

Supplemental Appendix for Effects of the Minimum Wage on Employment Dynamics

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In [Dube \[2013\]](#), Arindrajit Dube criticizes an earlier draft of our paper.¹ Some of his concerns – such as our choice of data sets, the time periods we examine, and the inclusion of unemployment rates as a control – we address in the latest version. In this appendix, we briefly respond to two primary criticisms which do not merit in-depth discussion in the main text: first, that our results are spurious due to insufficient controls for differences between states with high and low minimum wages; and second, that the effects of the minimum wage are seen in the “wrong” industries (namely, those with a relatively low prevalence of minimum wage earners).

1 Spurious effects due to unobserved differences

[Dube \[2013\]](#), [Allegretto, Dube, Reich, and Zipperer \[2013\]](#), and other papers written by this set of authors dismiss results contradicting their own by asserting that researchers who find such (negative) effects have failed to control sufficiently for unobserved heterogeneity between states. Dube argues that “states that have raised the minimum wage [by] more over the past several decades are systematically different from other states. These states have experienced more severe economic downturns; they have experienced greater job polarization in the form of sharper reduction in jobs involving routine tasks; and they have seen faster growth in upper-half wage inequality. Inability to account for these and other differences

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¹Some of these criticisms appear in [Allegretto, Dube, Reich, and Zipperer \[2013\]](#) as well.

can easily produce spurious results.” Beginning in [Dube, Lester, and Reich \[2010\]](#), these authors instead advocate for a county cross-border design to address this perceived spurious correlation. While this design has some intuitive appeal, [Neumark, Salas, and Wascher \[2013\]](#) illustrate a number of problems with this approach, concluding that these “methods are flawed and lead to incorrect conclusions.” We do not delve into the appropriateness of the cross-border design, but rather focus on the more general assertion that this sort of unobserved heterogeneity is driving the result found by our state panel specification, as claimed by [Dube \[2013\]](#).

For the results in our primary specification (Column (4) of Panels A, B, and C in Table 2) to be driven by confounders, one would have to believe that increases in the minimum wage were systematically correlated with unobserved shocks to job growth in that state in the same time period, but not other states in that region, unrelated to existing state-specific time trends, and that these shocks are not reflected in measures of state-specific demographics or business cycles. Dube’s claim that high- and low-minimum-wage states are fundamentally different in time-invariant ways is accounted for by state-specific fixed effects. Region-specific time effects control for time-varying factors that affect neighboring states at the same time, accounting for much of the spatial heterogeneity claimed in [Dube et al. \[2010\]](#) and [Allegretto et al. \[2011\]](#). Further, state-specific time trends will control for the general evolution of a state’s labor market. The inclusion of state-specific demographic and business-cycle controls should account for additional variation that may give rise to spurious correlation between increases in the minimum wage and changes in job growth. Yet the coefficients from our specifications in Table 2 that include these variables are effectively identical to those that do not, suggesting that the previously-discussed controls adequately account for other factors that might affect both a state’s nominal minimum wage and its labor market.²

More to the point, many of the examples that are cited as reflecting “systematic differences” between states, such as a reduction in jobs involving routine tasks, could easily be *effects* of higher minimum wages rather than confounders that remain despite the extensive set of spatial, time, and spatial-by-time controls that are included in our specifications. Dube and his coauthors simply assert that these are omitted variables.

Finally, [Dube \[2013\]](#) purports to use the Quarterly Census of Employment and Wages to demonstrate the importance of cross-border controls, though oddly choosing to annualize quarterly data (more on this point below) in his Table 3, Panel A. He shows that the

²Furthermore, we show in Table 3 of the paper that our results are robust to the inclusion of Census *Division* time period effects and quadratic state time trends, despite the higher saturation of these models.

coefficient in a specification not dissimilar to ours, though at the county level, shifts from -0.035 (s.e. = 0.013) to -0.015 (s.e. = 0.025) when cross-border controls are included. He claims that this finding “confirm[s] the likely spurious nature” of our results. Yet, the lack of precision of his preferred estimates is striking: the 95% confidence interval for his estimate extends to -0.064, *larger in absolute value than the bottom range of the confidence interval for the result without the border controls*. This seems grossly insufficient to support the bold claim that minimum wages do not affect job growth or employment outcomes; it is far more likely that these specifications are highly over-fitted, as evidenced by the greatly increased standard errors.

2 Results by industry

An additional concern voiced in Dube [2013] is that – when disaggregated by industry in the QCEW – the minimum wage appears to have a negative effect “exactly in the wrong places.” Dube argues that, if the minimum wage actually does negatively effect job growth, then Accommodation and Food Services and Retail Trade are sectors for which the effect “certainly has to involve much stronger reductions.” By the same token, he asserts that, “[i]f spurious trends are contaminating minimum wage estimates, manufacturing could play an important role in [illuminating] that process.”

We are less certain than Dube [2013] why it is ex ante clear that any particular *industry code* should not show any response to the minimum wage. First, NAICS (and alternative industry classification) codes are based on the *output* of a firm, not the job descriptions for particular employees. Second, even in industries such as manufacturing, many industry codes suggest the presence of jobs that are likely to be paid at or close to minimum wage. For instance, some of the largest sub-industries within the manufacturing NAICS codes (31-33) are printing, apparel manufacturing, and retail bakeries.

However, even leaving aside the ex ante selection of industries, our results in Table 4 of the paper – which reports estimates separately for *all* industries – run counter to Dube’s specific criticism. We find that the minimum wage reduces job growth in Accommodation and Food Services by -0.0217 percentage points per quarter, a statistically significant effect. For Retail Trade, the estimate is -0.0092 percentage points, also statistically significant. In contrast, we estimate no statistically significant effect of the minimum wage on the job growth rate for Manufacturing.³

³Our estimates for these sectors are similar in magnitude and statistical significance when using either

Dube [2013] makes two odd choices in his analysis. Most prominently, despite arguing throughout most of his paper that we lack sufficient business cycle controls and an extensive history of arguing that “[l]ack of controls for spatial heterogeneity in employment trends generates biases,” he selects a specification that omits both business-cycle controls and state-specific time trends.⁴ Second, he annualizes the originally quarterly data by taking the average employment across a calendar year. In any case, when using the richer specification we detail in the paper, as well as the original data from the QCEW, we do not find the same effects as Dube does, neither for the full sample nor for the time periods he selects.⁵

3 Concluding remarks

Dube [2013] claims that results disaggregated by industry indicate that our findings must be spurious. We show that Dube’s evidence for the effects of the minimum wage on various industries appears to be an artifact of the choice to annualize the data in the Quarterly Census of Employment and Wages and is not consistent with our estimates using the original quarterly data.

More importantly, he asserts that our findings are erroneous, because differences between high- and low-minimum wage states drive changes in both the minimum wage and employment growth. In Table 2 of our paper, we begin with the standard state panel difference-in-differences model. Moving across the columns, we include additional spatial, temporal, and spacial-by-time controls into the specifications, recognizing the inherent trade-off between controlling for potentially confounding variation and saturating a model beyond the point of informative inference. Dube’s conclusion – that only his preferred research design “successfully filters out the confounding artifacts” – borders on the tautological: he is contending that until a statistically insignificant effect of the minimum wage has been found (even with a large negative point estimate), a specification has not sufficiently controlled for potential confounding factors. We hope that readers will reject this unscientific and unfalsifiable assertion.

the QCEW or the *Quarterly Workforce Indicators* (QWI) data.

⁴In Allegretto et al. [2011], the authors advocate for specifications “(1) allowing for Census division-specific time effects, which sweeps out the variation across the nine divisions and thereby controls for spatial heterogeneity in regional economic shocks; and (2) including a state-specific linear trend that captures long-run growth differences across states.” They argue that “[t]he inclusion of these geographic controls changes the estimates substantially.”

⁵Other, equally sensible approaches to annualizing – such as examining year-over-year changes – show results similar to those using the quarterly data.

References

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