(1.258)	(0.027)	
8. February 1992 to November 1992 employment change	0.624	0.027	687
	(0.927)	(0.024)	

Notes: The table reports the coefficient (with standard error in parentheses) for the New Jersey dummy variable from a regression of the change in employment [column (1)] or proportionate change in employment [column (2)] on a New Jersey dummy variable, chain dummy variables, a dummy variable indicating whether the restaurant is reported as a subunit of a multiestablishment employer, and a constant.

effect, on fast-food industry employment in New Jersey vis-à-vis eastern Pennsylvania. To probe this finding further, in Table 3 we examine a variety of other specifications and samples. Panel A of the table presents results using our original 7 Pennsylvania counties, and panel B uses the wider set of 14 counties. In all of the models, we include a full set of chain dummy variables and the subunit dummy variable. Results are reported for both the change in employment specification [column (1)] and the proportionate employment growth specification [column (2)].

For reference, the first row replicates the basic specifications from Table 2. Rows 2 and 3 examine the sensitivity of our results to alternative choices for handling stores with missing employment data in November–December 1992. In the base specification these stores are assigned 0 employment in the second period, which is equivalent to assuming that they all closed. Recall that some of these stores may have actually remained open but changed reporting identifiers. In row 2, we delete from the sample all stores with missing employment data in the second period; this is equivalent to assuming that all of these stores remained open but were randomly missing employment data. Finally, in row 3, we use the imputation codes in the ES-202 database to attempt to distinguish between closed stores (with an imputation code of 9) and those that had missing data for other reasons. In particular, we add back to the sample any restaurant with missing employment data (or those with 0 reported employment) if they were assigned an imputation code indicating a closure. In our opinion, this is the most appropriate sample for measuring the effect of the minimum wage on the set of stores that were in business just before the rise in the minimum. A comparison of the results in rows 2 and 3 with the base specifications indicates that eliminating stores with missing or zero second-period employment, or including such stores only if the imputation code indicated the store was closed, tends to increase the coefficient on the New Jersey dummy variable.

Two of the observations in the sample had employment increases about twice the mean wave 1 size; the next largest increase was less than the mean size.[14] These large employment changes may have occurred because one franchisee acquired another outlet, or for other reasons. To probe the impact of these two outliers, they are dropped from the sample in row 4. The estimates are not very much affected by these observations, however.

In Card and Krueger (1994) we calculated the proportionate change in employment with average employment over the two periods in the denominator. (This procedure is widely used by analysts of micro-level establishment data, e.g., Davis et al., 1996.) This specification was selected because we thought it would reduce the impact of measurement error in the employment data. We have used that specification in Tables 2 and 3 of this paper. The specification in row 5 of Table 3, however, measures the proportionate change in employment with the first-period employment in the denominator. With this specification, New Jersey's employment growth is slightly lower than that in the 7-county Pennsylvania sample, although employment growth in New Jersey continues to be greater than in Pennsylvania when the 14-county sample is used.

In row 6 we eliminate from the sample restaurants that are located in counties on the New Jersey shore. These counties may have different seasonal demand patterns than the rest of the sample. The results are not very different in this truncated sample, however. Another way to hold seasonal effects constant is to compare year-over-year employment changes. In row 8 we measure employment changes from March 1992 to March 1993. This 12-month change has the added advantage of allowing New Jersey employers more time to adjust to the higher minimum wage. The relative change in the level of employment in New Jersey is notably larger when March-to-March changes are used.

Finally, in row 8 we measure employment changes from February 1992 to November 1992. As mentioned, these are the months when the preponderance of data in our survey was collected. It is probably not surprising that these results are quite similar to the base specification estimates, which use the average February–March 1992 and average November–December 1992 employment data.

On the whole, we interpret the BLS longitudinal data as indicating that fast-food industry employment growth in New Jersey was about the same, or slightly stronger, than that in Pennsylvania following the increase in New Jersey's minimum wage. It is nonetheless possible to choose samples and/or specifications in which employment growth was slightly weaker in New Jersey than in Pennsylvania. This is what one would expect if the true difference in employment growth was very close to zero. In none of our specifications or subsamples do we find any indication of significantly weaker employment growth in New Jersey than in eastern Pennsylvania.

II. Repeated Cross Sections from the BLS ES-202 Data

As described above, we also used the quarterly BLS ES-202 data to draw repeated cross

[14] Large negative employment changes are more likely because of restaurant closings.

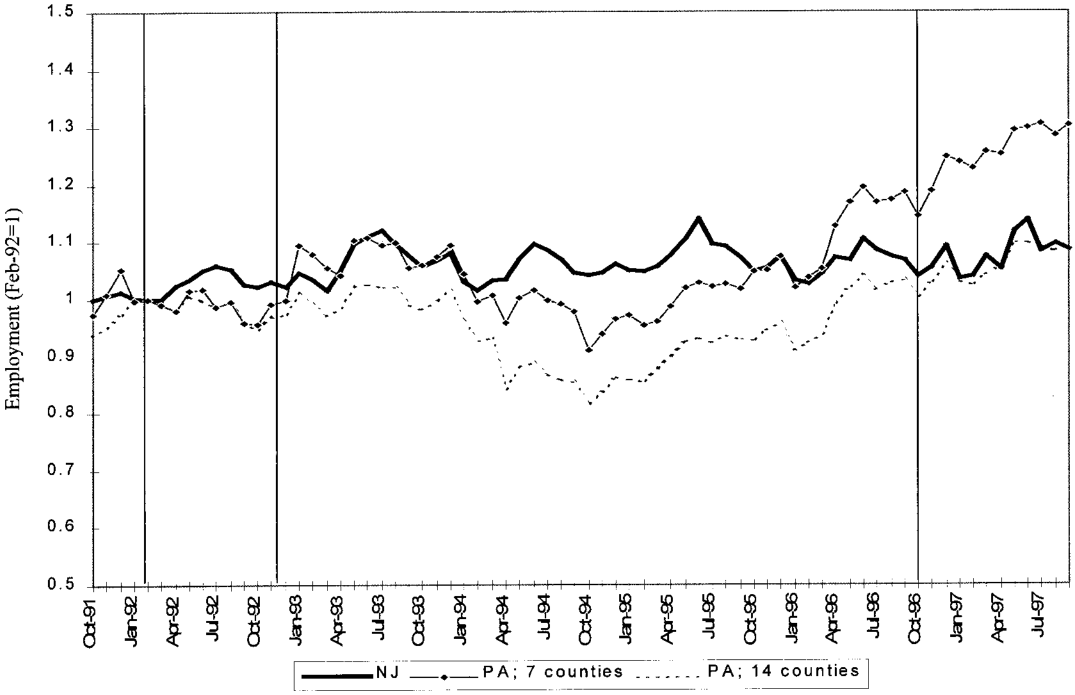

FIGURE 2. EMPLOYMENT IN NEW JERSEY AND PENNSYLVANIA FAST-FOOD RESTAURANTS, OCTOBER 1991 TO SEPTEMBER 1997

Note: Vertical lines indicate dates of original Card-Krueger survey and the October 1996 federal minimum-wage increase.
Source: Authors' calculations based on BLS ES-202 data.

sections of fast-food restaurants for the period from 1991 to 1997. We used these cross-sectional samples to calculate total employment for New Jersey, for the 7 counties of Pennsylvania used in our original study, and for the broader set of 14 eastern Pennsylvania counties in each month. Figure 2 summarizes the time-series patterns of aggregate employment from these files. For each of the three geographic regions, the figure shows aggregate monthly employment in the fast-food industry relative to their respective February 1992 levels.

The figure reveals a pattern that is consistent with the longitudinal estimates. In particular, between February and November of 1992—the main months our survey was conducted—fast-food employment grew by 3 percent in New Jersey, while it fell by 1 percent in the 7 Pennsylvania counties and fell by 3 percent in the 14 Pennsylvania counties. Although it is possible to find some pairs of months surrounding the minimum-wage increase over which employment growth in Pennsylvania exceeded that in New Jersey, on whole the figure provides little evidence that Pennsylvania's employment growth exceeded New Jersey's in the few years following the minimum-wage increase.

A. *The Effect of the* 1996 *Federal Minimum-Wage Increase*

On October 1, 1996, the federal minimum wage increased from $4.25 per hour to $4.75 per hour. This increase was binding in Pennsylvania, but not in New Jersey, where the state's $5.05 minimum wage already exceeded the new federal standard. Consequently, the same comparison can be conducted in reverse, with New Jersey now serving as a "control group" for Pennsylvania's experience. This reverse comparison is particularly useful because any long-run economic trends that might have biased employment growth in favor of New Jersey during the previous minimum-wage hike will now have the opposite effect on our inference of the effect of the minimum wage.

The results in Figure 2 clearly indicate greater employment growth in Pennsylvania than in New Jersey following the 1996 minimum-wage increase. Between September 1996 and September 1997, for example, employment grew by 10 percent in the 7 Pennsylvania counties and 2 percent in New Jersey. In the 14-county Pennsylvania sample employment grew by 6 percent. It is possible that the superior growth in Pennsylvania relative to New Jersey reflects a delayed reaction to the 1992 increase in New Jersey's minimum wage, although we doubt that employment would take so long to adjust in this high-turnover industry. We also doubt that Pennsylvania's strong employment growth was caused by the 1996 increase in the federal minimum wage, but there is certainly no evidence in these data to suggest that the hike in the federal minimum wage caused Pennsylvania restaurants to lower their employment relative to what it otherwise would have been in the absence of the minimum-wage increase.

To more formally test the relationship between relative employment trends and the minimum wage using the data in Figure 2, we estimated a regression in which the dependent variable was the difference in log employment between New Jersey and Pennsylvania each month, and the independent variables were the log of the minimum wage in New Jersey relative to that in Pennsylvania and a linear time trend. For the 7-county sample, this regression yielded a positive coefficient with a t-ratio of 5.2 on the minimum wage. Although we would not necessarily interpret this evidence as suggesting that a higher minimum wage causes employment to rise, we see little evidence in these data that the relative value of the minimum wage reduced relative employment in the fast-food industry during the 1990's.

III. A Reanalysis of the Berman-Neumark-Wascher (BNW) Data Set

A. *Genesis of the BNW Sample*

The conclusion we draw from the BLS data and our original survey data is qualitatively different from the conclusion NW draw from the data they collected in conjunction with Berman and the EPI. This discrepancy led us to reanalyze the BNW data, devoting particular attention to the possible nonrepresentativeness of the sample.[15] Problems in the BNW sample may have arisen because a scientific sampling method was not used in the initial EPI data-collection effort, and because the data were collected three years after the minimum-wage increase, rather than before and after the increase, as in our original survey.

A fuller account of the origins of the BNW sample is provided in our earlier paper (Card and Krueger, 1998). In brief, an initial sample of restaurants from two of the four chains included in our original study was assembled by EPI in late 1994 and early 1995. According to Neumark and Wascher (2000 Appendix A), this initial sample of restaurants was drawn partly by using informal industry contracts, and partly from a survey of franchisees in the *Chain Operators Guide.* We refer to this initial sample of 71 observations, augmented with data for one New Jersey store that closed during 1992, as the "original Berman sample." Following the release of early reports using these data by Berman (1995) and Neumark and Wascher (1995a), data collection continued. Neumark and Wascher (1995b) reported that "to avoid conflicts of interest we subsequently took over the data collection effort from EPI, so that the remaining data came from the franchisees or corporations directly to us."[16] During the period from March to August 1995 they added information for 18 additional restaurants owned by franchisees who had already supplied some data to EPI, as well as information from 7 additional franchisees and one chain. We refer to this sample of 154 restaurants as the Neumark-Wascher (NW) sample. Data for 9 other restaurants were supplied by EPI after NW took over data collection (see Neumark and Wascher, 1995b footnote 9). We include these 9 restaurants in the pooled BNW sample, but exclude them from the original Berman subsample and from the NW subsample.[17]

[15] The BNW data that we analyze were downloaded from www.econ.msu.edu in November 1997.

[16] A referee pointed out to us that Neumark and Wascher (2000 Appendix A) offers a different rationale for taking over the data collection, namely, "to get data on all types of restaurants represented in CK's data."

[17] The most recent version of NW's data set includes an indicator variable for restaurants collected by EPI. This variable shows a total of 81 restaurants in the EPI sample, representing the 72 restaurants in the original Berman sam-

TABLE 4—DESCRIPTIVE STATISTICS FOR LEVELS AND CHANGES IN EMPLOYMENT BY STATE, BNW DATA

	Means with standard deviations in parentheses: New Jersey Before	New Jersey After	New Jersey Change	Pennsylvania Before	Pennsylvania After	Pennsylvania Change	Difference-in-differences New Jersey-Pennsylvania (standard error)
Total payroll hours/35:							
1. Pooled BNW sample	17.5	17.5	−0.1	15.1	15.9	0.8	−0.85
	(5.5)	(5.9)	(3.4)	(4.0)	(5.9)	(3.5)	(0.49)
2. NW subsample	17.7	16.7	−1.0	13.4	12.4	−1.0	−0.05
	(6.1)	(6.3)	(3.3)	(3.8)	(4.9)	(3.5)	(0.61)
3. Original Berman subsample	17.1	19.3	2.1	16.9	20.4	3.4	−1.28
	(3.5)	(4.3)	(2.7)	(3.4)	(4.3)	(2.1)	(0.63)
Nonmanagement employment:							
4. Pooled BNW sample	24.8	28.4	3.6	29.0	31.3	2.2	1.39
	(6.0)	(6.8)	(3.0)	(5.5)	(6.8)	(4.7)	(1.20)

Notes: See text for description of employment variables and samples. Sample sizes are as follows. Row 1: New Jersey 163; Pennsylvania 72. Row 2: New Jersey 114; Pennsylvania 40. Row 3: New Jersey 49; Pennsylvania 23. Row 4: New Jersey 19; Pennsylvania 33.

Although NW attempted to draw a complete sample of restaurants not included in the original Berman sample, they successfully collected data for only a fraction of fast-food restaurants in New Jersey and eastern Pennsylvania belonging to the four chains in our original study.[18] We can obtain a lower bound estimate of the number of restaurants in this universe from the number of working telephone listings we found in January 1992 in the process of constructing our original sample. In New Jersey, where the geographic boundaries of the sample frame are unambiguous, we found 364 valid phone numbers, whereas the BNW sample contains 163 restaurants (see Card and Krueger, 1995 Table A.2.1). In eastern Pennsylvania, we found 109 working phone numbers in the 7 counties we surveyed, whereas the BNW sample contains 72 restaurants in 19 counties.[19] These comparisons suggest that the BNW sample includes fewer than one-half of the potential universe of restaurants. If the BNW sample were *random* this would not be a problem. As explained below, however, several features of the sample suggest otherwise. In particular, the Pennsylvania restaurants in the original Berman sample appear to differ from other restaurants in the data set, and also exhibit employment trends that differ from those in the more comprehensive BLS data set described above. Conclusions about the relative employment trends in New Jersey and Pennsylvania are very sensitive to how the data for this small subset of restaurants are treated.

B. *Basic Results*

Table 4 shows the basic patterns of fast-food employment in the pooled BNW sample and in various subsamples. The first three rows of the table report data on NW's main employment measure, which is based on average payroll hours reported for each restaurant in February and November of 1992. Franchise owners reported their data in different time intervals—

ple and the 9 restaurants which were provided directly to EPI after March 1995.

[18] Neumark and Wascher's letter to franchisees stated that they planned to "reexamine the New Jersey-Pennsylvania minimum-wage study" and emphasized that they were working "in conjunction with ... a restaurant-supported lobbying" organization. This lead-in may have affected response patterns for restaurants with different employment trends in New Jersey and Pennsylvania, accounting for their low response rate. We asked David Neumark if he could provide us with the survey form that EPI used to gather their data, and he informed us, "To the best of my knowledge there was no form; this was all solicited by phone" (e-mail correspondence, December 8, 1997).

[19] BNW's sample universe covers a broader region of eastern Pennsylvania than ours because BNW define their geographic area based on our three-digit zip codes. These zip codes encompass 19 counties, although our sample universe only included restaurants in 7 counties.

weekly, biweekly, or monthly—for up to three "payroll periods" before and after the rise in the minimum wage. NW converted the data (for the maximum number of payroll periods available for each franchisee) into average weekly payroll hours divided by 35. As shown in row 1 of Table 4, this measure of full-time employment for the pooled BNW sample shows that stores were initially smaller in Pennsylvania than New Jersey (contrary to the pattern in the BLS ES-202 data), and that during 1992 stores in Pennsylvania expanded while stores in New Jersey contracted slightly (also contrary to the pattern in the BLS ES-202 data). The "difference-in-differences" of employment growth is shown in the right-most column of the table, and indicates that relative employment fell by 0.85 full-time equivalents in New Jersey from the period just before the rise in the minimum wage to the period 6 months later.

In rows 2 and 3 we compare these relative trends for restaurants in the original Berman sample and in NW's later sample. The difference in relative employment growth in the pooled sample is driven by data from the original Berman sample, which shows positive employment growth in both states, but especially strong growth in Pennsylvania. All 23 Pennsylvania restaurants in the original Berman sample belong to a single Burger King franchisee. Thus, any conclusion about the growth of average payroll hours in the fast-food industry in New Jersey relative to Pennsylvania hinges on the experiences of this one restaurant operator.

The final row of Table 4 reports relative trends in an alternative measure of employment available for a subset of restaurants in the pooled BNW sample—the total number of nonmanagement employees. In contrast to the pattern for total payroll hours, nonmanagement employment rose *faster* in New Jersey than Pennsylvania.[20] Taken at face value, these findings suggest that the rise in the New Jersey minimum wage was associated with an increase in employment and a small decline in hours per worker.[21] Unfortunately, although one-half of restaurants in the original Berman sample supplied nonmanagement employment data, only 10 percent of restaurants in the NW subsample reported it. Thus, the BNW sample available for studying relative trends in employment versus hours is very limited.

C. *Regression-Adjusted Models*

The simple comparisons of relative employment growth in Table 4 make no allowances for other sources of variation in employment growth. The effects of controlling for some of these alternative factors are illustrated in Table 5. Each column of the table corresponds to a different regression model fit to the changes in employment observed for restaurants in the pooled BNW sample.

Column (1) presents a model with only a New Jersey dummy: the estimated coefficient corresponds to the simple difference-of-differences reported in row 1 of Table 4. Column (2) reports a model with only an indicator for observations in the NW subsample. This variable is highly significant (*t*-ratio over 8) and negative, implying that restaurants in the NW subsample had systematically slower employment growth than those in the original Berman sample. The model in column (3) explores the effect of chain and company-ownership controls. These are jointly significant and show considerable differences in average growth rates across chains, with slower growth among Roy Rogers and KFC restaurants than Wendy's or Burger King outlets.

Finally, the model in column (4) includes indicators for whether the restaurant's employment data were derived from biweekly or monthly intervals (with weekly data the omitted category). These variables are also highly sig-

[20] Among the subset of stores that reported nonmanagement employment, the difference-in-differences in average payroll hours/35 is −0.43, with a standard error of 0.55. Thus, there is no strong difference between relative payroll hours trends in the pooled BNW sample and among the subset of restaurants that reported nonmanagement employment.

[21] To compare relative changes in hours and employees it is convenient to work with logarithms, so scaling is not an issue. For the sample of 55 observations that reported both numbers of employees and hours, the difference-in-differences of log payroll hours is −0.018; the difference-in-differences of log nonmanagement employees is 0.066; and the difference-in-differences of log employees minus log hours is 0.084 (*t*-ratio = 2.28). Thus, the apparent opposite movement in hours and employees is statistically significant for this small sample.

TABLE 5—ESTIMATED REGRESSION MODELS FOR CHANGE IN AVERAGE PAYROLL HOURS/35, BNW DATA

	Specification:						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
New Jersey	−0.85	—	—	—	−0.36	−0.66	−0.09
	(0.49)				(0.44)	(0.41)	(0.42)
NW subsample (1 = yes)	—	−3.49	—	—	−3.44	—	—
		(0.42)			(0.43)		
Chain dummies:							
Roy Rogers	—	—	−3.56	—	—	−3.14	−1.98
			(0.81)			(0.85)	(0.89)
Wendy's	—	—	−0.85	—	—	−0.71	−1.35
			(0.67)			(0.67)	(0.70)
KFC	—	—	−6.51	—	—	−6.30	−6.56
			(0.90)			(0.90)	(0.89)
Company-owned	—	—	−0.89	—	—	−1.31	−0.72
			(0.76)			(0.81)	(0.95)
Payroll data type:							
Biweekly	—	—	—	1.73	—	—	1.65
				(0.52)			(0.52)
Monthly	—	—	—	−2.60	—	—	−1.06
				(0.48)			(0.89)
R^2	0.01	0.23	0.41	0.30	0.23	0.10	0.45
Standard error of regression	3.47	3.07	2.70	2.95	3.08	3.32	2.62

Notes: Standard errors are in parentheses. Sample consists of 235 stores. Dependent variable in all models is the change in average weekly payroll hours divided by 35 between wave 1 and wave 2.

nificant, and suggest that the reporting basis of the payroll data has a strong effect on measured employment trends. Relative to restaurants that provided weekly data (25 percent of the sample), restaurants that provided biweekly data experienced faster hours growth between the two waves of the survey, while restaurants that provided monthly data had slower hours growth.

An important lesson from columns (1)–(4) of Table 5 is that a wide variety of factors affect measured employment growth in the BNW sample. Many of these factors are also highly correlated with the New Jersey dummy. For example, a disproportionately high fraction of New Jersey stores in the pooled sample were obtained by NW. Since the NW subsample has slower growth overall, this correlation might be expected to influence the estimate of relative employment trends in New Jersey. Additionally, the Pennsylvania sample contains none of the slow-growing KFC outlets. Thus, it may be important to control for these other factors when attempting to measure the relative trend in New Jersey employment growth.

The models in columns (5)–(7) include the indicator for New Jersey outlets and various subsets of the other covariates. Notice that the addition of any subset of controls lowers the magnitude of the New Jersey coefficient by 20–90 percent, and also improves the precision of the estimated coefficient by 10–15 percent. None of the estimated New Jersey coefficients are statistically significant at conventional levels once the other controls are included in the model. Simply controlling for an intercept shift between restaurants in the NW subsample and the balance of the pooled data set reduces the size of the estimated New Jersey coefficient by over 50 percent.

The addition of controls indicating the time interval over which the hours data were reported has a particularly strong impact on scaled hours, and on any inference about the effect of the minimum-wage increase in these data. Even controlling for chain and ownership characteristics, the biweekly payroll indicator is highly statistically significant ($t = 3.19$). In Card and Krueger (1997 Appendix) we present results suggesting that the differences in employment growth across reporting intervals are not driven by specific functional form assumptions or outliers. We are unsure of the reasons for the highly significant differences in measured growth rates between restaurants that reported data over different payroll intervals, but we suspect this pattern reflects differential seasonal factors that systematically led to the mis-scaling of hours in some pay periods. For example, many restaurants are closed on Thanksgiving. The Thanksgiving holiday probably was more likely to have been covered by monthly payroll intervals than weekly or biweekly ones, which would spuriously affect the growth of hours worked. Unfortunately, Neumark and Wascher did not collect data on the number of days stores were actually open during their pay periods, or on the dates which were spanned by the pay periods covered by the data they collected.[22] Consequently, no adjustment to work hours can be made to allow for whether stores were closed during holidays. Another factor that may have affected changes in payroll hours for restaurants that reported on weekly versus biweekly or monthly intervals was a massive winter storm on December 10–13, 1992, which caused two million power outages and widespread flooding, and forced many establishments in the Northeast to shut down for several days (see *Electric Utility Week*, December 21, 1992). Some pay intervals in the BNW sample may have been more likely to include the storm than others, leading to spurious movements in payroll hours.[23]

Absent information on whether restaurants were closed because of Thanksgiving or the December 10–13 storm for some part of their pay period, the best way to control for these extraneous factors is to add controls for the pay period to the regression model for scaled hours changes. The results in column (7) of Table 5 show that the addition of controls for the payroll reporting interval has a large effect on the estimated New Jersey relative employment effect, because a much lower fraction of New Jersey restaurants supplied biweekly data. Once these differences are taken into account, the employment growth differential between New Jersey and Pennsylvania all but disappears, even in the pooled BNW sample.

D. *Alternative Specifications and Samples*

An important conclusion that emerges from Tables 4 and is that the measured effects of the New Jersey minimum wage differ between restaurants in the original Berman sample and those in the subsequent NW sample. Table 6 reports the estimated coefficient on the New Jersey dummy from a variety of alternative models fit to the pooled BNW sample, the NW subsample, and the original Berman sample. Each row of the table corresponds to a different model specification or alternative measure of the dependent variable; each column refers to one of the three indicated samples. For example, the first row reports the estimated New Jersey effect from models that include no other controls: these correspond to the differences-in-differences reported in Table 4.

Row 2 of the table illustrates the influence of the data from the single Burger King franchisee that supplied the Pennsylvania observations in the original Berman sample. When the restaurants owned by this franchisee are excluded, the estimated New Jersey effect in the pooled BNW sample becomes positive.[24] Without this owner's data it is impossible to estimate the New Jersey effect in the original Berman sample. In the NW sample, however, the exclusion has a negligible effect.

Row 3 of Table 6 shows the estimated New Jersey coefficients from specifications that control for chain and company ownership. The results in row 4 control for the type of payroll data supplied to BNW (biweekly, weekly, or

[22] In view of this fact, we disagree with Neumark and Wascher's (2000) assertion that because they collected hours worked for a "well-defined payroll period (which is specified as either weekly, biweekly or monthly)" the BNW data set should provide a more reliable measure of employment changes than our survey data. Because Neumark and Wascher failed to collect the dates covered by their payroll periods, or the number of days the store was in operation during their payroll periods, there are potential problems such as the correlation between employment growth and the reporting interval that cannot be explained in their data.

[23] These factors are unlikely to be a problem in our original survey data or in the BLS data because the number of workers on the payroll should be unaffected by temporary shutdowns, and because the BLS consistently collected employment for the payroll period containing the 12th day of the month. It is possible that weather and holiday factors account for the contrasting results discussed previously for hours versus number of workers in the BNW data set.

[24] This franchisee supplied data on 23 restaurants (all in Pennsylvania) to the original Berman/EPI data-collection effort, and on three additional restaurants (all in New Jersey) to NW's later sample.

TABLE 6—ESTIMATED RELATIVE EMPLOYMENT EFFECTS IN NEW JERSEY FOR ALTERNATIVE SAMPLES AND SPECIFICATIONS, BNW DATA

	Pooled BNW sample	Neumark-Wascher sample	Original Berman sample
A. *Change in Average Payroll Hours/35*			
1. No controls	−0.85	−0.05	−1.28
	(0.49)	(0.61)	(0.63)
2. Exclude first Pennsylvania franchisee, no controls	0.37	−0.11	—
	(0.56)	(0.62)	
3. Controls for chain and ownership	−0.66	−0.27	−0.95
	(0.41)	(0.53)	(0.64)
4. Controls for chain, ownership and payroll period	−0.09	−0.22	0.58
	(0.42)	(0.54)	(0.72)
B. *Change in Payroll Hours/35 Using First Pay Period per Restaurant*			
5. No controls	−0.55	0.18	−0.85
	(0.50)	(0.63)	(0.67)
6. Controls for chain, ownership, and payroll period	0.07	−0.15	0.96
	(0.43)	(0.52)	(0.78)
C. *Proportional Change in Average Payroll Hours/35*			
7. No controls	−0.06	−0.00	−0.09
	(0.05)	(0.07)	(0.07)
8. Controls for chain and ownership	−0.05	−0.03	−0.04
	(0.05)	(0.07)	(0.07)
9. Controls for chain, ownership, and payroll period	−0.01	−0.03	−0.08
	(0.05)	(0.07)	(0.08)

Notes: Pooled BNW sample has 235 observations; NW sample has 154 observations; original Berman sample has 71 observations. In row 2, data for 26 restaurants owned by one franchisee are excluded. In this row only, pooled BNW sample has 209 observations; and NW sample has 151 observations. Dependent variable in panel A is the change in average payroll hours between the first and second waves, divided by 35. Dependent variable in panel B is the change in payroll hours for the first payroll period reported by each store between the first and second waves, divided by 35. Dependent variable in panel C is the change in average payroll hours between the first and second waves, divided by average payroll hours in the first and second waves. Standard errors are in parentheses.

monthly). As noted, once controls for the payroll period are included, the New Jersey effect falls to essentially zero in the pooled sample. In the original Berman sample, the New Jersey effect becomes positive when controls are added for the payroll period.

In most of their analysis NW utilize an employment measure based on the average scaled hours data taken over varying numbers of payroll periods across restaurants in their sample. (Data are recorded for up to three payroll periods per restaurant in each wave). To check the sensitivity of the results to this choice, we constructed a measure using only the *first* payroll period for restaurants that reported more than one period. In principle, one would expect this alternative measure to show the same patterns as the averaged data. As illustrated in panel B (rows 5 and 6) of Table 6, the use of the alternative employment measure leads to results that are uniformly less supportive of NW's conclusion of a negative employment effect in New Jersey. Even in the original Berman sample the use of the simpler hours measure leads to a 33-percent reduction in the New Jersey coefficient, and yields an estimate that is insignificantly different from zero.

Finally, panel C of Table 6 reports estimates from models that use the proportional change in average payroll hours at each restaurant—rather than the change in the level of average hours—as the dependent variable. The latter specifications are more appropriate if employment responses to external factors (such as a rise in the minimum wage) are roughly proportional to the scale of each restaurant. Inspection of these results suggests that the signs of the New Jersey effects are generally the same as in the corresponding models for the levels of employment, although the coefficients in the proportional change models are relatively less precise.

Our conclusion from the estimates in Table 6 is that most (but not all) of the alternatives show a negative relative employment trend in New Jersey, although the magnitudes of the estimated effects are generally much smaller than the naive difference-in-differences estimate from the pooled BNW sample. The estimated New Jersey effect is most negative in the original Berman sample. In the NW sample or in the pooled sample that excludes data for the Pennsylvania franchisee who supplied Berman's data, the relative employment effects are small in magnitude and uniformly statistically insignificant (*t*-ratios of 0.7 or less). These patterns highlight the crucial role of the original Berman data in drawing inferences from the BNW sample. Without these data (or more precisely, without the observations from the single Burger King franchisee who provided the initial Pennsylvania data) the BNW sample provides little indication that the rise in the New Jersey minimum wage lowered fast-food employment. Even with these data, once controls are included for the payroll reporting periods, the differences between New Jersey and Pennsylvania are uniformly small and statistically insignificant.

E. *Consistency of the BNW Sample with the Card-Krueger and BLS Samples*

Neumark and Wascher (2000) argue that there is "severe measurement error" in our original survey data and argue at length that our dependent variable has a higher standard deviation than theirs. In Card and Krueger (1995 pp. 71–72) we noted that our survey data contained some measurement errors, and tried to assess the extent of the errors by using reinterview methods. Since measured employment changes are used as the *dependent* variable in our analysis, however, the presence of measurement error does not in any way affect the validity of our estimates or our calculated standard errors, provided that the mean and variance of the measurement errors in observed employment changes are the same in New Jersey and Pennsylvania. Neumark and Wascher's concern about bias due to measurement error in our dependent variable is only relevant if the variable either contains no signal, or if the means of the errors are systematically different in the two states. To check the validity of our original data it is useful to compare employment trends in the two data sets at the substate level. The public-use versions of both data sets include only the first three digits of the zip code of each restaurant, rather than full addresses. This limitation necessitates comparisons of employment trends by restaurant chain and "three-digit zip-code area."[25] We also compare the BNW data to the BLS data at the chain-by-zip-code level, which points up further problems in the BNW sample.

A useful summary of the degree of consistency between the two samples is provided by a bivariate regression of the average employment changes (by chain and zip-code area) from one sample on the corresponding changes from the other. In particular, if the employment changes in the BNW sample are taken to be the "true" change for the cell, then one would expect an intercept of 0 and a slope coefficient of 1 from a regression of the observed employment changes in our data on the changes for the same zip-code area and chain in the BNW data.[26] This prediction has to be modified slightly if the employment changes in the BNW sample are "true" but scaled differently than in our survey. In particular, if the ratio of the mean employment level in our survey to the mean employment level in the BNW sample is k, then the expected slope coefficient is k.

Table 7 presents estimation results from regressing employment growth rates by chain and zip-code area from our fast-food sample on the corresponding data from the BNW sample. Although 98 chain-by-zip-code cells are available in our data set, only 48 cells are present in the

[25] The first three digits of the postal zip code do not correspond to any conventional geographic entity.

[26] The situation is more complex if the BNW data are treated as a noisy measure of the truth, e.g., because of sampling or nonsampling errors. In particular, let λ_j represent the reliability of the observed employment changes (by zip code and chain) in survey j ($j = 1, 2$). In this case, if the measurement errors in the two surveys are uncorrelated, the probability limit of the regression coefficient from a linear regression of the employment change in survey 1 on the change in survey 2 is λ_2 (the reliability of the second survey), and the probability limit of the R^2 is $\lambda_1 \cdot \lambda_2$ (the product of the reliability ratios).

TABLE 7—COMPARISONS OF EMPLOYMENT GROWTH BY CHAIN AND ZIP-CODE AREA, CARD-KRUEGER DATA VERSUS BERMAN-NEUMARK-WASCHER DATA

	New Jersey and Pennsylvania	New Jersey only	Pennsylvania only
A. *Using Combined BNW Sample*			
Intercept	−0.32	0.41	−3.91
	(0.56)	(0.50)	(1.77)
Change in employment in BNW sample	0.78	0.90	0.65
	(0.22)	(0.19)	(0.68)
R^2	0.22	0.38	0.09
Standard error	8.97	7.35	10.76
p-value: intercept = 0, slope = 1	0.47	0.65	0.07
Number of observations (chain × zip-code cells)	48	37	11
B. *Using Combined BNW Sample Excluding Data from One Franchisee*			
Intercept	−0.26	0.36	−3.52
	(0.54)	(0.51)	(1.67)
Change in employment in BNW sample	0.87	0.91	0.93
	(0.21)	(0.20)	(0.73)
R^2	0.28	0.39	0.17
Standard error	8.56	7.40	10.27
p-value: intercept = 0, slope = 1	0.71	0.72	0.14
Number of observations (chain × zip-code cells)	46	36	10

Notes: Dependent variable in all models is the mean change in full-time employment for fast-food restaurants of a specific chain in a specific three-digit zip-code area, taken from the Card-Krueger data set. Independent variable is the mean change in payroll hours divided by 35 for fast-food restaurants (in the same chain and zip-code area) taken from the BNW data set. In panel B, restaurants in the BNW sample obtained from the franchisee who provided Berman's Pennsylvania data are deleted prior to forming average employment changes by chain and zip-code area. All models are fit by weighted least squares using as a weight the number of observations in the chain-by-zip-code cell in the Card-Krueger data set. Standard errors are in parentheses.

pooled BNW sample. Column (1) shows results for these cells, while columns (2) and (3) present results separately for chain-by-zip-code areas in New Jersey and Pennsylvania. The data underlying the analysis are also plotted in Figure 3.

Inspection of Figure 3 and the regression results in Table 7 suggests that there is a reasonably high degree of consistency between the two data sets: the correlation coefficient is 0.47. The two largest negative outliers are in zip codes containing a high proportion of restaurants from EPI's Pennsylvania sample. In light of this finding, and the concerns raised in Table 6 about the influence of the data from the franchisee who supplied these data, we show a parallel set of models in panel B of Table 7 that excludes this owner's data from the average changes in the BNW sample.

Looking first at the top panel of the table, the regression coefficient relating the employment changes in the two data sets is 0.78. An F-test for the joint hypothesis that this coefficient is 1 and that the intercept of the regression is 0 has a probability value of 0.47. Comparisons of the separate results for New Jersey and Pennsylvania suggest that within New Jersey the two data sets are in closer agreement. Across the relatively small number of Pennsylvania cells the samples are less consistent, although we can only marginally reject the hypothesis of a zero intercept and unit slope. Because we used the same survey methods and interviewer to collect data from New Jersey and Pennsylvania, there is no reason to suspect different measurement error properties in the two states in our sample. A comparison of the results in the bottom panel of the table shows that the exclusion of data from the franchisee who provided EPI's Pennsylvania sample *improves* the consistency of the two data sets, particularly in Pennsylvania. While not decisive, this comparison suggests that the key differences between the BNW sample and our sample are driven by the data from the single franchisee who supplied the Pennsylvania data for the Berman sample.

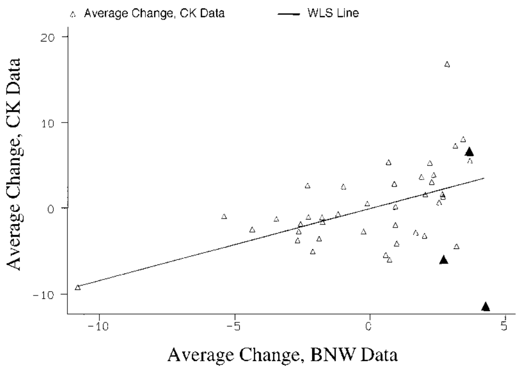

FIGURE 3. GRAPH OF CK DATA VS. BNW DATA AT THE THREE-DIGIT ZIP-CODE-BY-CHAIN LEVEL

Notes: Shaded triangles indicate Berman/EPI Pennsylvania sample. The line shown on the graph is the WLS regression fit using the subsample collected by NW. Weights are the number of restaurants in the cell based on CK data.

To further explore the representativeness of the BNW data, the BLS ES-202 data and the BNW data were both aggregated up to the three-digit zip-code-by-chain level for common zip codes and chains. Specifically, we calculated average employment changes for establishments in each of these cells in the BLS data and in BNW's data, and then linked the two cell-level data sets together. Because the BNW sample does not contain all of the restaurants in each cell, the sets of restaurants covered in the two data sets are not identical.[27] Nonetheless, if the two samples are representative, the cell averages should move together. The resulting cell-level data set was used to estimate a set of regressions of the employment change in BNW's data on the employment change in the BLS data. If the BNW sample is unbiased, no other variable should predict employment growth in that data set, conditional on true employment growth.

Column (1) of Table 8 reports coefficients from a bivariate regression in which the cell-average employment change calculated from the BNW data set is the dependent variable and the cell-average employment change calculated from the BLS ES-202 data set is the explanatory variable. There is a positive relationship between the two measures of employment changes. Because the BNW employment variable is scaled hours, not the number of workers employed, one would not expect the slope coefficient from this regression to equal 1. In column (2), we add a variable to the regression model that measures the proportion of restaurants in each cell of BNW's data set that was collected by EPI. Lastly, in column (3) we interact this variable with a dummy variable indicating whether the cell is in New Jersey or Pennsylvania.

The results in column (2) indicate that the proportion of observations in BNW's cells that were collected by EPI has a positive effect on employment growth, conditional on actual employment growth for the cell as measured by the BLS data. This finding suggests that the subsample of observations collected by EPI are not representative of the experience of the cell. Moreover, the larger coefficient on the Pennsylvania interaction in column (3) suggests that the problem of nonrepresentativeness in the original Berman data is particularly acute for the Pennsylvania restaurants. Together with the other evidence in Tables 4–6, this finding leads us to question the representativeness of the EPI's sample, and of the pooled BNW sample.

Neumark and Wascher (2000) argue that, "The only legitimate objection to the validity of

TABLE 8—COMPARISONS OF EMPLOYMENT GROWTH BY CHAIN AND ZIP-CODE AREA, BERMAN-NEUMARK-WASCHER DATA VERSUS BUREAU OF LABOR STATISTICS ES-202 DATA (DEPENDENT VARIABLE: AVERAGE CHANGE IN EMPLOYMENT, BNW DATA)

	(1)	(2)	(3)
Average change in employment, BLS data	0.17	0.10	0.09
	(0.05)	(0.05)	(0.05)
Fraction of sample collected by EPI	—	3.46	—
		(0.70)	
Fraction of sample collected by EPI × Pennsylvania	—	—	4.33
			(1.19)
Fraction of sample collected by EPI × New Jersey	—	—	3.22
			(0.75)
Constant	0.04	−0.95	−0.96
	(0.34)	(0.34)	(0.34)
R^2	0.19	0.49	0.50

Notes: Weighted least-squares estimates are presented. Weights are equal to the number of BNW observations in the cell. Cells are composed of the three-digit zip-code-by-chain areas. Standard errors are in parentheses.

[27] Only the subsample of cells with nonmissing data in both cell-level data sets was used in the analysis.

the combined sample is that some observations added by the EPI were not drawn from the *Chain Operators Guide*, but rather were for franchisees identified informally." This assertion is incorrect, however, if personal contacts were used to collect data from some restaurants listed in the *Guide* and not others. Moreover, Neumark and Wascher's separate analysis of restaurants listed and not listed in the *Guide* does not address this concern. All of the restaurants in their sample could have been listed in the *Chain Operators Guide*, and the sample would still be nonrepresentative if personal contacts were selectively used to encourage a subset of restaurants to respond, or if a nonrandom sample of restaurants agreed to participate because they knew the purpose of the survey.

F. *Patterns of Employment Changes Within New Jersey*

The main inference we draw from Table 7 is that the employment changes in the BNW and Card-Krueger data sets are reasonably highly correlated, especially within New Jersey. Larger discrepancies arise between the relatively small subsamples of Pennsylvania restaurants. A comparison of the BLS and BNW data sets also suggests that the Pennsylvania data collected by EPI and provided to Neumark and Wascher skew their results. The consistency of the New Jersey samples is worth emphasizing since, in our original paper, we found that comparisons of employment growth *within* New Jersey (i.e., between restaurants that were initially paying higher and lower wages, and were therefore differentially affected by the minimum-wage hike) led to the same conclusion about the effect of the minimum wage as comparisons between New Jersey and Pennsylvania.

To further check this conclusion we merged the average starting wage from the first wave of our original fast-food survey for each of the chain-by-zip-code areas in New Jersey with average employment data for the same chain-by-zip-code cell from the BNW sample. We then compared employment growth rates from the BNW sample in low-wage and high-wage cells, defined as below and above the median starting wage in February–March 1992. The results are summarized graphically in Figure 4. As in our original paper, employment growth within New Jersey was *faster* in chain-by-zip-code cells that had to increase wages more as a consequence of the rise in the minimum wage.

We also merged the average proportional *gap* between the wave-1 starting wage and the new minimum wage from our original survey to the corresponding chain-by-zip-code averages of employment growth from the BNW sample.[28] We then regressed the average changes in employment (ΔE) on the average gap measure (*GAP*) for the 37 overlapping cells in New Jersey. The estimated regression equation, with standard errors in parentheses, is:

$$\text{(1)} \qquad \Delta E = \underset{(1.11)}{-2.00} + \underset{(9.75)}{17.98}\, GAP \qquad R^2 = 0.09.$$

The coefficient on the *GAP* variable in BNW's data is similar in magnitude to the estimate we obtain if we use the New Jersey micro data from our survey to estimate the corresponding micro-level regression (13.1 with a standard error of 6.6). Furthermore, if we estimate another cell-level model with BNW's employment data and add dummy variables indicating the restaurant chain, we obtain:

$$\text{(2)} \qquad \Delta E = \underset{(0.78)}{0.77} + \underset{(5.76)}{12.00}\, GAP + \textit{Chain Dummies} \qquad R^2 = 0.78.$$

In this model, the coefficient on the *GAP* variable is slightly smaller than in the bivariate regression, but it has a higher *t*-ratio. The positive estimated coefficients on the *GAP* variable indicate that employment rose faster at New Jersey restaurants located in areas that were required to raise their entry wage the most when the minimum wage increased. The pattern of employment growth rates within BNW's sample of New Jersey restau-

[28] At the restaurant level this proportionate gap is defined as the difference between the new minimum wage and the restaurant's starting wage in wave 1 divided by the starting wage in wave 1. (The gap is set to zero if the starting wage is above the new minimum wage.) The *GAP* measure in our regressions is the weighted average of the restaurant-level proportionate gaps, where the weights are the number of restaurants in the cell.

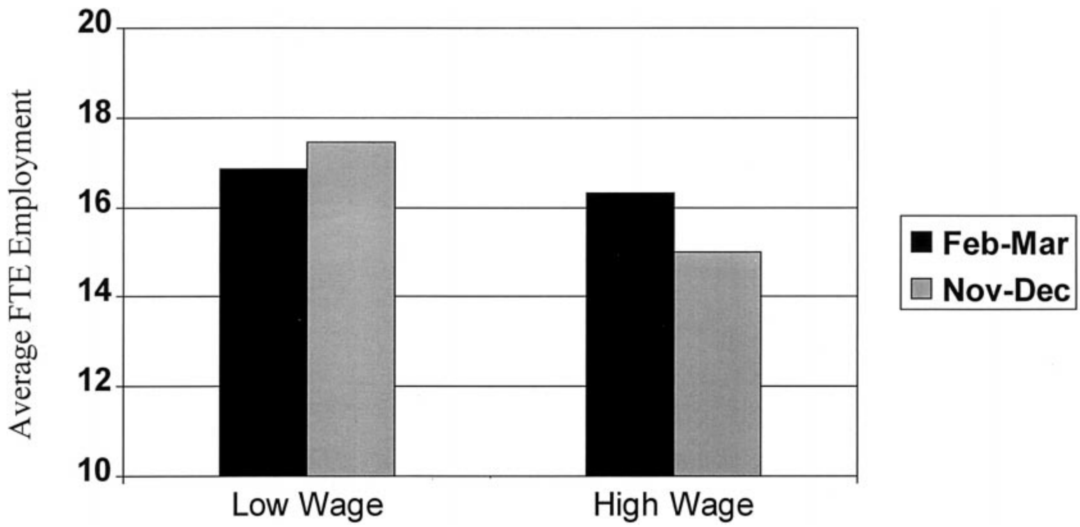

FIGURE 4. AVERAGE FTE EMPLOYMENT IN LOW- AND HIGH-WAGE AREAS OF NEW JERSEY, BEFORE AND AFTER 1992 MINIMUM-WAGE INCREASE

Notes: Average FTE employment is calculated from BNW data set. Restaurants were aggregated to the chain-by-zip-code level, and divided into low-wage and high-wage areas based on whether the average starting wage for restaurants in the cell in the CK data set was above or below the median starting wage in February–March 1992.

rants supports our original finding that the rise in the minimum wage had no adverse effect on employment growth at lower-wage relative to higher-wage restaurants in the state.

Neumark and Wascher (2000) also performed a cell-level analysis using a wage-gap variable. However, they only selectively replicate our original analysis. Neumark and Wascher (2000) describe the analysis of the wage-gap variable in our 1994 paper as follows: "This experiment continues to identify minimum-wage effects off of the difference in employment growth between New Jersey and Pennsylvania, but adds information on the extent to which the minimum-wage increase would have raised starting wages in New Jersey." This description is incomplete because it ignores the estimates in column (v) of Table 4 of our 1994 paper, which included dummy variables for broad regions in Pennsylvania and New Jersey. In these estimates, identification of the wage-gap variable arises entirely from differences within New Jersey.[29] Indeed, this was a major motivation for our analysis of the wage-gap variable. Unfortunately, Neumark and Wascher only report results that exclude the region controls in their Table 5. They do report in their text, however, that when they restrict their sample just to cells within New Jersey, they find that restaurants in areas that were required to raise their wages the most by the New Jersey minimum-wage increase also tended to have faster employment growth. These results from within New Jersey confirm an essential finding of our original paper.

G. *Other Evidence for the Eating and Drinking Industry*

In the final section of their Comment, Neumark and Wascher present an analysis of aggregate-level data for the entire eating and drinking industry, taken from two publicly available sources: the BLS-790 program and the ES-202 program. The former are only available on a

[29] The wage-gap variable was assigned a value of zero for all Pennsylvania restaurants. Including dummy variables that indicate whether restaurants are located in Pennsylvania or New Jersey thus completely absorbs interstate variability in the wage-gap variable.

TABLE 9—ESTIMATES OF MINIMUM-WAGE EFFECTS ON EMPLOYMENT GROWTH IN THE EATING AND DRINKING INDUSTRY FROM FEBRUARY/MARCH TO NOVEMBER/DECEMBER

	BLS 790 data, New Jersey and Pennsylvania			ES-202 data, New Jersey and 7 counties of Pennsylvania	
	NW (1)	Revised data (2)	Revised data and correctly dated unemployment (3)	NW (4)	Correctly dated unemployment (5)
Minimum-wage change	−0.15	−0.11	−0.03	−0.11	−0.01
	(0.10)	(0.10)	(0.08)	(0.10)	(0.07)
New Jersey	−0.05	−0.38	−0.41	0.25	0.21
	(0.95)	(0.95)	(0.80)	(0.96)	(0.72)
Change in unemployment[a]	−0.32	−0.39	−1.47	−0.49	−1.84
	(0.47)	(0.46)	(0.44)	(0.46)	(0.39)
R^2	0.15	0.13	0.38	0.14	0.51

Notes: Standard errors are in parentheses. Models are estimated using changes in employment in SIC 58 (eating and drinking) between February/March and November/December of 1982–1996. Dependent variable in columns (1)–(3) is the percentage change in statewide employment in SIC 58 from the BLS 790 program. Dependent variable in columns (4)–(5) is the percentage change in employment from the ES202 program; New Jersey data are statewide and Pennsylvania data are for 7 counties only. Columns (1) and (4) are taken from Neumark and Wascher (2000 Table 10). Models in columns (2)–(3) use revised BLS 790 data for 1995 and 1996. Sample size is 30 observations.

[a] In columns (1), (2), and (4) the change in unemployment represents the change in the annual average unemployment rate. In columns (3) and (5) the change in unemployment represents the difference between the average of the seasonally adjusted rates in February and March and the average of the seasonally adjusted rates in the following November and December.

statewide basis, while the latter are available by county, permitting a comparison between New Jersey and the 7 counties of Pennsylvania included in our original survey. Neumark and Wascher summarize their findings from these data as providing "... complementary evidence that [the] minimum wage reduces employment in the restaurant industry."

Columns (1) and (4) of Table 9 reproduce two key regression models from their Table 10, which suggest a negative impact of the minimum wage on employment. The specifications are fit to state-specific changes in employment between February/March and November/December of each year from 1982 to 1996, and include as explanatory variables the percentage change in the effective minimum wage in the state, an indicator for observations from New Jersey, and the change in the annual unemployment rate from the preceding calendar year to the calendar year in which the data are observed.

As the other results in the table make clear, however, the estimated impacts of the minimum wage are extremely sensitive to minor changes in the data or control variables used by Neumark and Wascher. In column (2) we report estimates that simply replace NW's data for 1995 and 1996 with the revised BLS-790 employment data.[30] The effect of the minimum wage is smaller and statistically insignificant ($t = -1.1$) when the revised data are used. Notice also that the minimum-wage effects estimated from the BLS-790 and ES-202 data are similar when the revised data are used [compare columns (2) and (4)].[31] This similarity might be expected since the BLS-790 data are benchmarked to the ES-202 data. In column (3) we report estimates from a model that controls for changes in unemployment over the same period as the dependent variable (i.e., from February/March to November/December). The use of chronologically aligned unemployment data leads to a very noticeable improvement in the fit

[30] The BLS-790 data are revised after their initial release. We are uncertain of when Neumark and Wascher assembled their data set; however, their data for 1982–1994 are identical to the data available as of January 1999. The data we used for the estimates in the table are the final BLS employment estimates, and not subject to revision.

[31] Similarly, using the revised data affects their estimates based on December-to-December changes. The minimum-wage coefficient from the model in panel A, column (4), of their Table 10 falls to −0.12 (standard error 0.08) with the revised data.

of the model, and to a larger and more significant coefficient on the unemployment rate. More importantly, it also leads to a much smaller estimated minimum-wage effect. As shown in column (5), the effect is about the same on estimates derived from the ES-202 data. Controlling for properly aligned changes in the unemployment rate, the estimated effect of the minimum wage is negligible.[32]

We have investigated a number of other extensions to the findings in Table 9. For example, adding two more years of data from the BLS-790 series (albeit based on preliminary data for 1998) leads to coefficient estimates that are similar to those reported in column (3). Similarly, adding an additional year of ES-202 data has little effect on the results in column (5). We also considered an alternative estimation method that regresses the difference in employment growth rates between New Jersey and Pennsylvania on the differences in the changes in minimum wages and unemployment between the states. This specification is perhaps most comparable to the "difference-in-differences" specification used in our original paper. These results are very consistent with the estimates in columns (3) and (5): for example, the coefficient of the relative minimum-wage variable in models for the BLS-790 employment data is 0.003 (standard error 0.11) without controlling for relative unemployment, and 0.02 (standard error 0.12) controlling for relative changes in unemployment.

Based on the findings in Table 9, and these further analyses, we conclude that changes in the minimum wage in New Jersey and Pennsylvania over the 1980's and 1990's probably had little systematic effect on employment in the eating and drinking sectors of the two states. Thus, contrary to the impression conveyed by Neumark and Wascher's analysis based on the unrevised employment data and an incorrectly aligned aggregate unemployment variable, the aggregated BLS data are quite consistent with our findings from the fast-food sector in Section I, and with our original survey results.

[32] Again, a similar pattern is found using the December-to-December changes in the BLS-790 data also analyzed by Neumark and Wascher. In particular, the estimated coefficient of the minimum-wage variable falls to −0.09 (standard error 0.07) controlling for December-to-December changes in unemployment.

IV. Conclusion

After analyzing BNW's data, our original survey data, publicly available BLS data, and most importantly, the BLS ES-202 fast-food establishment data, we reach the following conclusion: *The increase in New Jersey's minimum wage probably had no effect on total employment in New Jersey's fast-food industry, and possibly had a small positive effect.* We have previously written that, because of frictions in the labor market, a minimum-wage increase can be expected to cause some firms to reduce employment and others to raise employment, with these two effects potentially cancelling out if the rise in the minimum wage is modest (Card and Krueger, 1995 especially pp. 13–14). If this view is correct, then it would not be surprising to find some specifications and data definitions that yield a negative impact of the minimum wage on employment. But we doubt that a representative survey of fast-food restaurants in New Jersey and eastern Pennsylvania would show a significant adverse impact of the minimum wage on total employment.

The only data set that indicates a significant decline in employment in New Jersey relative to Pennsylvania is the small set of restaurants collected by EPI. Results of this data set stand in contrast to our survey data, to the BLS's payroll data, and to the supplemental data collected by Neumark and Wascher. The difference between the New Jersey-Pennsylvania comparison in our original survey and BNW's data cannot be reconciled by inherent differences between a telephone survey and administrative payroll records because the BLS ES-202 data are based on administrative payroll records. Instead, we suspect the common denominator is that representative samples show statistically insignificant and small differences in employment growth between New Jersey and eastern Pennsylvania, while the nonrepresentative sample informally collected for Berman produces anomalous results.

An alternative interpretation of the full spectrum of results is that the New Jersey minimum-wage increase did not reduce total employment, but it did slightly reduce the average number of hours worked per employee. Neumark and Wascher (1995b) reject this interpretation. Although we are less quick to rule out this possibility, we are skeptical about any conclusion concerning average hours worked per employee that relies so heavily on the informally collected Berman/EPI sample, and the exclusion of controls for the length of the reporting interval. Moreover, within New Jersey the BNW data indicate that hours grew *more* at restaurants in the lowest wage areas of the state, where the minimum-wage increase was more likely to be a binding constraint. This finding runs counter to the view that total hours declined in response to the New Jersey minimum-wage increase.

REFERENCES

Berman, Richard. "The Crippling Flaws in the New Jersey Fast-Food Study." Mimeo, Employment Policies Institute, Washington, DC, March 1995.

Card, David and Krueger, Alan B. "Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania." *American Economic Review*, September 1994, *84*(4), pp. 772–93.

______ . *Myth and measurement: The new economics of the minimum wage*. Princeton, NJ: Princeton University Press, 1995.

______ . "A Reanalysis of the Effect of the New Jersey Minimum Wage Increase on the Fast-Food Industry with Representative Payroll Data." Industrial Relations Section Working Paper No. 393, Princeton University, December 1997 [available at http://www.irs.princeton.edu/pubs/working_papers.html].

Chain Operators Guide. Various issues.

Davis, Steven J.; Haltiwanger, John C. and Schuh, Scott. *Job creation and destruction*. Cambridge, MA: MIT Press, 1996.

Electric Utility Week. "Two-Day 'Nor' Easter' Cuts Power to Nearly 2 Million in Northeast." December 21, 1992, p. 7.

Lane, Julia; Stevens, David and Burgess, Simon. "Worker and Job Flows." *Economics Letters*, April 1996, *51*(1), pp. 109–13.

Neumark, David and Wascher, William. "The Effects of New Jersey's Minimum Wage Increase on Fast-Food Employment: A Re-Evaluation Using Payroll Records." Unpublished manuscript, Michigan State University, March 1995a; August 1995b.

______ . "Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania: Comment." *American Economic Review*, December 2000, *90*(5), pp. 1362–96.