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WAS BREAD GIFFEN? THE DEMAND FOR FOOD IN ENGLAND CIRCA 1790

Roger Koenker*

> I agree that it is possible that the elasticity of the English demand for wheat may be positive. This certainly *used* to be the case, but I doubt if it is appreciably the case now.
>
> —A. C. Pigou (1908)

Two seminal budget studies by David Davies (1795) and Frederick Eden (1797) are employed below to investigate the place of bread in the diets of English rural laborers at the end of the eighteenth century.[1] Because of the considerable geographic and temporal dispersion in prices of foodstuffs found in these budgets, they afford a unique opportunity to study the influences of both prices and income on individual household consumption decisions. In particular a test is made of the famous hypothesis, attributed by Marshall to Robert Giffen,[2] that a rise in the price of bread, *ceteris paribus*, increases its consumption among the lower classes.

Wheaten bread was, in the Middle Ages, a luxury food of the landed classes in Europe. Its gradual introduction into laboring class diets in the modern period prompted David Landes (1969, p. 47) to conclude, "...one of the best signs of comfort in Europe is the consumption of white bread." The transition in England to wheat as "the almost universal bread corn of the whole people" took place, according to Sir William Ashley (1928, pp. 1–2) "primarily in the eighteenth century and was virtually complete by 1795." The rise of wheat occurred most rapidly in the southern and eastern counties and was favored by a more capitalistic agriculture since it often required special liming, other fertilization, and tilling.

To contemporaries, and some modern historians, this change to wheaten bread seemed, for purely psychological reasons, to be irreversible. Radcliffe Salaman (1949, pp. 480–481) writes:

> There is abundant evidence to show that white bread had always served as a token of class distinction, and was recognized as a mark of privilege. Its adoption by the working classes should be interpreted as evidence of an equalitarian spirit beginning to make itself felt throughout England... [A]fter 1770, as provisions began to get scarcer and dearer, and meat had all but vanished from their tables, it was white wheaten, and not a cheaper and coarser barley loaf, which together with cheese, constituted the staple food of the masses. Moreover there was no going back, not even when the balance of fortune turned against them towards the end of the century. It was felt to be better to make use of the Irishman's potato, or even the coolie's rice, both food of peoples regarded socially as little better than slaves, than return to a coarse and coloured loaf.

The determination of the poor to consume wheaten bread in bad times was a cause of great consternation among the upper classes. Pitt attributed the attraction to sheer "prejudice." G. M. Trevelyan (1965, p. 378), following the example of the *Times* during the 1790's, argues that "Englishmen of all classes became so dainty as to insist on refined wheat bread that had previously been regarded as a luxury of the rich." Arthur Young's *Annals of Agriculture* in 1796 reported the popular view that the laborers of Nottinghamshire "had lost their rye teeth."

J. L. and Barbara Hammond (1911) challenged the naive acceptance of this "change in taste" interpretation. They argued that wheat had been introduced into rural laborers' diets at a time when meat, cheese and butter were relatively abundant. As the price of bread rose at the end of the eighteenth century laborers were compelled to substitute greater quantities of bread for cheese and meat; they found the wheaten loaf better suited to an austerity diet than the coarser maslin loaf. But it should be remembered that by the end of the century the price of wheat relative to other grains had fallen considerably.

The Hammonds' view is consistent with a strong

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[1] George Stigler (1954) discusses the Davies and Eden budget surveys briefly in his 1954 essay on the early history of empirical demand analysis.

[2] Stigler (1947) has called into question Giffen's grasp of Giffenness in a lucid essay on the history of the Giffen paradox. As evidence that wheat was not Giffen in Giffen's time Stigler cites the fact that per capita consumption and the price of wheat were negatively correlated in the period 1889–1903. For an interesting recent attempt to rehabilitate the Giffen paradox along the lines of Lancaster's "new theory of demand," see Lipsey and Rosenbluth (1971).

economic tradition, led by Marshall and Pigou, which holds that the English demand for wheat at the end of the eighteenth century was positively sloped. Classical writers, like Ricardo, who viewed the market process in grain as one in which the price was bid up to the level at which a fixed supply would clear the market, would presumably have viewed an upward sloping demand for wheat with alarm. With an inelastic supply a positively sloped demand would have produced unstable price responses. But to those developing the theory of consumer behavior along utility maximization lines after 1870 it seemed perfectly reasonable that if the price of an important budget item like bread rose, a consumer (hence possibly most consumers) might find it necessary to increase consumption of that item. After the repeal of the Corn Laws in 1846 the supply of wheat in Britain was quite elastic at the world market price, a fact which allowed Marshall to be more sanguine about the implication of upwardly sloping demand for wheat than Ricardo might have been.

In some further remarks, I wish to discuss some estimates of demand functions for bread and meat by English rural laborers at the end of the eighteenth century. To my knowledge these estimates offer the best available evidence on the hypothesis of "Giffenness" of the eighteenth century English demand for wheat. It is my hope that this work may encourage others interested in problems of historical demand analysis to take advantage of the rich legacy of European and American budget studies.

In 1787, David Davies, then a rector in the parish of Barkham, Berkshire, undertook a study of the laboring poor of his parish. He collected six detailed budgets of "typical" agricultural laborers living in Barkham and circulated these budgets widely to friends throughout the kingdom. Some of these correspondents were persuaded to produce similar budgets for their own localities. In 1795 Davies edited 127 of these budgets, wrote a dispassionate plea for a minimum wage law tied to the price of wheat and published both as *The Case of Labourers in Husbandry*. J. L. and Barbara Hammond called Davies' work "a priceless legacy to those who are impatient of the generalizations with which the rich dismiss the poor" (1911, p. 71).

Two years after the publication of Davies' book, Frederick M. Eden finished his magnificent three-volume work, *The State of the Poor*.[3] Budgets of 60 agricultural laborers from various parts of England were published as an appendix to this work in almost the same format as that used by Davies. Eden was led to his subject by the high prices of 1794 and 1795; most of his budgets were collected during those years and reflect the inflation.

While Davies and Eden collected their budgets, the Jacobins had swept to power in France and *La Grande Armée*, soon to be led by that arch-Jacobin Napolean Bonaparte, was defeating the Coalition of European powers which had formed to restore the French monarchy. Britain entered the war in 1793, and a difficult period for the English agricultural laborer had begun. The winter of 1794–95 was unusually severe and the wheat crop was extensively damaged. Imports were limited as much by poor northern European and American crops as by the French blockade. Malthus contended that the extent of the wartime rise in the price of wheat could be attributed to an increase in poor relief with the result that the burden of the scarcity was shared among "5 or 6 millions perhaps, instead of 2 or 3" (1970, pp. 5–26). Others, including Ashton (1964), have argued that the war's effect on the price level could be attributed primarily to the monetary policy of the Bank of England.

The multitude of interpretations does not deny the fact that Britain experienced a rapid rise in the "price of provisions" during 1794–96.[4] Because of this rise and because markets were at that time rather localized affairs, substantial differences in food prices existed among the counties sampled at the time the Davies and Eden budget surveys were conducted.[5] These temporal and geographic price differentials afford an unusual opportunity for empirical demand analysis. Income, family size and price effects on the demand for basic food commodities can be estimated with cross-section data on individual families.

Two small subsamples of the Davies and Eden budgets were selected for analysis.[6] The subsamples were drawn solely on the basis of the availability and completeness of price and expenditure data and family size information for each household in the sample. The first subsample is made up of 35 households from 7 parishes in 4 counties; all of these families consume wheaten bread and none are reported to purchase other starches like potatoes or oatmeal. The second sample is comprised of 14 households all of whom are reported to consume some potatoes as well as bread. Demand equations

[3]Karl Marx (1915) called Eden, "the only disciple of Adam Smith during the eighteenth century who produced any work of importance."

[4]Standard contemporary references to this problem are Thomas Tooke (1824) and Edmund Burke (1852). Excellent recent contributions include those of Mancur Olson Jr. (1963) and Walter Stern (1964). Together these references deal with a broad range of economic policy questions.

[5]See, e.g., T. S. Ashton (1954), p. 147.

[6]The data are available from the author on request.

for wheaten bread and meat are estimated for both samples; the second sample includes the price of potatoes as an explanatory variable in both equations. Households from a single parish constitute a single observation from the point of view of the price data.

Although both Davies and Eden published expenditure data on clothing, shelter, medical care and other items in addition to food, it is very difficult to assess quality variation in the non-food items. The diets of eighteenth century English agricultural laborers were, on the other hand, composed of a small number of relatively homogeneous foods: oatmeal, wheaten bread, potatoes, bacon, milk, cheese, butter, sugar, tea, beer and a few others. Prices as well as expenditures of the families were published for some of the parishes. The statistical analysis reported here focuses on the two most important food items, bread and meat.

In many households flour, not bread, was purchased in the marketplace. In most cases this eventually became bread, although a watery paste mixture called hasty pudding was not uncommon. At the time of the surveys, bread production was regulated by an Act of Parliament. A loaf of fixed weight (17 lbs. 6 oz.) was designated as a peck loaf, meaning that it could be made with slightly less than a peck of wheaten flour—the surplus going to pay wages and other costs of baking. So for our purposes, a household purchasing a peck of flour a week for one shilling, sixpence is treated as though it buys a one peck loaf at the same price. Meat consumption is treated in a similar fashion. Most households purchased bacon; those few purchasing another meat are treated as consuming an amount of bacon which could have been purchased with the same expenditure.

We begin the empirical analysis by postulating a linear system of demand equations,[7]

$$q_i = \alpha_i + \beta_i m + \sum_{j=1}^{N} \gamma_{ij} p_j + u_i, \qquad i = 1, \ldots, N. \tag{1}$$

The intercept coefficients, α_i, have the interpretation of "committed demands" and presumably depend upon family size as well as other factors. Family size is explicitly introduced into the statistical analysis by making α_i's linear functions of family size, s, yielding the final estimating equations,

$$q_i = \alpha_{0i} + \alpha_{1i} s + \beta_i m + \sum_{j=1}^{N} \gamma_{ij} p_j + u_i, \qquad i = 1, \ldots, N. \tag{2}$$

The total expenditure variable, m, is for empirical purposes taken to be total expenditure on food. This choice was dictated by the difficulty of monetizing income-in-kind received by many of the sampled households, making reported household money incomes from the surveys almost useless.

The estimates from the first subsample of (2) are given in table 1. We note the following:

(i) An increase in family size increases bread consumption and decreases meat consumption.

(ii) Both bread and meat are normal goods. The estimated income elasticities of demand (evaluated at points of sample means) support the view that bread is a "necessity" ($\hat{\eta}_B = .49$) and meat is a luxury ($\hat{\eta}_M = 2.24$).

(iii) The uncompensated own-price derivatives of both bread and meat are strongly negative; since both goods are normal the income effects reinforce the "pure" price effects.[8]

Thus even for a group of households that consume no bread substitutes, wheaten bread appears to be not only not Giffen, but actually a normal good!

The estimated demand equations for the second sample are presented in table 2. Of primary interest is the effect of the introduction of potatoes on the income and price coefficients for households who consumed no potatoes. The following additional points may be noted:

(i) Family size still exerts a positive effect on

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[7] Or expressed more compactly,

$$q = \alpha + \beta m + \Gamma p + u$$

where q denotes an N-vector of commodity demands expressed in physical terms, m is total expenditure, and p denotes the N-vector of prices of the components of q. Except under very severe restrictions on the parameters, the linear system is not globally plausible, i.e., it will not satisfy the restrictions,

$q(m,p) \geq 0$	(non-negativity)
$p'q(m,p) = m$	(adding-up)
$Q^{-1}(m,p)[\beta m + \Gamma p] = 0$	(homogeneity)
$\Gamma + \beta q' = \Gamma' + q\beta'$	(Slutsky symmetry)
$x'(\Gamma + \beta q')x \leq 0$ for all $x \in R^N$	(negative semi-definiteness)

on all positive m,p. (Q is the diagonal matrix with i^{th} diagonal element q_i.) The demand system, nevertheless, serves as a valid local approximation to a general form, and in empirical applications we would expect that the restrictions would hold approximately in the estimated parameters within the range of the sample data on m and p.

[8] The Slutsky price effects are given by

$$\hat{\Gamma} + \hat{\beta}\bar{q}' = \begin{bmatrix} -.239 & 0.612 \\ (.056) & (.161) \\ .354 & -1.163 \\ (.058) & (.162) \end{bmatrix}.$$

(Figures in parentheses are standard errors.)

TABLE 1.—ESTIMATED DEMAND EQUATIONS: SAMPLE 1

Demands	Intercept	Family Size	Expenditure (pence/week)	Price Variables: Bread (pence/loaf)	Price Variables: Meat (pence/lb.)	R^2
Bread (loaves/week)	0.401 (1.031)	0.413 (0.112)	0.0245 (0.0079)	−0.355 (0.063)	0.570 (0.161)	.800
Meat (lb./week)	7.814 (1.045)	−0.437 (0.114)	0.0401 (0.0080)	0.163 (0.063)	−1.23 (0.163)	.721

Note: Standard errors are reported in parentheses.

TABLE 2.—ESTIMATED DEMAND EQUATIONS: SAMPLE 2

Demands	Intercept	Family Size	Expenditure (pence/week)	Price Variables: Bread (pence/loaf)	Price Variables: Meat (pence/lb.)	Price Variables: Potatoes (pence/lb.)	R^2
Bread (loaves/week)	2.218 (3.094)	0.306 (0.163)	0.017 (0.007)	−0.311 (0.230)	0.451 (0.762)	0.050 (0.111)	.915
Meat (lb./week)	11.479 (5.811)	−0.971 (0.307)	0.049 (0.014)	1.012 (0.433)	−3.100 (1.431)	−0.437 (0.207)	.792

Note: Standard errors are reported in parentheses.

bread consumption and a negative effect on meat consumption.

(ii) Both bread and meat are still normal. But now, $\hat{\eta}_B = .55$ and $\hat{\eta}_M = 3.88$.

(iii) The estimated Slutsky matrix confirms the intuitively appealing hypotheses that bread and potatoes are substitutes and meat and potatoes are complements.[9] This viewpoint is strengthened by noting that the Engel derivative for bread is smaller in the potato sample than in the non-potato sample, while the Engel derivative for meat is larger in the potato sample than in the non-potato sample. Hence the opportunity to purchase potatoes has the effect of shifting consumption away from bread and toward meat and potatoes as income rises.

(iv) An attempt to estimate a demand for potatoes equation foundered on data problems. The prices reported by Davies and Eden for potatoes seem to reflect actual scarcity values. However, since many households raised potatoes or bartered for them, the quantities purchased, as reported in the surveys, are a very erratic reflection of actual consumption.

In the face of adversity the English rural laborer leaned heavily upon his staff of life, the wheaten loaf. But complaints of affluent contemporaries that the consumption of bread actually rose among the lower classes during periods of scarcity seem very improbable in light of the Davies and Eden budget evidence. Economic historians have largely neglected any systematic study of early budget studies, and as a consequence, historical interpretations of consumer demand rely heavily on the *deus ex machina* of "changes in taste." Gradual processes of habit formation and sudden caprice are often given credit for fundamental shifts in the composition of consumer demand which, on closer examination, could be attributable primarily to changes in relative prices and income. Such is the case for the rural laborers studied here.

The professional schism between theorists and measurers was already well established in economics by Frederick Eden's time. He clearly saw himself as a "carrier of water" for the political arithmeticians, saying of the theorists of his day, "they voluntarily impose upon themselves the task, so much and so justly complained of by the Israelites, of making bricks without straw." There is some small justice in the fact that his budgets seem to put a few more cracks in the most famous strawless brick of economic theory—the Giffen good.

[9] The Slutsky matrix for the second sample is

$$\hat{\Gamma} + \hat{\beta}q' = \begin{bmatrix} -0.22 & 0.47 & 0.08 \\ 1.26 & -2.98 & -0.37 \\ — & — & — \end{bmatrix}.$$

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