

The Cost of Living and Real Wages in Eighteenth Century England

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THE COST OF LIVING AND REAL WAGES IN EIGHTEENTH CENTURY ENGLAND

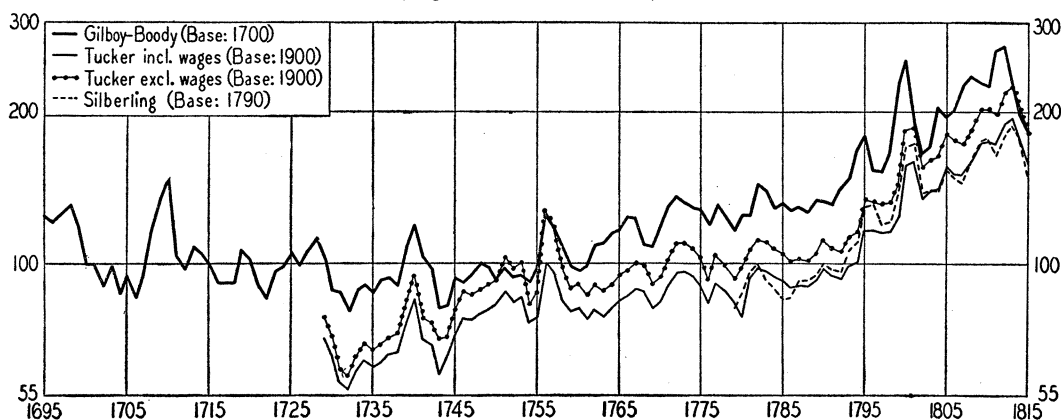
THE course of the cost of living and that of real wages over time is a subject of never failing interest to the economist.¹ In studies of the business cycle, in explanations of the changing well-being of the laboring class, as in various other connections, trends of living costs and of real wages are important features. One does not need to cite examples, since the phenomenon is so common.

The movements of these indices during the eighteenth century are of special significance, not merely to the economic historian but also to the economic theorist. This century was one

The author has worked previously on the English wage situation in the eighteenth century and has made some attempt to estimate real wages on the basis of wheat prices and contemporary comment.² At the time of this earlier research, there were no adequate data from which a cost of living index for this period might be derived.

Thanks to the generosity of Sir William Beveridge and the English section of the International Committee on Price History, some sixty price series covering the eighteenth century have been made available to Dr. Boody. Some of these

CHART I.—INDICES OF THE COST OF LIVING IN LONDON, ANNUALLY
(Logarithmic vertical scale)



of particularly important changes on the technical side of industrial production. What effect did these changes have on the well-being of the working class? Were all parts of England similarly affected?

¹ The present article makes report upon the first of two studies on eighteenth-century prices conducted in common by Dr. Elizabeth Boody and the writer. The research has been carried on jointly at all stages, but it was decided to divide the presentation of results. An article by Dr. Boody, which will be published in a later issue of this REVIEW, will deal with general business conditions and the price movements of producers' and consumers' goods from 1660 to 1815. She will also investigate cyclical movements in the various indices.

We are indebted to the Harvard University Committee on Research in the Trade Cycle for a grant of money which made possible this inquiry. We are also most grateful to Miss Dorothy Wescott and her staff for their efficiency in carrying out the statistical computations.

Dr. Boody and Professor W. L. Crum have gone over the manuscript, and I am grateful to them for a number of valuable suggestions.

series go back to 1660; most of them to 1695. A number of them extend to 1815 or 1820. All were taken from original manuscript sources and have not as yet been published.³ Thirty of them were sufficiently continuous to be utilized in our cost of living index. Even with these, a great amount of interpolation was necessary. The methods by which the latter was accomplished are explained in detail in the statistical appendix, but here it may be said that Tooke, Rogers, and the Parliamentary Reports provided the main bases for such expediences.⁴

² Elizabeth W. Gilboy, *Wages in Eighteenth Century England* (Cambridge, Mass., 1934).

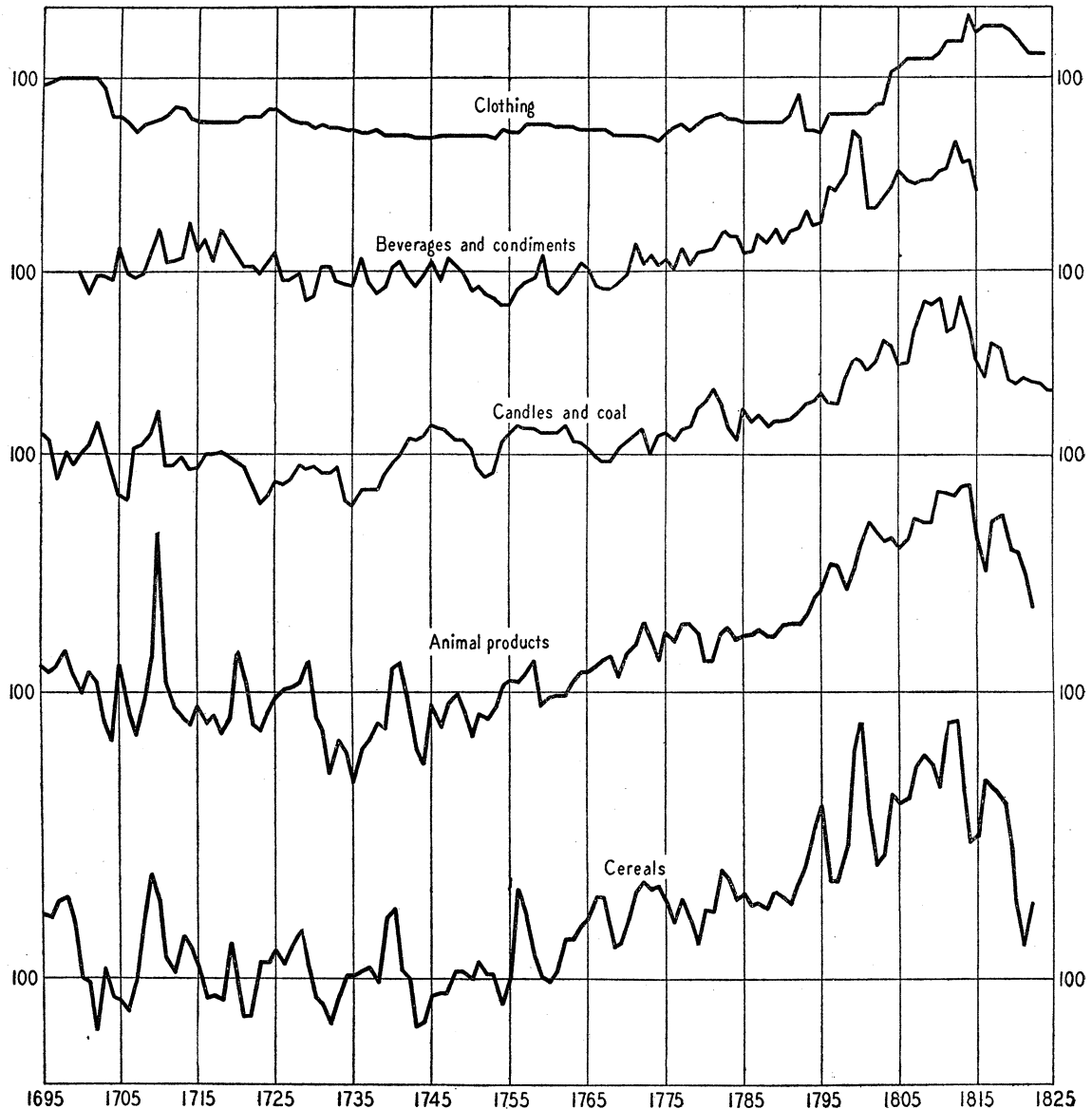
³ These series and many additional ones will be published shortly by the English Price History Committee. Sir William Beveridge has been kind enough to authorize our use of them in advance, for the purpose of this investigation.

⁴ The exact references are given in the Appendix (p. 141).

The final index (see Chart 1) is a weighted arithmetic average of price relatives, with 1700 as a base, extending over the decades from 1695 to 1815. It is composed of thirty-one price

group (see Chart 2). The final index was based upon these group indices with the following weights: cereals, 5; animal products, 2; candles and coal, 1; beverages and condiments, 1; cloth-

CHART 2.— GILBOY-BOODY INDEX OF THE COST OF LIVING IN LONDON, BY GROUPS, ANNUALLY
(Base: 1700. Logarithmic vertical scale)



series, relating, as far as data permit, to goods which were consumed by the English laborer of that period. The commodities were divided into five groups: (1) cereals, (2) animal products, (3) beverages and condiments, (4) candles and coal, and (5) clothing. Unweighted arithmetic averages of price relatives were computed for each

ing, 1. The weights were determined after a careful study of sample budgets published by Eden and Davies.¹ It was found that the aver-

¹ Sir Frederick Eden, *State of the Poor*, Vols. I-III (London, 1797), and David Davies, *The Case of the Laborers in Husbandry* (Bath, 1795). Thirty-five budgets were examined in detail; rough averages of expenditure for the several budgetary

age laborer spent 40 per cent of his total expenditure for bread and flour, 20 per cent for animal products, 9 per cent for sugar, tea, beer, etc., 4 per cent for "groceries" (soap, candles, etc.), 15 per cent for rent and fuel, and 8 per cent for clothing. In our index, no attempt was made to allow for rent expenditure, and cereals were given a somewhat greater weight. This latter step has justification in that the Eden and Davies budgets apply to the years 1790-96, when the laborer's budget was more diversified and included a relatively smaller expenditure on cereals than in the first half of the century.

STATISTICAL SOURCES

The actual series used in our index, with their sources, are as follows:¹

	<i>Source</i>
I. Cereals	
Biscuit, 1695-1814	Admiralty, Treasurers' and Contract Ledgers
Barley, 1695-1822	Kent Quarter Sessions Records to 1791; Tooke, 1792-1822
Beans, 1684-1822	Royal Household, Lord Stewards' Accounts to 1790; Tooke, 1791-1822
Flour, 1695-1826	Admiralty, Treasurers' and Contract Ledgers
Oats, 1695-1822	Winchester College Rents to 1806; Tooke, 1807-22
Peas, 1695-1826	Admiralty, Treasurers' and Contract Ledgers
Rye, 1695-1822	Kent Quarter Sessions Records to 1785; Tooke, 1791-1822 (Data interpolated from movement of barley series, 1786-90)
Wheat, 1695-1822	Admiralty, Treasurers' and Contract Ledgers to 1801; Tooke, 1802-22
Bread, 1728-1815	Westminster School and Abbey Accounts to 1784, Parliamentary Report (1814-15), 1785-1815
II. Animal Products	
Beef for Salting, 1695-1824	Admiralty, Treasurers' and Contract Ledgers to 1796; Tooke, 1797-1824
Butter, 1695-1826	Admiralty, Treasurers' and Contract Ledgers
Cheese, 1695-1826	Admiralty, Treasurers' and Contract Ledgers
Pork Hogs, 1695-1822	Admiralty, Treasurers' and Contract Ledgers to 1813; Tooke, 1814-22

items were secured; and the percentage of each to total expenditure was computed.

¹ The periods listed are those for which the series are available. In computing the cost of living index, however, the earliest year used for any one series is 1695; the latest, 1815. Certain of the group indices were extended a few years beyond 1815.

² This was substituted for the tea series of the Price History Committee, which did not start until 1763 and showed almost no changes in level. The amount of the import duty was added to the East India Company's selling price.

III. Beverages and Condiments

Tea (Bohea), 1740-1822	British Document 390, Parliamentary Papers, 1845, Vol. 46, 191 ²
Ale, 1695-1812	Royal Household, Lord Stewards' Accounts
Beer, 1715-1818	Chelsea Hospital Accounts
Cider, 1695-1828	Royal Household, Lord Stewards' Accounts
Hops, 1695-1826	Admiralty, Treasurers' and Contract Ledgers
Sugar, 1700-1822	Westminster School and Abbey Accounts to 1784; Tooke, 1785-1822
Malt, 1695-1826	Admiralty, Treasurers' and Contract Ledgers
White Pepper, 1700-99	Royal Household, Lord Stewards' Accounts
Raisins, 1701-99	Westminster School and Abbey Accounts to 1776; Royal Household, Lord Stewards' Accounts, 1777-99

IV. Candles and Coal

Coal, 1683-1826	Admiralty, Treasurers' and Contract Ledgers
Tallow Candles, 1660-1830	Admiralty, Treasurers' and Contract Ledgers to 1799; Royal Household, Lord Stewards' Accounts, 1800-30

V. Clothing

Hair, 1695-1778	Admiralty, Treasurers' Ledgers and Bill Books
Kersey, 1660-1795	Admiralty, Treasurers' Ledgers and Bill Books
Leather Backs, 1660-1792	Admiralty, Treasurers' Ledgers
Brussels Linen, 1700-35; Irish Linen, 1736-95	Royal Household, Lord Stewards' Accounts
Stockings (blue yarn), 1712-1827	Greenwich Hospital Accounts
Felt Hats, 1712-1827	Greenwich Hospital Accounts
Broadcloth, 1660-1830	Westminster School and Abbey Accounts

It will be noticed that in Group I, bread does not enter the index until 1728; in Group III — for which the first year of the index is 1700 rather than 1695 — tea enters in 1740 and beer in 1715; in Group V, linen enters in 1700, stockings and felt hats in 1712. Groups III and V include several series which end before 1815: for example, ale in 1812; white pepper and raisins in 1799; hair in 1778; kersey and linen in 1795; and leather backs in 1792. The majority of the series cover the main part of the period, and this is particularly true of those in the most heavily weighted groups. Before 1700, however, and after 1790 the index is definitely less satisfactory than over the other decades. Although most of the prices refer to London or its vicinity, less inaccuracy than might be supposed is involved in using the index as representative of England. Prices, particularly for grains, showed little regional divergence. On the other hand, a similar statement cannot be made relative to wages; and our indices of money wages can be

used to represent wage movements only in the regions to which they refer.

In a cost of living index, it is desirable to include only retail prices, for it is well known that wholesale and retail prices show differences in movement. Unfortunately the statistician who dares to deal with past periods cannot usually choose what he will use. He must take what is available and make the most of it. The prices here employed cannot clearly be marked as either retail or wholesale prices. The Admiralty prices (providing half of the series) are probably closely related to wholesale prices; on the other hand, the Greenwich Hospital, Chelsea, Westminster, Kent, and Royal Household prices are definitely akin to retail prices, in the opinion of the English Price History Committee. The index is, therefore, neither a wholesale nor a retail price average but something in between. All series represent contract prices. The contracts vary from a very short period of a few months to periods of several years. The only group which is markedly influenced by long-period contracts is the clothing group (see Chart 2). On the whole, the series within any one of the several groups showed a great similarity of movement, and all the commodities were selected either for their places in the laborers' budgets, or for their influences upon some article actually consumed. We are well aware of the defects of the index, but it is probably a better measure than has yet been found of the general course of the cost of living for the period.

COST OF LIVING MOVEMENT

According to the index presented in Chart 1 and Table 1, the broad tendency of living costs was slightly downward from the period 1708-11 until about 1755. A distinctly upward movement began in the late 'fifties, which was accelerated in the inflationary period after 1790, and which culminated in the peaks of 1800 and 1812. The index fluctuated around the level of the base year, 1700, until the 'fifties, rose to about 150 by 1793, and to 270 by 1812. The peaks are attributable, for the most part, to exceptionally bad harvests in particular years, notably, 1698, 1710, 1740, 1756, 1766, 1782, 1795, 1800, and 1812. The rise in 1698 was influenced also by monetary difficulties; that of 1708-10 by the fact that Admiralty prices were unusually high as a result of a heavy discount on Navy

TABLE 1.—ANNUAL INDICES OF THE COST OF LIVING IN LONDON
(Base: 1700)

Year	Index	Year	Index	Year	Index
1695	124	1735	88	1775	128
1696	122	1736	93	1776	120
1697	126	1737	94	1777	131
1698	131	1738	91	1778	123
1699	118	1739	109	1779	117
1700	100	1740	119	1780	125
1701	100	1741	103	1781	125
1702	91	1742	98	1782	144
1703	99	1743	82	1783	139
1704	88	1744	83	1784	129
1705	95	1745	94	1785	132
1706	86	1746	92	1786	128
1707	94	1747	95	1787	130
1708	116	1748	100	1788	127
1709	135	1749	98	1789	134
1710	147	1750	93	1790	133
1711	104	1751	98	1791	131
1712	98	1752	94	1792	140
1713	108	1753	95	1793	148
1714	105	1754	92	1794	168
1715	100	1755	98	1795	179
1716	92	1756	125	1796	153
1717	92	1757	118	1797	152
1718	92	1758	108	1798	165
1719	106	1759	99	1799	229
1720	102	1760	97	1800	252
1721	91	1761	99	1801	190
1722	86	1762	109	1802	166
1723	97	1763	110	1803	171
1724	99	1764	115	1804	204
1725	105	1765	117	1805	196
1726	100	1766	124	1806	201
1727	106	1767	123	1807	226
1728	112	1768	109	1808	236
1729	102	1769	108	1809	229
1730	89	1770	118	1810	225
1731	88	1771	130	1811	266
1732	81	1772	136	1812	270
1733	89	1773	131	1813	224
1734	91	1774	129	1814	198
....	...	....	...	1815	183

Bills. The whole period after 1790 was, of course, influenced by inflation. Pronounced cyclical movements are apparent, but they will not be dealt with here.

Among the group indices, the widest short-time fluctuations appear in cereals, with animal products not far behind. The two groups move together quite closely, except for a difference

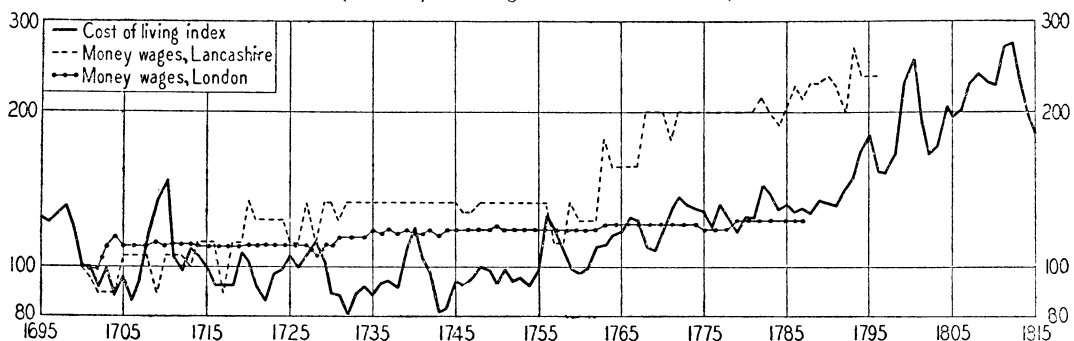
in timing of the upward trend. With cereals the rise begins in the 'fifties; with animal products, in the late 'thirties. The other three groups move less violently and are little affected by years of bad harvest. Beverages and condiments rise until 1714 and then decline slowly until the middle 'fifties. The upward movement then initiated is less marked than in the other two food groups. The rise in coal and candles begins in the 'thirties but is not pronounced until the end of the century. The clothing group shows great stability: after dropping sharply in the

although the extreme violence of the short-time fluctuations and the severity of the rise in the late eighteenth and early nineteenth centuries is mitigated by the stability in prices of the other three groups.

WAGES

Chart 3 indicates the movement of money wages in London and Lancashire as compared with that of the cost of living. The indices of money wages (Table 2) were computed from data on daily wage rates of common labor,

CHART 3.— GILBOY-BOODY INDICES OF THE COST OF LIVING IN LONDON, MONEY WAGES IN LONDON, AND MONEY WAGES IN LANCASHIRE, ANNUALLY
(Base: 1700. Logarithmic vertical scale)



first decade of the eighteenth century to about 80 (1700=100), the index remained close to this figure until the 'nineties. Clothing prices do not rise noticeably until after 1800 and reach their peak in 1814.

The movement of the group indices is consistent with other information from contemporary sources. Textile prices, particularly cotton,¹ declined during the century. So did the prices of certain imported luxuries such as tea, coffee, spices, and the like. Contemporary comment is unanimous in stating that many of these commodities were included in the laborer's budget for the first time in the latter eighteenth century. Grain and meat prices were known to increase in the last half of the century, with attendant misery on the part of the working classes, especially in years of bad harvest. The final index is largely influenced by the cereal and animal products groups,

¹ We were not able to secure a series of cotton prices sufficiently continuous to include in the index. Mr. A. P. Wadsworth — author with Miss Mann of *The Cotton Trade and Industrial Lancashire, 1600-1780* (Manchester, England, 1931) — wrote to Dr. Boody recently that he has been unable to find a good series of cotton prices for this period.

mostly in the building trades.² The London index is an arithmetic average of price relatives of the daily wage rates of bricklayers', masons', paviours', and plasterers' labor at Westminster Abbey, with 1700 used as the base year. The Lancashire index is a simple series of price relatives, on a 1700 base, of the daily wages of labor on buildings and roads. These two series were found to represent wage rates in London and the north of England, respectively, in the study mentioned above.

The stability of wages over long periods of years is evident, particularly in the London index.³ Money wages in London rose slightly until the 'forties, and the level again advanced in the 'sixties and 'eighties. The Lancashire series went up much more sharply. There was

² See *Wages in Eighteenth Century England*, Appendix II, for the original series. Laborers' wages were used rather than those of craftsmen because the latter are less complete and more subject to quality differences. The long-time movements of the two are very similar, except that craftsmen's wages ordinarily rise first in periods of advance. They are also on a higher level throughout the century, as might be expected.

³ Year-to-year fluctuations in wage rates cannot be relied upon, especially in the Lancashire series, since they may represent quality and place differences that could not be entirely eliminated.

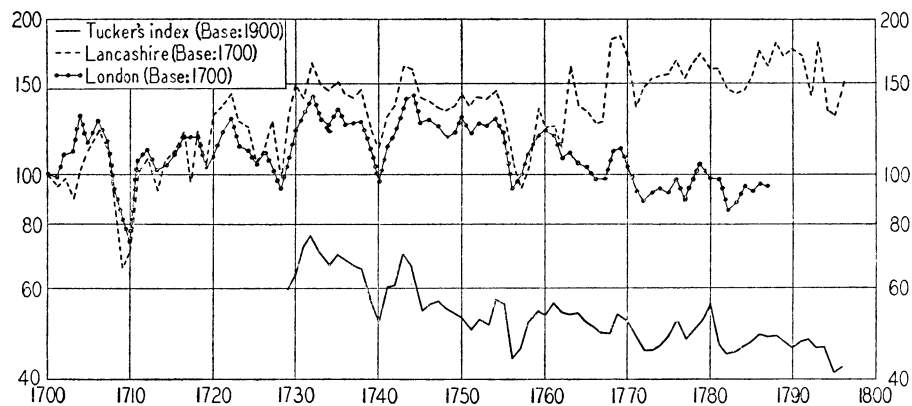
an irregular rise from 1700 to 1730, stability at the new level until the late 'fifties, and a steep rise in the 'sixties, until by 1768 the index was at 200, where it remained, with the exception of one year, until 1781. In the 'eighties and 'nineties, an upward movement to a still higher level took place. Over the century, money wages in the North moved upward in a far greater degree than in London.

Real wages are pictured in Chart 4. Real-wage indices (Table 2) were computed by

S. Tucker.² Dr. Tucker's two indices of the cost of living appear on Chart 1; his index of real wages, on Chart 4. We are primarily interested in his indices for the period which is covered also by our own data, namely, the years 1729-1815.

For the eighteenth century (or, more exactly, until 1805), Dr. Tucker's cost of living index, excluding wages, is of the weighted geometric type, with 1900 taken as the base year. Essentially it is a five-year index of consumers'-goods prices, based on secondary, printed sources.

CHART 4.—GILBOY-BOODY INDICES OF REAL WAGES IN LONDON AND LANCASHIRE, AND TUCKER INDEX OF REAL WAGES IN LONDON, ANNUALLY
(Logarithmic vertical scale)



dividing the money-wage indices by our index of the cost of living.¹ London and Lancashire real wages move almost in unison until 1719; thereafter the Lancashire index is at a higher level than that for London. Real wages in London begin to decline in the late 'forties; in Lancashire, they rise until the late 'sixties, and then fluctuate about a level somewhat above 150 in terms of the 1700 base. The general picture is that of slightly rising real wages for both London and the North for the first half of the century, then declining real wages for London, but another sharp upward movement for the North.

Before any more general conclusions are attempted, it seems desirable to compare the indices above presented with others which have been published. The most extensive survey of the period is that recently made by Dr. Rufus

¹ There are those who will object to deflation of this sort. It may be said, however, that the index of cost of living makes as accurate a denominator as we could devise, and that the numerator and denominator have no elements in common. There seems to be no danger of spurious correlation.

His weights for the period before 1815 are approximately as follows: foods, 75 per cent; clothing, 14 per cent; fuel and light, 7 per cent; miscellaneous, 4 per cent. Dr. Tucker's second cost of living index, the one which he himself uses to determine real wages, combines the consumers'-goods index just mentioned (which is given a weight of four) with the wage index (which is given a weight of one). The inclusion of wages in the cost of living index is founded on Mr. Arthur Young's theory that rents and wages fluctuate together, and that wages may therefore be used to represent the movement of rent in the laborer's budget.³ The two indices

² "Real Wages of Artisans in London, 1729-1935," *Journal of the American Statistical Association*, xxxi (1936), pp. 73-84.

The evidence on this point is incomplete and confusing. Young found that rent tended to equal one-sixth of the annual wage, but his figures apply only to a few scattered years in the latter part of the century. There is no way of telling whether this relationship was the same for the whole period. My own research indicates that laborers' rents, especially in the country districts, were stationary over long periods, and appear to have been fixed by custom. In many cases, cottages were given rent-free. There were complaints about the rise of rents in the London district at the end of the century. We

TABLE 2.—ANNUAL INDICES OF WAGES IN ENGLAND
(Base: 1700)

Year	London		Lancashire		Year	London		Lancashire		Year	London		Lancashire	
	Money wages	Real wages	Money wages	Real wages		Money wages	Real wages	Money wages	Real wages		Money wages	Real wages	Money wages	Real wages
1700	100	100	100	100	1735	118	134	133	151	1770	121	103	200	169
1701	99	99	95	95	1736	116	125	133	143	1771	121	93	177	136
1702	99	109	89	98	1737	118	126	133	141	1772	121	89	200	147
1703	109	110	89	90	1738	116	127	133	146	1773	121	92	200	153
1704	114	130	89	101	1739	118	108	133	122	1774	121	94	200	155
1705	109	115	105	111	1740	116	97	133	112	1775	118	92	200	156
1706	109	127	105	122	1741	116	113	133	129	1776	118	98	200	167
1707	109	116	105	112	1742	118	120	133	136	1777	118	90	200	153
1708	109	94	105	90	1743	115	140	133	162	1778	118	96	200	163
1709	111	82	89	66	1744	118	142	133	160	1779	123	105	200	171
1710	109	74	105	71	1745	118	126	133	141	1780	123	98	200	160
1711	110	106	105	101	1746	118	128	128	139	1781	123	98	200	160
1712	110	112	105	107	1747	118	124	128	135	1782	123	85	211	147
1713	110	102	100	93	1748	118	118	133	133	1783	123	88	200	144
1714	109	104	111	106	1749	118	120	133	136	1784	123	95	189	146
1715	109	109	111	111	1750	120	129	133	143	1785	123	93	205	155
1716	109	118	111	121	1751	118	120	133	136	1786	123	96	223	174
1717	109	118	89	97	1752	118	126	133	141	1787	123	95	211	162
1718	109	118	111	121	1753	118	124	133	140	1788	...	...	228	180
1719	109	103	111	105	1754	118	128	133	145	1789	...	...	228	170
1720	110	108	133	130	1755	118	120	133	136	1790	...	...	233	175
1721	110	121	123	135	1756	118	94	133	106	1791	...	...	223	170
1722	110	128	123	143	1757	118	100	111	94	1792	...	...	200	143
1723	110	113	123	127	1758	118	109	111	103	1793	...	...	267	180
1724	110	111	123	124	1759	118	119	133	134	1794	...	...	233	133
1725	110	105	111	106	1760	118	122	123	123	1795	...	...	233	130
1726	110	110	111	111	1761	118	119	123	124	1796	...	...	233	152
1727	110	104	133	126	1762	118	108	123	113	...	...	...	...	...
1728	105	94	111	99	1763	121	110	177	161	...	...	...	...	...
1729	110	108	133	130	1764	121	105	156	136	...	...	...	...	...
1730	109	122	133	149	1765	121	103	156	133	...	...	...	...	...
1731	114	130	123	140	1766	121	98	156	126	...	...	...	...	...
1732	114	141	133	164	1767	121	98	156	127	...	...	...	...	...
1733	114	128	133	149	1768	121	111	200	183	...	...	...	...	...
1734	114	125	133	146	1769	121	112	200	185	...	...	...	...	...

differ considerably in level, and the inclusion of wages seems to moderate the upward trends obvious in the former over the periods 1732-55 and 1792-1813. To be sure, short-time movements are very similar.

know that in recent decades rents and wages lag behind other prices, but the relation between the lags is not clearly established for our early period. It is impossible to say, in the absence of continuous rent figures, what happened in the eighteenth century.

However, the deflation of a given wage series by means of a cost of living index in which the same wage series is a significant element appears to be a questionable statistical procedure.

The most striking difference between Dr. Tucker's indices of the cost of living and our index is that the upward movement in his indices becomes apparent in the 'thirties, whereas the advance in our index does not begin until the late 'fifties. At that time, Dr. Tucker's index excluding wages — which really is more nearly comparable with our index than is his index including wages — overlaps our index at four points, despite the fact that its level is usually well below that of our series. The upward trend of Dr. Tucker's index, which is especially marked from 1730 to the late 'fifties, becomes more

gradual from the latter decade until the 'nineties, when it is again steeply inclined.

Dr. Tucker's index of real wages reflects the difference in trend (see Chart 4), showing a continuous declining trend throughout the period, whereas our real-wage index for London does not decline until the 'fifties. The difference appears to be a result of the divergence in trend existing between Dr. Tucker's cost of living index and ours. This divergence may be due to the fact that Dr. Tucker interpolated from a few series¹ within the five-year periods of his original cost of living index; this would be true particularly if these series rose above his five-year points in the intervening years. At any rate, Dr. Tucker's general conclusion that real wages in England declined throughout the eighteenth century² is not confirmed, even by our London index, and is strongly opposed by our index for Lancashire.

Chart 1 also contains Professor Silberling's cost of living index from 1779 to 1815.³ His index is a weighted geometric average of price relatives, each series weighted individually, of fifteen commodities, on the base 1790. The nine series for food and drink are given a total weight of 75 per cent; the four series for clothing, approximately 14 per cent; and the coal and candles series together make up approximately 11 per cent of the total. Within the food group, animal products are weighted almost as heavily as cereals. Since Professor Silberling's weights are derived from nineteenth century budgets, it is not surprising that they should differ to some extent from ours.⁴ The Silberling index follows the Tucker index (including wages) very closely, particularly at the end of the period. This is interesting inasmuch as the Tucker index is an average of retail prices,⁵ whereas the Silberling index is a wholesale price index. Possibly the difference between retail and wholesale prices in this period is less than

is generally supposed. More probably, the use of annual series and of contract prices (by Dr. Tucker) has obscured any differences in movement that may exist. Both these indices differ in level and to some extent in trend from our index. The difference in level is undoubtedly due to the variant base years employed, while some divergence in trend may arise from the use of a geometric index by Tucker and Silberling as opposed to the arithmetic form that we utilized. However, the extent of the trend difference between Tucker's index and ours cannot be explained on this technical ground alone.

CONCLUSIONS

Crude as our index is, it is based on the most complete, continuous, and homogeneous series now available. It affords a better basis for estimating the condition of the working classes in eighteenth-century England than the grain prices used earlier.⁶ It is necessary to modify somewhat the conclusion there expressed concerning the trend of the standard of living of the London laborer. The present index shows a much more certain decline in real wages for London in the last half of the century. Real wages in the North, however, rose consistently during the entire hundred years, as indicated by the earlier investigation. An index of real wages in the west of England was not computed in connection with the present inquiry, but it would undoubtedly show a decline, and, indeed, one that started much earlier than that of London. Regional differences in the course of real wages in eighteenth-century England are very evident. Sufficient data are not at present available to make any statements concerning the movement of real wages in England as a whole for this period.

It is of considerable interest to note that real wages as well as money wages in the North increased in the latter half of the century, when the cost of living was rising. It is Dr. Tucker's opinion that gains in real wages are made almost entirely in periods of falling prices.⁷

⁶ Gilboy, *op. cit.* Detailed analysis of non-statistical evidence on real wages will be found here, as well as examination of the effects of hours of work, unemployment, etc., for which no continuous figures exist. It may be said that this non-statistical evidence tends to emphasize the rise in real wages in the North, and to mitigate the extent of the decline in London.

⁷ *Op. cit.*, p. 84.

¹ What these series are Dr. Tucker does not say, except that wheat was used before 1735.

² *Op. cit.*, p. 82.

³ "British Prices and Business Cycles, 1779-1850," this REVIEW, v (1923), pp. 223-61.

⁴ Weighting animal products equally with cereals is not justifiable, however, for any part of the eighteenth century, as far as laborers' budgets are concerned.

⁵ The Greenwich Hospital prices which Dr. Tucker uses are more related to retail than wholesale prices, but they are certainly affected by contracts and discounts, and cannot be called pure retail prices.

Mr. Keynes states that money wages may be expected to rise in periods of rising prices but that real wages will ordinarily fall, except perhaps in the case of a single industry.¹ It is possible that the Lancashire wages fall into the category of Mr. Keynes' exception. Although these wages are for common labor and labor in the building trades, not for industrial labor, they may reflect the increasing demand for labor set in motion by the expanding cotton and woolen industries. I am inclined to think, however, that the cause lies deeper than changes in a single industry. Increasing real wages may occur simultaneously with advancing prices in periods when extraordinary industrial and technical changes are under way. Such changes are in the nature of external economies and affect more than a single firm or a single industry. In

¹ J. M. Keynes, *The General Theory of Employment, Interest, and Money* (New York, 1936), p. 10.

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the eighteenth century, the north of England was undergoing such changes and, although the cotton industry was in the van of this "industrial revolution," it was only one element in the process. Under such circumstances, it might not be unreasonable to expect real wages and money wages to rise together. Even if money wages lag behind prices, as they frequently do, real wages need not fall except for a very short period at first. Once wages begin to increase, they may rise relatively faster and in greater proportion than prices, thus making possible a real-wage increase despite the lag. In the north of England, money wages and prices rose almost simultaneously. From 1760 to 1775, prices went up about 40 per cent, while wages increased approximately 70 per cent. There appears to be no inherent reason why this situation should not be repeated, if similar economic conditions should occur.

ELIZABETH W. GILBOY

STATISTICAL APPENDIX

Description of Series

It is not possible in a short paper of this type to print and describe the series in full. The relation of these prices to retail and wholesale prices and the main sources of the series are given in the article itself. It should be added here that most of the series are quoted in harvest years, from October to October, and that October 1700 to October 1701 is called 1700, so that the year 1700 is really made up in large part of 1701.

No correction for harvest years versus calendar years was made in the index as a whole, although in interpolating for certain of the grain series, an adjustment was made. These series are listed below. On the whole, no clear and consistent difference in the timing of the movements of our index in comparison with the other indices was shown. Some differences in the timing of the peaks are noticeable in our index as compared with Tucker's and Silberling's, but these differences are not uniform throughout the period. They may, however, be attributable to the use of the harvest year. It is to be noted, however, that the peaks after 1790, particularly 1795, 1800, and 1812, coincide with the description of harvests and price movements given in *Business Annals*.¹

Statistical Method

An arithmetic index was chosen because the authors felt the data too unsatisfactory to warrant the extra time and expense necessary for the calculation of a geometric index. Miss Bezanson found that the geometric index was very little

¹ W. L. Thorp and W. C. Mitchell, *Business Annals* (National Bureau of Economic Research, New York, 1926), pp. 150-55.

different from the arithmetic in her study of eighteenth-century Philadelphia prices.² The year 1700 was selected as a base year since we were particularly interested in comparing changes in the last part of the century with the beginning and since 1700 appeared to be a fairly "normal" year at the beginning of the period for almost all the series. It is to be noted that the index fluctuates about the level of the year 1700 for the first half of the century.

Interpolation

Interpolations in the clothing and fuel groups were made by Dr. Boody, and her methods will be published in a forthcoming article in this REVIEW. I was responsible for interpolation in the cereal, animal products, and beverages and condiments groups. There is not space to print the original series or an itemized list of interpolations. In general the procedure was as follows:

1. Where one or two years were missing, if no comparable series could be found from other sources, an arithmetic average of the two adjoining years was taken. There were a few interpolations of this sort in almost every series.

2. When a number of years were missing, or it was desired to extend the series, the original series was charted with a comparable series derived from another source. In every case of this sort, there were one or more overlapping years, and in most cases a number of overlapping years. If the series were similar during the overlapping years, with no difference in level or timing, the new series was substituted for the old without any change. This was done in the case of bread.

² Anne Bezanson, Robert D. Gray, and Miriam Hussey, *Prices in Colonial Pennsylvania* (Philadelphia, 1935).

Interpolation was based on the series quoted from *Wholesale and Retail Prices*.¹ If a constant difference in level was observed, but the movement was the same, a figure for 1700 was computed for the new series by the following simple method:

Let x = the required estimate for 1700

a = the 1700 value for the original series

b = the value of any given year for the original series

b_1 = the value of the same given year for the new series

then

$$\frac{x}{a} = \frac{b_1}{b}$$

The new series was then corrected for the difference in level and added on to the original series. In the case of more than one overlapping year, an average of the estimated values for 1700 was taken as the base. This method assumes that a constant difference in level existed between the two series throughout the century, and although this assumption is doubtless not completely justified, it seemed more reasonable to make the adjustment than to add the interpolated series with no allowance for differences in level.

This method was used in the case of rye, beef, cheese, pork hogs, and sugar. For these commodities, the interpolated series

¹ House of Commons Report (London, 1903).

were taken from Tooke² in all cases except cheese. The original cheese series was composed of figures for Cheshire and Suffolk cheese which had to be adjusted in the same way.

3. In some series there was no figure for 1700. In the case of tea, this figure was determined by the above method of proportions from comparable figures listed in Rogers.³ For the beer series, the 1700 figure was assumed to be the same as that for 1715. The 1701 value for raisins was used as that for 1700. Certain gaps in the raisins series were also filled in from Rogers.

4. Missing years in the flour series were interpolated from Greenwich Hospital figures by adding one shilling to the Greenwich values. The overlapping values indicated roughly a constant difference of this amount.

5. In some instances, the interpolated series showed clearly a constant lag in relation to the original series. This was adjusted by moving forward the interpolated figures. It is probably due to the difference between harvest years and calendar years. Barley, wheat, beans, and oats, taken from Tooke, were adjusted in this way.

² *Thoughts and Details of the High and Low Prices . . . from 1793 to 1822* (London, 1824).

³ *History of Agriculture and Prices*, Vol. VII, Part I (London, 1902).