

The Landlord and Agricultural Transformation, 1870-1900: A Rejoinder¹

By RICHARD PERREN

DR Ó Gráda's comment on my article embodies the use of a more sophisticated technique than I employed to measure the efficiency of landlord investment during the "Great Depression" of British agriculture. However, neither the methodology used nor the conclusions reached are beyond criticism. Although it is an ingenious and resourceful exploitation of the data, and more comprehensive than my own, the nature of the source makes it doubtful whether this treatment is a success. Ordinary least squares (OLS) regression is appropriate where the statistical information provides a fairly unambiguous measurement of the phenomenon it is employed to explain, and where the explanatory variables can be correctly identified. It is also necessary that the model which is selected should be correctly specified; and at the very least this requires that it includes the single most important explanatory variable. On a number of counts Dr Ó Gráda's model fails to satisfy these needs.

The use of rent charge (RC) as an estimate of the return on landlord investment is open to query. In taking the difference between average rent per acre between two points in time, Dr Ó Gráda misses out any return on investment in the intervening years. This certainly presents a problem with both his 1872-92 equations because rents generally rose up to 1877.² Nineteenth-century landlords would have expected to receive a stream of income from the money they invested, in the form of annual returns,

¹ I should like to thank R. Edwards, C. P. Hallwood, C. H. Lee, G. A. Mackay, and A. G. Kemp for their helpful comments on points contained in this reply. I should also like to thank Cormac Ó Gráda, who freely supplied information regarding the compilation of his data. I am responsible for any errors and misunderstandings remaining.

² R. H. Rhee, *The Rent of Agricultural Land in England and Wales, 1870-1943*, 1949, pp. 40, 42.

over the lifetime of their investments. I do not think that the division of the data into two partially overlapping sets fully answers the inability of Dr Ó Gráda's measure of these returns to include all of the continuing income effects between the base and final years. Thus the return on this investment is biased downwards.

There are also problems involved in the timing of the returns, which he admits is unknown.³ Certain items of expenditure cause more difficulty than others. With buildings there is no problem because they could be filled with crops, animals, or equipment as soon as completed. However, laying down permanent pasture was a more complex business, as revealed by the parliamentary debates of 1883 over the various Bills to provide landlord compensation for tenants' improvements. One member observed:

It was too difficult to obtain anything like an approximate idea of what the compensation should be for laying down permanent pasturage. It was difficult because so much depended upon the way it was dealt with and cared for during the first 10 years. They all knew that [if] during the first two years the grass was mown and no sheep fed over it, and if at the end of the third year fresh seed were thrown down, and afterwards careful attention were given to it, at the end of 10 years there would be really good old turf. . . . It was a matter of impossibility to make with approximate accuracy . . . a calculation of what should be paid.⁴

As permanent pasture was one of the items included in the Royal Commission estate

³ Ó Gráda, "The Landlord and Agricultural Transformation, above, p. 41.

⁴ *Hansard*, 9 May 1883, col. 329: speech by Mr Staveland Hill.

accounts, and therefore in Dr Ó Gráda's measure of improvement expenditure (I), it is not difficult to see that the same problems arise when one considers the possible timing of any returns to landlords on this investment. Again, some other types of investment were likely to have had a very short life. In the estate accounts column 13 is headed: "Drainage, Allowance for Grass Seeds, and other Improvements." Although the expenditures were titled PERMANENT IMPROVEMENTS,⁵ it is hard to believe that some landlords did not include things like lime, bone manure, and other fertilizers which had a life of anywhere between two and around five years.⁶ Indeed, the whole problem of the timing and duration of returns on agricultural investments was widely acknowledged to be exceedingly difficult. The Agricultural Holdings Act of 1883 admitted that it was impossible to determine, except in individual cases. The 1875 Act, which that of 1883 replaced, did have a schedule setting out the duration of various classes of investment, but that of 1883 scrapped the schedule, and set up a formal machinery of arbitration to decide each case on its merits, if landlord and tenant could not agree together.⁷

Whereas the return on investment (RC) is biased downwards by unavoidable omissions, Dr Ó Gráda's statistic for the actual improvement outlay (I) is complete. However, it is difficult to know precisely what meaning should be attached to it when it is related to RC . Thus RC is simply the difference between two points in time which may or may not be fully representative of the intervening years, whilst I constitutes a measure of the stock of improvements over the whole period chosen for the regressions. The specification of the model is itself misleading. At one point Dr Ó Gráda writes: "the intercept term [is] our measure of rent charge on land not improved over the

period." If one accepts his following assertion that the negative coefficient on I is "the realized rate of return"⁸ on investment, then the logic of his former statement is that rents would have declined less had landlords *not* invested at all. This is a line of argument that I find too unconventional to accept. It is generally acknowledged that rents declined not because landlords invested in their estates, but because agricultural prices fell. Indeed, landlords invested to arrest this decline in rents. But because Dr Ó Gráda has chosen a cross-sectional model there is no way that the decline in agricultural prices can be incorporated into it, since prices declined over time. Although this decline had a different impact on each estate according to how the output mix from the farms on each varied, this is something that cannot be observed for each estate. It may be argued that the dummy for land type (D) goes some way towards filling this gap but, as I hope to show below, it does not perform this function satisfactorily.

If we turn to the regression results we find that here we are on very uncertain ground. Indeed, the regression results are at such variance with the statements in the text that one is left with the impression that they have been added as an after-thought. In all the equations the correlation between I and RC is very weak. Thus any regression of I on RC will not yield a statistically significant estimate of the slope bI . Even when the dummy is added to the regressions the results are not much better. The best R^2 (coefficient of determination) value is for the first equation (1872-92, sample size 13) where it is 0.59. But without the dummy the R^2 is only 0.5 (which can be inferred from $r_{RC,I}$). Of course, the use of dummies is completely legitimate, but the reader is warned that over 90 per cent of this equation's explanatory power is vested in a variable that takes only the values of 1 and 0. A similar conclusion applies also to the other three equations. When we examine the slope coefficients bI there are further difficulties. Dr Ó Gráda states: "The estimated

⁵ *R.C. Agriculture: Particulars on Expenditures and Outgoings on Certain Estates in Great Britain, and Farm Accounts*, B.P.P., xvi (1896).

⁶ J. R. McQuiston, 'Tenant Right: Farmer Against Landlord in Victorian England, 1847-1883', *Ag. Hist.*, XLVII, 1973, p. 93.

⁷ Cf. 38 & 39 Vict., ch. 92, with 46 & 47 Vict., chs. 61-2.

⁸ See above, p. 41.

coefficients on I are all negative."⁹ This is misleading. Only in the case of one equation (1872-92, sample size 24) does the standard statistical test support this assertion. We can test the hypothesis for the first equation (1872-92, sample size 13) that bI has a negative influence on RC . This involves a one-tailed test of the null hypothesis $H_0: bI = 0$ against the alternative $H_1: bI < 0$. If H_0 is true bI will be centred on $bI = 0$, and there will be only a 5 per cent possibility of observing a t -statistic for this coefficient of less than -1.812 ; this defines our rejection region.¹⁰ Dr Ó Gráda's observed t -statistic is -1.79 , and this falls within the region bounded by the critical value because it is greater. Hence we cannot reject the null hypothesis. Of course, Dr Ó Gráda may have chosen to test at a less rigorous level, but the 95 per cent one is usually employed,¹¹ and it is appropriate in a case where the dangers of falsely rejecting the null hypothesis are greater than those of wrongly accepting it; that is where the sign for bI is contrary to what theory might lead us to expect. Similar conclusions are reached if we test the same hypothesis for the estimate of bI in both the 1882-92 equations. In the third case (1882-92, sample size 24) the t -statistic Dr Ó Gráda has obtained is so poor that it is significant only below the 90 per cent level. Therefore, as we cannot say that the value obtained is significantly different from zero, we know nothing about its sign.

There is one point where I think Dr Ó Gráda has misunderstood part of my original article.

⁹ See above, p. 41.

¹⁰ From the table of critical values of t . This is with $n-k$ degrees of freedom where n = sample size = 13; and k = number of explanatory variables (which in this case are a , bI and cD) = 3. Dr Ó Gráda's presentation of t -statistic is technically incorrect: for bI the sign should be negative. The testing of hypotheses is well explained in R. J. Wonnacott and T. H. Wonnacott, *Econometrics*, New York, 1970, pp. 63-70, where they deal with "interpreting an estimated regression." See also J. Stewart, *Understanding Econometrics*, 1976, pp. 37-46.

¹¹ Indeed, it is one that he himself has used in a recent publication elsewhere, which also indicates that he does understand these elementary points about the interpretation of regression results: C. Ó Gráda, 'The Beginnings of the Irish Creamery System, 1880-1914', *Econ. Hist. Rev.*, 2nd ser., xxx, 1977, pp. 293-4.

The hypothesis he refers to in his title was simply that "there was a broad correlation between the amount a landlord spent on the farms on his estate and the extent to which rent levels were maintained after 1879."¹² But somewhere along the line Dr Ó Gráda has transformed this simple statement into the hypothesis that depression may have been exacerbated by low investment on the part of landlords. On re-reading my article I can find no point where this is said. But I do agree with his statement that the rate of return on landlord investment at this time was negative, although I do not agree that his model is an effective demonstration of this fact. Indeed, the use of the model in this instance is rather akin to taking a sledgehammer to crack a nut, and then missing. After all, there is support for this view of the return on landlord investment in works that are neither new nor so old that their conclusions have been forgotten.¹³ Indeed, it would be no more than common sense to draw the same inference from my article which correlated estate expenditures with the extent of rent declines. It is unfortunate that Dr Ó Gráda did not carry out my original rank correlation exercise between rent fall and expenditure as a percentage of rent received on the larger sample which he has used for his regressions, because this is a way of directly testing the original hypothesis. I have performed this exercise for the English estates only, for 1872-92 and 1882-92. In the first place it must be emphasized that when the sample size is widened the relationship, as shown by the Spearman coefficients, is considerably weaker. Indeed, it should be rejected because the original test was conducted at the 95 per cent level, and the results obtained here are significant only at the 86 and 83 per cent levels, respectively. However, the Pearson correlations between the percentage decline in rent per

¹² Perren, 'The Landlord and Agricultural Transformation, 1870-1900', *Ag. Hist. Rev.*, xviii, 1970, p. 50.

¹³ F. M. L. Thompson, *English Landed Society in the Nineteenth Century*, 1963, pp. 315-16; C. S. Orwin and E. H. Whetham, *History of British Agriculture, 1846-1914*, 1964, p. 309.

TABLE I

CORRELATIONS BETWEEN PERCENTAGE DECLINE IN RENT PER ACRE AND EXPENDITURE AS A PERCENTAGE OF RENT RECEIVED (COLS. *a* AND *b*) AND EXPENDITURE PER ACRE (COL. *c*) FOR ENGLISH ESTATES ONLY

<i>Period</i>	<i>Sample size</i>	<i>r_s</i> <i>a</i>	<i>b</i>	<i>r</i> <i>c</i>
1872-92	8	-0.67 (0.03)	0.51 (0.10)	0.52 (0.09)
1872-92	13	-0.32 (0.14)	0.27 (0.19)	0.33 (0.14)
1882-92	8	-0.52 (0.09)	0.44 (0.14)	0.47 (0.12)
1882-92	24	-0.20 (0.17)	0.04 (0.43)	0.20 (0.17)

Notes:

r_s, Spearman rank correlation; *r*, Pearson product moment correlation.

Rent decline per acre between 1872-4 and 1890-2, my original dates and those used by Dr Ó Gráda for his equations. Expenditure per acre is calculated as in Dr Ó Gráda's equations (i.e. for all years in the sample minus the last).

For the Spearman correlation the highest expenditure and the largest rent fall are given the highest ranking.

The first and third samples are my original eight estates. The second and fourth samples are for Dr Ó Gráda's first and third equations. My original sample includes estate XIII; Dr Ó Gráda excludes this estate from his samples.

The bracketed figures are the level of significance.

acre¹⁴ and expenditure per acre (which is Dr Ó Gráda's measure of investment) are also statistically insignificant. The results which are presented in the table confirm the extremely poor relationship which is also shown in the statistics presented in Dr Ó Gráda's comment.

Perhaps some remark on the appropriateness

¹⁴ I prefer to use this measure of rent change, rather than Dr Ó Gráda's absolute figure: I think it gives a better indication of the extent of rent falls. This is because a rent fall of 10p an acre on land originally let at 80p an acre represents a greater percentage decline than a fall of 12p on land let at £1.10.

of OLS regression to this problem should be made here. My opinion is that the nature of the data, as collected by the Royal Commission, does not permit a measurement of the rate of return on landlord investment. Also the formulation of Dr Ó Gráda's model omits the most important explanatory variable, price change, and there is no way that it can be included with this specification. These problems are "historical," and are faced by all historians when they decide what methods to apply to data which are often very limited. But given that Dr Ó Gráda feels the source material can sustain his particular approach, the interpretation of his results requires that certain well-established statistical procedures be impartially applied. In particular, his lack of significance tests for the parameter estimates of his coefficients of *I* is a cause for concern. As Dr Ó Gráda has chosen to ignore the low level of significance which can be attached to three of these values, one wonders why he should bother to include their *t*-statistics at all if they are merely to be ignored. These tests are not a thing that can be neglected or done in an unthinking and purely mechanical way, as they are a crucial part of the interpretation of regression results; a matter which at least one textbook author regards as: "in part an art requiring practice and common sense grounded in an understanding of basic statistical principles."¹⁵ The linear model adopted by Dr Ó Gráda is an extremely powerful and widely used statistical tool. But its use demands care. "As in all statistical applications, however, the power of the method depends on the underlying assumptions being fulfilled for the particular application in question."¹⁶ My own feeling is that in this case they are not.

¹⁵ R. E. Beals, *Statistics for Economists*, Chicago, 1972, p. 284.

¹⁶ J. Johnston, *Econometric Methods*, 2nd edn, New York, 1972, pp. 159-60.