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Labour Productivity in the South Wales Coal Industry: Reply

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In our earlier article in this Journal, we estimated several empirical models attempting to explain the determination of labour productivity in the British and, separately, South Wales coalfields between 1874 and 1914. A major finding for South Wales was a significant negative relationship between average labour productivity and both a nominal and real-wage rate index, thus providing support for the contention of economic historians (and some contemporary observers) that a significant reduction of work effort occurred in response to rising wage rates. Professor Greasley is sceptical of these findings and offers several criticisms of our data and interpretation. Indeed, he claims that our principal result is “without statistical foundation” and that we were led to reach “conclusions that are implausible”. We disagree strongly with these contentions. While some of his comments may warrant an airing, we find little in his paper that alters our original conclusions.

Greasley makes three potentially relevant points: (1) there exist measurement problems with the labour productivity and wage variables used in our paper (which were taken from Walters, 1975); (2) our empirical results rely, Greasley contends, on the assumption of money illusion by miners; and (3) because wages are closely tied to coal prices, causation may run from productivity to prices to wages and not, as we modelled, from prices to wages to productivity. We address each of these points in turn.

Following Walters, we used data on overall labour productivity even though much of our discussion concerned the response of hewers to rising wages. It is clear that hewers comprised the primary class of mine workers who could vary their intensity of effort in response to changing wage rates. Thus, Greasley, in his Figure 1, constructs a separate productivity series for hewers for 1874-1914. Rather remarkably, this series is based on interpolation and extrapolation from three data points (1889, 1905 and 1914). Yet even using his new series as a measure of productivity, Greasely finds a negative relationship between productivity and wages equal in magnitude and statistical significance to that found in our paper, thus reinforcing our original findings.

Greasley also criticizes us for using Walters’s wage rate index, although he offers no substitute measure for this time period. He is furthermore concerned by the high correlation of the wage index with the price of coal. Yet we modelled the relationship between coal price, wages and labour productivity explicitly in our paper (as both a recursive system and as a system of equations estimated by FIML). Hence, this criticism is not valid unless one has a strong prior that miners responded to coal price independent of their compensation (a view with which we do not sympathize), or that causation runs in the opposite direction (a point of potential interest on which we comment below).

While Greasley provides no substitute for Walters’s wage index in his comment, he has elsewhere (Greasley, 1982) provided an alternative wage
series for the period 1900–1914. Although 15 years may be too brief a period to obtain reliable estimates, it is worth noting that we obtain virtually identical regression results for these years using either the Walters or the Greasley wage index. Table 1 presents the coefficients (t-ratios in parentheses) on the nominal and real-wage variables using, alternatively, the Walters and Greasley indices. Estimation is by the Beach–MacKinnon procedure, and other included variables are strike and hours law dummy variables, the percentage change in trade, mine size, and a time trend. While the magnitude of the wage coefficients are lower (in absolute value) than for the entire 1874–1914 period, our use of Walters’s wage series produces estimates quite close to those produced using Greasley’s own wage series.

In our paper we used both real and nominal wage indices because of Walters’s contention that no satisfactory retail price index exists for this period. Similar results were obtained with both measures. Greasley separates the real wage into nominal wage and price level components and demonstrates that labour productivity is related to the nominal wage, but not to retail prices. He contends (incorrectly, we believe) that we therefore must assume that miners exhibited money illusion. As we originally warned, the true relationship between productivity and retail prices may be unobservable owing to measurement error in the price index. Alternatively, the analysis may be reflecting the fact that the price level index varied little over this time period. Or miners may in fact have suffered from money illusion in the short run and not responded immediately to price level changes. This is hardly implausible, given workers’ poor knowledge of economy-wide price level changes.

Greasley’s most relevant criticism may be his contention that causation runs not from wages to productivity (via labour supply responses), but rather from productivity to the price of coal to wages, thus rendering our rather robust statistical results spurious. This is an important point, which we failed to consider explicitly in our paper. Unfortunately, Greasley offers no evidence in support of his hypothesized chain of causation. For Greasley’s scenario to be plausible (of course, these alternative explanations for a negative productivity–wage relationship are not mutually exclusive) there must exist determinants of labour productivity not accounted for by our model, and changes in aggregate South Wales productivity must be sufficient to affect the South Wales coal price. While Greasley fails explicitly to state or consider either of these assumptions, both may be reasonable in this case. Greasley’s proposed chain of causation can not explain, however, the negative relationship we found between wages and labour productivity in three individual South Wales coal companies, since productivity in any single company did not appreciably affect aggregate coal price or wages.

### Table 1

<table>
<thead>
<tr>
<th></th>
<th>Nominal wage</th>
<th>Real wage</th>
</tr>
</thead>
<tbody>
<tr>
<td>In (W): Walters measure</td>
<td>-0.113</td>
<td>-0.143</td>
</tr>
<tr>
<td></td>
<td>(-2.21)</td>
<td>(-2.42)</td>
</tr>
<tr>
<td>In (W): Greasley measure</td>
<td>-0.122</td>
<td>-0.156</td>
</tr>
<tr>
<td></td>
<td>(-2.50)</td>
<td>(-2.76)</td>
</tr>
</tbody>
</table>
While we believe that the points addressed above are the most important elements in Greasley's comment, a few other remarks warrant a reply.²

1 We did not attempt to test rigorously the entrepreneurial failure thesis. We carefully stated, quite reasonably in our opinion, that our positive (but generally insignificant) time trend for labour productivity provides no support for the entrepreneurial failure argument. Greasley's finding of an even more significant positive time trend (his Table 1), if anything, strengthens our position.

2 Greasley (note 9) objects to our lumping him with believers of the entrepreneurial failure thesis and then proceeds to quote himself somewhat out of context. He stated (Greasley, 1982, p. 263): “Our contention is that the gradual adoption of machine-cutting should primarily be discerned as an economically rational response to local technical change, although a role for entrepreneurial sluggishness in delaying the adoption of cost-efficient technology is also found.” And earlier (p. 262). “Alternatively, the estimated rate of adjustment parameters provides evidence for a pessimistic interpretation of the quality of British entrepreneurship.” It should be noted that Greasley carefully hedges his conclusion.

3 Greasley (note 5) notes that he replicates our results except for obtaining smaller coefficients of determination when using the Beach-MacKinnon procedure. As we noted in our tables, our R²s were based on ρ-transformed data, whereas Greasley's apparently are not.

In summary, we remain convinced by our earlier conclusion that "rising wage rates played a major role in explaining decreased productivity, this decrease taking the form of greater absenteeism, fewer hours of work and a lessened intensity of effort" (Hirsch and Hausman, 1983, p. 154). While the historical data clearly leave much to be desired, the robustness of our statistical findings—combined with the numerous anecdotal comments by contemporary observers and subsequent conclusions reached by economic historians—make us confident that this conclusion is warranted.

NOTES

1 Although we did not point it out, it was our own scepticism regarding the hypothesized negative relationship between productivity and wages that led us to pursue this research.

2 According to Daunton (1981), “Hewers had an autonomy in their work which the other grades, pressured as much by the hewer as by the deputy to maintain production, did not possess” (p. 585). And “In South Wales, hauliers were paid by the day, ... This meant that a reduced wage rate in South Wales gave the hauliers no opportunity to maintain earnings by increasing their work load, as could the face workers” (p. 591).

3 Although Greasley accuses us of replicating unacceptable elements in Walters's framework, “albeit without the qualifications”, he apparently ignores Walters's (1977, p. 228) warning that “it would be unwise to place too much credence on a calculation based on the differences in hewers' output between 1889 and subsequent dates”.

4 Greasley contends that the assumption of money illusion is particularly inappropriate since miners' wages were tied directly to price. This argument is incorrect since wages were tied to coal prices and not to an index of consumer prices (as used to deflate nominal wages). In fact, short-term money illusion is probably a more realistic assumption than that of instantaneous adjustment to the real wage.

5 We might also add some of our own reservations regarding our paper. We are not satisfied that diminishing returns (a physical or geological concept in this case) have been handled adequately. We know that the proportion of underground oncost (“unproductive”) workers increased during this time period and that the average mine was getting both larger and older, all of which (in the absence of significant technological change) were affecting adversely overall
labour productivity. In addition, we would like to have been more precise regarding the process by which the apparent diminished intensity of work effort took place. Finally, with the exception of our strike variable, the relationship between miners and owners has been neglected even though it is likely to have been important (see Pencavel, 1977). As Walters (1977, p. 231) notes, on at least one occasion the Mines Inspectors acknowledged the reduced intensity of effort of the miners, but attributed it to "the antipathy between men and their masters rather than to the effects of high wages".

REFERENCES


