NOTES

Labour Supply Behaviour of the Poor in the English Industrial Revolution *

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I. Introduction

The study of labour has long been occupied a significant place in the literature on the economic history of England in the age of the industrial revolution. Poverty and the exploitation of child and female labour are merely a few examples of the topics intensively discussed. Yet these cases are particulary interesting and instructive, for they offered the opportunity to examine the relevance of social policies, such as the Speenhamland system of relief and the Factory Acts, and the quality of the arguments in debates on these policy measures.

In economic terms, both cases bear upon *labour supply behaviour* of working people and the way in which, the labour market worked in those days. In the case of the Old Poor Law, one of the crucial questions has been what effects subsidies had on short-term schedules of labour supply as well as on marriage and population. D.N. McCloskey, for instance, argued in his recent contribution that out-door relief administered as an income subsidy reduced the supply of work effort and would consequently raise market wages, suggesting that the verdict given in the Poor Law Report of 1834 was right in so far as the first point was concerned, while it did not realize that the first implied the second.[1]

* Earlier versions of this paper were read at various meetings and seminars. To all the participants on these occasions, especially to Keiichiro Obi, I am most grateful for comments and suggestions. My thanks are also due to Richard Wall who read an earlier draft and gave me suggestions.

[1] D.N. McCloskey, 'New Perspectives on the Old Poor Law', *Explorations in Economic History*, X (1973).

Mark Blaug, on the contrary, maintained in his influential essay that the effects were minimal in every respect.[2] As for employment of women and children, on the face of it, the theoretical implication in relation to the workings of the labour market is less obvious. Factory legislation is generally considered an intervention made on humanitarian grounds in response to « miseries » in the early mills. However, it is documented that J.R. McCulloch and some other classical economists argued in the prolonged debates that the regulation of working hours would in the end reduce wages, whereas the leaders of the Ten Hours Movement wanted employment of women and children to be restricted so as to maintain men's employment and wages.[3]

Thus it is not difficult to see that what matters in both cases is the interplay between income, market wages and the amount of labour supplied. Evidently, the classical economists had no theoretical tools to deal with this knotty problem. Their subsistence wage and wages fund doctrines ignored variations in participation by family members, i.e. women and children, in the labour force[4] (although in the case of family heads and unmarried male adults it is safe to assume that the participation rate for them varied very little). In other words, they had no theory of determining what per cent of the total population of working age entered the labour force. The Malthusian principle of population could explain how the size of working-age population was determined, but obviously it is not equal to the labour force. And it is changes in the labour force participation of women and children that accounted for most variations in the size of the total labour force. Probably McCulloch was unique in recognizing that a rise in prices (hence a fall in real wages) tended to oblige females and children « to quit their homes, or to engage in some species of employment ».[5] But he did not go any further. He and his fellow economists failed to see the possibility that an increased number of female and child workers not only forced wage levels down in the short run, but also depressed men's wages still further, and that this implied more female and child labour supplied, thus, without interference deteriorating the poor's bargaining power in general and forcing them to accept even worse conditions of work. They did not ask either if, once the market wage touched the subsistence level or

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[2] M. BLAUG, 'The Myth of the Old Poor Law and the Making of the New', *Journal of Economic History*, XXIII (1963) (hereafter 'Myth') and 'The Poor Law Report Re-Examined', *Jn. Econ. Hist.* XXIV (1964).

[3] M. BLAUG, 'The Classical Economists and the Factory Acts — A Re-Examination', *Quarterly Journal of Economics*, LXXII (1958) (hereafter 'Classical Economists'). See also B.L. HUTCHINS and A. HARRISON, *A History of Factory Legislation* (2nd edn. 1911), pp. 48-9, 65.

[4] Cf. BLAUG, 'Classical Economists', p. 25.

[5] J.R. MCCULLOCH, *The Principles of Political Economy* (Murray's reprint edn. 1890), p. 180. Cf. D.P. O'BRIEN, *J.R. McCulloch: A Study in Classical Economics* (1970), p. 361; ditto, *The Classical Economists* (Oxford, 1975), pp. 112-3.

sank below it, the poor could afford to adjust the amount of their labour supply in response to the sum of parish pay by adding or withdrawing one of their family members to or out of the labour force.

Unfortunately the treatment of the problem by economic historians of later days is no better than that of the classical writers. It appears that the question of variations in the rate of labour force participation have never been taken up in economic history. Population change and emigration from agriculture have often been discussed in terms of labour supply.[6] Otherwise, attention has been turned to a negative relationship between real wages and hours worked by individual workers who were already in the labour force, i.e. the so-called « backward sloping supply curve of labour » in preindustrial times, which is sometimes considered a reflection of the state of economic backwardness.[7] Even McCloskey, who, claiming that « the existing economic analysis of the Old Poor Law... warrants a return to square one », displayed his own micro-economic analysis, paid no attention to a mechanism under which the size of the labour force and wages were determined in relation to the given amount of labour demand.[8] In effect, the importance of variations in the labour force participation of women and children has virtually been neglected in the historical literature.[9]

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[6] See for example J.D. CHAMBERS, ' Enclosure and Labour Supply in the Industrial Revolution ', *Economic History Review*, 2nd ser. V (1953).

[7] This implies that during the industrial revolution there was a transition from this type of supply curve to a positively sloped one. See E. FURNISS, *The Position of the Laborer in a System of Nationalism* (New York, 1920), pp. 234-5; T.W. HUTCHISON, ' Berkeley's *Querist* and its Place in the Economic Thought of the Eighteenth Century ', *British Journal for the Philosophy of Science*, IV (1953); D.C. COLEMAN, ' Labour in the English Economy of the Seventeenth Century ', *Econ. Hist. Rev.* 2nd ser. VII (1956); J.D. CHAMBERS, ' The Vale of Trent, 1670-1800 ', *Econ. Hist. Rev. Supplement* no. 3 (1957), pp. 4-5, 58; P. DEANE, *The First Industrial Revolution* (Cambridge, 1967), pp. 141-2. Recently however, M.A. Bienefeld has demonstrated that the correlation between high wages and short hours of work *remained unchanged* even in the nineteenth century and after; *Working Hours in British Industry: An Economic History* (1972).

[8] MCCLOSKEY, *loc. cit.* p. 419.

[9] It is appropriate, however, to note here that, although almost all the observations on labour supply behaviour of the poor in preindustrial times were made with respect to the number of days or hours worked by those already working (see Furniss, *op. cit.* ch. VI), there are some indications that they occasionally considered the matter in terms of effects on the size of the workforce. The eighteenth-century historian John Hutchins, for instance, wrote of the working people in the Dorset parish of Corfe Castle, which happens to give one of the main sources used later, as follows (*The History and Antiquities of the County of Dorset* (2nd edn. 1796), I, p. 276):

> Its centrical (sic) situation affords a greater opportunity of procuring employment in husbandry ... and the wages of carpenters, smiths, masons, etc. are higher than in other parts of the county. The neighbourhood of the clay works, of the stone quarries and of the sea, insures employment to a large proportion of the inhabitants,

In this essay, I shall first concentrate on the question of how their participation in the labour market was determined in the *household* context, drawing attention to the differences between the effect of the household head's earnings and that of wages obtainable by the wife and children. It is generally agreed in labour economics that the less the head earns, the more likely are his wife and children to look for employment, and that the more attractive wages are offered to women and children, the more likely are they to join the labour force.[10] When the negative effect of the earnings of the head of the family is larger than the positive effect of wages for women and children, it is natural to suppose that they enter the labour market chiefly because they have to supplement the breadwinner's income and, consequently, that their bargaining position tend to become particularly weak. I shall also focus my attention on the differences in labour supply behaviour between very poor families and those who were poor but could eke out their livelihood. It will be interesting if there are some significant differences between the two groups of families in the way in which labour force participation decisions were made, for it was the former that the Speenhamland version of poor relief aimed at. Finally, wider implications of the findings that have emerged from statistical analysis will be discussed with respect to the operation of the labour market in the industrial revolution.

> at nearly double the wages of ordinary labour ... (Yet) such is the propensity of the people to idleness, and to bringing up their children in the same bad habits, that all Mr. Pitt's attempt to introduce spinning into the town have hitherto been of no effect, nor will they take example from, or endeavour to produce for themselves the like benefit which they see enjoyed by neighbouring parishes and hamlets, where almost every woman and child are employed, and earn from 1s. to 3s. per week ...

This clearly shows that there was a relation between high wages for men and low participation rates for women and children, and that the greater earning power of men meant a higher supply price of female and child labour for a newly introduced industry.

[10] The first relationship was first established statistically by P.H. DOUGLAS, based on prewar American data; see his *The Theory of Wages* (New York, 1934), ch. XI, and E.H. SCHOENBERG and P.H. DOUGLAS, 'Studies in the Supply of Labor: The Relation in 1929 between Average Earnings in American Cities and the Proportions Seeking Employment', *Journal of Political Economy*, XLV (1937). Since then this has been confirmed by many works in various countries. For married women, it has also been observed that the negatively sloped curve shifted upwards in the process of sustained economic growth, which reflects the second relationship. For a standard treatment of this duality, see J. Mincer, 'Labor Force Participation of Married Women', in H.G. LEWIS, ed., *Aspects of Labor Economics* (Princeton, 1962) and W.G. BOWEN and T.A. FINEGAN, *The Economics of Labor Force Participation* (Princeton, 1969) for the U.S., and C. GREENHALGH, 'A Labour Supply Function for Married Women in Great Britain', *Economica*, XLIV (1977) for the U.K. A more rigorous research on household labour supply has been conducted for many years by Prof. K. OBI at Keio University, from which I have learnt a great deal.

II. Analytical framework and data

The purpose of the study specified in Section I itself points to the research design. Since it is essential to know how, given market conditions, a choice between gainful work and leisure (or non-market work) was made by the wife and children in the household context, the unit of analysis ought to be the household rather than the individual in isolation; accordingly it is vital to find historical source material which gives us information about both economic activities and earnings of individual member of each household as well as its demographic profiles.

Such documents are of course scarce, but two usable ones do exist: Sir F.M. Eden's collection of family budgets in 1795-6 and the 1790 listing of inhabitants of Corfe Castle, Dorset.[11] Eden's budget collection is well-known for its rich information concerning consumption patterns of the poor. The collection, moreover, contains a good number of cases where earnings and demographic traits of each family member are also given, and it is these cases that are analyzed here. The Corfe Castle document, on the other hand, is a census-type of material and lists all the people in the parish with sex, age, marital status, relation to household head and occupation.[12] To these, unlike other pre-censal listings, are added « probable weekly earnings » of each person at work, although this additional information is confined to labouring families and some craftsmen's.

From these two sources, however, only nuclear family households headed by a married male with at least one child aged 10-14 are selected. This is because in those days, as I have noted elsewhere,[13] those who were in a marginal position in the household with respect to labour supply were the wife and children under 15 years of age; and because if the husband was dead or absent then their participation rates would jump up. To put it another way, they formed a reservoir where the flow of household labour supply was adjusted sensitively to changes in economic circumstances. The proportion of those employed who were in this reservoir is thus calculated for each household, then it is put with earnings of the head of the family and other variables into the least-squares multiple regression form.[14]

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[11] F.M. Eden. *The State of the Poor* (1797), and Hutchins, *op. cit.* p. 290.

[12] I have already made use of this listing in comparison with the Bedfordshire parish of Cardington; 'Who Worked When: Life-Time Profiles of Labour Force Participation in Cardington and Corfe Castle in the Late Eighteenth and Mid-Nineteenth Centuries', *Local Population Studies*, No. 22 (1979).

[13] Ibid.

[14] The size of data is unfortunately too small to carry on this mode of analysis with respect to other types of household. It is worth noting, however, that the nuclear family household was a dominant type in England, comprising nearly three-fourths of all households (including solitary and no family ones) in the period c. 1600-1850; P. Laslett,

The cases from the two sources are pooled for statistical procedure. The geographical distribution of the observations in the sample is shown in the Appendix. There are some regional differences in the rate of labour force participation as well as differences between income groups (see Table 1). It is our first task to estimate how strongly these factors were associated with variations in the participation rate. But, before going into this, it is desirable to discuss the definitions of the variables appearing in the regression equations and some difficulties in the ways they are measured.

TABLE 1

THE RATE OF LABOUR FORCE PARTICIPATION BY EARNINGS OF HOUSEHOLD HEAD, REGION, AND DATA SOURCE (per cent)

	Data source	
	Eden	Corfe Castle
Earnings of head		
9s. 6d. and over	54.8 (N = 14)	56.9 (N = 12)
Less than 9s. 6d.	69.4 (N = 12)	79.6 (N = 18)
Region		
North	41.6 (N = 6)	—
North-West (Manchester & Kendal)	77.8 (N = 6)	—
Midlands & Home Counties	62.8 (N = 13)	—
South	*	70.6 (N = 30)

Note: Each figure is the mean of the rates of labour force participation calculated for individual households in each category. For the definition of the participation rate, see text.
* N = 1.

Dependent variable. — It is the proportion of those employed in the « labour reservoir » of each household, which consists of the wife and children under 15. The denominator is the number of children aged 10-14 plus one (i.e. wife), while the numerator is the number of under-15-year-olds who are in employment, plus one if the wife is also working. When there are children aged under ten who are in employment, they are included in the numerator, but not in the denominator, so that there can be a case where the figure exceeds 100 per cent. This measure is simply called « the rate of labour force participation » hereafter. It should be noted, however, that it is a *proxy* for the rate of labour force participation in the true sense. The definition adopted here ignores those unemployed but seeking employment, who, according to the modern terminology, should be regarded as economically active and being in the labour force. Thus, if there is « involuntary unemployment », then the proxy will understate the actual amount of labour supplied. To this is added another source of underestimation: in the Corfe Castle listing, it is likely that

' Characteristics of the Western Family Considered over Time ', in his *Family Life and Illicit Love in Earlier Generations* (Cambridge, 1977).

women and children actually working in agriculture and some miscellaneous trades were not returned as « occupied ». In the Eden file, too, there may be such cases, for even if earnings of (say) young children who usually worked with their father were included in the head's earnings, it is practically impossible to put them in the « working » category. Probably it is fair to assume that these drawbacks are particularly serious for agricultural villages; and this qualification will become important when the results of statistical analysis are interpreted in a wider context.

On the independent or explanatory variable side, the following three are of prime importance within the analytical framework:

Earnings of household head. — This is weekly earnings that the head earned from his economic activities of any kind. When the earnings are given as an annual income it is divided by fifty-two but when they are given as an average weekly income, that figure is used without modification. Of course one can doubt, especially in the latter case, if that is the figure obtained after allowing for extra earnings such as harvest income. In the Eden file there are some cases where such an extra income is given separately, or where it is stated that it is not included, but in many cases no mention is made of such earnings. As for the Corfe Castle listing, it seems certain that they were not taken into account when « probable » earnings figures were put down by the enumerator. One can also doubt, when only an average weekly value is given, if that is the average of summer and winter wages — in winter agricultural wages were lower and underemployment was a serious problem. Indeed it may well be that in the Corfe Castle case the winter rates were not taken into account at all. All these shortcomings throw doubt upon the reliability and comparability of the data used here. Yet no modification of the data is made, simply because there is no way of correction.[15]

Earnings of children aged 15 and over. — This is measured in the same manner as above. When a household contained children in that age group and earnings of all earners in the household were to be added up, the contribution of the children in that age group to the family budget was usually great. If, on the one hand, they were regarded from the household's point of view as chief breadwinners like their father, then their earnings would have the same effect, at least in direction, on the rest of the family members as those

[15] All the data used in this study had been collected before the Speehanmland method started spreading. Nevertheless, there are many cases where poor relief is specified in the data source. In some cases, it was given in kind or in the form of selling wheat, coal, etc. at cheaper prices than market rates, but no effort is made to evaluate these in money terms. Even when the sum of money received is given, it is not included in earnings of head. Instead, a regression with poor relief added as an explanatory variable in the 0-1 form (1 if any kind of relief is speciefied) was tried. However, its results were so poor that they are not reported in the text.

of their father had. If, on the other, they were economically more independent despite their co-residence with their parents, then the money they earned would only have a negligible effect.

Expected female wage rate. — In theory, this variable ought to be an average weekly amount of earnings from all kinds of activities in which women and young children could be engaged through a local labour market. In practice, however, there is too little information to work out such a measure for each area in the sample except for Corfe Castle and, to a lesser extent, for Manchester and Kendal. As regards the rest of the parishes in the sample, therefore, I have classified them into agricultural and non-agricultural areas (based on the availability of non-agricultural employment for women, which is shown in Appendix Table) and estimated women's standard weekly earnings from agricultural employment for the former area and those from non-agricultural activities for the latter. As for Manchester it is reported that: « Women earn from 6s. to 12s. a week: their clear weekly earnings may be stated at 8s. » [16] Since, it seems, this sort of description usually overstated the actual amount of money earned, 6s. is taken as the standard rate.[17] In the case of Kendal the median of weekly earnings of all Kendal women over 15 appearing in the sample is used (2.25s., N = 7). The figure for the other non-agricultural parishes in the Eden file is calculated in the same way (1.5s., N = 14), which happens to be the same as for Corfe Castle (N = 45). Finally, the standard earnings figure for agricultural villages is estimated at 0.5s. per week, which is the mode of earnings of farm labourers' wives in David Davies's collection of family budgets (N = 102).[18] It is assumed that these standard rates also reflect earnings of young children in corresponding areas.

So far the three variables are expressed in terms of money wages. It is however preferable to allow for variations in the purchasing power of money earned across the areas appearing in the sample. As for regional price variations, Arthur Young found that prices rose as he moved from a remote county to London.[19] Since it was not possible to get sufficient price information from the Eden file, I have decided to follow Young's proposition. Thus, three price zones are set up according to the distance from the capital and the

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[16] EDEN, *op. cit.* II, p. 357.

[17] Even this may be overstated, because Arthur Young gave 5s. 4d. for Manchester, which is a little lower than the one taken here, whereas 4s. that he gave for Kendal is higher than the one calculated from the file; *A Six Months' Tour through the North of England* (1770), IV, p. 471. At any rate, it may well be that such figures as Eden or Young quoted are best seen as earnings of full-time workers, while figures taken from actual earnings records reflect those of part-time workers too.

[18] *The Case of the Labourers in Husbandry* (Bath, 1795). The mode, not the median, is used in this case, for some figures in the highest category were apparently affected by the existence of non-agricultural employment.

[19] YOUNG, *op. cit.* IV, pp. 424-7.

price index is worked out for each zone by using, with weights computed from budgets in the Eden file,[20] the data Young himself collected (the results are given in Appendix Table). The assumption that the same price index can be applied to any area in a zone is of course too naive. However, even standardization with such a crude measure has produced somewhat better results in comparison with the unstandardized ones. So, unless otherwise stated, all the three variables will hereafter be expressed in their « real » values.

Finally, three non-economic variables are to be introduced in order to get less biased coefficients of the economic variables:

Family size. — The sample consists only of households at a certain stage of the family life cycle, but by this alone it is not possible to control for the effects of differences in demographic composition. In fact, family size varies from four to nine in the sample. This variable is expected to be positively related to the rate of labour force participation.

Number of children under five years of age. — This is added because of its negative effect on labour supply of mothers.

Data source. — This is a 0-1 dummy variable: 0 if the case is taken from the Corfe Castle file, and 1 if from the Eden file. As has been noted earlier, the two different data files are combined to facilitate statistical analysis. Yet it is uncertain if the two are homogeneous as data sources. First of all, the earnings figures given in the two sources may not be comparable to each other because of price changes. Indeed, the Corfe Castle listing was taken before the Napoleonic wars, while the Eden data were collected after the war had begun. Between the two dates consumer prices rose by about 20 per cent because of the outbreak of war.[21] In addition, there are differences in occupational and industrial structure between the two files, which are not well represented in the variables listed above.[22] It is hoped that the effects of these factors and other unknown ones are controlled for to some extent by inserting this dummy variable in the equations.

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[20] Young examined the prices of bread, butter, cheese, and meat, of which only bread and meat are given weights here. This is because a considerable number of households do not give expenses for butter and cheese. Prices other than those of bread and meat are, therefore, assumed constant across the areas in question. The weight adopted is 41 per cent for bread and 9 per cent for meat (expenditure for rent, childbirth, or illness was excluded from the calculation).

[21] Based on the Schumpeter-Gilboy series; B.R. MITCHELL and P. DEANE, *Abstract of British Historical Statistics* (Cambridge, 1962), p. 468.

[22] More labourers among Eden householders: 50 per cent as against 30 per cent for Corfe Castle; but more lucrative jobs for Corfe Castle boys: their contribution to family budget was as high as 38 per cent as against 12 per cent for the Eden file (including those with no children over 15).

III. Results of the regression analysis

The results obtained from the least-squares multiple regression analysis using all the observations in the sample are presented in Table 2.[23] There two specification forms are considered, i.e. the ordinary linear form and the semi-log linear one. In the latter case, since an independent variable which takes zero as its value cannot be used, the number of children under 5 is omitted and earnings of children over 15 are added to those of head.

At first sight, fairly low values for R^2 may give an impression that the hypotheses should be rejected. But, such low figures are not surprising for data of this type;[24] in fact the *F*-scores indicate that all the R^2s for equations (1)-(3) are statistically significant at the one per cent level. A comparison in R^2 between equations (1)-(2) and (3)-(4) suggests that the assumption of linearity gives rise to no serious problem.

Turning to individual dependent variables, in the first place, both head of family earnings and female wages have had good results. As had been expected, the former has a negative sign and the latter a positive one. The *t*-ratios indicate that the estimated coefficients are statistically significant at the one per cent level. Income of children over 15, on the contrary, exerted little influence and this accounts for a weaker impact of joint earnings of head and children in equation (4). In the second place, all the equations in the table seem to suggest that the two demographic factors are not very important. The sign of family size varies with specification and the *t*-ratio is low in every form. The number of under-five-year-olds has an expected sign, but has failed to gain statistical significance. Finally, the dummy variable's performance is also poor. This means that the two data files are comparable to each other, suggesting that Eden's earnings data did not completely reflect rising prices in 1795-6.[25]

An inspection of the data, however, revealed that there are noticeable differences between very poor families and relatively better-off ones. The whole sample was thus stratified into two, i.e. households with heads earning

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[23] The difference in the number of observations is due to a case where the number of children under 5 is unknown,

[24] The correlation coefficient or coefficient of determination is affected by changes in units of observation even with the model and its specification unchanged. When raw data are grouped (e.g. by class, region, etc.), the value of r or R^2 increases as the size of the grouping increases. For a demonstration of this exercise, see H.M. Blalock, Jr., *Causal Inferences in Nonexperimental Research* (Chapel Hill, 1961), p. 103.

[25] The time lag between price and money wage rises is suggested in one of Eden's Parochial Reports (*op. cit.* II, p. 434). Eden wrote of a labourer of Ealing, Middlesex, who was employed by a gentleman, as follows: 'he complains heavily of the hardness of the times ..., and is now soliciting his master for an increase of wages'. This report was made in June 1796.

TABLE 2

REGRESSIONS OF THE RATE OF LABOUR FORCE PARTICIPATION ON SELECTED VARIABLES FOR THE WHOLE SAMPLE (*t*-ratios in parentheses)

	(1)	(2)	(3)	(4)
X_1: Earnings of head	— 3.44	— 3.44	—100.12	—
	(— 2.85)	(— 2.82)	(— 3.17)	—
X_2: Female wage	18.46	18.46	74.46	62.05
	(3.96)	(3.91)	(3.29)	(2.60)
X_3: Earnings of children over 15	—	.03	—	—
		(.03)		
X_4: Earnings of head and children over 15	—	—	—	— 35.21
				(— 1.36)
X_5: Family size	1.22	1.14	— 6.29	24.28
	(.37)	(.29)	(— .16)	(.54)
X_6: Children under 5	— 5.26	— 5.13	—	—
	(— .82)	(— .68)		
X_7: Data source	— 5.04	— 4.97	— 2.11	— 9.99
	(— .63)	(— .68)	(— .27)	(— 1.16)
Constant	68.35	68.62	157.03	78.18
	(2.72)	(2.58)	(3.43)	(2.00)
Specification [1]	Linear	Linear	Semi-log	Semi-log
N	55	55	56	56
R^2	.337	.337	.273	.160
F-ratio	4.98	4.07	4.79	2.42

Sample means and standard deviations

	N = 55		N = 56	
Variable	Mean	S.D.	Mean	S.D.
Participation rate (per cent)	66.67	32.03	66.37	31.28
X_1 (s. per week)	10.51	3.44	1 .00 [2]	.13 [2]
X_2 (s. per week)	1.76	.85	.21 [2]	.18 [2]
X_3 (s. per week)	3.81	5.78	—	—
X_4 (s. per week)	—	—	1.12 [2]	.17 [2]
X_5	6.25	1.34	.79 [2]	.10 [2]
X_6	.65	.75	—	—
X_7	.45	.50	.46	.50

[1] Linear: $Y = a + b_1 + b_2 X_2 + \ldots$.
Semi-log linear: $Y = \log a + b_1 \log X_1 + b_2 \log X_2 + \ldots$.
[2] The mean or S.D. of logarithms.

9s. 6.d and more (income class I) and those with heads earning less than 9s. 6d. (income class II), and the regressions were calculated for each class. The results are presented in Table 3, where earnings of heads are removed from the right-hand side of the equations. Equations (1) and (2) indicate that the breakdown has yielded improvements for income class I. The signs of all the coefficients are expected ones and all the *t*-ratios except for the dummy variable are higher than those in Table 2. In equation (2), the number of children under 5 has gained statistical significance at the five per cent level. The *t*-ratio for family size has not reached the five per cent significance criterion, but it is now unmistakable that this variable is positively related to the rate of labour force participation. As for earnings of children over 15, despite its expected sign and an improvement in its *t*-ratio, the explanatory power is still very weak, which is reflected in both a small coefficient size and a low *t*-value.

The results for income class II are strikingly different, however. The values of R^2 for equations (3) and (4) indicate that any variable on the right-hand side of the equations has no impact on the variable to be explained. This implies that for the household in this class the rate of labour force participation was determined regardless of both economic and demographic conditions of the household.

Finally, returning to Table 2, a comparison is made between the effects of the two main economic variables, i.e. earnings of head and female wage. A glance at the coefficients in equations (1) and (2) may lead us to think that the latter's effect was far greater than the former's, but in view of the gaps between the levels of value for the two variables, it is changes in percentage points of the rate of labour force participation in response to a one per cent change in earnings of heads and to that in female wages that should be compared. If the equation has the semi-log linear formula, on the other hand, the measure is directly obtainable as a regression coefficient.[26] From equation (3), therefore, it is possible to say that when earnings of heads increase by one per cent, the rate of labour force participation decreases by 1.0 percentage point, while when the female wage rises by one per cent, the participation rate increases by 0.7 percentage points. In the case of the ordinary linear formula, however, it is not a straightforward matter, because the value of this measure varies with the value of an independent variable. When, for instance, it is evaluated at the sample mean (given in the lower panel of Table 2),[27] the effect becomes -0.36 percentage points for head's earnings and 0.32 percentage points for female wage. If the mean for income class I is used (given in the lower panel of Table 3), then it will be -0.46 percentage

[26] Since the regression coefficient of an independent variable (X_i) is $dY/d(\log X_i)$, it can be rewritten as $\Delta Y/(\Delta X_i/X_i)$.

[27] By multiplying the sample mean of X_i, the regression coefficient becomes $\Delta Y/(\Delta X_i/\bar{X}_i)$, where the bar denotes the mean of X_i.

TABLE 3

REGRESSIONS OF THE RATE OF LABOUR FORCE PARTICIPATION ON SELECTED VARIABLES BY INCOME CLASS (*t*-ratios in parentheses)

	Income class I		Income class II	
	(1)	(2)	(3)	(4)
X_1: Female wage	20.40	20.67	23.64	23.50
	(4.48)	(4.59)	(1.09)	(1.06)
X_2: Earnings of children	—	— 1.79	—	.33
		(— 1.24)		(.27)
X_3: Family size	5.59	9.67	— 1.47	— 2.13
	(1.15)	(1.66)	(— .29)	(— .37)
X_4: Children under 5	— 14.64	— 21.74	— 1.06	.05
	(— 1.87)	(— 2.26)	(— .10)	(.004)
X_5: Data source	— 11.45	— 13.09	— 3.60	— 2.34
	(— 1.12)	(— 1.29)	(— .24)	(— .15)
Constant	.24	— 14.45	49.40	51.14
	(.01)	(— .51)	(1.12)	(1.12)
N	25	25	30	30
R^2	.531	.566	.076	.079
F-ratio	4.53	4.95	.51	.41

Sample means and standard deviations

Variable	Income class I		Income class II	
	Mean	S.D.	Mean	S.D.
Participation rate (per cent)	56.00	32.23	75.56	29.52
X_1 (s. per week)	1.97	1.19	1.59	.30
X_2 (s. per week)	2.05	4.36	5.29	6.44
X_3	6.04	1.27	6.43	1.38
X_4	.84	.80	.50	.68
X_5	.52	.51	·40	.50

Note: All the equations in this table are specified in the linear form.

points and 0.36 percentage points respectively. Apparently the range of estimates is wide. In fact, the largest difference between the two effects is 0.3, whereas the narrowest is as small as 0.04. However, one thing is clear: the negative effect of heads' earnings exceeds the positive one of female wage in every case.

To sum up the findings in this section:

(1) A rise in real earnings of the household head, other things being equal, lowered the rate of labour force participation, which means that more women and children under 15 could choose leisure or non-market work.

(2) When the income of the head remained constant, a rise in female real wages could attract more female and child labour to the labour market, thus raising the rate of labour force participation.

(3) Yet, their participation in the labour market was more affected by changes in earning of the head than by changes in female market wages. Apparently necessity outweighed opportunity.

(4) Earnings of children over 15, even when they co-resided with their parents, had only a negligible effect on labour force participation decisions by their mother and younger brothers or sisters. In view of the fact that whenever a mother with her daughters over 15 at home was working, the daughters were already in employment, but not *vice versa*,[28] the finding in this section should be taken to mean that it was the earnings of male children in that age group that did not affect the labour supply of their mother and younger brothers or sisters.

(5) When all the economic variables were held constant, it was a combination of the two demographic variables, i.e. family size and the number of under-five-year-olds, that determined the household's rate of labour force participation.

(6) However, these findings are only true of the household whose head was a relatively better-paid worker. The rate of labour force participation for income class II was related to neither economic nor demographic factors. This fact strongly suggests that a choice between income and leisure did not exist for the wife and children when the head's earnings were too meagre.

IV. Wider implications

Despite the imperfections of the data used, the empirical findings in the preceding section are coherent and sufficiently substantial. It is not impossible to draw from these findings various implications for the study of labour and its related areas in social and economic history of the late eighteenth century and after. Admittedly it is hazardous to apply findings at one point in time to dynamic situations, especially in an age in which drastic changes took place in both social and economic systems. However, since there exist no other data which are comparable to the ones used in this study, it is of some interest to make a couple of suggestions, keeping in mind the limitations of this sort of exercise, with respect to the workings of the labour market in the late eighteenth and nineteenth centuries.

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[28] Saito, *loc. cit.*

In the first place, the conclusion that necessity outweighed opportunity in the decision making of women and children on the participation in the labour force is in accord with Michael Anderson's findings for married women of a factory town in the mid-nineteenth century.[29] This agreement is important, since it suggests that the results reported in the previous section are not confined to the period before the factory system established itself, but are relevant to nineteenth-century situations too, and thus lends support for the view that there occurred no changes in labour supply behaviour of working people during the industrial revolution.

This is of course a speculation. However, the results of an analysis based on county level data for 1871 provided suggestive evidence [30]. In that analysis, age-specific rates of labour force participation were regressed on male and female wages for agricultural workers, with the proportion of females in agricultural employment controlled for. Admittedly, the regression contained flaws, from which the present work is free: in the 1871 published census report, disaggregation by marital status is impossible; the agricultural wage data probably contained some unknown errors; and even, if not, the data may have been representative only of unskilled occupations, while the labour force data covered all social classes. Nevertheless, the regression results for 1871 point to the same conclusion: the adverse effect of male wages was far greater than the positive effect of female wages on women's labour force participation.

In Section III, it is admitted, the differences between the two effects, on which the above conclusion is based, were not large. Yet there are a few reasons to believe that the reported differences were understated. First, it should be remembered that those out of work but seeking employment were unlikely to be returned as occupied unless they were adult male workers. The possibility of underestimation of this kind is no doubt great for agricultural parishes where men's wages were generally low because of chronic unemployment. It may well be therefore that the regression coefficient of earnings of heads was underestimated, whereas how that of female wages was measured also calls for attention. The range of values that is taken represents not only variations in wage rates across the country, but the whole spectrum of employment patterns observed at that time, which is a combined sequence of those from agriculture to industry, from part-time to full-time work, and from domestic work to workshop, if not quite factory, employment. Since the estimated wage varies along this spectrum, it is not unlikely that the regression coefficient of this variable reflects solely the effect of changes in

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[29] M. ANDERSON, *Family Structure in Nineteenth-Century Lancashire* (Cambridge, 1971), pp. 72-4.

[30] O. SAITO, 'Occupational Structure, Wages, and Age Patterns of Female Labour Force Participation in England and Wales in the Nineteenth Century', *Keio Economic Studies*, XVI (1979).

industrial structure, not that of wage change within a given industrial structure. The 1871 results are again suggestive in this respect; they show that the net effect on females' labour supply of a one per cent change in both male and female market wages was negative and its absolute value was not smaller than 0.66, when the effect of agriculture's share in female employment was controlled for. They also suggest that if married women were singled out, then the net effect would become far greater.[31] The regression results in section III, therefore, should be taken to mean that the negative effect of earnings of heads was greater even if compared with the combined positive effect of female wages and changing industrial structure.

Should this argument hold, it would have an interesting implication. Since the direction of changes in women's wages was unlikely to differ from that of changes in men's wages, the total amount of female and child labour supplied must have decreased when the general level of market wages rose, and *vice versa*. The *aggregated* schedule of labour supply, therefore, will be negatively sloped when drawn against the general wage level.

One might thus expect that as real wages rose in the long run, women's participation in the labour force decreased. Indeed, the proportion of occupied females aged 10 and over in Britain fell at a rate of 0.7 percentage points per decade during the second half of the nineteenth century,[32] although it is perhaps too naive to suppose that this change was a result of successive shifts to the right of the demand curve alone. The supply curve might also have shifted in the long run. Also important is whether or not the demand curve is steeper than the supply curve. If the demand curve is flatter, then the equilibrium point reached will be stable. If, on the other hand, the demand curve is steeper, then the labour market may not be stable. Suppose, for instance, that the adjustment by employers of labour demand to changes in market wages was less elastic than the response of households supplying labour, but that it was easier for the employers to substitute female and child for adult male labour within the given workforce. In such a case, once the wage level started falling in slack times, it would continue to move downwards, because the households would react to reduced earnings by increasing their supply in the market, which would in turn pull down the wage level still further. This movement would go on until the wage fell to the subsistence level.

To decide if this is a real picture of how the labour market worked during the industrial revolution, more evidence is needed. As far as textiles are concerned, however, it appears that it was the case. In fact, it is said that the cotton industry, one of the fastest growing, was able to tap an ample supply of female and child

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[31] SAITO, *loc. cit.*

[32] That is the slope of a trend line for Great Britain, 1851-1901 ($r = -0.83$); data from MITCHELL and DEANE, *op. cit.* p. 60.

labour and « by-pass reliance on male labour »,[33] and that in the first half of the nineteenth century all the working-class agitations for factory legislation, designed to restrict working hours of children and women in textile mills, took place in depressed years in the hope that the restriction might halt a downward trend in wages and an increase in unemployment.[34] These phenomena are consistent with the model of the unstable labour market. It should be stressed, however, that even if that model were a good fit for the cotton industry, it could not follow that every industry exhibited the same pattern. Nor would that imply that the « reserve army » of the unemployed was always available at the subsistence level, which is apparently inconsistent with an actual trend in real wages in the second half of the nineteenth century and after. It is here that factors which shifted the demand and supply schedules ought to be taken into account. It is also probable that the subsistence level itself shifted upwards in the long run.

Another major finding that most of wives and children in income class II had to work irrespective of economic conditions they were facing, implies that their standard of living was at, or below, the socio-biological minimum. As to this suggestion, however, two questions may arise. First, the dividing line of the two income classses was rather arbitrarily set at 9s. 6d. in the previous sections. Can this be regarded as the critical minimum at that time? Second, not all wives and children aged 10-14 were working even in income class II; in fact, only three-quarters of them were in employment (see Table 4). If their household heads' earnings were not enough to provide for their families, why could the rest of the wives and children stay out of the labour force?

TABLE 4

PARTIAL CORRELATION COEFFICIENTS BETWEEN THE RATE OF LABOUR FORCE PARTICIPATION AND EARNINGS OF HOUSEHOLD HEAD FOR FAMILIES WITH HEAD EARNING LESS THAN 9*s.* 6*d.* AND 13*s.* A WEEK AND FOR THE WHOLE SAMPLE

Earnings of head less than	Partial correlation coefficient	Mean rate of labour force participation (%)	N
9s. 6d.	— .07	75.6	30
13s.	— .33	68.5	45
Whole sample	— .38	66.7	55

Note: The specification form is the same as for equation (2) in Table 2.

[33] S. POLLARD, 'Labour in Great Britain', in P. MATHIAS and M.M. POSTAN, eds., *Cambridge Economic History of Europe*, VII, pt. 1 (Cambridge, 1978), p. 133.

[34] See BLAUG, 'Classical Economists', p. 121.

As regards the first question, Table 4 shows how the partial correlation coefficient between earnings of head and the rate of labour force participation for the lower-income class changes as the grouping criterion is altered. When it is raised to 13s., the partial correlation coefficient jumps up from −0.07 to −0.33, which is not much lower than the figure for the whole sample, −0.38 (the latter two are statistically significant at the one per cent level, whereas the first one is not even at the five per cent level). This result suggests that the wife and children could choose leisure or non-market work only when their houseold heads' weekly income totalled well above 10s. As to the second question, three possibities should be taken into account. One is that in the lower-income class the proportion of those who were too ill to work because of malnutrition was probably higher. A second is, as has been suggested, that in low-income farming villages where the rate of unemployment was generally high, the gap between the rate of labour force participation in the true sense of the term and the proportion occupied, a proxy for the former, tended to be wider. That, for instance, an eleven-year-old daughter of a shepherd who earned merely 7s. a week in Buckden, Huntingdonshire, was given no earnings in Eden's report, does not necessarily mean that she was in « voluntary unemployment ». It may be that she was in bad health, or that she wanted to take employment but could not find any in the village. A third possibility is that her family was helped by their relatives or benevolent neighbours.[35] It is probably safe, therefore, to attribute the difference between the rate obtained from the sample (70-5 per cent) and the expected one (nearly 100 per cent) to one of the three causes or a combination of some of those. All wives and children, unless they were incapable of taking employment, had to work if their household head's weekly earnings including aids did not reach a critical line lying somewhere between 9s. 6d. and 13s.

Quite interestingly, the Speenhamland table of « what should be the weekly Income of the Industrious Poor », adopted by the Berkshire magistrates in 1795, indicates that 9s. 6d. was the minimum weekly income for the two-child family, which happens to be the smallest in the sample, and 13s. for the four-child family, which is about the average in the file.[36] This coincidence suggests that the magistrates' estimate of the subsistence level was not very wide of the mark. Yet, a more important implication for the understanding of the Old

[35] One may add parish relief in this list. If, however, the possibility that the lack of assistance from kin was one of the conditions for receiving relief from the parish is taken into account, then it is not suprising that the performance of parish relief as a predictor of the rate of labour force participation was poor (see footnote 15).

[36] Based on the 1790/1 and 94/5 price of bread in London (the prices for both harvest years happened to be the same); MITCHELL and DEANE, *op. cit.* p. 498. The 1795/6 price was not taken, because the performance of the data source dummy variable in section III suggested that earnings figures in Eden's collection did not reflect a steep rise in prices in 1795 (see p. 642). The Speenhamland table is quoted in Eden, *op. cit.* I, p. 577.

Poor Law is that allowances given in aid of wages must have had little influence on the supply of labour, as far as it is measured in terms of labour force participation. Indeed, families entitled to receive out-door relief under the Speenhamland system could not let one of the family members be idle even if they were given some amount of money.

In this sense, Mark Blaug is right in stressing that the Old Poor Law was neither pointless nor irrational as the Report of 1834 contended. This, of course, does not imply that various measures adopted under the old system were the best ones that could be taken in those days, nor that such measures worked well when implemented; alternatives such as minimum-wage legistration might have been more effective. Nor does the argument have a direct bearing on the question of whether the real cause of poverty in the Napoleonic war period was unemployment or high food prices.[37] What is suggested here is simply that since the individual household's preference function between income and leisure, on the basis of which the whole price mechanism in the labour market operates, cannot be defined for the poor below the socio-biological minimum, there is no point in using the notion of competitive equilibrium in the labour market to discuss the effects of unemployment and family allowances on labour supply,[38] and hence that a « welfare state » approach is more appropriate in this case.[39]

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[37] For this question, see D.A. BAUGH, 'The Cost of Poor Relief in South-East England, 1790-1834', *Econ. Hist. Rev.* 2nd ser. XXVIII (1975).

[38] « The choice between income and leisure », says Pollard, « is largely an unreal one, invented by economists » (*loc. cit.* p. 125). In so far as the poor below the critical minimum level are concerned, his claim is right. However, it should also be noted that once they reach that level, the market mechanism starts working, although, as suggested above, the labour market might have some peculiarities in its workings in comparison with other markets. The significance of the « critical minimum » in the Edgeworth box diagram of market exchange and the characteristics of the labour market in that diagram are discussed in K. TSUJIMURA and others, *Economic Policy and General Interdependence* (Tokyo, 1981), ch. 1. I wish to thank the authors of this book for allowing me to read it in draft.

[39] The « welfare state » analogy was first drawn by Blaug himself in his 'Myth', p. 152.

APPENDIX

GEOGRAPGICAL DISTRIBUTION OF HOUSEHOLDS IN THE SAMPLE, WITH INFORMATION ABOUT NON-AGRICULTURAL EMPLOYMENT, ESTIMATED STANDARD EARNINGS OF WOMEN, AND PRICE INDEX

County	Parish	No. of households in sample	Non-agricultural employment for women and children	Earnings of women (s. per week) [1]	Price index (Zone I = 100)
The North					
Cumb.	Wetheral	2	Linen and cotton	1.5	81
Durham	St. Nicholas, Durham		Woollen	1.5	81
	Stanhope	1		0.5	81
	Sunderland	1		0.5	81
Lancs.	Manchester	1	Cotton	6.0	88
Westmnd	Kendal	5	Woollen	2.25	81
Yorks. E.R.	Sigglesthorne	1	Spinning	1.5	88
The Midlands and the South					
Beds.	Clopshill	3	Lace	1.5	100
Berks.	Streatley	1		0.5	100
Dorset	Corfe Castle	30	Spinning, knitting, and rope making [2]	1.5	88
Herts.	Hinxworth	2	Spinning	1.5	100
Hunts.	Buckden	1		0.5	100
Leics.	Kibworth Beauchamp	1	Worsted	1.5	100
	St. Martin, Leicester	1	Worsted stockings	1.5	100
Oxon	Banbury	1	Worsted and hair-shagg (i.e. plush)	1.5	100
	Elsfield	1	Spinning	1.5	100
Salop	Ellesmere	1		0.5	88
Somerset	Frome	1	Woollen	1.5	88
Staffs.	Wolverhampton	1	Manufactories	1.5	88

[1] Given in money terms.

[2] Rope making for boys only.

Note: Information about non-agricultural employment is based on Eden's Parochial Reports and the Corfe Castle listing. A rough check can be made for some «agricultural» parishes by referring to Answers to Question 11 in the Rural Query drawn up by the Poor Law Commission (*Report from His Majesty's Commissioners for inquiring into the Administration and praticcal Operation of the Poor Laws*, Appendix B. 1, pt. 1, P.P. 1834, XXX):

Berks.	Streatley	[Not given]
Durham	Stanhope	Chiefly in the fields ... In the Mining District, Boys have regular work in dressing lead-ores. There is ... no work for women.
	Sunderland	None generally employed, except during the harvest.
Hunts.	Buckden	Some get Employment in the Summer at weeding and hay-making.
Salop	Ellesmere	[Not given]