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Minimum Wages and Employment: Reply

Andrew Leigh*
John F. Kennedy School of Government
Harvard University

Abstract

The results of my study (Leigh 2003, 2004) on the effect of minimum wages on employment have been brought into question by Watson (2004), which raises some potential methodological concerns. Careful reanalysis of the Western Australian minimum wage experiment demonstrates that this critique is not well founded. Further checks show that the results are robust to a number of alternative specifications, in addition to those presented in the original article.

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1. Introduction

Discussion and critique are important endeavours in economics, especially when the findings of a study are controversial. In his Comment on my *Australian Economic Review* study of the employment effect of minimum wages (Leigh 2003, 2004), Watson (2004) outlines six issues that he argues might affect the validity of the results. He then concludes a priori that the study is 'fundamentally flawed' and that we remain ignorant about the effect of minimum wages on employment in Australia.

Before dealing with Watson's criticisms in turn, it is worth noting that most of them do not concern omitted variables bias, but classical errors-in-variables. Omitted variables bias may cause the parameter of interest to be estimated as non-zero when it is really zero. By contrast, errors-in-variables has the consequence that the estimate of the parameter of interest will be attenuated towards zero. Since Watson never provides evidence that the estimated elasticity of labour demand in my study is biased towards the finding that raising the minimum wage costs jobs, one could accept his critique in its entirety, and still be left unable to explain why my estimate of the elasticity of labour demand is negative and statistically different from zero at the 1 per cent level.

However, correctly estimating the sign of the elasticity of labour demand is only one part of the picture. Precisely estimating the magnitude is at least as important—if not more so—than estimating the sign (a point I will return to later). For this reason, it is essential to carefully address each of Watson's six criticisms, to see

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whether any of them are supported by theory or evidence.

2. Use of Aggregated Employment Figures

Watson begins by arguing that the use of aggregated figures (such as the total number of people employed in a state in a given month) is unacceptable for the purpose of investigating the effect of minimum wages on employment. He appears to believe that any studies that do not use individual-level employment data fall short of the appropriate evidentiary standards, and should be rejected out of hand. As evidence for his rejection of *macrodata* aggregates he cites Machin and Manning (1994), who criticise studies of the effect of minimum wages that use *macroeconomic* models.

Watson seems to be conflating the use of macrodata aggregates with macroeconomic modelling. Yet the two are quite different. Machin and Manning (1994, p. 321) are condemning studies that calculate the effect of the introduction of the minimum wage on the average level of wages, and then enter that value into one of the macroeconomic models of the economy. Their critique is of no relevance to a natural experiment based on macrodata aggregates. Indeed, Machin and Manning themselves use published macrodata aggregates!

Whether we aggregate by year*industry (as Machin and Manning do), by month*state (as Tables 2 and 3 of my article do), or by month*state*age*sex (as Table 4 of my article does), macrodata remain an imperfect substitute for microdata—principally because the latter allow for the inclusion of a richer set of controls. Economists should always note how their data sources are less than ideal. But the perfect should not become the enemy of the good. Unless one can produce a credible explanation for why macrodata aggregates should bias the results, using macrodata instead of microdata will merely introduce more noise into the regression. Until the Australian Bureau of Statistics (ABS) changes its strict policy on access to microdata, it is hard to see why the nation's labour economists should refrain from studying the effect of minimum wages on employment.

3. Selection of Control Group

Watson goes on to contend that with respect to employment, the rest of Australia is a poor control group for Western Australia. However, it would have been helpful if he had discussed the reasons that the rest of Australia was selected as the control group:

- analysis of the pre-1994 period revealed that no single state or territory was a better control than all states and territories combined;
- weighting the other states and territories to create a 'synthetic Western Australia' (in the manner of Abadie and Gardeazabal 2003) did not produce a significantly better control than merely summing employment across the rest of Australia;
- it would be impossible to use employment data from those living on either side of one of Western Australia's state borders (in the manner of Holmes 1998), since the population density in these regions is too sparse; and
- careful analysis of payroll taxation rates (a key state policy which could potentially have affected the employment rate during the period of the study) revealed no variation that was correlated with changes in the Western Australian statutory minimum wage.

Reading Watson's critique of the chosen control group, it is difficult to escape the conclusion that he not only believes that the rest of Australia is a poor control, but that he believes that *no* adequate control group for Western Australia could ever be found.

In discussing the appropriate control group for Western Australia, Watson also fails to canvass one of the disadvantages of using a single state as a control. One of the curious facts about Card and Krueger's study of fast food employment in New Jersey and Pennsylvania is that the largest movement is not in the treatment state, but in the control state (Pennsylvania), which saw a sizeable drop in fast food employment during the period of the study

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(Card and Krueger 1994). Card and Krueger attribute this to a regional economic downturn, but it is clear that using a single state as a control group increases the possibilities that idiosyncratic factors will affect employment in the control state.

By contrast, what would have had to happen for the control group in the Western Australian minimum wage experiment to be tainted? Such a problem could only occur if a shock impacted all states and territories *except* Western Australia, *and* that shock was correlated with the timing of more than one increase in the Western Australian minimum wage (recall that the estimates are robust to excluding any of the minimum wage increases). Watson gives no evidence of any such shock, and it is difficult to imagine what it might have been.

4. Employment Trends in Treatment and Control Group

Was the employment gap between Western Australia and the rest of Australia trending apart during the period when Western Australia had a statutory minimum wage? Watson speculates that this might be the case, but offers no evidence to support this claim. Yet this hypothesis is easily tested. Column (1) of Table 1 below presents the baseline estimate found in Leigh (2004, Table 3). Column (2) adds a linear time trend to the regression—allowing for the possibility that the difference-in-difference estimator is moving in a systematic direction (which would occur if the employment gap between the two states was expanding or narrowing). The coefficient on the time trend is 0.00003, which is statistically indistinguishable from zero. With the inclusion of a time trend, the estimate of the elasticity of labour demand shifts from –0.290 to –0.296.

Column (3) goes further still, adding a separate fixed effect term for each year. If indeed it is the case that systematic differences between Western Australia and the rest of Australia during the 1990s are biasing the results, the estimates in columns (1) and (3) should differ substantially. This is not the case. Including

Table 1 Further Robustness Checks

	Before and after period					
	Three months			*One month*	*Two months*	*Four months*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Employment effect (in percentage points)	–0.149***	–0.151***	–0.144***	–0.087***	–0.123***	–0.083
	(0.048)	(0.050)	(0.043)	(0.017)	(0.027)	(0.060)
Linear time trend		0.00003				
		(0.00008)				
Year fixed effects	No	No	Yes	No	No	No
N	247	247	247	251	249	245
R^2	0.04	0.04	0.14	0.02	0.03	0.01
Estimated elasticity of labour demand	–0.290***	–0.296***	–0.282***	–0.170***	–0.240***	–0.163
	(0.094)	(0.097)	(0.084)	(0.033)	(0.052)	(0.117)

Notes: (a) The dataset is all $[(T + X) – (T – X)]$ difference-in-difference estimates of the full-time equivalent, seasonally adjusted, employment to population ratio between Western Australia and the rest of Australia over the period February 1981 to February 2002, where X is three months for columns (1), (2) and (3); one month for column (4); two months for column (5); and four months for column (6).

(b) On the six occasions between 1994 and 2001 when the Western Australian statutory minimum wage was increased by a non-negligible amount, the 'employment effect' coefficient is set to the percentage rise in the Western Australian statutory minimum wage. In all other cases, it is set to zero. The estimated employment effect coefficient is therefore the percentage point change in employment associated with a given rise in the minimum wage.

(c) Robust standard errors are in parentheses. ***, ** and * denote significance at the 1 per cent, 5 per cent and 10 per cent levels respectively.

(d) The estimated elasticity is the employment effect divided by the mean full-time equivalent employment to population ratio in Western Australia between 1994 and 2001.

Source: ABS, *Labour Force Survey*, Cat. no. 6203.0, ABS, Canberra.

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year fixed effects in the model shifts the point estimate of the elasticity of labour demand by only a tiny amount, to –0.282 (it also reduces the standard error). Clearly the original estimates were not driven by divergent employment trends between Western Australia and the rest of Australia.

5. Choice of Before and After Periods

In analysing the employment effect of the Western Australian minimum wage, employment rates three months before the rise were compared with rates three months after the rise. This time-frame was used to minimise the risk that employers anticipated the rise, and to recognise that any effect would only have occurred after some delay. The seven-month gap between the before and after periods is precisely the same interval used by Card and Krueger (1994), whose 'methodological rigour' Watson praises. Yet in the case of the Western Australian minimum wage experiment Watson speculates that the observed effects may not be robust to alternative before and after periods. He offers no evidence to support this contention.

Before turning to the data, it is important to note that the speed with which employers respond to a rise in the minimum wage is an empirical issue, not a theoretical one. The right question to ask is not 'Do we observe statistically significant employment effects for *every* possible before and after interval?', but 'Do we observe statistically significant employment effects for *any* before and after interval?'. Choosing the correct interval will also affect the precision of the estimate. In this sense, arguments can be made both for widening or narrowing the interval. A narrower interval will be less likely to be contaminated by other factors affecting employment, but may miss some changes that occur with a lead (caused by employers anticipating the rise) or a lag (for example, lay-offs may take some time to occur). On the other hand, a wider interval will capture lead and lag effects, but will be more affected by errors-in-variables (as the range widens, the minimum wage becomes a less important factor affecting employment during the period). For very wide intervals, attenuation bias will most likely make it impossible to discern the effect of the minimum wage rise amidst the noise of employment fluctuations.

Do we observe statistically significant employment effects for *any* before and after interval? As my article demonstrated, the answer is yes. When a three-month before and after period is used, the employment impact of raising the minimum wage is statistically distinguishable from zero at the 1 per cent level. In deference to Watson, however, columns (4) to (6) of Table 1 above reanalyse the Western Australian minimum wage experiment using three alternative before and after periods. Recall that when a three-month before and after period is used, the estimated elasticity of labour demand with respect to the Western Australian statutory minimum wage is –0.29. If instead a two-month before and after period is used, the estimate falls to –0.24, and if a one-month before and after period is used, the estimate falls further to –0.17.[1] The one-month, two-month and three-month estimates are all distinguishable from zero at the 1 per cent level of significance. If a four-month before and after period is used, the estimated elasticity is –0.16, which is not statistically significant at the 10 per cent level ($p = 0.17$). It is hardly surprising that as we measure employment further and further away from the point at which the minimum wage rise occurred, the employment effects are subject to greater attenuation bias. But the findings of the original study are clearly robust to various before and after periods.

6. Potential Endogeneity

One of the problems confronting those who would study the employment effects of minimum wages in Australia is that minimum wages tend to be set by industrial commissions, taking account of forecast economic conditions. When economic conditions are predicted to be good, industrial commissions are likely to put in place higher minimum wages than if the economy is expected to turn sour. Such fine-tuning doubtless benefits employees; but it also bedevils studies of the employment effects of minimum wages. If minimum wages are

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boosted only when times are good, estimates of the elasticity of labour demand will be positively biased. Where studies of the employment effect of minimum wages rely only upon endogenous variation in minimum wages, it is difficult to believe that we can derive an unbiased estimate of the elasticity of labour demand.

By contrast, the political context is more likely to produce minimum wage rises that are exogenous to prevailing economic conditions. In the case of the Western Australian statutory minimum wage, the timing of each of the six increases under analysis appears to have been exogenous. Moreover, the magnitude of at least two of the increases was credibly exogenous to the economic environment. In the case of the other four, the minister may have made the decision with an eye to economic conditions, but even so, the decision was made by a single individual, not a commission, and without any formal hearing procedure. By comparison with other minimum wage changes in Australia, increases in the Western Australian statutory minimum wage were unusually exogenous.

As I pointed out in the original study, it is possible that four of the six increases in the Western Australian minimum wage experiment were endogenous to economic conditions. Watson appears to regard this as a potential source of bias, which should lead us to question the robustness of the results. Yet if he had proceeded to the next logical step—discussing the sign of the potential endogeneity bias—he would have seen the flaw in this chain of reasoning. Suppose that the rises were indeed entirely endogenous to prevailing economic conditions, since the Western Australian Government correctly predicted each time it increased the minimum wage that employment conditions in the state would be better than in the rest of Australia. If true, this would bias the estimated employment effect towards a finding that raising the minimum wage *increased employment*. Far from driving the statistically significant negative results in the article, endogeneity should bias the results towards a positive effect. If endogeneity really did affect increases in the Western Australian minimum wage, then the observed coefficient is an underestimate of the true elasticity of labour demand with respect to the minimum wage.

7. Statistical Significance

Lastly, Watson claims that changes in the Western Australian minimum wage cannot be distinguished among the 'noise' of month to month changes in ABS estimates of employment. Reading Watson's critique, one might be misled into thinking that the original article omitted standard errors. This is not the case. The difference-in-difference estimates presented in the original article showed the standard error for each point estimate—calculated using ABS tables of standard errors. Using the usual formula for the standard error of a difference, the standard errors on the point estimates were then used to calculate the standard errors on the differences, and the standard errors on the difference-in-difference estimates.

Watson asks, rhetorically, 'Given the normal variability in employment, is it conceivable that one could actually discern such an impact?'. The answer can be found merely by consulting Table 2 of Leigh (2004), which uses ABS standard error tables to determine statistical significance. And the answer is that—*using ABS standard error tables*—four of the six minimum wage increases are negative and statistically distinguishable from zero at the 5 per cent level or better.[2] Again, the critique appears to be without substance.

8. Conclusion

There are two key issues to be determined in analysing the effect of minimum wages on employment—the sign and the magnitude. Watson's characterisation of my study as one that 'supported the conventional view' reveals that he regards the critical question as the sign, not the magnitude. Similarly, when my study has been discussed in the press, the media's focus has frequently been on the sign, rather than the magnitude, of the effect.[3]

Yet there can ultimately be little doubt about the sign. As Card and Krueger (1995, p. 355) put it, 'at sufficiently high levels, the predicted

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employment losses of the standard model will be borne out'. From a theoretical standpoint, the employment effect of raising the minimum wage may be large and negative; it may be modest and negative; or it may be negative yet so small as to be statistically indistinguishable from zero. But the labour demand curve *is* downward-sloping, and few would contend that doubling the federal minimum wage tomorrow would cost no jobs.[4]

However, knowing that the sign is negative tells us nothing about whether the minimum wage should be increased, since no sensible social welfare function puts infinite weight on employment or zero weight on earnings. For any policy debate, the magnitude is the most important issue. A tiny negative effect on employment yields similar policy conclusions to a zero effect, but both yield very different conclusions from a large negative effect. Correctly estimating the employment effect will help those setting minimum wages to gauge whether a given minimum wage increase will raise or lower net welfare.[5] As the Western Australian minimum wage experiment has shown, there is an employment cost to raising the Australian minimum wage, but it seems to be smaller than many have argued.

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Endnotes

1. For simplicity, the robustness checks presented here use symmetrical before and after periods: one month before and one month after, two months before and two months after, etc. Results for all 16 combinations of 1–4 months before and 1–4 months after are available from the author upon request.

2. Although it is not a point raised by Watson, it may be useful to note that when it comes to aggregating the results of the six minimum wage increases, the standard errors are not, of course, based upon ABS estimates. Instead, the standard errors in Tables 3 and 4 of the original article (and Table 1 of this article) are heteroscedasticity-robust standard errors from a regression of 247 seven-month 'difference-in-difference' estimates over the period 1981–2002 on a variable denoting the percentage change in the Western Australian statutory minimum wage.

3. See Davis (2004) and the editorial, 'Wage case hurting low-income families', in *The Australian* (26 February 2004, p. 12).

4. Even in the wake of the publication of Card and Krueger (1994), most leading US labour economists believed that a 10 per cent increase in the minimum wage would have negative employment consequences (Fuchs, Krueger and Poterba 1998).

5. Better yet, we might seek to directly measure the combined impact of the employment and earnings effects on welfare and distribution. For an example of this type of study, see Neumark and Wascher (2002).

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