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A Reanalysis of the Effect of the New Jersey Minimum Wage Increase on the Fast-Food Industry with Representative Payroll Data

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Abstract

This paper re-examines the effect of the 1992 New Jersey minimum wage increase on employment in the fast-food industry. We begin by analyzing employment trends using a comprehensive new data set derived from the Bureau of Labor Statistics's (BLS's) ES-202 data file. Both a longitudinal sample and a repeated-cross-section sample drawn from these data indicate similar or slightly faster employment growth in New Jersey than in eastern Pennsylvania after the rise in New Jersey's minimum wage, consistent with the main findings of our earlier survey. We also use the ES-202 data to measure the effects of the 1996 increase in the federal minimum wage, which raised the minimum wage in Pennsylvania but not in New Jersey. We find no indication of relative employment losses in Pennsylvania. In light of these findings, we re-examine employment trends in the sample of fast-food restaurants assembled by the Employment Policies Institute (EPI) and David Neumark and William Wascher. The differences between this sample and both the BLS data and our earlier sample are attributable to a small set of restaurants owned by a single franchisee who provided the original Pennsylvania data for a 1995 EPI study. We also find that employment trends in the EPI/Neumark-Wascher sample are strikingly different for firms that reported their data on a weekly, biweekly or monthly basis, possibly because of seasonal factors. Controlling for the systematic effects of the varying reporting intervals, the combined EPI/Neumark-Wascher sample shows no difference in hours growth between New Jersey and Pennsylvania.

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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, Neumark and Wascher (1997) 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 on a non-randomly selected set of restaurants initially collected for 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 re-analyzing 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 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 may have affected our

[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.

earlier results. In addition, because the ES-202 data include information for every covered employer, 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 main 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 difference between New Jersey and Pennsylvania is small and statistically insignificant. We use the BLS data to examine longer-run effects of the New Jersey minimum wage increase, and to conduct an analysis of 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 is consistent with the conclusion that modest changes in the minimum wage have little systematic effect on employment.

In light of these findings we go on to re-examine 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 re-analysis leads to four main conclusions. First, the pattern of employment growth (or more precisely, scaled hours changes) in the BNW sample of fast-food restaurants across chains and geographic areas *within* New Jersey is quite consistent with our original survey data. In particular, employment grew faster in areas of New Jersey where wages were forced up more by the minimum wage than in other parts of the state. The differences between the BNW sample and ours are attributable to differences in the sample of Pennsylvania restaurants in their data set, which unlike our original sample and the BLS data, show a *rise* in fast-food employment in the state. Second, the anomalous behavior of the BNW Pennsylvania sample is driven by restaurants owned by one Burger King franchisee, who comprised the entire EPI sample of Pennsylvania franchises. Third, the patterns of employment changes across different restaurants in the BNW sample vary systematically with the period over which the data were reported. Establishments that reported on a bi-weekly basis had significantly faster growth than those that reported on a monthly or weekly basis. We conjecture that the reporting periods matter because of different seasonal factors in the two waves of the BNW sample, such as the occurrence of Thanksgiving or bad weather, which would temporarily cause a store to close for a portion of the pay interval. Regardless of the explanation, however, a higher fraction of Pennsylvania restaurants reported their data in bi-weekly intervals, leading to a relatively high employment growth rate for stores in that state. Once this peculiar feature of the BNW sample is taken into account, it indicates virtually identical hours growth in New Jersey and eastern Pennsylvania. Fourth, if Neumark and Wascher's analysis of publicly-available BLS data is replicated with the revised BLS data, there is no effect of the minimum wage on employment in the eating and drinking industry.

Based on all the evidence now available, including the BLS sample, our earlier sample, 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 quarterly employment records reported 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 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. Our sample of fast food restaurants from the ES-202 data was drawn as follows. We first selected all records

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[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.

[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.

on 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 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 a sampled chain's name was mentioned in one of these text fields, the record was selected and then visually examined to ensure that it was a restaurant belonging to one of the sampled chains. In addition, records on 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 data on the restaurants for months between the first quarter of 1992 and the fourth quarter of 1994 to create a longitudinal file. To mirror the CK sample, only establishments with non-zero employment in February or March of 1992 -- the months covered by Wave 1 of our survey -- were included in the longitudinal analysis file.[5] The final data set 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 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 if 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 single establishment units or multi-establishment units. The BLS encouraged employers to report their data at the county level or below in the early 1990s. 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 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

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[5]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 5 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.

restaurants were temporarily or permanently closed at the end of 1992.[6]

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. Perhaps more importantly, these problems do not affect the repeated cross-sectional files that we also analyze.

To draw the repeated cross-section file, the final name-search algorithm described above was applied each quarter between 1991:Q4 and 1997:Q3.[7] This time period spans the months covered in our original survey. 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"

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[6]An interviewer visited all of the non-responding stores in both states to determine if they were closed in our original survey.

[7]Because of a relatively high frequency of imputed employment values prior to 1991:Q4, we do not use data from earlier months.

pertains to *average* employment in November and December of 1992.[8] The second row reports employment figures for February and November, which were the most common survey months in our telephone survey. The third row uses data spanning the 12-month period 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 calculated total employment in our survey data 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 indicate 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

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[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.

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 (1997) 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 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 change in employment across reporting units between February and November of 1992 was 10.12 according to 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 multi-establishment restaurants that may have broken out over time, whereas our unit of observation was consistently the individual restaurant. To address this issue, we restricted the BLS sample to reporting units that initially had fewer than 40 employees; reporting units this size 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 the employment changes show a high degree of dispersion strikes us as off the mark for three other 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 from that in other establishment-level employment surveys (e.g., Davis, Haltiwanger, and Schuh, 1996).[10] Second, as long as measurement error in the dependent variable has the same mean in New Jersey and Pennsylvania, and there is some signal in the data, estimates 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. Third, 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. NW convert weekly payroll hours data into a measure of employment by dividing by 35, but a smaller divisor would 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 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, and the dependent variable in the last two columns is

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[10]Although Neumark and Wascher (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, Haltiwanger and Schuh'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 Lane, Stevens and Burgess, 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 (1997) 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. But this does not detract from our point that their arbitrary method of scaling hours into bodies affects the degree of dispersion in their data.

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 variable for the identity of the restaurant chain; and a dummy variable indicating whether the reporting unit was a sub-unit of a multi-unit employer.[12]

The regression results in Panel A of Table 2, which are based on the employment changes for restaurants in 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 seven 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

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[12]Observations that are not reported as sub-units of multi-unit establishments are either part of a multi-unit reporting 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.

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. 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 effect, on fast-food industry employment in New Jersey *vis-a-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 sub-unit 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 used by some other analysts of employment change data, including Davis, Haltiwanger, and Schuh, 1996).

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

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 1 and 2 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 employment over the same months. In row 8 we measure employment changes from March 1992 to March 1993. This 12-month change has the added advantage of allowing employers more time to adjust employment. In levels, the faster employment growth in New Jersey is notably larger when 12-month 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. We doubt, however, that a representative sample of fast-food restaurants would show robust evidence that employment growth was significantly weaker in New Jersey than in eastern Pennsylvania in the months we have studied.

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

As described above, we used the quarterly BLS ES-202 data to draw repeated cross-sectional data sets for the fast-food chains each month from the end of 1991 through 1997. With these data, we calculated 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 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 because New Jersey's $5.05 state minimum already exceeded the new federal minimum. 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 also noteworthy because any continuing, pre-existing 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 6 percent in the 14 Pennsylvania counties and 2 percent in New Jersey. In the 7 county Pennsylvania sample employment grew by 10% 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, but 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 dependent 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. 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 minimum wage has reduced employment in the fast-food industry during the 1990s.

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 re-analyze the BNW sample, devoting particular attention to the possible non-representative nature of the data.[15] We suspect that problems in the BNW sample arise because a scientific sampling method was *not* used in the EPI data collection effort, and because the data were collected three years after the minimum wage increase.

The BNW sample was assembled in several phases. First, Berman (1995) released a report based on 41 restaurants.[16] This report, which included analysis conducted by David

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

[16]The actual sample size was not reported. We estimate the sample size from Figures 1 and 2 of the report, which display data for a total of 41 restaurants. Berman also referred to these data in a Wall Street Journal op-ed on March 29, 1995.

Neumark, made no mention of the methods used to identify the restaurants in the sample. A companion paper by Neumark and Wascher (1995a) reported that the EPI sample contained 71 restaurants and provided some information on the origins of the sample.[17] Informal industry contacts were heavily relied on to select these restaurants; information in Neumark and Wascher (1997; Table 7) indicates that more than half of the restaurants in the Berman/EPI sample are not listed in the Chain Operators Guide. Moreover, even for restaurants listed in the Guide, personal contacts and private information could have been used by EPI to encourage some franchisees to provide data. We refer to the EPI sample of 71 restaurants, augmented with information for one New Jersey store that closed during 1992, as the "original Berman sample." The sample contains data for 10 franchisees in the Burger King and Wendy's chains, and *all* of the Pennsylvania restaurants belong to one Burger King franchisee who apparently supplied EPI with data on his Pennsylvania outlets but not his New Jersey outlets.

Around the time that Berman launched the EPI study, the Wall Street Journal (January 31, 1995, p. 1) reported:

> "Lobbyists for small businesses, retailers and big companies huddled Friday at the Washington office of the National Restaurant Association to plot strategy against the Clinton effort to boost the $4.25-per-hour minimum wage. ... The group plans to poke holes in a study widely used by proponents to show employment rose in New Jersey fast-food restaurants when the minimum wage was raised there."

With this type of publicity in the background, concerns were raised about whether a

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[17]The description of the data set in the earliest Neumark and Wascher (1995a) paper states, "Contact was made with franchisees identified in the Chain Operator's Guide"; no mention was made of informal contacts. A more recent version of the paper (Neumark and Wascher 1997, Appendix A) states that "... the original EPI sample was drawn partly from franchisees in the Chain Operator's Guide ..., partly from restaurants owned by other franchisees ... that were identified informally, and partly from parent corporations...." A letter explaining the origins of the sample from the Chief Economist of EPI dated October 21, 1995 made no mention of the Chain Operator's Guide.

representative sample of restaurants would have responded to an industry-group's data collection efforts (e.g., Schmitt, 1995). In their August 1995 paper Neumark and Wascher wrote 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." During the period from March to August 1995 they added information for 18 additional restaurants owned by franchisees in the original Berman sample, along with 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 apparently collected by EPI after NW took over data collection (see Neumark and Wascher 1995b, footnote 9).[18] We include these 9 restaurants in the pooled BNW sample, but exclude them from the original Berman subsample and from the NW subsample.

Although NW attempted to draw a complete sample of those restaurants not included in the original Berman sample, there are reasons to doubt the representative nature of their final data set. First, at least one-third of the franchise owners in the NW supplementary sample had previously supplied some data to EPI. This raises questions about the comprehensiveness of EPI's data collection efforts. Second, and probably more important, NW's letter to franchisees stated that they were collecting data to "re-examine 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 the low response

[18]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 sample and the 9 restaurants which were provided directly to EPI after March 1995.

rate in their survey. 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" (correspondence, December 8, 1997). Thus, we are unable to asses the lead-in and procedures EPI used to collect their data.

For whatever reasons the combined BNW sample represents only a fraction of fast-food restaurants in New Jersey and eastern Pennsylvania belonging to the four chains in the sample. While we do not have a precise count of the total number of restaurants in their potential sample universe, we can obtain a lower bound estimate from the number of working telephone listings we found in January 1992 for our own fast-food 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 as many as 19 counties.[19] These comparisons suggest that the BNW sample includes fewer than half of the potential universe of restaurants. If the BNW sample were *random* this would not be a problem. As explained below, however, many features of the sample suggest otherwise. In particular, the Pennsylvania restaurants in the original Berman sample appear to be substantially different from other restaurants in the data set. If restaurants in the original Berman sample are non-representative, their presence biases results based on the combined BNW sample even if the NW subsample is representative. As it happens, any down-weighting of the original Berman restaurants in the

[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 cover 19 counties, although our sample universe only included restaurants in 7 counties.

pooled BNW sample substantially weakens the conclusion that employment fell in New Jersey relative to Pennsylvania.

Neumark and Wascher (1997) claim that, "The only legitimate objection to the validity of 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." But this claim is not valid if personal contacts were used to collect data from some restaurants listed in the Guide and not others. 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 non-representative 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.

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 to EPI and Neumark-Wascher in different time intervals -- weekly, bi-weekly, 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 patterns 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 patterns 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 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. We emphasize that *all the 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 including data for this single franchisee. Although we do not know why EPI gathered data on only one franchisee's stores in Pennsylvania, there is reason to be concerned about the representativeness of the employment trends at only one chain in one part of southeast Pennsylvania. For example, the President of a corporation that owns 23 Burger King stores in the same zip-code areas as the EPI's Pennsylvania franchisee's stores is quoted in a 1990 interview as saying, "There's been explosive growth in the entire retail sector in this region in the past several years, but there just aren't enough young people to take the jobs available" (Business News Inc., 1990).

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 non-management employees. In contrast to the pattern for total payroll hours, non-management 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 non-management 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 sparse.

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

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[20] Among the subset of stores that reported non-management 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 non-management 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 non-management 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.

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 bi-weekly or monthly intervals (with weekly data the omitted category). These variables are also highly significant, and suggest that the period over which the data were reported affects measured employment trends. Relative to restaurants that provided weekly data (25 percent of the sample), restaurants that provided bi-weekly 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 bi-weekly payroll indicator is highly statistically significant (t=3.19). In Card and Krueger (1998; 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 may have been more likely to have been covered by some November payroll intervals (e.g., bi-weekly versus weekly) than others, 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 could have influenced hours differently across pay intervals is that on December 10-13 the Northeast was hit by one of the worst snow storms in decades, causing nearly two million power outages, widespread flooding, and bringing traffic to a halt (see Electric Utility Week, December 21, 1992). This storm forced many establishments in the Northeast to shut down for several days. It is likely that some pay intervals in NW's data were more likely to encompass the storm than others, again causing spurious movements in hours.[23]

Absent information on whether restaurants were closed because of a storm or holiday for some length of time in their pay period, controlling for the pay periods over which the data were reported is the best way to control for these extraneous factors that would influence scaled hours. Most importantly, Table 5 indicates that controlling for the type of payroll data has a large effect on the estimated New Jersey relative employment effect, because a much lower fraction of New Jersey restaurants supplied bi-weekly 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.

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[22]In view of this fact, we disagree with Neumark and Wascher's (1998, p. 10) assertion that because they collected hours worked for a "well-defined payroll period (which is specified as either weekly, bi-weekly 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, we do not consider their payroll periods "well-defined".

[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.

D. Alternative Specifications and Samples

The results in Tables 4 and 5 suggest that the measured effects of the New Jersey minimum wage differ between the original Berman sample and 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 Burger King franchisee who supplied the Pennsylvania observations in the original Berman sample. When the 26 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.

Rows 3 and 4 of Table 6 show the estimated New Jersey coefficients from specifications that control for chain and company ownership, and these variables plus indicators for the type of payroll data supplied to BNW (bi-weekly, weekly or 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 switches sign.

In most of their analysis NW utilize an employment measure based on the average scaled

[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.

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 qualitatively similar to the averaged data, but 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, yielding 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, although even in this sample the estimated New Jersey effect reverses sign once controls are introduced for the payroll period of the data. 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 informally-collected 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.

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

Neumark and Wascher argue that there is "severe measurement error" in our survey data and argue at length that our dependent variable has a higher standard deviation than theirs. But the key question is not whether there is noise in our dependent variable, but whether there is signal, and whether the average of the measurement error differs systematically between Pennsylvania and New Jersey. For this reason, it is valuable to compare the employment patterns in the two data sets below the state 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 of biased sampling in the BNW sample.

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

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 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

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[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-squared is $\lambda_1 \cdot \lambda_2$ (the product of the reliability ratios).

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 prob-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.

To further explore the representativeness of the BNW data, the BLS ES-202 data and the BNW 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 were unbiased, no other variable would 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 nonrepresenativeness in the BNW data is particularly acute for the Pennsylvania

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

restaurants. Together with the other evidence in Tables 4-6, this finding leads us to question the representativeness of the EPI's sample.

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. 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:

$$\underset{}{\Delta E} = \underset{(1.11)}{-2.00} + \underset{(9.75)}{17.98}\ \text{GAP} \qquad R^2 = .09.$$

The coefficient on the GAP variable in BNW's data is similar in magnitude to the estimate we obtain using the New Jersey micro data from our survey (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:

$$\Delta E = \underset{(0.78)}{0.77} + \underset{(5.76)}{12.00}\ \text{GAP} + \text{Chain Dummmies} \qquad R^2 = .78.$$

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 restaurants 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 (1998) have also performed a cell-level analysis using a wage gap variable. In presenting their results, however, they mischaracterize the wage gap analysis in our

[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.

1994 paper, and only selectively replicate our original analysis. Neumark and Wascher (1998) 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 misleading because it ignores the estimates in column v of Table 4 of our 1994 paper, which controlled for 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 confirm an essential finding of our original paper.

G. Other Evidence for the Eating and Drinking Industry

In the final section of their paper, 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 state-wide basis, while the latter are available by county, permitting a comparison between New Jersey and

[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.

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 year to the 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

[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 1982-94 are identical to the data available as of January 1999.

[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.

variable (i.e. from February/March to November/December). The use of chronologically-aligned unemployment data leads to a noticeable improvement in the fit 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 1980s and 1990s probably had

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[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.

little systematic effect on employment in the eating and drinking sectors of the two states. Thus, the aggregated BLS data are quite consistent with our findings from the fast-food sector in Section I, and with our original survey results.

IV. Conclusion

After analyzing BNW's data, NW's data, our original survey 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, esp. 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, non-random group of restaurants collected by Berman and 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 non-representative 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 reduce the average number of hours worked per employee. Neumark and Wascher (1997) 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.

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Figure 1: Areas of New Jersey and Pennsylvania Covered by Original Survey and BLS Data

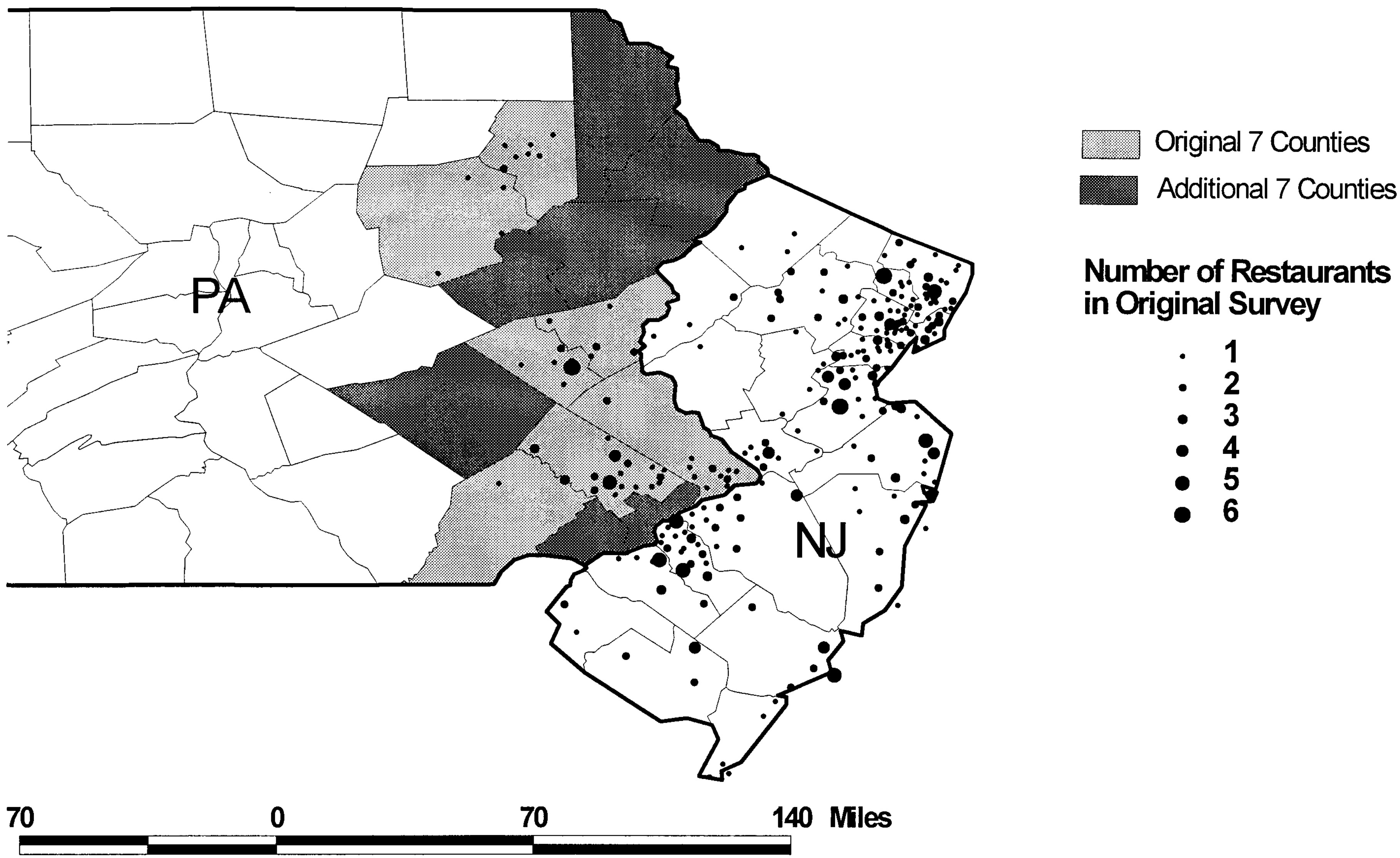
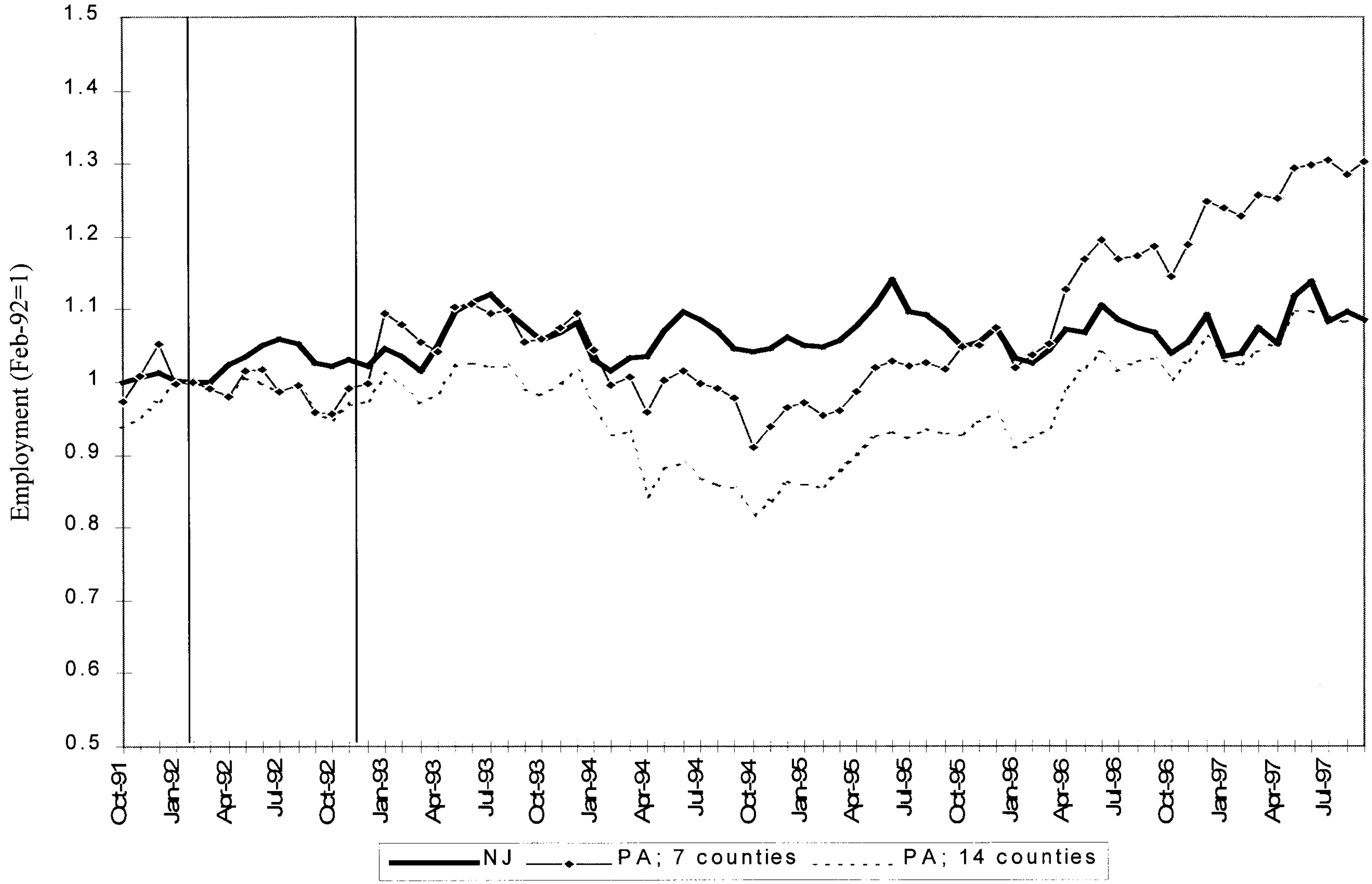
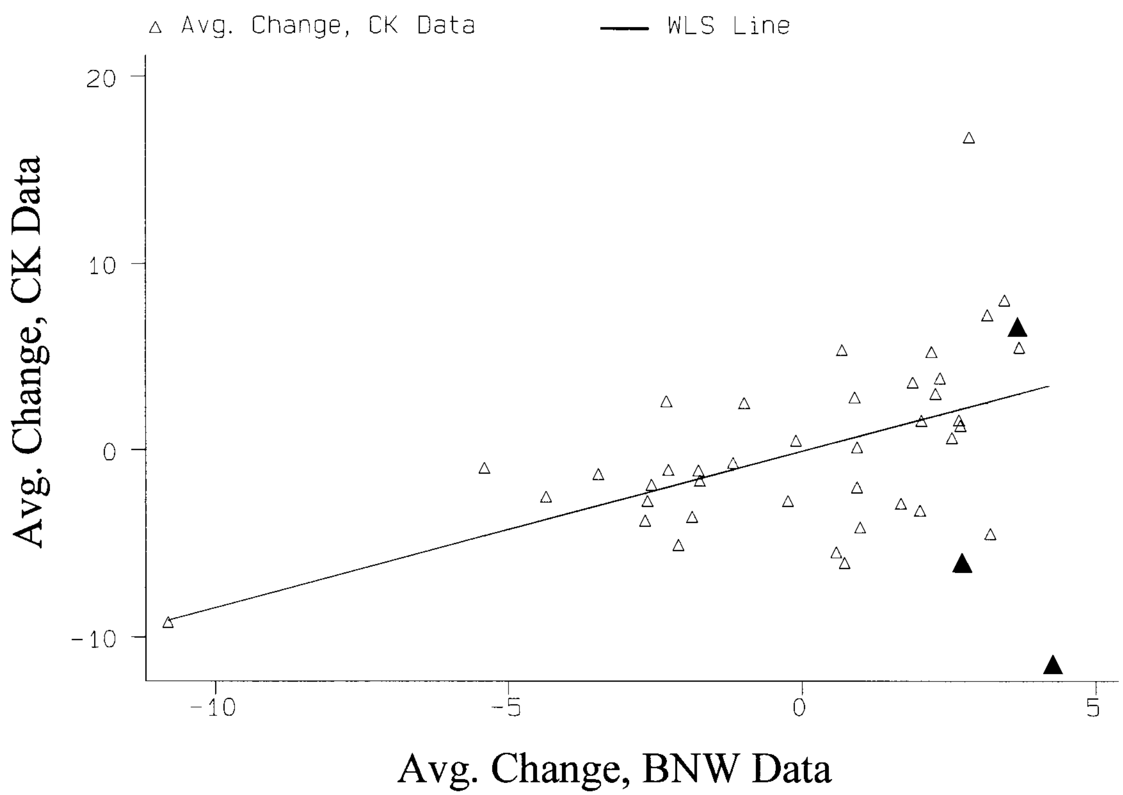


Figure 2
Employment in NJ and PA Fast Food Restaurants, Oct. 1991 to Sept. 1997



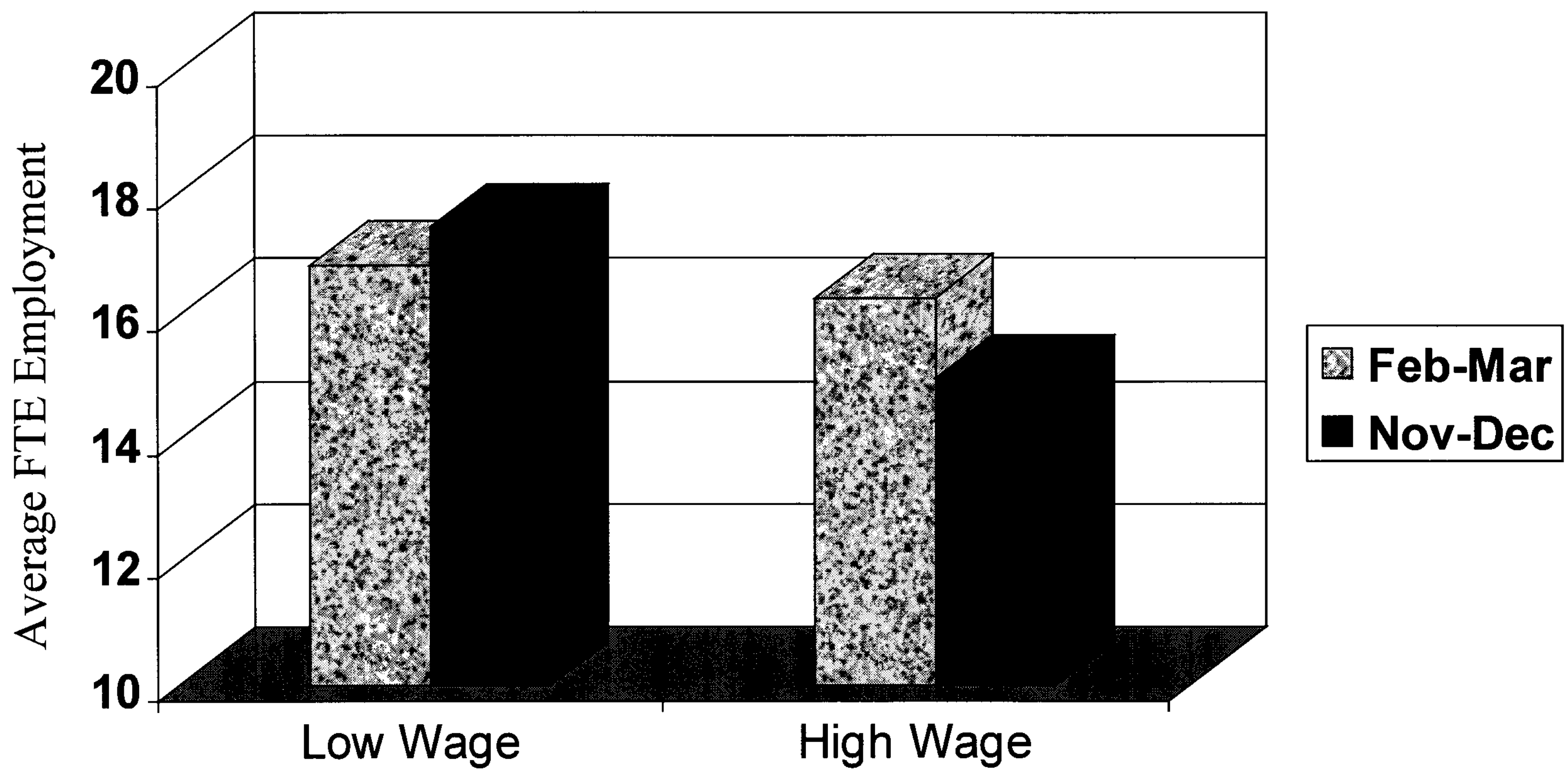
Source: Authors' calculations based on BLS ES-202 data.
Note: Vertical lines indicate dates of original Card-Krueger survey.

Figure 3: Graph of CK Data vs. BNW Data at the 3-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.

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 zip-code-by-chain 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.

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									
Feb-Mar to	37.2	37.6	0.41	42.5	42.4	-0.12	44.8	44.3	-0.53
Nov-Dec 92	(19.9)	(21.0)	(9.82)	(23.2)	(23.5)	(10.94)	(53.7)	(59.9)	(12.32)
Feb-92 to	37.2	37.8	0.57	42.7	42.2	-0.54	44.9	44.4	-0.58
Nov-92	(19.9)	(20.9)	(10.12)	(23.8)	(23.2)	(12.82)	(53.6)	(60.4)	(13.83)
Mar-92 to	37.2	34.8	-2.48	42.3	37.5	-4.80	44.7	40.7	-4.0
Mar-93	(20.1)	(20.0)	(13.99)	(22.8)	(18.6)	(22.74)	(54.0)	(54.5)	(18.1)
B. Card-Krueger Survey Data									
Feb-92 to	29.8	30.0	0.19	33.1	30.9	-2.23	NA	NA	NA
Nov-92	(12.5)	(13.0)	(9.82)	(14.7)	(10.6)	(11.98)			

Notes: Sample sizes for the first two rows are 437 for NJ, 127 for PA 7 counties, and 250 for PA 14 counties; sample sizes for third row are 436, 127, and 250, respectively; sample sizes for the last row are 309 for NJ and 75 for PA. The 7 PA 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.

Table 2: Basic Regression Results; BLS ES-202 Fast-Food Data and Card-Krueger Survey Data

Explanatory Variables	Dependent Variable: Change in Levels (1)	(2)	Proportionate Change (3)	(4)
Panel A: All of NJ and 7 Pennsylvania Counties, BLS Data				
NJ Indicator	0.536 (1.017)	0.225 (1.029)	0.007 (0.029)	0.009 (0.029)
Chain Dummies and Sub-unit Dummy Var.	No	Yes	No	Yes
Reg. Std. Error	10.09	9.99	0.286	0.281
R-Squared	0.001	0.029	0.000	0.046
Panel B: All of NJ and 14 Pennsylvania Counties, BLS Data				
NJ Indicator	0.946 (0.856)	0.272 (0.859)	0.045 (0.024)	0.032 (0.024)
Chain Dummies and Sub-unit Dummy Var.	No	Yes	No	Yes
Reg. Std. Error	10.80	10.63	0.303	0.294
R-Squared	0.002	0.042	0.005	0.071
Panel C: Original Card-Krueger Survey Data				
NJ Indicator	2.411 (1.323)	2.488 (1.323)	0.029 (0.050)	0.030 (0.049)
Chain and Co. Ownership Dummies	No	Yes	No	Yes
Reg. Std. Error	10.28	10.25	0.385	0.382
R-Squared	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. Sub-unit dummy variable equals one if the reporting unit is a sub-unit of a multi-unit 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 in parentheses.

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
Panel A: NJ and 7 PA Counties			
1. Basic Specification	0.225 (1.029)	0.009 (0.029)	564
2. Excluding Closed Stores	0.909 (0.950)	0.031 (0.024)	549
3. Excluding Closed Stores Unless Imputation Code=9	0.640 (0.973)	0.022 (0.025)	553
4. Drop Large Outliers	0.251 (0.970)	0.009 (0.028)	563
5. Proportionate Change with Initial Employment In Base	---	-0.001 (0.032)	564
6. Excluding New Jersey Shore	0.032 (1.092)	0.008 (0.030)	480
7. March 1992 to March 1993 Employment Change	2.345 (1.678)	0.007 (0.035)	563
8. February 1992 to November 1992 Employment Change	1.05 (1.10)	0.013 (0.032)	564

- Continued -

Table 3: Continued

Specification and Sample	Change in Levels (1)	Proportionate Change (2)	Sample Size
	Panel B: NJ and 14 PA Counties		
1. Basic Specification	0.272 (1.029)	0.032 (0.024)	687
2. Excluding Closed Stores	0.639 (0.776)	0.055 (0.021)	671
3. Excluding Closed Stores Unless Imputation Code=9	0.338 (0.787)	0.044 (0.021)	675
4. Drop Large Outliers	0.72 (0.78)	0.032 (0.023)	685
5. Proportionate Change with Initial Employment In Base	---	0.020 (0.024)	687
6. Excluding New Jersey Shore	0.069 (0.924)	0.030 (0.025)	603
7. March 1992 to March 1993 Employment Change	1.196 (1.258)	0.009 (0.027)	686
8. February 1992 to November 1992 Employment Change	0.624 (0.927)	0.027 (0.024)	687

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 sub-unit of a multi-establishment employer, and a constant.

Table 4: Descriptive Statistics for Levels and Changes in Employment by State, BNW Data

	Means With Standard Deviations in Parentheses:						Difference in Differences NJ-PA (std. error)
	New Jersey			Pennsylvania			
	Before	After	Change	Before	After	Change	
Total Payroll Hours/35:							
1. Pooled BNW Sample	17.5 (5.5)	17.5 (5.9)	-0.1 (3.4)	15.1 (4.0)	15.9 (5.9)	0.8 (3.5)	-0.85 (0.49)
2. NW Subsample	17.7 (6.1)	16.7 (6.3)	-1.0 (3.3)	13.4 (3.8)	12.4 (4.9)	-1.0 (3.5)	-0.05 (0.61)
3. Original Berman Subsample	17.1 (3.5)	19.3 (4.3)	2.1 (2.7)	16.9 (3.4)	20.4 (4.3)	3.4 (2.1)	-1.28 (0.63)
Non-Management Employment:							
4. Pooled BNW Sample	24.8 (6.0)	28.4 (6.8)	3.6 (3.0)	29.0 (5.5)	31.3 (6.8)	2.2 (4.7)	1.39 (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.

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 (0.49)	--	--	--	-0.36 (0.44)	-0.66 (0.41)	-0.09 (0.42)
NW Subample (1=yes)	--	-3.49 (0.42)	--	--	-3.44 (0.43)	--	--
Chain Dummies:							
Roy Rogers	--	--	-3.56 (0.81)	--	--	-3.14 (0.85)	-1.98 (0.89)
Wendy's	--	--	-0.85 (0.67)	--	--	-0.71 (0.67)	-1.35 (0.70)
KFC	--	--	-6.51 (0.90)	--	--	-6.30 (0.90)	-6.56 (0.89)
Company-Owned	--	--	-0.89 (0.76)	--	--	-1.31 (0.81)	-0.72 (0.95)
Payroll Data Type:							
Bi-weekly	--	--	--	1.73 (0.52)	--	--	1.65 (0.52)
Monthly	--	--	--	-2.60 (0.48)	--	--	-1.06 (0.89)
R-squared	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 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.

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 (0.49)	-0.05 (0.61)	-1.28 (0.63)
2. Exclude First PA Franchisee, No Controls	0.37 (0.56)	-0.11 (0.62)	--
3. Controls for Chain and Ownership	-0.66 (0.41)	-0.27 (0.53)	-0.95 (0.64)
4. Controls for Chain, Ownership and Payroll Period	-0.09 (0.42)	-0.22 (0.54)	0.58 (0.72)
B. Change in Payroll Hours/35 Using First Pay Period per Restaurant			
5. No Controls	-0.55 (0.50)	0.18 (0.63)	-0.85 (0.67)
6. Controls for Chain, Ownership and Payroll Period	0.07 (0.43)	-0.15 (0.52)	0.96 (0.78)
C. Proportional Change in Average Payroll Hours/35			
7. No Controls	-0.06 (0.05)	-0.00 (0.07)	-0.09 (0.07)
8. Controls for Chain and Ownership	-0.05 (0.05)	-0.03 (0.07)	-0.04 (0.07)
9. Controls for Chain, Ownership and Payroll Period	-0.01 (0.05)	-0.03 (0.07)	-0.08 (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 in parentheses.

Table 7: Comparisons of Employment Growth by Chain and Zip-code Area, Card-Krueger data versus Berman-Neumark-Wascher Data

	NJ and PA	NJ Only	PA Only
A. Using Combined BNW Sample			
Intercept	-0.32 (0.56)	0.41 (0.50)	-3.91 (1.77)
Change in Employment in BNW Sample	0.78 (0.22)	0.90 (0.19)	0.65 (0.68)
R-squared	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 (0.54)	0.36 (0.51)	-3.52 (1.67)
Change in Employment in BNW Sample	0.87 (0.21)	0.91 (0.20)	0.93 (0.73)
R-squared	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 3-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 in parentheses.

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	.17 (.05)	.10 (.05)	.09 (.05)
Fraction of Sample Collected by EPI	---	3.46 (0.70)	---
Fraction of Sample Collected by EPI x PA	---	---	4.33 (1.19)
Fraction of Sample Collected by EPI x NJ	---	---	3.22 (0.75)
Constant	.04 (.34)	-.95 (.34)	-.96 (.34)
R-Square	.19	.49	.50

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

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, NJ and Pa			ES-202 Data, NJ and 7 Counties of Pa	
	NW (1)	Revised Data (2)	Revised Data & Correctly-aligned Unemployment Rate (3)	NW (4)	Correctly-aligned Unemployment Rate (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-squared	0.15	0.13	0.38	0.14	0.51

Notes: Standard errors in parentheses. Models are estimated using changes in employment in SIC 58 (eating and drinking) between February/March and November/December of 1982-96. Dependent variable in columns 1-3 is the percentage change in state-wide 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 replications of Neumark and Wascher, 1998, 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. The data in columns 3 and 5 are chronologically aligned with the dependent variable.