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FERTILITY AND THE MACROECONOMICS OF INEQUALITY

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ABSTRACT

There seems to be good reason for believing that extra fertility affects the size and "quality" of the labor force in ways that raise income inequalities. Fertility, like immigration, seems to reduce the average "quality" of the labor force, by reducing the amounts of family and public school resources devoted to each child. The retardation in the historic improvement in labor force quality has in turn held back the rise in the incomes of the unskilled relative to those enjoyed by skilled labor and wealthholders.

These connections have been revealed by a comparison of trends in American income inequality with trends in fertility, immigration, and the growth in the size and quality of the labor force. Inequalities rose gradually on all fronts in the century before World War I, when the supply of unskilled labor was recurrently fed by large immigration inflows. As fertility continued to decline and immigration was shut off around World War I, inequalities in income began to contract and continued to do so until about the end of the Korean War. Since then income inequality has shown no clear upward or downward trend. It appears likely, from data on their numbers and schooling, that the passage of baby-boom children into the labor force will be one force countering any further equalization of incomes for the rest of the 1970s. The historical evidence in favor of these conclusions is not airtight, however. It is always possible to construct other, more elaborate, hypotheses to explain the swings in American income inequality. Yet at some point simplicity is to be preferred, and the reasoning linking inequality to fertility and labor supply has fewer cumbersome working parts than others that happen to fit American experience.

If this reading of the macroeconomic evidence is correct, the case for collective policies to encourage birth restriction in countries with rapid population growth is strengthened. Greater equality in the distribution is a public good that political systems have great trouble purchasing directly through taxes and transfers. The social returns to a long-run investment in income through birth restriction, while quite distant, may be very high.

FERTILITY AND THE MACROECONOMICS OF INEQUALITY

I. What Theory Suggests

The 1960s and the start of the 1970s were a period of agitation for less inequality and less discrimination, and also a period of concern over the consequences of high fertility and population growth. Yet the two sets of concerns were not joined. Jencks' monumental Inequality (1972), for example, passed over family size (and other factors) as sources of inequality. The concern about fertility and population growth remained tied to the fight for environmental quality. Only occasionally was it even suggested that fertility and the expansion of the labor force might have been major determinants of the degree of income inequality.

Yet there are several theoretical reasons for expecting reductions in fertility to turn into reductions in income inequality a generation later. There are, first, two microeconomic effects that should link declining fertility to a later levelling of incomes through the effects of family inputs on child achievements:

(1) A reduction in fertility lowers the dispersion of family sizes, since birth restriction typically reduces the number of children born into very large families by a greater percentage than it reduces the number of first and second children. Since larger family size seems like a factor that should retard the development of earning capacity in individual children, the reduction in family size differences ought to reduce later earnings inequality.

(2) Since about 1910, birth restriction has on balance reduced the share of children born into poor and less educated families. The same should be true of birth restrictions from 1970 into the future, since surveys have found that in the 1960's unwanted births were still a greater share of total births among the poor.[1] Birth restriction should thus tend to lower income inequality by cutting down on the share of children born into the extreme disadvantage of being unwanted members of large low-income families.[2]

There is a "strain on public schools" reason for suspecting that lower fertility means less inequality:

(3) If the total amount of philanthropic and taxpayer support for schooling is characterized by inertia, then the strain on school systems should be directly related to the share of the population that is of school age. Reducing births

may reduce the ratio of children to adults more than it reduces public (and philanthropic) school expenditures per adult, so that the smaller cohort of school-age children enjoys greater public educational outlays per child. To the extent that this public-support effect is more relevant below college than it is for public funding of higher education, the extra public expenditures per child should help the most disadvantaged children the most. This should reduce inequalities of schooling and income.

There are also several macroeconomic reasons for believing in a long-run link between fertility and inequality. Some of these relate to the presumed effects of fertility, through labor supply, on the structure of wage rates and the level of profits:

(4) A drop in fertility means fewer labor-force entrants a generation later. This in turn should accelerate the rise of all employee wage rates--skilled and unskilled--relative to profit rates and to rates of return on property.[3] Since the ownership of property is almost always distributed less equally than is human earning power,[4] a rise in employee wage rates relative to rates of return for property-holders and profit recipients makes income more equally distributed.

(5) Among employees, the reduced dispersion, and higher average level, of skills caused by the microeconomic effects of birth reduction (see [1] and [2] above) should further reduce inequality of earnings by bidding down the premia earned by higher-paid employees. That is, fertility reduction should raise the wage rates of unskilled labor more than it raises skilled wage rates.[5]

Other macroeconomic arguments relate to the effects of changes in fertility on the demand for final products. Extra children, like extra immigrants or a decline in incomes, will tend to shift consumer demand somewhat toward agricultural products, especially food. This suggests that a decline in fertility should tend to have three effects on overall inequality:

(6) By shifting demand away from agricultural products, reductions in fertility may lower the relative price of these products. This would tend to reduce inequalities in real purchasing power to the extent that agricultural products are a greater share of the cost of living of poor families than of rich.

(7) The same demand shift would cause a shift of labor and capital out of agriculture, in proportions that would reduce the farm sector's share of total labor employment more noticeably

than its share of total capital employment would be reduced. This shift of low-paid labor out of agriculture into what will tend to be higher-paid jobs elsewhere should reduce inequality somewhat, farm labor being among the lowest paid in the country.

(8) On the other hand, the shift in demand away from agriculture is a shift toward sectors that use low-paid labor less intensively. This might weaken the relative pay position of unskilled laborers somewhat, causing a counter-tendency toward inequality.

These three demand effects of fertility decline are each probably of less magnitude than the other macroeconomic effects, which operated through labor supply. The net demand effect is also not likely to be large, since the last demand effect pulls in the opposite direction from the first two.

For reasons like these, theory tends to favor the argument that fertility should be positively linked to inequality. Most general-equilibrium models imply that a rise in the labor force, as would result from rising fertility with a lag of one generation, would lower wage rates and raise returns on capital. Econometric models also suggest that an exogenous rise in the labor force should retard the advance of wage rates even in the short run (e.g., Metcalf [1972]). A recent model simulating the effects on birth rates on inequality from generation to generation predicts what (1) and (2) above predict (Pryor [1973]). As far as theory goes, the arguments above seem reasonable. Do they fit the history of income distribution in America?

The main finding of this paper is that the micro- and macroeconomic arguments above appear to explain much of the long-run trends in inequality in America. An earlier paper* has shown that the effects of family size on child achievements are indeed such that lower fertility means slightly

lower inequality even if rates of pay do not change.[6] The magnitude of this microeconomic effect is limited, but its statistical significance is unmistakable. The "strain on public schools" argument receives qualified support from the evidence presented later in this paper. Reductions in the share of school-aged children in the population before and after the postwar baby boom wave may have raised the level of public school expenditure per child, given the level of income per adult.

Most of the present paper is given over to a demonstration that what we know about long-run movements in the distribution of income corresponds quite well with movements in the quantity and quality of labor supplied, and with the demographic movements that govern labor supply. The correspondence is good enough to suggest that it is much more plausible to assign great importance to both the micro- and the macroeconomic arguments above, and also some importance to the strain-on-public schools argument, than it is to leave any of these arguments out of one's explanation of trends in inequality.

It should be stressed at the outset that the set of hypotheses linking inequality to fertility and labor supply will receive only a limited test here. When the variable to be explained is a long-run rate of change in something macroeconomic, like aggregate inequality, we are always short on historical experiments. A national economy seldom yields historical data on income distribution over more than two or three epochs long enough to span a generation. With only two or three observations it is difficult to choose among the ten or more leading variables whose influence should be tested. When long-run influences are at issue, empirical macroeconomics has no choice but to exploit its handful of case studies for all they are

worth, and then leave it to readers to decide if they share the faith the researcher has expressed in the theory of his choosing. When the testing is done, what can be argued is that the facts fit the theory advanced--followed by the admission that the facts fit some other theories, too. Some competing explanations can be rejected, but others cannot.

The next two sections review the available evidence on what has apparently happened to income inequality and to pay differentials. After that the explanatory power of demographic and other variables will be judged.

II. Trends in American Inequality

The degree of aggregate inequality can be quantified in any of several ways that manage to reflect popular intuition about what makes inequality look great or small. Such measures as gini coefficients, areas over the Lorenz curve, variances or standard deviations in logarithms, percentile shares, and entropy measures all seem to rank the inequalities of different situations similarly.[7]

Any measure of aggregate inequality can be broken down into two parts when the population is divided into classes. The first part consists of the inequalities (dispersion, variation) between classes or groups, and the second consists of the inequalities within groups. This means that the change in inequality over time equals the sum of three changes:

(1) changes in inequalities within the classes or groups,

(2) changes in inequalities between classes caused by movements in their average rates of pay, and

(3) changes in aggregate inequality caused by changes in the shares of the population falling into the various classes.

Breaking overall changes in inequality up into these three parts provides

extra clues to the sources of changes in inequality over time. Many possible explanations of what forces have been altering the degree of overall inequality also carry implications about the directions in which each of these three parts should be moving. These implications can be tested against the movements of the three parts. For example, suppose that one wondered whether the most important influence reducing income inequality in a particular period might not be the movement of large numbers of farm workers to higher-paying jobs in industry. One could test this proposition by noting not only whether or not large numbers so moved, but also how overall inequality was affected by the shift in population alone (change [3] above) and by changes in the ratio of farm to nonfarm wage rates. For the hypothesis to be confirmed, it should be the case that overall inequality was greatly reduced by the shift in population out of the farm sector, and that the ratio of nonfarm to farm wage rates did not rise, and that any decline in this ratio of wage rates did not raise the measure of overall inequality so greatly as to offset the effect of the population shift.[8] In this way, hypotheses that are competing for explanation of the movements in overall inequality can also be tested against the separate movements of rates of pay, of population between classes, and of inequality within classes.

Recent research has developed measures of trends in inequality within the United States at various levels. Since the beginning of federal income tax returns in 1913-1914, and especially since the 1940 census, more and more data have become available on the overall distribution of income and wealth. Economic historians have also begun to come up with suggestive results for the century or so before World War I based on state income and wealth returns, probate and manuscript-census wealth samples, and time series

on wage rate differentials. From these various sources, an intriguing long-run pattern is beginning to emerge.

Table 1 and Figure 1 present an eclectic sampling of trends in various measures relating to the inequality of income in America. Some relate to aggregate income inequality, some to inequalities in wealth-holding, one to inequality of earnings, and one to regional income inequalities. All relate to some form of income without adjustments for taxes, hours worked, life expectancy, or group differences in the cost of living. The relevance of such adjustments is discussed in the next section. It is convenient to review the behavior of the different series period by period, starting with the well-documented postwar trends and moving back in time.

Since 1950 the overall inequality of income and wealth has changed little, despite some relative gains for blacks. The most comprehensive statistic of those presented here is the variance of logarithms of income, shown in Series (1a) and (1b). These annual figures, both for the wider and for the narrower age range, show little trend. Alternative calculations of the same log variances for 1947-1970 by T. Paul Schultz (1971, Table 2) are more suggestive of a trend toward inequality, but Schultz, like others, argues that no trend in life-cycle income inequality is apparent when fluctuations in the age distribution and levels of unemployment are taken into account. All of the postwar series, in fact, have shown only one clear pattern: inequality rises in recessions and falls in booms. It appears that the postwar business cycle has affected inequality more by movements in unemployment than by procyclical movements in profits.

For the period 1929-1950, every series in Table 1 and Figure 1 tells the same tale of pronounced levelling in income and wealth that is told

Table 1. Measures Related to the Inequality of U.S. Income, 1840-1970, and Wealth, 1810-1970

	(1a) variance in the log of personal income, males, 25-64	(1b) ditto, males, 35-44	(2)% share of top 60% in personal income *	(2)% share of top 60% in personal income **	(3)% share of top 5% in personal income *	(3)% share of top 5% in personal income **	(4)% share of top 5% in employee compen.	(5)% share of top 1% in pers. income	(6)% of wealth held by top 1%	(7)entropy measure of regional inequality of income 7 reg.	(7)entropy measure of regional inequality of income 9 reg.
1810	..	..	..		..		..	..	21	..	
1840	..	..	..		..		..	..	..	.0594	
1860	..	..	..		..		..	..	24	.0577	
1880	..	..	..		..		..	..	..	.0847	.0912
1900	..	..	..		..		..	..	26-31		.0724
1913	..	..	..		..		..	15.0%	..		..
1917	..	..	..		..		16.9% ▲	14.2 ▲	..		..
1920	..	..	..		..		16.0d 14.9d	13.0d 12.8d	..		.0469
1922	..	..	..		..		▲ 16.6	▲ 13.4	31.6		..
1929	..	..	87.5%		30.0%		16.4 16.1	14.7 14.5	36.3		..
1930	..	..	..		..		17.3	14.1	..		.0590
1933	..	..	86.7a		26.5a		20.1	12.5	28.3		..
1939	..	..	..		..		17.8	11.8	30.6		..
1940	..	..	86.4b		24.0b		16.9	11.9	..		.0546
1945	..	..	84.2c		20.7c		9.7	8.8	23.3		..
1948	..	..	..		..		10.9	8.4	..		..
1949	.6533	.6229	..		..		..	..	20.8		..
1950	.6341	.5477	84.3	83.5%	21.4	17.0%	..	..	.. ▲		.0137
1953	.5844	.5231	83.8	..	19.9	..	..	..	24.3 27.5		..
1960	.6635	.5886		83.1		16.8	..	..	..		.0140
1965	.6282	.5629		82.6		15.8	..	..	29.2		.0098
1969	.5813	.5231		82.1		14.7	..	..	24.9		..
1970	..	..		82.5		14.4	..	..	..		.0067

Notes:

a = 1935-36.
b = 1941.
c = 1944.
d = 1919.

▲ = change of series. See sources for details.
* = families and unrelated individuals.
** = families only.

For additional years plotted in Figure 1, see sources.

Sources for Table 1 and Figure 1

Series (1a) and (1b): Barry R. Chiswick and Jacob Mincer, "Time-Series Changes in Personal Inequality in the United States from 1939, with Projections to 1985," Journal of Political Economy, vol. 80, no. 3, Part II(May/June 1972), p. S60. For alternative series, ones showing more drift toward inequality in the postwar period, see T. Paul Schultz, "Long Term Change in Personal Income Distribution: Theoretical Approaches, Evidence, and Explanations," RAND Corporation, Santa Monica, California, December 1971; an expanded version of a paper of the same title published in the American Economic Review, vol. LXII, no. 2(May 1972).

Series (2): for 1929-1957 - U.S. Bureau of the Census, Historical Statistics of the United States: Colonial Times to 1957(Washington: GPO, 1960), p. 166, Series G100 and G101, referring to families and unrelated individuals together. For 1950-1970 - U.S. Bureau of the Census, Stistical Abstract of the United States, 1972(Washington: GPO, 1972), p. 324, referring to families alone.

through (5):

Series (3): Same as (2), the series in Historical Statistics being Series G105 for (3), Series G138 for (4), and Series G131 for (5).

Series (6): 1810, 1860, and 1900 - the conjectures for 1810/and sample aggregates for 1860 in Robert E. Gallman, "Trends in the Size Distribution of Wealth in the Nineteenth Century: Some Speculations," in Lee Soltow(ed.), Six Papers on the Size Distribution of Wealth and Income(New York: NBER, 1969), p. 6. For 1922-1958 - Robert J. Lampman, The Share of Top Wealth-Holders in National Wealth, 1922-1956(Princeton: Princeton University Press, 1962), p. 202. For 1953-1969 - James D. Smith and Stephen D. Franklin, "The Concentration of Personal Wealth, 1922-1969," American Economic Review, vol. LXIV, no. 2 (May 1974), p. 166.

Series (7): For 1840-1950 - Richard A. Easterlin, "Regional Income Trends, 1840-1950," in Robert W. Fogel and Stanley L. Engerman(eds.), The Reinterpretation of American Economic History(New York: Harper and Row, 1971), pp. 44,45. For 1960 and 1970: U.S Bureau of the Census, Statistical Abstract of the United States, 1972(Washington: GPO, 1972), pp. 12,319.

The entropy measure of inequality used here is Theil's formula

$$H_G = \sum_{g=1}^{G} Y_g \cdot \ln (Y_g/N_g),$$

where Y_g is the g^{th} region's share of national personal income before taxes, and N_g is the same region's share of national population. The units of measurement for the inequality measure are Theil's"nits." The regions are the usual Census "divisions": New England, Middle Atlantic, East North Central, etc. For 1840-1880, the Mountain and Pacific regions were omitted. Alaska and Hawaii were omitted throughout, and the District of Columbia was omitted before 1930.

Figure 1

Measures Related to the Inequality of U.S. Income, 1840-1970, and Wealth, 1810-1970

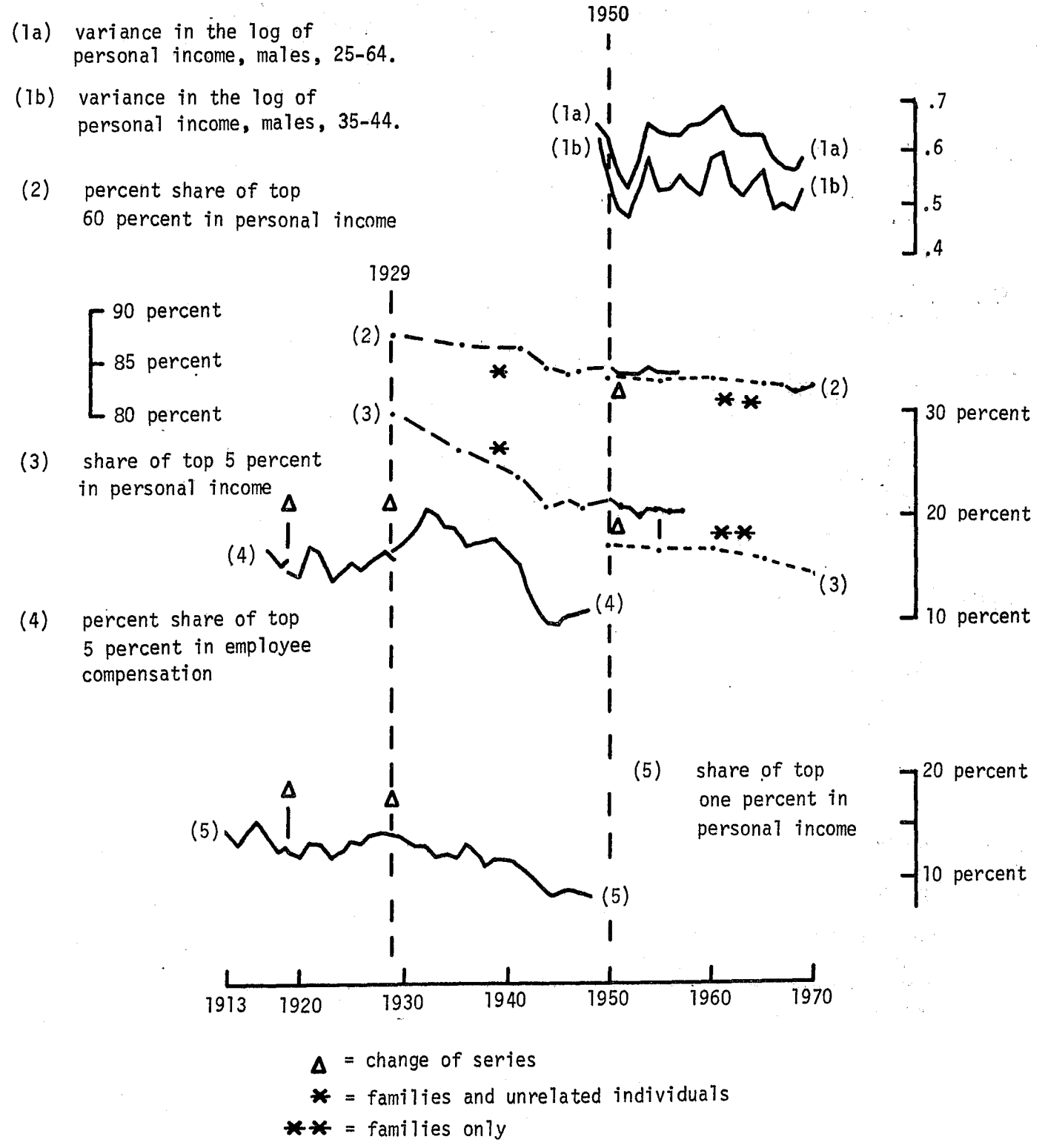
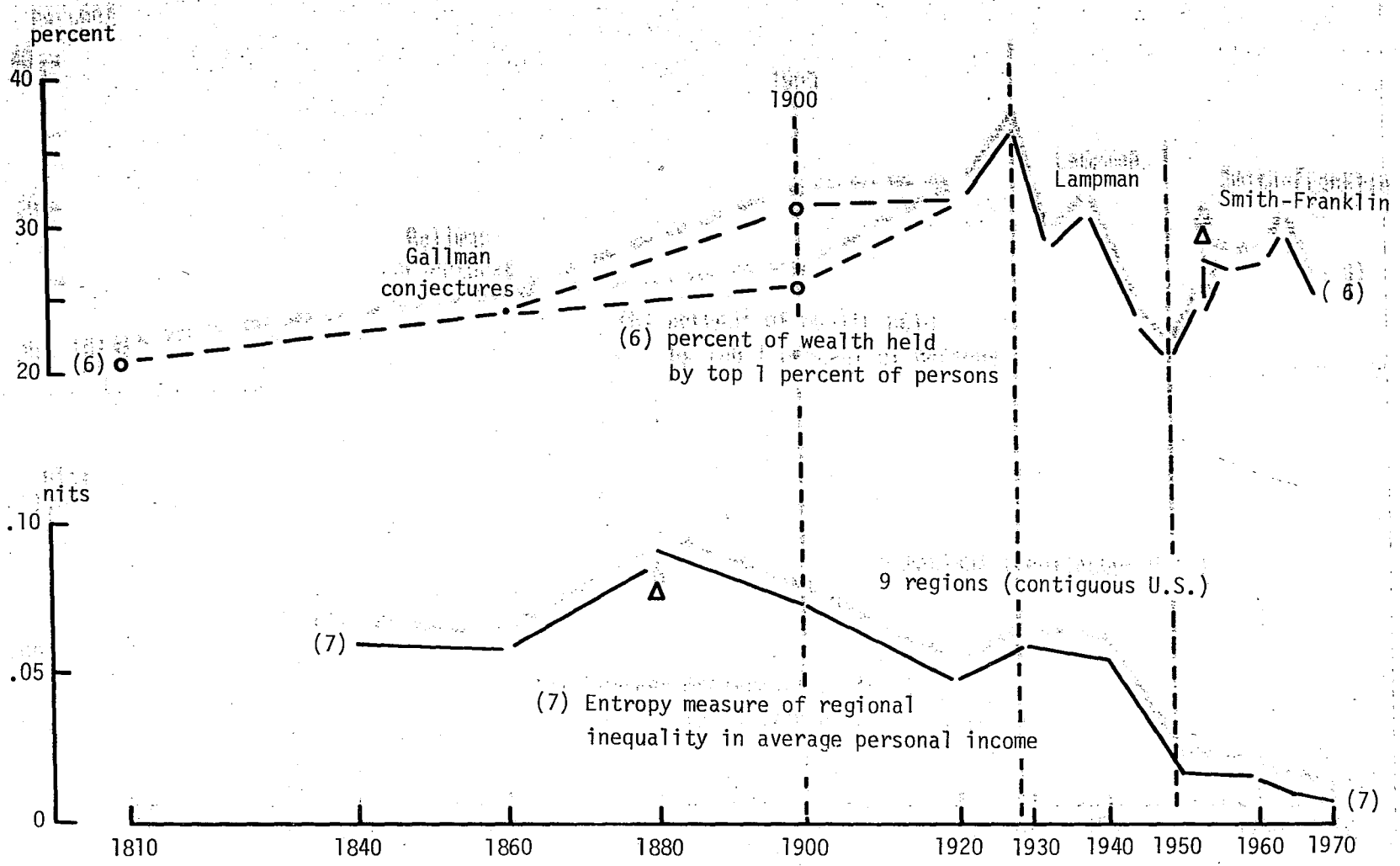


Figure 1 (cont.)
Measures Related to the Inequality of U.S. Income, 1840-1970, and Wealth, 1810-1970



by other series not shown here. The net change is impressive. The only factual question requiring a closer look is whether the Great Depression saw more levelling or less levelling than World War II. Both in the 1930s and in the 1940s the relative position of the top one percent of wealth holders declined (Series [6]). The classes gaining in relative shares differed between the two decades. During the Depression higher-paid employees, such as skilled and white-collar workers and professionals, suffered less than others simply by keeping their jobs at negotiated nominal wage rates that were less sensitive than others to the cycle. Meanwhile the positions of the urban unskilled, of the farm sector, and of profit-takers all declined. Thus the series on the relative position of the top five percent of employees (Series [4]) and the top-income regions (Series [7]) actually peak at the bottom of the Depression and are still no worse in 1940 than in 1929.[9] The 1940s, by contrast, saw a clear contraction of the entire income spectrum. The shares of top-percentile individuals dropped again, but this time the biggest gainers were those at the bottom--farm workers, blacks, the South, women, and unskilled urban white males.

A more limited set of time series is available for the period 1913-1929. For 1919-21 and 1929 we have data on state and regional personal income per capita (e.g., Series [7]), and income tax returns have yielded a picture of the relative position of the rich over the entire period. What data we have show a definite narrowing of inequalities from 1913 to 1920, and an equally clear widening across the 1920s. This pattern is evident in Series (4) and (5) of Table 1 and Figure 1. Other studies have come up with the same result. Soltow's annual series on the inequality of Wisconsin incomes shows a steep drop in inequality for 1913-1920, and a steep rise for 1920-1929 (Soltow [1971],

pp. 14, 135-139). The same pattern is shown in the estimates of factor shares, which show the property-and-profit share falling from 1913 to 1920 and rising over the next decade, both for the economy as a whole and for each major nonfarm sector.[10]

What is less clear about the 1913-1929 experience is the net change in inequality over the period as a whole. The share of the top one percent in personal income was apparently the same in 1913 as in 1929 (Series [5]). If estimates on regional inequalities were worked up from the state production figures in the 1910 Census, they would probably show that income was as unequally, or perhaps slightly more unequally distributed in 1909 as in 1929. Soltow's annual series on Wisconsin incomes shows greater inequality for 1913 than for 1929, and the series on factor shares tend to show the same. For the Age of the Income Tax, then, the years of greatest income inequality were 1913 and 1929, with inequality probably greater in 1913 than in 1929.

Before 1913 the evidence is very thin. We have data on the distribution of Massachusetts wealth and of Wisconsin income and wealth for various years from 1850 on (King [1915], Soltow [1971]). Gallman has taken wealth samplings from the 1860 manuscript census, in addition to comparing the wealth of super-rich families with aggregate wealth between 1840 and 1890 (Gallman [1966]). A growing list of studies is documenting the concentration of wealth in various cities and areas for years running far back into the colonial period. In addition, there are the regional income estimates, the dispersion of which is measured in Series [7].

The existing studies of wealth concentration suggest that the inequality of wealth-holding was slowly on the rise before 1913 starting before 1810, and possibly as far back as 1607.[11] That is, the literature to date supports

the trend views posed by Gallman's extrapolations from 1810 to 1900, which he derived by applying shifting population weights to his 1860 wealth subsamples (Series [6]). A drift toward inequality is certainly consistent with the estimated rise in saving's share of GNP across mid-century. The series on regional inequalities (Series [7]) has its own type of trend to inequality, one dominated by the outcome of the Civil War and slave emancipation. The dramatic shift in income and wealth away from the South probably raised the (unmeasured) inequality of incomes for the nation as a whole, and may also have heightened inequalities somewhat within the North.[12]

Over the two centuries of U.S. history, then, the trend in inequality appears to have had one long-run reversal, a switch from a lightly-documented drift toward inequality toward a better-documented equalization trend from World War I to the Korean War, followed by two decades of relative stability. The main uncertainty is whether incomes were as unequal again in 1929 as in 1913. The overall picture supported by the current evidence, however, is one of a widening followed by a narrowing of income inequality. The picture painted by the current evidence is exactly the one offered only as a cautious conjecture by Simon Kuznets twenty years ago (Kuznets [1955]), when fewer data had been gathered. The turning point came about when he said. The striking long-run change requires explanation.

III. Trends in Pay Ratios

The first step toward explaining the longer-run movement in inequalities is to muster some available evidence on what was happening to the ratios in the rates of pay received by particular groups. As argued above, this sort of information offers valuable clues for choosing between competing explanations

of the trend in overall income dispersion. Some hypotheses that seem to fit the overall movements may have their predictions contradicted by the behavior of individual pay ratios.

The kinds of pay ratios measured over long periods are ratios of the hourly or daily rates paid to employees whose jobs seem to change in skill only very slowly and at similar rates. Perhaps the most courageous use of a pay ratio for examining trends is to draw implications from the movement of the ratio of bricklayers' to building laborers' wages in southern England from the thirteenth century to the twentieth (Brown and Hopkins [1955]). The figures command interest, but deciding what they mean about skills and inequality requires knowledge of how the jobs changed and how the fortunes of workers in the building trades compared with those in the rest of society. The same caveats about coverage apply to each of the various modern series available on "skill differentials" or "skilled wage ratios" in major countries. For various stretches of years we have estimates of the ratios of journeymen's to helpers' and laborers' wages in the building trades, the ratios of tool and dye makers' to common laborers' wages in the nonelectrical machinery sector, and similar ratios within other sectors. Data can also be had on wage rates for farm laborers and teachers and (for fewer years) doctors and lawyers. Each of these can be compared to the others, but doubts remain whether each ratio is really representative of movements in relative rates of pay or inequality over any large part of society.

The reservations one might have about pay ratios lead to the expectation that such ratios might move every which way and show no particular link to movements in overall inequality. Even if so, such ratios are still useful for testing the working parts of larger hypotheses. Yet that expectation

meets a surprise when one looks at the behavior of pay ratios like those in Figures 2 and 3 and Table 2. It turns out that the behavior of pay ratios mirrors the behavior of the inequality measures, in both the short run and the long.

The short-run cyclical pattern of the pay ratios is generally countercyclical, like that of the measures of income dispersion. The pay ratios tend to drop in booms and to rise in recessions. This tendency is much more pronounced when the boom or contraction comes rapidly than when it takes a few years to gather momentum. This tendency is also a little more pronounced for teachers, whose pay contracts are longer in term. Thus the sharpest oscillation is in the ratio of teachers' to unskilled wages (Fig. 3) during the price level swings of World War I and its wake, during which the unskilled wage rate shot up and down with the volatile cost of living while teachers' nominal salaries were fixed for a year or two. The more controlled, or at least less sudden, inflations of the Civil War, World War II, Korea, and Vietnam lowered pay ratios more gently.

More striking is the long-run parallelism between the two kinds of indicators. Like the inequality measures, the pay ratios seem to be on the rise for the entire century ending in World War I. Burgess' industrial series (in Fig. 2) is the only one stating that the ratios prevailing on the eve of World War I had previously been exceeded (in 1876-1881), and even this series shows an upward trend from the 1840s to the 1910s. In view of how unrelated some of these occupations might have seemed, it is curious to find that both farm and industrial unskilled labor lost ground relative to various kinds of skilled craftsmen (Fig. 2) and public school teachers (Fig. 3) and top wealth holders (Fig. 1) for so many decades.

Figure 2. Skilled Wage Ratios in U.S. Manufacturing and Building, Selected Series, 1816-1972

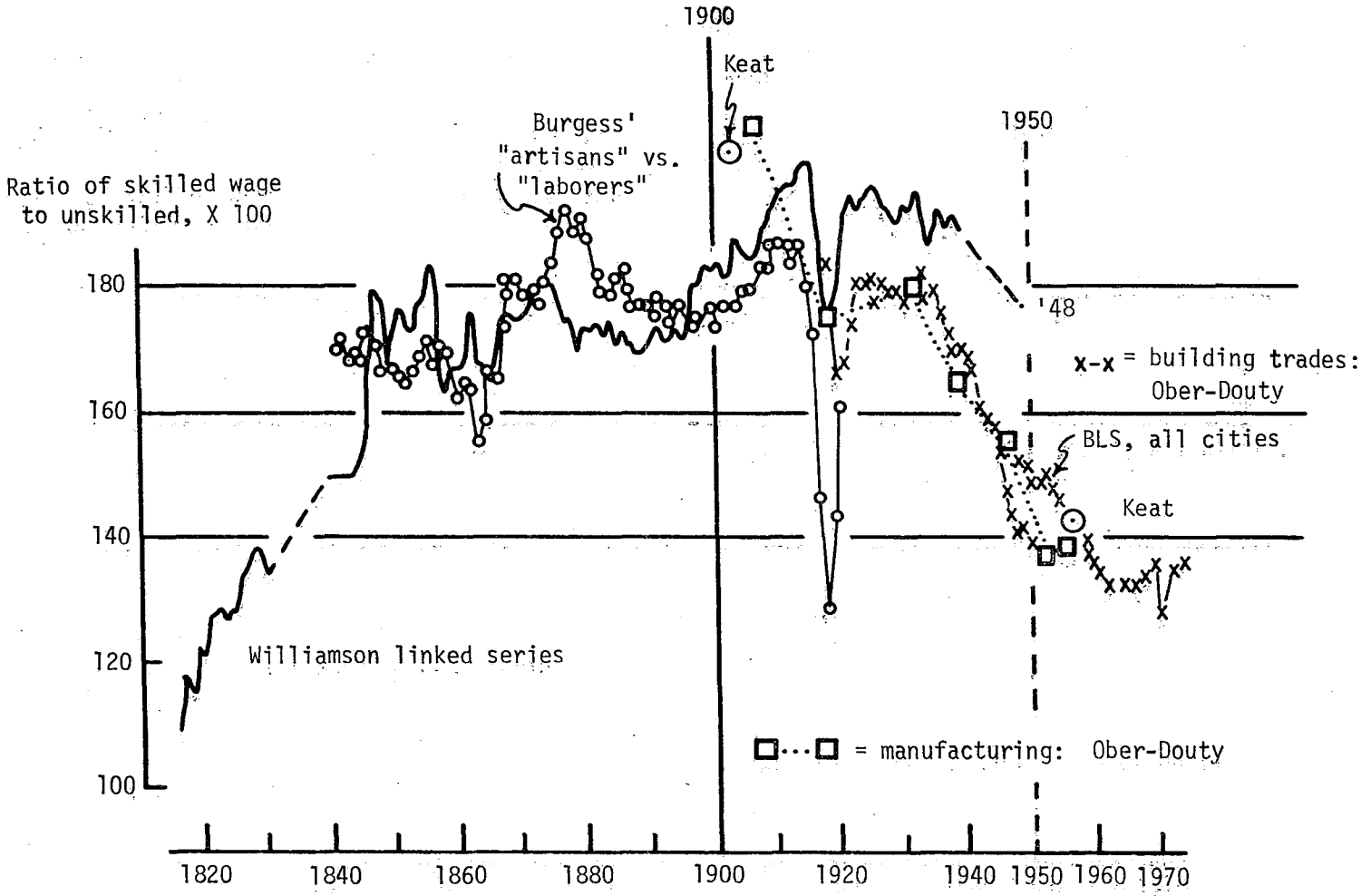


Figure 3. The Ratio of Teachers' Pay to the Wage Rate of Unskilled Labor, 1841-1970

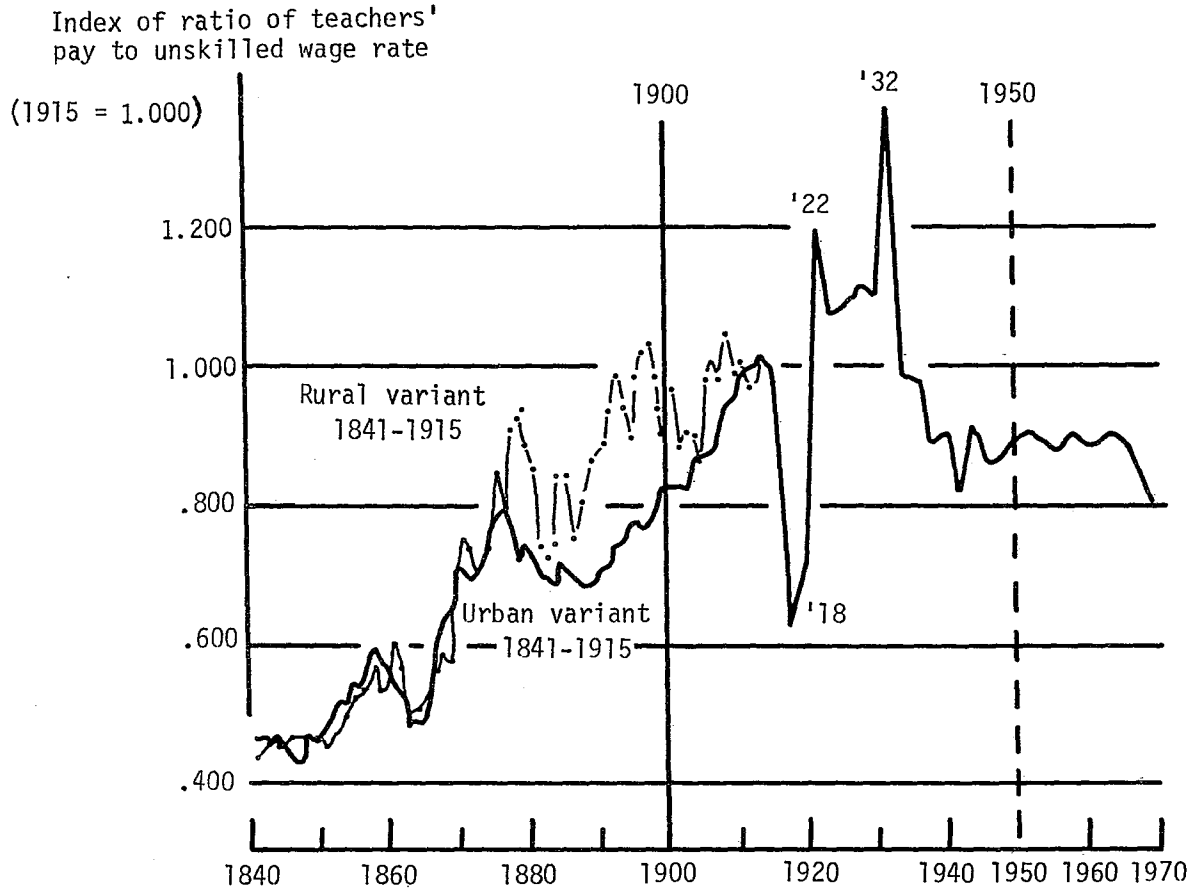


Table 2. Selected Pay Ratios, U.S., 1816-1972

Year	Ratio of skilled to unskilled wage rates (x100)					Index of ratio of public school teachers' pay rates to unskilled hourly wages (1915 = 1.000)	
	Williamson linked series	Burgess' "artisans" vs. "laborers"	Building trades		Manufacturing, Ober-Douty	Urban variant	Rural variant
			Ober et al.	BLS			
1816	109.4						
20	120.7						
30	134.6						
40	149.8						
1841	149.8	170.4				.461	.434
42	149.8	171.4				.462	.442
43	149.8	168.3				.459	.459
44	151.1	169.3				.466	.446
45	153.7	168.3				.448	.455
46	156.4	172.7				.435	.464
47	178.4	170.1				.425	.462
48	177.3	165.9				.433	.458
49	167.3	171.8				.466	.459
1850	173.6	166.7				.460	.480
51	176.2	165.6				.479	.446
52	173.8	165.2				.495	.465
53	173.5	166.8				.517	.477
54	176.9	168.6				.513	.498
55	178.1	171.0				.547	.525
56	183.6	167.3				.535	.535
57	167.9	170.3				.562	.538
58	163.0	169.8				.600	.585
59	166.8	167.0				.572	.533
1860	166.8	162.9				.564	.537
61	168.6	164.1				.544	.602
62	175.8	161.9				.526	.564
63	167.6	155.6				.482	.494
64	167.7	158.6				.489	.498
65	165.2	166.7				.486	.513
66	168.4	165.2				.530	.569
67	174.9	172.8				.605	.566
68	175.3	179.1				.638	.593
69	174.4	181.3				.650	.589
1870	175.4	181.0				.710	.675
71	176.1	178.6				.714	.755
72	177.4	180.7				.698	.745
73	181.2	177.5				.706	.704
74	181.0	180.4				.744	.732
75	179.6	183.7				.779	.743
76	176.2	188.7				.788	.853
77	174.0	193.0				.801	.808
78	174.5	192.4				.779	.915
79	169.7	189.0				.727	.926
1880	173.4	190.6				.749	.886
81	173.6	187.2				.733	.853
82	174.1	181.2				.704	.740
83	171.4	178.9				.693	.729
84	174.7	178.0				.689	.745
1885	170.3	180.7				.720	.846

Table 2. (Cont.). Selected Pay Ratios, U.S., 1816-1972

Year	Ratio of skilled to unskilled wage rates (x100)					Index of ratio of public school teachers' pay rates to unskilled hourly wages (1915 = 1.000)	
	Williamson linked series	Burgess' "artisans" vs. "laborers"	Building trades		Manufacturing, Ober-Douty	Urban variant	Rural variant
			Ober et al.	BLS			
1886	172.6	183.1				.713	.843
87	170.5	179.5				.699	.754
88	169.7	176.6				.686	.812
89	170.0	176.6				.687	.835
1890	170.2	177.3				.694	.874
91	173.2	174.8				.711	.891
92	170.6	178.4				.720	.935
93	171.7	177.0				.745	.989
94	173.5	174.0				.748	.945
95	171.8	176.7				.778	.892
96	171.9	174.8				.785	.984
97	179.7	173.9				.773	1.023
98	180.1	175.1				.792	1.030
1899	182.5	175.1				.818	.985
1900	182.5	177.0				.830	.901
01	182.9	173.7				.829	.966
02	180.9	176.5				.834	.885
03	182.6	177.5				.827	.910
04	187.8	177.3				.869	.900
05	185.7	179.8				.867	.873
06	184.6	179.9				.880	.985
07	184.9	179.0	185		205	.885	1.014
08	187.9	182.7	188			.925	.985
09	190.9	182.7	191			.954	1.046
1910	191.9	186.3	192			.960	.985
11	194.9	187.0	195			.992	1.004
12	196.0	186.1	197			.998	.972
13	196.0	183.7	197			.999	.973
14	198.9	186.2	199			1.017	1.011
1915	198.9	180.6	199			1.000	1.000
16	198.9	172.6	199			.948	.881
17	187.6	146.2	191			..	.762
18	176.4	128.6	183		175	.636	.681
19	172.2	143.6	180			..	.734
1920	180.6	161.5	166			.726	.722
21	190.4		168			..	
22	194.3		174			1.197	
23	191.7		180			..	
24	193.3		180			1.075	
25	195.2		181			..	
26	195.3		177			1.087	
27	192.2		180			..	
28	191.9		179			1.115	
1929	189.3		179			..	

Table 2. (Cont.). Selected Pay Ratios, U.S., 1816-1972

Year	Ratio of skilled to unskilled wage rates (x100)					Index of ratio of public school teachers' pay rates to unskilled hourly wages (1915 = 1.000)
	Williamson linked series	Burgess' "artisans" vs. "laborers"	Building trades		Manufacturing, Ober-Douty	
			Ober et al.	BLS		
1930	192.2		177			1.143
31	190.3		179		180	..
32	195.1		179			1.375
33	191.2		182			..
34	186.5		178			.992
35	188.0		179			..
36	191.7		175			.983
37	189.3		172			..
38	190.1		170		165	.896
39	188.8		170			..
1940	..		169			.902
41	..		167			..
42	..		160			.821
43	..		159			..
44	..		158			.915
45	..		154			..
46	..		147		155	.862
47	..		143	155.7		..
48	177.3		140	151.0		.864
49			141	151.0		..
1950			139	148.5		.897
51			138	148.6		..
52			138	150.0	137	.902
53				147.7		..
54				145.9		.895
55				143.1	138	..
56				140.6		.883
57				138.4		..
58				138.8		.903
59				135.4		..
1960				134.0		.891
61				131.4		..
62				132.4		.898
63				132.2		..
64				131.2		.911
65				131.1		..
66				131.6		.889
67				132.9		..
68				134.1		.855
69				135.6		..
1970				127.2		.812
1971				134.1		
1972				135.4		

Sources and Notes to Table 2 and Figures 2 and 3

Williamson linked series: Jeffrey G. Williamson, "The Relative Rental Price of Men, Skills, and Machines: 1816-1948," University of Wisconsin, Graduate Program in Economic History, Discussion Paper EH 74-25, July 1974, Tables 5 and 11. For the years 1816-1860, Williamson compared a variety of sources. For 1860-1890, he used data from the Aldrich Report cited in Long. For 1890-1903, he took an average from the building trades plus 10 manufacturing industries, given in the 19th Annual Report of the Commissioner of Labor(1904). The years 1904-1907 were covered by Bureau of Labor Bulletins. For the period 1907-1914, Williamson used the Ober series for the building trades (also given in this table) as an index linked to the others at 1907. His figures for 1914-1948 are the National Industrial Conference Board manufacturing series. For further details see Williamson, op. cit. I am deeply indebted to Professor Williamson for making this series available.

Burgess' "artisans" vs. "laborers": W. Randolph Burgess, Trends in School Costs (New York: Russell Sage Foundation, 1920), Table 8. His "artisans" were "blacksmiths, carpenters, machinists, painters, and printers(compositors)." (p. 70.) He is vague about the construction of the series, but reveals that he spliced together various series taken from the U.S. Department of Labor, the reports of the Massachusetts Bureau of Labor Statistics, the Weeks Report, and the Aldrich Report (p. 70).

Building trades: Harry Ober, "Occupational Wage Differentials, 1907-1947," Monthly Labor Review, vol. LXVII(August 1948), p. 130; H.M. Douty, "Union Impact on Wage Structures," Proceedings of the Industrial Relations Research Association, 1953, pp. 61-76; and, for the different 1947-1972 series, U.S. Department of Labor, Bureau of Labor Statistics (BLS), 1973 Handbook of Labor Statistics Washington: GPO, 1973), p. 218. The series is the average ratio of hourly wage rates for journeymen and for helpers and laborers in the building trades, averaged from such data for a number of cities.

Manufacturing, Ober et al.: Ober, op. cit.; Douty, op. cit.; and Herman P. Miller, Income Distribution in the United States (Washington: GPO, 1966), p. 79.

Keat (in Figure 2): Paul G. Keat, "Long-Run Changes in Occupational Wage Structure, 1900-1956," Journal of Political Economy, vol. 68(December 1960), p. 595, gives the following benchmark skilled wage ratios averaged over a wide range of manufacturing industries:

1903: 205 (%)
1956: 142

Additional annual series on dispersion in wage rates for many manufacturing industries from 1934 through 1969 can be found in Albert Rees and Mary T. Hamilton, "Changes in Wage Dispersion," in John F. Burton et al.(eds.), Readings in Labor Market Analysis(New York: Holt Rinehart and Winston, 1971), p. 486. The Rees-Hamilton series plummet from 1941 to about 1947, then rise somewhat across the 1950's and remain steady across the 1960's.

Sources and Notes to Table 2 and Figures 2 and 3 (Continued)

Construction of the series comparing teachers' rates of pay with unskilled wage rates:

Urban variant, 1841-1920: For 1841-1890, the teachers' pay series is based on the average weekly salary for male public elementary and secondary school teachers in 21 cities given in W. Randolph Burgess, Trends in School Costs (New York: Russell Sage Foundation, 1920), pp. 32-33. These values were multplied by a constant so that the series linked up in 1890 with the series used for 1890-1970. This later series is an index derived by dividing the average annual pay of public elementary and secondary school principals, supervisors, and teachers (all regions, including rural) by the number of days in the average public school year. The series on the average annual pay of instructional staff is that regularly published in the Annual Report of the U.S. Commissioner of Education through 1915, then in the Biennial Survey of Education in the United States through 1958, and then in the Office of Education's Digest of Educational Statistics from 1962 to the present. The series on the average number of days in the public school year is from Abbott L. Ferriss, Indicators of Trends in American Education (New York: Russell Sage Foundation, 1969), pp. 384-385, and the 1972 Digest of Educational Statistics.

The mixing of supervisors, principals, and teachers together in the same average might have led to distortions if the shares of each differently-paid occupational group in the total had changed greatly over the years. Data in the Historical Statistics of the United States (Series H234-H240) show that the share of supervisors and principals drifted upward only very slowly from 1920 to 1956 and was low enough in 1920 that any earlier upward drift in the share of these higher paid groups could not have affected the trend greatly. Since women were lower paid than men teachers, it is also worth asking whether shifts in the sexes' shares of teaching positions could have affected the trends in average teachers' pay in a way that misstates the trend in what should represent a fixed-weight index. The share of the (higher-paid) males in classroom teaching positions was declining throughout the nineteenth century, dropping from 38.7 percent in 1870 to its all-time low of 16-17 percent for the 1920's. It rose slowly thereafter. This trend in the sex ratio among teachers means that the index developed here may slightly understate the rise in teachers' relative pay to the 1920s and understate its decline thereafter.

The unskilled wage rate used as the denominator in the urban variant, 1841-1920, is Burgess' series for "laborers" (op.cit., p. 71).

Rural variant, 1841-1920: The teachers' pay series is based on the average weekly salary for rural male teachers in public elementary and secondary schools in 20 counties in 10 states given in Burgess (op.cit., pp. 32-33).

The unskilled wage rate is the index of wage rates for Vermont male farm hands given in T.M. Adams, Prices Paid by Vermont Farmers...1790-1940... (Burlington: Vermont Agricultural Experiment Station, 1944), Experiment Station Bulletin no. 507, pp. 87-89.

Sources and Notes to Table 2 and Figures 2 and 3 (Continued)

Construction of the series comparing teachers' rates of pay with unskilled wage rates (Continued):

Common variant, 1920-1970:

The series for teachers' pay is the one described in the urban variant above for the years from 1920 on.

The series on the unskilled wage rate after 1920 is a splicing of three series. For 1920-1939, I used the data on average hourly earnings of unskilled male production workers in 25 manufacturing series reported by the National Industrial Conference Board in its Economic Almanac, 1951-52 (New York: NICB, 1952), p. 274. For 1939-1964, I used the union scales for the hourly wage of helpers and laborers in the building trades, from NICB, Economic Almanac, 1967-68 (New York: NICB, 1968), p. 67, and Historical Statistics of the United States, Series D646. For 1964-1972, the conveniently available series was the average hourly farm wage rate reported in various issues of the Economic Report of the President.

Between the years just before World War I and the Korean War years, the pay ratios again mirror the behavior of the aggregate measures of inequality. Both sets of indicators record an impressive narrowing of gaps.[13] The pay ratios shot downward in World War I, recovered something like their prewar levels by 1922, and remained near their all-time peaks for the rest of the 1920s. The relative position of the teachers, unlike all other series, reached its long-run peak not before World War I but at the end of the 1920s (ignoring the artificial peak in the school year 1931-32, when negotiated annual teacher salaries were honored while hourly wage rates plummeted). Across the New Deal years, the teachers and skilled blue-collar groups saw their pay position erode relative to those unskilled laborers who held jobs, even though the concentration of unemployment in the lowest-paid ranks meant that the skilled groups suffered less than the unskilled as a whole.

During the 1940s and the Korean War, the pay ratios, like overall inequality, contracted further. This erosion of pay advantage for skills was experienced not only by the skilled blue collar workers and teachers represented in Figures 2 and 3, but by almost all professional groups. In the 1940s unskilled workers were also gaining on lawyers, dentists, college teachers, and engineers. Within the ranks of the engineers the premia for several years' experience also dropped. Of the professionals only physicians in independent practice seemed to advance their rates of pay as fast as unskilled labor (Blank and Stigler [1957], p. 25 and App. A).

Since the Korean War the pay ratios, like inequalities, have moved less dramatically than in earlier years. The difference is that the pay

ratios all show some decline. The decline shown for the building trades was steeper than most. Data for several other industries show much less decline and on some measures even rose slightly (OECD [1965], p. 36; Rees and Hamilton [1971]; Evans [1971], p. 163). It is interesting to note that teachers' relative wages, after remaining steady across the 1950s, dropped off somewhat in the post-Sputnik, baby-boom-related "teacher shortage" of the 1960s.

Thus far we have been examining ratios of nominal incomes and rates of pay that are not adjusted for group differences in taxes, hours worked, life expectancy, or the cost of living. Adjusting for these factors would only accentuate the long-run patterns just described. The rise in progressive taxation, for example, has made the decline in after-tax income inequality even sharper after 1913 than was implied above.

Adjusting the income figures in Table 1 for the number of hours worked also reinforces the shift toward a levelling trend early in this century: the yearly hours of professionals and managers have hardly changed at all in this century (Wilensky [1961]), while laborers' yearly hours dropped considerably, before World War II for nonfarm and after World War II for farm laborers. These trends in hours have no bearing on the trend in pay ratios, but they do mean that the trend in the inequality of full-time income was more steeply downward than the trend in income unadjusted for hours. A similar twist to the trend may have been imparted by the twentieth-century jump in life expectancy. The dispersion in length of life (and morbidity) has dropped radically, since child and early adult mortality rates have plummeted without any great change in life expectancy for the elderly. To the extent that the dispersion in survival rates is

a dispersion by income class, potential incomes per lifetime have again levelled more rapidly since 1900 than the inequality series in Table 1 imply.

Adjusting the income and wage rate measures for differences in the cost of living would not alter the picture of long-run trends painted in the figures above. The fact that different classes buy goods in different proportions, and often at different prices, is a potentially important influence on the distribution of real purchasing power. Current research is finding, however, that movements in class living costs have important effects only over shorter periods but leave the long run trends in inequality essentially unchanged.[14] This result, combined with the points about taxes, hours, and life expectancy, makes it clear that the trends in the inequality of real lifetime potential incomes are the same as those shown in Figures 1 through 3, but with a sharper levelling of incomes in this century.

It is interesting to note that several other high-income countries, but not all, have had essentially the same experiences as the United States. The rough correspondence in the timing of movements in overall inequalities have been pointed out by other authors (Kuznets [1955], Lydall [1968, ch. 6], Paukert [1973]). What deserves more stress is that the similarities in pay ratio trends are in many cases at least as clear as the similarities in aggregate inequality trends.

A number of other countries apparently went through a shrinkage of pay differentials at various times between 1913 and 1950, with little trend shown in the available data before 1913 or after 1950. British pay ratios were unchanged up to 1913 from 1880 at the latest, and perhaps much earlier (Knowles and Robertson [1951], pp. 110-113; Phelps Brown and Hopkins [1955],

pp. 205-206). They followed the American path from 1913 on, dropping considerably in both World Wars, regaining part of the wartime drop in the 1920s, but holding steady after World War I (Knowles and Robertson, loc. cit.; Phelps Brown and Hopkins, loc. cit.; Routh [1965], pp. 104-107; United Nations [1967], Ch. 5, p. 32). Germany showed a somewhat similar pattern: no clear trend in pay ratios before World War I, a sharp drop during that war, a partial rise in the 1920s, and no change after World War II. What is different about the German ratios is that no further changes were evident after the 1920s (Bry [1960], pp. 81-89, 363-365; United Nations [1968], loc. cit.; OECD [1965], pp. 36-37). Data from Canada, Norway, and Australia also record a contraction in pay differentials between either the eve of World War I or the 1920s and the start of the 1950s (Woods and Ostry [1962]; Soltow [1965], p. 133; Leiserson [1959], pp. 136-141; Lydall [1968], pp. 191-193), followed by a trendless postwar experience (United Nations [1968], loc. cit.; OECD [1965], pp. 36-39).

Not all high-income countries[15] have shared the same chronology of pay ratios. One that has not is Japan.[16] Occupational wage differentials show no net change between 1880 and 1960 (Taira [1970], pp. 16, 25, 78). In the case of Japan, these occupational wage differentials have less meaning than in other countries. Japanese employment institutions have long been such as to make differentials by age, size of firm, and sector better indicators of aggregate inequality than the skilled wage ratio. Still, these other differentials also record no long-run trend between 1880 and 1960, though they do show some noteworthy cycles. Since 1960, inequalities and pay ratios have been compressed, especially for younger workers, but it is

too early to tell if this is a new trend (Taira [1970], Evans [1971]).

IV. The Correlation with Labor Force Growth

What could explain these long-run trends? What changes were most important in accounting for the fact that inequalities and pay ratios reversed their long-run trend sometime near World War I? Were these changes at work in other countries as well? How do they relate to fertility?

I shall suggest in this and the next section that it is difficult to account for the change in trend without assigning a principal role to movements in the quantity and average "quality" of the labor force. Movements in the number of persons in the labor force affect overall inequality by affecting the ratio of profits to (all) wage rates, while movements in the average quality of labor should move the pay ratio. Sections VI and VII identify how movements in the size and quality of the labor force are in turn affected by movements in fertility.

Although labor supply is given the central role here, it must be stressed that a monocausal theory of income distribution is not being advanced. It is only over long periods of time, such as periods each a decade or longer, that the prominence of labor supply as a source of inequality seems to stand out. For shorter periods, and even for comparisons of certain decades, other factors seem to deserve equal emphasis. Even over the long run, it is incorrect to assume that other factors lack a strong unit impact on the distribution of income. Rather, what makes the long-run role of labor supply central is that of all the several forces having a strong unit impact on the degree of inequality, labor supply is the one that happens to have changed greatly.

With this warning about monocausality in mind, let us examine the raw correlation between trends in inequalities and trends in labor supply, in order to suggest what story might be told in terms of the labor supply trends alone. The next section takes up the issue of what other forces might really deserve the credit that this first simplified view attributes to labor supply.

Figure 4 and Table 3 compare movements in pay ratios to movements in two measures of labor force growth. The series on changes in pay ratios is acting partly as a proxy statistic for the movements in overall inequality plotted in various ways in Figure 1 above. For the period 1869/78 on, the more relevant series on the growth of the labor force is that showing the changes in total man-hours worked in peak employment years in the private economy. This series takes account of the trends in part-time work and in average full-time yearly hours, as well as trends in the number of persons in the labor force. We lack hard data on trends in total man-hours worked before 1869/78, but qualitative evidence suggests that man-hours per person employed changed little, making the growth of the number of persons in the labor force a good measure of the growth of man-hours supplied in the early and mid-nineteenth century.

Over long periods of time, there is a positive correlation between the growth of the labor force and the rate of movement toward income inequality. This is true whether labor force growth is being compared with the wage-ratio movements in Figure 4 or with changes in the inequality measures in Figure 1. The century ending in 1915 was one of rapid growth in the size of the labor force and widening inequalities. The next forty years saw a narrowing of inequality on all fronts, along with much lower rates of growth in the

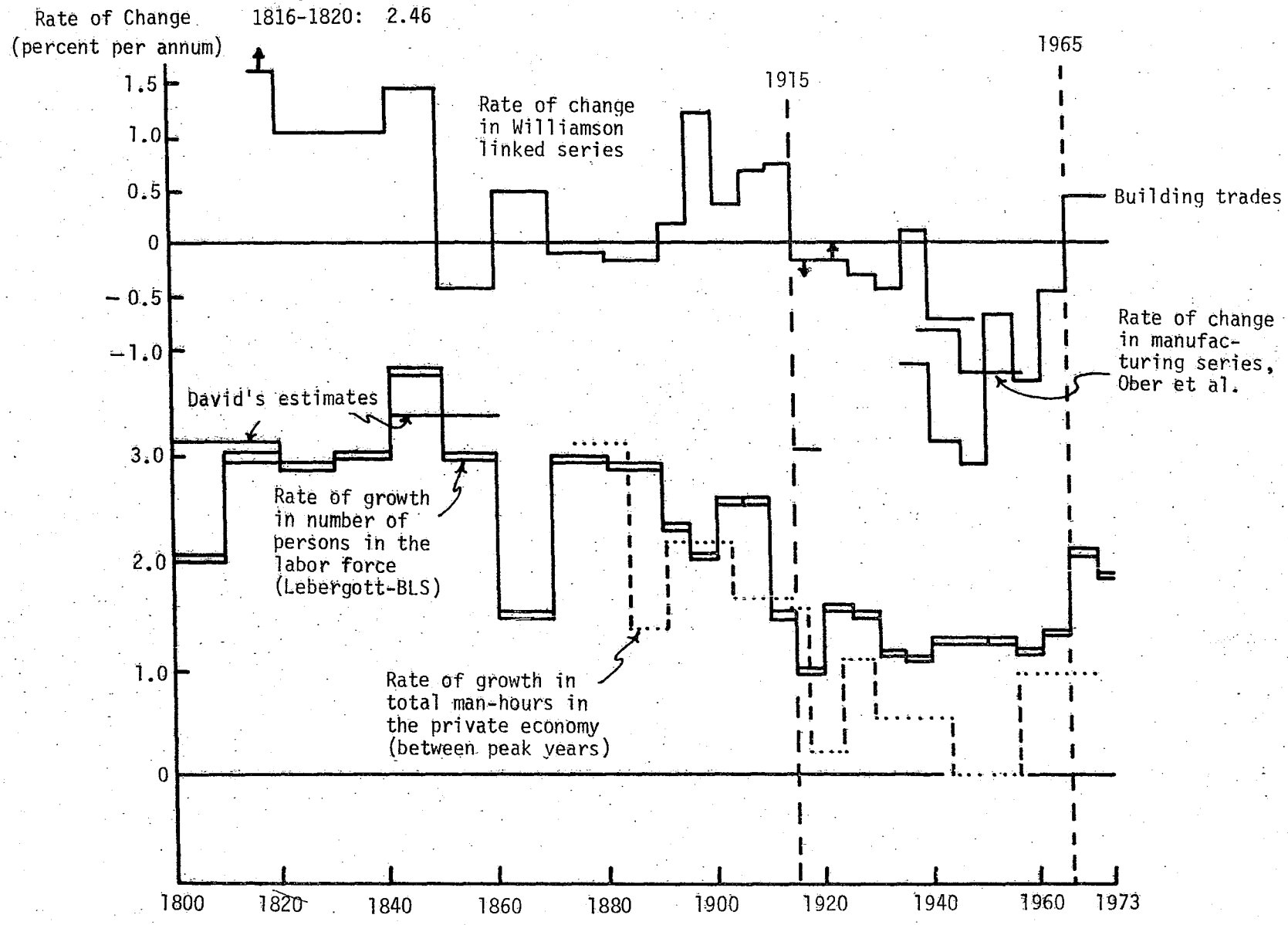


Figure 4. The Rate of Change in the Skilled Wage Ratio, 1816-1972, Compared with Rates of Growth in the Labor Force, 1800-1973

Table 3. Rates of Growth in the Size and Quality of the Labor Force, Selected Periods, 1800-1973.

(Percent per annum)

SIZE				QUALITY			
Period	Total labor force, persons 10 and older	Period	Total private man-hours	Period	Denison's index of labor input/man-hr.	Period	Median Schooling of population 25 and over
	David estimates						
1800-20	3.11						
1820-40	2.95						
1840-60	3.36						
	Lebergott-BLS						
1800-10	2.04						
1810-20	2.97						
1820-30	2.92						
1830-40	2.98						
1840-50	3.77						
1850-60	2.98						
1860-70	1.52						
1870-80	2.96	1869/78-1879/88:	3.22				
1880-90	2.93						
1890-95	2.35	1879/88-1892:	1.39				
1895-00	2.10						
1900-05	2.57	1892-03:	2.21				
1905-10	2.57	1903-13:	2.21	1909-15:	0.57		
1910-15	1.53	1913-17:	1.70			1910-20:	0.12
1915-20	0.96	1917-23:	0.26				
1920-25	1.60			1915-29:	0.71	1920-30:	0.24
1925-30	1.53	1923-29:	1.15				
1930-35	1.19					1930-40:	0.24
1935-40	1.11	1929-43:	0.56	1929-48:	1.07		
1940-50	1.27a	1943-56:	-0.01			1940-50:	0.78
1950-55	1.28			1948-58:	0.88	1950-57:	1.87
1955-60	1.16	1956-69:	1.00				
1960-65	1.35			1958-65:	0.38	1957-65:	1.34
1965-70	2.14			1965-69:	0.65	1965-72:	0.48
1970-73	1.94						

a:	1940-45	1945-50
total labor force:	3.01	-0.65
civilian labor force:	-0.45	3.22

Sources for Table 3:

Total labor force, persons 10 and older: The David estimates for early periods are from Paul A. David, "The Growth of Real Product in the United States before 1840: New Evidence, Controlled Conjectures," Journal of Economic History, vol. XXVII, no. 2(June 1967), p. 196. The Lebergott-BLS series is from U.S. Bureau of Economic Analysis, Long-Term Economic Growth, 1860-1970(Washington: GPO, 1973), Series A107(to 1930) and A108(from 1930 on), plus the Economic Report of the President for the most recent years and the Lebergott volume cited in Long-term... for the early nineteenth century.

Sources for Table 3 (Continued):

Total man-hours in the private economy: U.S. Bureau of Economic Analysis, op. cit., Series A68.

Denison's index of labor input per man-hour: 1909-1929 - Edward F. Denison, The Sources of Economic Growth and the Alternatives Before Us (New York: Committee for Economic Development, 1962), p. 85. 1929-69 - Edward F. Denison, Accounting for United States Economic Growth, 1929-1969 (Washington: Brookings Institution, 1974), Table 4-1. Denison's index has been criticized as an overestimate of the rate of growth of labor quality attributable to schooling by David Schwartzman, "The Contribution of Education to the Quality of Labor, 1929-1963," American Economic Review, vol. LVIII, no. 3, Part 1 (June 1968), pp. 508-514. Schwartzman's criticisms, however, do not seem to alter the ranking of different time periods according to their rates of growth in labor quality per man-hour.

Median years of schooling of population 25 and over: U.S. Bureau of Economic Analysis, op. cit., Series B40, reproducing the estimates of Folger and Nam and of the decennial censuses. Other estimates have been offered for 1960 and earlier census years by Susan O. Gustavus and Charles B. Nam, "Estimates of the 'True' Educational Distribution of the Adult Population of the United States from 1910 to 1960," Demography, vol. 5, no. 1 (1968), pp. 410-421. The Gustavus-Nam revisions lower the median level slightly for 1960 and increasingly for each earlier census. As a reault, using their revised estimates raises the rate of growth in median schooling of adults for each decade from 1910-1960, and slightly raises the rate for the early 1960's as well. Their revisions do not cover more recent years, and I have assumed that the recent estimates are not subject to the second-guessing they applied to the Folger-Nam backward projections based on the age distributions in 1950 and 1960.

labor force. After 1955 the expansion of the labor force picked up moderately, while measures of inequality showed little further change. Within each of these longer periods, to be sure, the correlation between labor force growth and income inequality is much less evident--but the long-run correlation is unmistakable nevertheless.

Glancing at the rate of growth of the labor force gives insights into the determinants of overall inequality, but it fails to explain the movement of the pay ratios in any direct way. A faster expansion of the number of persons in the labor force would add more unskilled and more skilled workers in uncertain proportions. It is therefore not obvious how an expansion in the size of the labor force should affect the skilled wage ratio. The relevant labor supply indicator for discussing pay ratios is the average skill level, or average "quality," of the labor force. Whatever makes it fall will tend to raise the skilled wage ratio.

Movements in the average skill level of the labor force have been estimated by Edward F. Denison (1962) for the period 1909-1958. As shown in Table 3, his estimates suggest that the growth of labor "quality" accelerated from 1910 to the decade after World War II--a span of time over which the rate of growth in the size of the labor force had slowed down (and temporarily stopped in the period 1943-1956). This acceleration in labor force quality stems mainly from trends in schooling, which are also represented in Table 3, by the rates of growth in median years of schooling. The series on schooling growth shows the same acceleration shown in Denison's series during the period of declining growth in the numbers of persons and man-hours in the labor force. The figures on schooling levels also show that in the 1960s and early 1970s, when the labor force was beginning to grow faster again, the rise in median and mean years of schooling for persons over 25 slowed down. A closer look at the advance of

schooling suggests that slower rates of growth in the schooling of the labor force should continue through the 1970s. The reason is that the generation of children born in the postwar baby boom has thus far not shown enough more schooling than the immediately preceding cohorts to match the previous rates of growth in schooling (Beverly Duncan [1968], p. 611).[17] It further appears unlikely that an acceleration of accumulated training on the job has been offsetting the deceleration of adults' total schooling since the 1960s, in view of the fact that the labor force is becoming younger and less experienced as postwar boom babies enter its ranks.

Within the twentieth century, then, it appears that the rate of growth of the "quality"--essentially, the schooling--of the labor force accelerated when that of the number of man-hours slowed down, and later slowed down when the growth in man-hours and persons picked up again. On both the "quality" and quantity fronts, a reversal in the growth rate trend came in the 1960s. This inverse relationship suggests a reason for the otherwise puzzling correlation between the trends in the skilled wage ratios and the trends in the growth of man-hours. It is not surprising that the skilled wage ratios and teachers' pay ratios declined rapidly in the 1940s and early 1950s, when the quality of the labor force was growing rapidly. Nor is it surprising that the same ratios also were dropping in the interwar period, when the supply of low-skilled immigrants was curtailed by the restrictive immigration laws of 1921, 1924, and 1929. The trends in the average quality of the labor supplied were in turn correlated inversely with the trends in man-hours, yielding a correlation in Figure 4 between the growth of the size of the labor force and the trends in pay ratios.

There even seems to be reason to believe that the concurrence of changes

in these various trends in the last half-century stem from the nature of growth in the labor force. The fall in fertility and the shutting off of immigration, both of which kept down the growth of the size of the labor force before the 1960s, both may have helped to accelerate the growth of its average skill level, thereby pushing down the skilled wage ratios between the 1920s and the 1960s. Both made the labor force rise in average age and experience, and a later section of this chapter will argue that the reduction in fertility before World War II, like the shutting off of immigration, may have accelerated the advance of schooling from cohort to cohort.

To judge how the rate of growth of skills before 1909 compared with more recent rates, one must use less direct measures of labor force quality. Instead of the schooling of the labor force itself, we have data on the enrollment and attendance rates of children, most of whom were to enter the labor force later, plus important data on immigration. The data on enrollment and attendance rates (Historical Statistics [1960], pp. 207, 212; U.S. Bureau of Economic Analysis [1973], Series B36 and B39) show no clear difference between the rates of growth in schooling per child between the second half of the nineteenth century and the first half of the twentieth. The only clear break comes around 1950, when the growth of both enrollment rates and days attended per enrolled pupil decelerates. Note that these indicators refer only to trends in the schooling of the part of the labor force that grew up in the United States.

A clearer contrast between the eras before and after, say, 1909 or 1915 is offered by what we know about immigration into the U.S. Before World War I fluctuations in the average skill level of the labor force were apparently dominated by changes in immigration. Immigration often accounted for a third

of the growth in the U.S. labor force. More relevant for the history of skilled wage ratios, the level and nature of immigration fluctuated considerably. When the rate of new arrivals jumped, the economy was presented with a generous supply of workers with lower levels of skills and market contacts than characterized the U.S. labor force as a whole (Thomas [1973], ch. IX; Higgs [1971]). The shortfall in their relative skills also fluctuated across the nineteenth and early twentieth centuries.

Figure 5 illuminates the link between immigration and trends in wage ratios, the growth of the labor force, and the average quality of the labor force. The period in which new arrivals from abroad had the greatest impact on the U.S. labor force was the decade 1846-1855, when a flood of Irish (and Germans) came to America. The period of second greatest impact in proportion to the size of the U.S. labor force was the last decade of peace before World War I. These two decades of peak influx were special in other ways as well. They were the decades in which the relative occupational "quality" of the immigrants was lowest. The data on the occupational classes of immigrants single out the Irish wave in mid-century as one in which the unskilled occupations reached their highest share of the total declared occupations. The 1903-1913 wave consisted primarily of immigrants from lower-income, non-English-speaking countries in eastern and southern Europe. Both waves helped to create the "labor aristocracy" that gave the English-speaking skilled native workers as high a pay advantage over the unskilled as skilled workers enjoyed in any other high-income country. The Williamson series on the skilled wage ratio in Figure 2 singles out theperiod of heavy immigration at mid-century as the one in which the skilled wage ratio shot up to record levels, and all the series in Figures 1 through 3

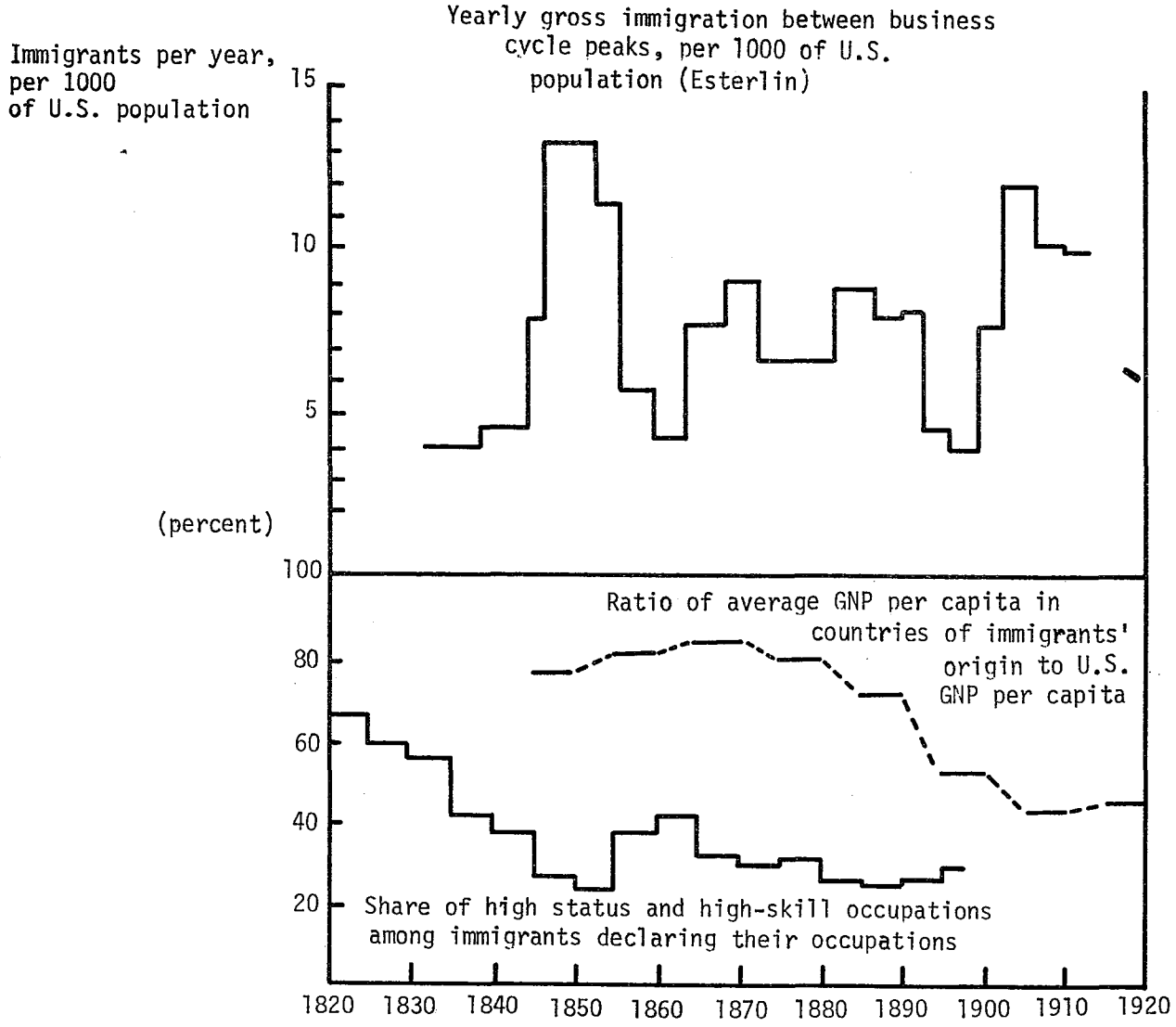


Figure 5. The Size and Economic Status of Immigration Flows into the United States, 1820-1920

Notes and Sources for Figure 5.

(a) Yearly gross immigration between business cycle peaks, per 1000 of U.S. population: Richard A. Easterlin, Population, Labor Force, and Long Swings in Economic Growth (New York: Columbia University Press, 1968), Table B-2. The series stops with 1910-13.

(b) Ratio of average GNP per capita in countries of immigrants' origin to US GNP per capita: Appendix G in the author's forthcoming book on Fertility and Scarcity in America. The observations plotted refer to the destinations' shares in immigration into the U.S. in the second halves of decades (e.g. 1846-50, 1856-60). The ratios of GNP per capita to that for the US, as explained in Appendix G, are for the preceding US census years (e.g. 1840 for the 1846-50 immigrants).

(c) Share of high-skill and high-status occupations among immigrants declaring their occupations: U.S. Bureau of the Census, Historical Statistics of the United States...(1960), Series C115-C132. The figures refer to average quinquennial shares taken by the categories "professional," "commercial," and"skilled" in total declared occupations. The last observation is 1896-98, after which a new and non-comparable occupational classification was adopted.

identify the last decade before World War I as a nadir in the relative status of unskilled labor.

It appears from this partial evidence that if we had a series on the rates of growth in the relative skill of the labor force from 1800 to the present, a consistent pattern would be seen. The periods in which the size of the labor force grew the fastest--in particular, the entire period before World War I--were periods in which the growth of the average skill level of the labor force grew slowly. And the period of slower growth in the labor force--roughly, the half-century from 1915 to 1965--was one of relatively rapid upgrading of the skill of the labor force. Furthermore, the periods in which numbers grew relatively fast and average skill relatively slowly were periods of rising (or steady) inequalities. The levelling of incomes was confined to the period of growth more in the quality than in the size of the labor force. There is a correlation, in other words, that points unmistakably at an explanation of inequality trends in which labor supply is the prime variable.

Exactly the same sort of correlation is suggested by a superficial glance at experience in other countries. Data on longer-run trends in the quality of other countries' labor forces are not yet gathered, but the correlation between pay ratios and the growth of the number of persons in the labor force holds for other countries' recent history as well as for our own. In Britain, as in the United States, the period from about 1913 to the first decade after World War II is both the period in which pay ratios and inequality plummeted and the period of slowest growth in the size of the labor force. Germany experienced both her only sustained drop in skilled wage ratios and a stagnation in growth of population and labor force between

the 1900s and the 1920s, primarily due to World War I.[18] Canada's contraction of skilled wage ratios between the early 1930s and 1950 also coincided with a period when the size of the Canadian labor force grew more slowly than it grew in the peak growth period of 1901-1911 or in the 1950s (Urquhart and Buckley [1965], pp. 55-66). The correlation even seems to fit the quite different economic history of Japan. As noted above, wage differentials by skill, age, industry, and size of firm have shown little long-run trend, and were as high as ever by about 1960. The same is true of the rate of growth of the Japanese labor force, which was at least as rapid in the 1950s as in any earlier decade (Bank of Japan [1966], pp. 53-57). For other countries, as for the United States, it would be worth investigating possible causal links behind this correlation, links that may also relate to the rate of growth in the average "quality" of the labor force.

Correlation is not causation, and there are many completely different forces from those mentioned so far that may be the true causes of movements in American inequalities, movements that just happen to resemble movements in labor supply. These must be considered carefully before one can reach conclusions about the apparent long-run role of labor supply. Most of these competing explanations fail to fit the facts, but some do fit and cannot be rejected.

V. Competing Explanations

Inflation and Equity. If one ignores the employment and price twists of the Great Depression, there is a correspondence between periods of inflation and periods of levelling of incomes and wage rates. Furthermore,

inflations in industrialized countries in this century have, until 1970, been tied to wars. It has been argued that inflation levels incomes and rates of pay in several ways. First, the postwar data clearly show a short-run cyclical relationship between inflation and measures of overall inequality of income. The reason is simply that inflation has been accompanied by reductions in unemployment great enough to govern the cyclical movement of inequality. The link between extra jobs and more equal incomes, however, is just a cyclical influence on aggregate inequality and lacks the scope to account for the parallel longer-run trends shown above.

A second variation on the inflation theme is that higher-level salaries are more fixed in money terms than unskilled wage rates. Higher-level salaries are often negotiated on long-term contracts and adjust only very slowly to unforeseen changes in the cost of living. This argument is supported by the fact that teachers' salaries, to take an example already implicit in Figure 3 above, failed to keep pace with the cost of living and unskilled wage rates during sudden inflations, and correspondingly failed to drop as fast when prices fell off in the early 1930s. The difficulty with this sticky-salary variation on the inflation argument is that it fails to explain why the equalizing that comes with sudden inflation should persist long after the inflation has stopped and all salaries have been renegotiated several times over (1920s, 1954-1960s).

Another variation on the inflation theme is one that sometimes relates to inflation and sometimes does not. It has been argued that in periods of wartime inflation the public considers it only fair that rates of pay should advance most rapidly for the poor. In part the argument seems to be that a fear that the poor will be especially damaged by inflation turns

sentiments in favor of more egalitarian pay settlements. But in part the argument seems to say that major wars call for a sharing of national burdens that is inconsistent with prewar economic inequalities. The same band-together spirit encouraged by having rich and poor stand in the same ration lines, and by knowing during World War II that Princess Elizabeth was an auto mechanic, may well have been a force compelling a jump in unskilled wage rates up toward skilled levels.

This wartime-sharing variant has the strength of being an argument that is consistent with the persistence of an egalitarian pay structure for some time after the war has ended. Once equity-consciousness has been raised by the wartime experience, it is plausible that the spirit should linger on in postwar pay settlements. It is difficult to see, however, how such a shift in attitude could still be a prime determinant of the pay structure a decade later. Competition and profit-maximization would soon take their toll and reward those firms and workers who agreed on rates of pay re-establishing the old inequalities if nothing but social attitudes had changed. The new attitudes could only persist if something else in the postwar setting made lower pay differentials profitable to tens of thousands of employers. To persist in the private sector, equity must be profitable.

All of the inflation and equity theories about income inequalities suffer from the additional defect that inequalities have failed to drop during some wars and other inflations. Pay ratios showed little net movement during the Civil War and drifted upward during the gentle 1900-1913 inflation. Inequalities and pay ratios were not greatly affected by the Vietnam war, except to the extent that fuller employment brought extra incomes to the poor. Thus far the inflation of the 1970s has apparently

done little levelling, since it has been characterized by less-than-full employment and a relative rise in the food and fuel prices that take a greater share of poor budgets than of rich.

Unions. The greatest reductions in wage differentials and overall inequality came in a period of rising union power. And while American unions have lacked an explicit policy for changing wage differentials, their demands have seemed to favor the lower-skilled worker, more since the 1930s than before. It is reasonable to ask whether the impact of unions has not been to raise the relative wages of the unskilled, while raising all wages at the expense of profits.

At the local level, one can find cases in which the impact of unions on the wage structure was profound. For example, the patternmakers at the McCormick Works were able to win a handsome hike in their pay advantage vis-a-vis unskilled workers during World War II, at a time when skilled wage premia were dropping in most sectors (Ozanne [1962], pp. 293, 296, 298).

At the aggregate level, however, the union impact on income and wage rate inequalities has apparently been minor at most. Union members still make up less than 30 percent of the labor force, and pay differentials have moved similarly in unionized and nonunionized industries. Changes in union power provide no explanation for the apparent reduction in some measures of inequality between 1913 and 1929, or for the tendency of pay differentials to stabilize after the Korean War, when union membership was greater than ever before. Furthermore, even if unions had won for their members the maximum possible influence allowed them by H. Gregg Lewis' study (1963), they could not have reduced aggregate measures of inequality

as much as these have declined in this century, in part because unions offer no relative gains for large numbers of unskilled non-union workers. Even what influence unions seem to have had is to be denied them in a longer-run perspective when one recognizes that union power can level rates of pay for decades only if the marketplace and/or the government somehow conspire to keep up the demand, or keep down the supply, of the kinds of labor that have become unionized. It thus appears, as other studies have concluded for pay ratios (e.g., Hildebrand and Delahanty [1966], Evans [1971], pp. 189-191), that union power can account for very little if any of the long-run aggregate movement in wage ratios or overall income inequalities.

Another form of union impact also seems to fall short as an explanation for trends in wage ratios and overall inequality. Unions have successfully pushed for the passage of minimum wage legislation ever since the New Deal, and it is reasonable to wonder whether or not this might not account for the levelling in the 1940s. Since the demand for unskilled labor always has some elasticity, especially over a decade or more, any ability of minimum wage legislation to drive up the relative price of unskilled labor would have to be reflected in either a sustained rise in unemployment specific to the unskilled or a retardation of the migration of workers from the legally exempt farm sector. Neither of these developments occurred in the 1940s and early 1950s, when wage differentials were shrinking.

If one entertains the further argument that these indications of the effectiveness of minimum wage legislation were prevented by government expansion aimed at preserving full employment along with legal minimum wages, it remains to be shown that the net result of this combination of

policies would have somehow kept skilled wages and profits from rising during the inflation designed to employ all of the unskilled at the minimum wage rates. The minimum wage hypothesis would at that point become equivalent to the inflation argument already examined.

The Supply of Land. It is common to argue that the rapid expansion of available land in America before 1900 must have been a considerable democratizing and levelling influence. An unskilled worker who faced poor prospects in Eastern industry could flee to the opportunity of developing a farm on good soil relatively unencumbered with obligations to landlords and governments. As more and more farmland became accessible, it might have turned out that incomes levelled. But this influence was apparently never the predominant one on the distribution of income among Americans. In the nineteenth century, when the supply of land grew rapidly, the distribution of wealth and skilled wage ratios moved toward inequality. Two decades after the rate of growth of farm acreage dropped off at the start of this century, income and wealth began to become more equally distributed. What we know about the supply of land reinforces, rather than solves, the task of explaining the historic trends in income distribution.

Engel's Law and the shift out of agriculture. Engel's Law has established that a given percentage increase in income per capita causes a smaller, but definitely positive, reduction in the share of household incomes spent on food. Largely for this reason, resources have been shifting out of agriculture for two centuries. Since agriculture tends to employ unskilled labor more intensively than the rest of the economy, it is reasonable to suspect that variations in the degree and impact of the shift in demand

away from agriculture might affect the relative income of unskilled labor, thereby contributing to an explanation of trends in inequality. Other authors have previously pointed out that a growth-induced shift of resources out of agriculture affects the degree of overall inequality in more ways than one. The shift in demand away from farm products should tend to raise the ratios of nonfarm skilled wage rates and profit rates to the wage rate on unskilled labor. On the other hand, the same shift should hurt the returns to farm land more than the wage rates for the unskilled, a tendency that should help reduce inequalities, since farm land is less equally distributed than farm or total unskilled labor power. At the same time, for any given structure of rates of pay, the migration of persons and property from the farm to the nonfarm sector can itself shift the degree of overall inequality.

The suspicion that growth in incomes, by shifting resources out of agriculture,[19] should widen gaps between higher earning rates (and profit rates) and the unskilled rate seems sound, even though the effect on the returns to farm property should partly counteract this inegalitarian tendency. The difficulty with this explanation of trends in inequality comes on the empirical level rather than the theoretical. The shift out of agriculture has been proceding rather steadily throughout our national history, and the rate of decline in agriculture's share was no greater when income inequality was widening before about 1910, or when it was steady after the Korean War, than when it was falling between the last prewar decade and the decade following World War II. It would appear that over the long run the growth of incomes and Engel's Law have had much less influence on the relative wage rate of unskilled labor than they have had on the returns to farm land ownership.

The other type of argument stressing the shift out of agriculture is the interesting suggestion by Kuznets (1955) and others that a steady movement of the population out of agriculture, even with rates of pay constant, can first raise and then lower overall inequality. The suggestion should be taken seriously, in view of the movement of U.S. income and wealth first toward and then away from inequality.

Under certain conditions, but not under others,[20] a steady migration away from agriculture can indeed generate a curved path of inequality. To see how, let us imagine a simple example similar to that used by Kuznets. Suppose that everyone employed in agriculture earns $5,000 a year and everyone employed outside of agriculture earns $10,000 a year. Start from a situation in which everyone is employed in agriculture. The migration of the first person to the new higher-paying sector creates inequality where none had existed before. Further migration will for a while continue to raise most measures of inequality, such as the share earned by the top five percent of individuals. Ultimately, though, the migration must bring a return to equality in this simple example. When the last farmer has moved to the other sector, perfect equality would again be restored, since everyone would be earning $10,000.

It turns out that this possibility is not only mathematically fragile but also unhelpful in explaining what has happened to the American distribution of income. Data series like those shown in Figures 1 through 3 make it clear that the up-then-down movement of inequality holds <u>within</u> each major sector, and is not just an aggregate artifact of migration between sectors. The forces that first widened and then narrowed inequalities were more pervasive in their impact than the migration examples can imply.

Biases in technological progress. A potentially powerful determinant of the distribution of income is the degree to which the course of technological progress tends to economize on certain factors of production and to favor the use of others. A bias toward saving on unskilled labor can widen income gaps by worsening job prospects and relative wage rates for the unskilled while bidding up rates of return on skills and property.

Econometric estimates of the aggregate bias in technological change in the twentieth century encourage the belief that in the pattern of bias we have discovered one of the keys to trends in American inequality. For the U.S. economy as a whole each of several studies has found considerable labor-saving bias from around the start of this century to 1929, followed by either neutrality or a labor-using bias from 1929 to World War II, and some debate over whether or not a strong labor-saving bias has resumed in the postwar period (David and van de Klundert [1965]; Brown [1966], ch. 10; Morishima and Saito [1968]). None of these studies actually made separate measurement of the use of unskilled and of skilled labor. This aggregation of all labor makes it more difficult to get inferences about the distribution of income, but it can be guessed that an era of labor-saving technological change is one in which the labor being replaced with other inputs by the change in techniques tended to be unskilled. The econometric literature thus suggests that the equalization of incomes between 1929 and 1945 may have been due to a switch in the bias of aggregate technological progress from labor-saving to labor-using. The absence of any further equalization within the postwar era might be tied to the tendency of technology to drift toward labor-saving once again.

On closer examination, this explanation breaks down for longer-run

movements, though it is still of considerable help in explaining certain decade-to-decade changes. To understand the causal role of technological bias, one must be careful to identify what part of the aggregate technological change is in fact exogenous rather than just a reflection of other forces already measured separately. The aggregate technological bias, say toward labor-saving, can for any time period be decomposed into the following more usable parts:

(1) aggregate bias due to shifts in sectoral shares of output (e.g., the shift out of agriculture);

(2) bias due to differences in the rate of neutral productivity advance between sectors using labor in different degrees;

(3) the labor-saving bias within sectors,
(3a) some of which is a response to movements in factor prices, and
(3b) some of which is exogenous.

All of the first and some of the third source of aggregate technological bias are not causal influences. The shift of resources from, say, agriculture to other sectors is something that looks like an unskilled-labor-saving technological change, in that the receiving sectors use unskilled labor less intensively than agriculture. But the shift of resources between sectors is not an exogenous determinant of the processes that determine incomes. It is instead an endogenous part of the same processes, and requires explanation. It may be that some other dimension of technological change, such as a rapid rate of technological progress outside of agriculture, is the cause of the shift between sectors, but the point remains that the sectoral shift itself ([1] above) is not a causal influence on the income distribution. The same point can be made about (3a): an apparent bias toward labor-saving that is just a response to rising wages does not deserve to be counted as a factor influencing wage rates and other incomes (unless one is for some

reason comparing what actually happened with a hypothetical world in which substituting other factors for labor were impossible). Thus, to identify technological biases that are independent influences on the distribution of income, one must empirically isolate the exogenous factors, (2) and (3b) above.

Some authors have taken care to provide measures of technological bias that succeed in pointing out some of its exogenous components for the United States in this century. Kendrick (1961, pp. 136-137) has presented separate estimates of total factor productivity growth for several sectors and subsectors for several periods from 1889 to 1953. Morishima and Saito (op. cit.), Keller (1973), and Williamson ("War, Immigration, and Technology" [1974]) have all examined the decomposition of technological bias into the working parts listed above. One outcome of these studies is to show that most of the apparent aggregate bias is due to shifts in sectoral shares plus sectoral differences in rates of neutral productivity advance. It turns out that a prime determinant of demand for factors has been the difference in neutral productivity advance between agriculture, which uses unskilled labor intensively, and industry (all nonfarm nonservice sectors). For example, Keller and Williamson have shown that what looked like a jump in labor-saving bias from the years around World War I to the 1920s was the result of a jump in the difference between productivity growth in manufacturing and in agriculture. With productivity advancing much more rapidly in manufacturing, which used unskilled labor much less intensively than agriculture, aggregate measures recorded a bias toward techniques--actually, toward a sector--that used unskilled labor much more sparingly.

Over the longer period, the productivity estimates of Kendrick and

others show that productivity continued to advance more rapidly in manufacturing, transportation and utilities than in agriculture until sometime around World War II. There is some evidence that this inter-sectoral gap in neutral productivity advance favored the non-farm sector more during periods of rising income inequality--1889-1909 and 1919-1929--than during periods of declining inequalities--1909-1919 and 1929-1953 (Kendrick, loc. cit.). In the sectoral differences in productivity growth, then, we may have found a force that can compete with movements in the quantity and quality of labor supply as a partial explanation of changes in the trends in American inequality.

The rate of capital accumulation. If the rate of accumulation of nonhuman capital were an exogenous force, it would seem attractive as an additional explanation for the observed trends in inequality. Between 1840 and 1912, when inequalities were widening, the capital stock grew at the rapid rate of 5.01 per cent per annum (Davis et al., p. 34). The subsequent levelling of incomes was accompanied by a rate of capital accumulation of only 2.07 per cent between 1912 and 1950, and the rate of accumulation rose to 3.30 during the 1950s, when no further equalizing trend was evident. These swings in the rate of capital accumulation were wide enough so that even the capital stock per man-hour grew faster during the drift toward inequality than during the levelling period. This correlation suggests that more rapid accumulation of nonhuman capital may raise inequalities by bidding up the return to skills of all sorts while displacing unskilled labor. That surmise is encouraged by the findings of Griliches (1969) and Berndt and Christensen (1973) that capital and skills tend to be complementary inputs, both of which tend to be substitutes for unskilled labor.

Yet the rate of capital accumulation is a variable that no explanation of trends in income inequality can afford to leave unexplained and exogenous. Both intuition and recent battles in economic growth theory point to the relationship between income distribution and capital accumulation as being a simultaneous, or reciprocal, one. It is as easy to argue that income inequality fosters rapid capital accumulation as it is to argue the reverse. To make good use of the information we have about trends in the rate of capital accumulation, one must identify long-run influences that could have altered both the rate of accumulation and the degree of income inequality together. Two basic changes in the economy could have caused the rate of accumulation, the trend in inequality, and the rate of profit all to take a long-term drop as they did around the time of World War I. Both changes have been introduced above. One is the shift in the rate of growth in the labor force. The other is the movement in sectoral differences in total factor productivity advance.

The drop in the rate of growth in the labor force during World War I and again at the end of the 'twenties is a force that could have squeezed profits, wage and salary inequalities, and capital accumulation simultaneously. The reduction in the rate of growth of the labor force held back the supply of both unskilled and skilled labor. The tendency of the slower growth of the labor force to raise the rate of improvement of its average skill level meant that the restriction in labor supply was more severe in the lower-skill job markets. Faced with this slower supply expansion, firms found it harder to keep profits up. The pressure on profits in turn cut into firms' ability to use inside funds to finance real capital formation. Since borrowed funds are in fact seldom available at the opportunity cost

of inside funds, the reduction of profits cuts investments through the total supply of funds as well as through its influence on expectations about the returns from capital formation. If this argument is correct, then the reduction in labor supply growth lowered the pay advantage of skilled labor in two ways: directly, by encouraging the growth of the average skill of those who supply labor, and indirectly, by cutting into the accumulation of nonhuman capital, which is complementary in use with skills.

The other influence driving skill premia, profits, and accumulation in the same direction is the history of sectoral differences in rates of productivity growth. Recall that productivity apparently advanced faster in industries using unskilled labor less intensively during the periods 1889-1909 and 1919-1929, while this was not true during the decade 1909-1919 or after 1929. This pattern, as noted, corresponded roughly with the time division between rising and falling inequalities. It could be that the shift in total factor productivity growth back toward sectors using unskilled labor intensively (agriculture, in particular), especially after 1929, not only depressed skills' pay advantage but also may have cut into profits and capital accumulation to the advantage of returns to farmers as well as to unskilled labor. It is not clear that a shift in the locus of productivity advance would have all these effects, but it is possible.

The effect of taking account of trends in the rate of capital accumulation is thus to add another channel through which movements in labor supply, and possibly sectoral differences in productivity advance, seem likely to have influenced trends in inequality.

The rise of government. The era in which inequalities shrank was also one in which the share of national product consumed by government rose. The

wars were, of course, the main influence on government's share, but after each war that share failed to fall all the way back to its prewar position. How might the rise of government have fostered the levelling of personal incomes measured before taxes? One way is by raising the share of the labor force drafted or induced into the armed forces, thereby bidding up wages. This type of government influence is but another form of labor supply restriction. Its importance during wars reinforces the labor-supply argument always discussed. The other kind of government impact is to shift the composition of demand for final products, both in war and in peace, by replacing what the government buys with what would have been bought were it not for the extra taxes and deficit financing.[21] If it could be shown that the government's purchases of goods and services create a much greater demand for labor, especially for more unskilled labor, than the same amount of displaced private demand, then the rise of government has been a levelling influence on incomes even aside from its effects on troop levels, aggregate demand, and the progressivity of taxation.

To compare the labor content of government demand with that of the demand it displaces, one needs data on the sectoral distribution of government demand and other demands, on the ratios of employment to sales in each sector, and an input-output table. A careful estimation of the labor content of government versus other demand cannot be performed here. A tentative judgment can be reached, however, by inspecting some of the features of the U.S. input-output structure in 1939, 1947, 1958, and 1963 (Carter [1970], ch. 8; Bezdek et al. [1973]). Casual inspection reveals no net difference between the man-hours of labor content of government demand and that of other sectors, whether the other sectors are all others or the private

demand mix that declined in periods when government's share rose. More revealing is an input-output performed by Anne P. Carter. She calculated the changes in labor and capital demand that would have ensued in the periods 1939-1947 and 1947-1958 if the actual changes in final demand composition had been combined with an unchanged structure of prices and input-output ratios (op. cit., pp. 150-151). In none of the variants tried did the shift in demand have any noteworthy effect on the aggregate ratio of capital stock to man-hours. This result obtained even though the period 1947-1958 was one in which the Cold War raised the government's share of real (1958-dollar) aggregate demand from 12.9 percent to 21.3 percent (Bureau of Economic Analysis, op. cit., Series A2 and A34).[22] Apparently a shift in demand from private parties to the government affects the relative strength of demand for labor very little if at all. The tentative conclusion reached is that the government shifts demand toward unskilled labor and away from capital primarily or solely by pulling bodies into the armed forces and by raising aggregate demand in the short run.

Conclusion. No other potential influence on the distribution of income fits the long-run movements in inequality as well as the behavior of the labor supply. The closest competitor is the sectoral distribution of advances in productivity, discussed above. Other forces presumably also have a strong unit impact on the degree of inequality. Exogenous shifts in demand, intra-sectoral technological innovations that throw the unskilled out of work, and the political power of organized labor all could have been the dominant influences on inequality if they had moved in the right directions while the labor supply grew at a steady rate. But that did not happen. Instead the trends in American inequality and movements in labor supply

happened to be such as to reveal the strong effect of the latter on the former. The marked changes in the rate of growth of man-hours supplied happened to govern changes in inequality trends, apparently through their effects on the rate of growth of skills and the rate of accumulation of capital.

VI. The Impact of Fertility on the Quantity and Quality of Labor Supply

If the rate of growth of the labor force is indeed a powerful influence on income inequality, then there is clearly a causal connection running from fertility to inequality: more babies, more workers later on, lower wages, and so forth. More needs to be said, however, about the link between fertility and labor supply. The number of extra children is not itself the number of extra workers created a generation later, and the link between fertility and labor quality deserves fuller documentation.

For several reasons the net impact of a given number of births on the size of the labor force is less than the proportion of these births that survives to labor-force age. First, the arrival of the extra children pulls wives out of the labor force to some extent. A third child, for example, tends to reduce the mother's labor force participation by 2779 hours (or 1.4 full-time years at 2000 hours a year), while raising the father's total work by something like 150 hours, over the 18 years in which the child is growing up in the home.[23] Second, half of the extra children will participate in the labor force only about half of their working-age years by virtue of being born female. Finally, the appearance of the extra labor force entrants when the extra children reach their later teens will worsen job prospects for others and induce them to drop out of the labor force. Figures presented by Easterlin ([1968], Table A-3) show that

since the shutting off of immigration in the 1920s there has been some tendency for growth of the labor force through natural increase to be partially offset by changes in labor-force participation rates. Yet when all of these effects are taken into account, it is still true that extra fertility has a large unit impact on the size of the labor force a generation later.

What is less obvious is that the connection between extra fertility, lower inputs into the development of each child, lower rates of improvement in skill levels, and wider income gaps can be demonstrated fairly clearly on both the national level and the individual level. The demonstration that larger family size significantly retards the achievements of individual children was the subject of Discussion Paper 218 in this series. We turn next to the macroeconomic signs pointing to a negative effect of fertility on the rate of improvement in labor force quality. On both levels the channel through which fertility transmits its negative effect on earnings power is the level of schooling.

The trend in overall inequality of income relates to schooling in two ways. The faster the average level of schooling advances, the more the skilled wage ratios will tend to decline, since a more schooled labor force is one in which the supply of skills is greater and more elastic relative to the supply of unskilled labor. Furthermore, overall inequality is somewhat enhanced by greater dispersion in schooling. The degree of dispersion in schooling in turn depends on the generosity of taxpayer and philanthropic support for elementary and secondary public schooling, which tends to be more of an income-equalizing influence than either private schooling or public support at the university level.

The rates of growth in the educational attainment of adults, already cited in Table 3 above, suggest that higher fertility may drag down the average educational attainment of entire cohorts of Americans. The growth of educational attainment of adults 25 and over began to decelerate in the period 1965-1972, when children schooled entirely within the postwar era began to reach age 25. The period from 1945 to the early 1960s was, of course, a boom period for both adult incomes and fertility. For the first time in our history a large and sustained improvement in incomes was accompanied by a rise, rather than a decline, in fertility. The lower rate of improvement in schooling registered for the postwar generation seems related to the pressures which rising fertility placed on the abilities of parents and taxpayers to find the time and money for raising child schooling and earning potential.

By itself the deceleration in schooling attainment for adults since 1965 is hardly proof that higher fertility has strained aggregate child support, even though Beverly Duncan's calculations (1968, p. 611) imply that the slower average schooling growth for those over 25 should last through the 1970s. More evidence is needed--and more evidence is available, both from time series and from cross-sections of the population.

The baby boom raised the share of the population that was of school age from 1950 through 1968. To see if this reversal in the long-run decline in childrens' share of the population really affected schooling inputs and attendance, we can compare educational expenditures and attendance rates in these years with the trends indicated by earlier years. To identify the effect of the baby bulge, it is important to give other independent variables their due weight. In particular, it is essential that the incomes

of adults be taken into account, since all relevant studies have shown that adults' incomes are the strongest determinant of both educational expenditures and the length of school attendance by children.

Figure 6 and Table 4 are designed to reveal the possible impact of the age distribution of the population on educational expenditures per child. Figure 6 plots the ratio of expenditures per child to income (GNP) per adult, both for public elementary and secondary schooling and for all schooling, against real income per adult. The first pattern revealed by the course of these two variables is that expenditures for education have been very elastic with respect to income, so much so that their ratio to income itself has risen sharply and systematically with income growth. This is true even though the data slightly overstate this elasticity by implicitly using the GNP price deflator to deflate educational expenditures, missing the fact that a service like education has risen in price more rapidly than GNP as a whole. A second pattern, similar to the behavior of teachers' wages in Figure 3 above, is the cyclical sensitivity of education's share of GNP. When prices shoot up, as in World War II, school budgets are very slow to respond, being locked into yearly pay contracts and some inertia in property tax receipts. The opposite happened with prices dropped in the Great Depression, for which data have not been presented here. When prices and wages fell off in the early 1930s, educational expenditures hardly changed at all, causing a sharp rise in their share of GNP. Over the longer run, however, this behavior cancels out, leaving a much more stable relationship between educational expenditures and income.

The possible role played by movements in fertility and the age distribution is shown in the shift of the trend in expenditures occurring in 1950.

Figure 6

The Relationship of Educational Expenditures per Child to Income per Capita and to the Share of Children 5-19 in the Population, 1840-1972

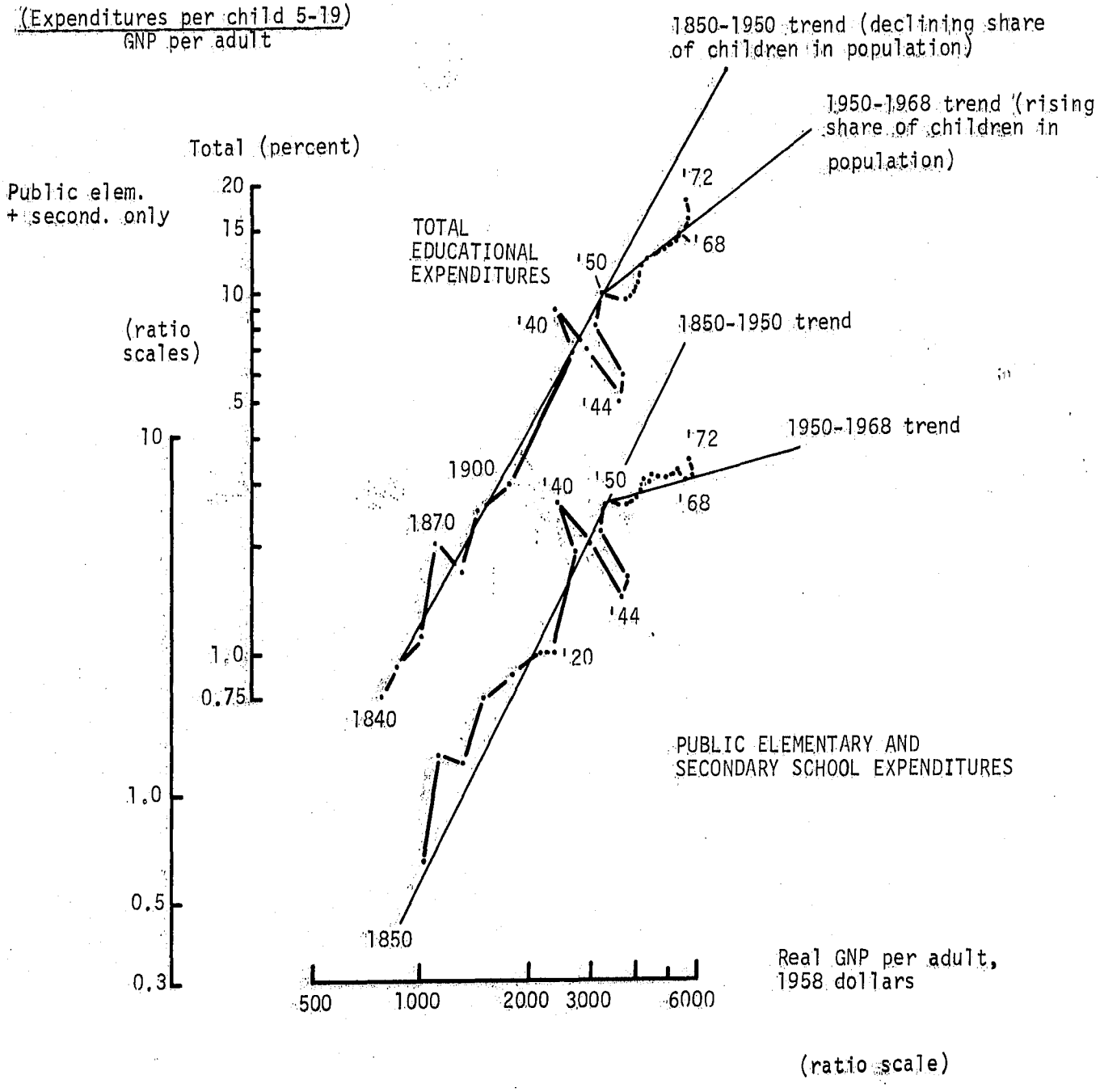


Table 4. The Relationship of Educational Expenditures to Income per Adult and to the Share of Children 5-19 in the Population, 1840-1972

School year ending in	Share of GNP spent on (1)public elem.&sec. schooling	(2)all achooling	(3)ratio of children 5-19 to adults (20 & up)	Educational expenditures per child ÷ GNP per adult (4)pub. elem.+sec.	(5)all expen.	(6)Exhibit: GNP per adult in 1958 dollars (previous yr.)
1840	..	0.6	.8008	..	0.75	799.9
1850	0.33	0.7	.7841	0.42	0.91	882.1
1860	0.46	0.8	.7335	0.63	1.09	1032.5
1870	0.84	1.3	.6601	1.28	1.97	1136.7
1880	0.81	1.1	.6611	1.22	1.67	1328.9
1890	1.13	1.5	.6210	1.81	2.42	1485.2
1900	1.23	1.7	.5787	2.14	2.89	1818.7
1910	1.28	..	.5224	2.44	..	2167.0
1920	1.23	..	.5018	2.42	..	2362.6
1930	2.25	3.1	.4776	4.70	6.74	2721.5
1940	2.59	3.5	.4006	6.46	8.73	2432.3
1942	1.87	2.6	.3783	4.93	6.87	2972.9
1944	1.28	1.8	.3633	3.52	4.96	3695.7
1946	1.37	2.0	.3508	3.91	5.70	3782.4
1948	1.86	2.8	.3513	5.31	7.97	3233.1
1950	2.28	3.4	.3507	6.49	9.70	3285.9
1952	2.24	3.4	.3612	6.20	9.42	3799.7
1954	2.49	3.8	.3828	6.51	9.92	4023.3
1956	2.75	4.2	.4017	6.86	10.45	4186.4
1958	3.10	4.8	.4224	7.34	11.36	4240.8
1960	3.20	3.2	.4417	7.24	11.55	4370.7
1962	3.40	3.4	.4617	7.36	12.13	4452.3
1964	3.50	3.5	.4713	7.39	12.89	4805.3
1966	3.80	3.8	.4891	7.76	13.49	5266.5
1968	3.80	3.8	.5119	7.42	14.07	5544.9
1970	3.56	3.6	.4785	7.44	15.68	5778.7
1972	3.80	3.8	.4539	8.37	17.63	5669.5

Sources for Table 4 (and Figure 6):

Column (1) For some years, the figures on public elementary and secondary school expenditures came from separate sources; for others, their ratio was given in a signle source. The figures on public expenditures, 1840-1870, of which less than 5% were for public support to higher education, are from Albert Fishlow, "Levels of Nineteenth-Century American Investment in Education," Journal of Economic History, vol. 26, no. 4(December 1966), Table 1. For 1870-1920, the figures for public elementary and secondary expenditures come from U.S. Bureau of the Census, Historical Statistics of the United States...(Washington: GPO, 1960), Series H252. For 1930-1968, the ratio of these expenditures to the previous year's GNP is given by Abbott L. Ferriss, Indicators of Trends in American Education(New York: Russell Sage Foundation, 1969), p. 184. The expenditure figures for 1970 and 1972, along with GNP for 1969 and 1971, are given in U.S. Bureau of the Census, Statistical Abstract of the United States 1972(Washington: GPO, 1972). The GNP figures for 1890-1970 are from U.S. Bureau of Economic Analysis, Long-term Economic Growth, 1860-1970(Washington: GPO, 1973), Series A7 and A8. For 1840-1880, the estimates of GNP in current dollars are the Gallman estimates cited by Fishlow, op. cit., Table 3.

Sources for Table 4 (and Figure 6) (Continued):

Column (2): For 1840-1900, Fishlow, Table 3. For 1930-1972: U.S. Office of Education, Digest of Educational Statistics, 1972 (Washington: GPO, 1972), p. 25.

Column (3): For decennial census years, 1840-1950, Historical Statistics, pp. 8-10, with the 1840 ratio applying to males only. For all other years, various reports in Current Population Reports, Series P-25, P-45, and P-47.

Column (4) = (1) ÷ (3).

Column (5) = (2) ÷ (3).

Column (6): For 1890-1970, Bureau of Economic Analysis, op. cit., Series A1 and A2, divided by the share of adults in the population, which was calculated from the same sources cited for Column (3). This series was spliced at 1890 onto an index of NNP per member of the labor force from Lance E. Davis et al., American Economic Growth (New York: Harper and Row, 1972), p. 34, to derive estimates of the 1958-dollar GNP per adult for 1840-1880. For 1972, Statistical Abstract, ...1972.

That was the year that children born toward the end of the war entered primary school, and the year in which the share of school-age children in the population stopped its historic decline and began rising. The trend in expenditure's relation to income remains less steep from then until 1968, when the share of the population that is of school age peaks and begins to decline again. The 1950-1968 pattern represented an even sharper break for public elementary and secondary school expenditures than for total expenditures, suggesting (but not documenting) a shift to a less equal distribution of school inputs among children. The consistency of this flatter trend over the 18-year period is striking in view of the good reasons one could have had for expecting no such dip in the long-run trend. The period 1950-1968 was one in which a large share of voters had a direct parental stake in better schools and higher taxes. The decade 1958-1968 was also the Sputnik decade, in which a whole nation cried for better schools to catch up with the Russians. Yet in these years the trend in expenditures, given the level of adult incomes, remained flatter than the trend for 1850-1950 or, so far, that for 1968 on.

The same peculiarity of the years after 1950 is shown by the data on enrollment rates and attendance rates in Table 5. These confirm that the trends in median years of schooling for adults revealed by census-based data in Table 3 above, are not a misleading indication based on the arbitrariness of using a median to represent a mean.

It can still be objected that the time series just reviewed do not prove that the extra births dragged down society's inputs into children's educational developments. Perhaps there were other factors that made 1950-1968 look special, factors wholly unrelated to the rush of a large share

Table 5. Rates of Growth in School Enrollment Rates and Attendance Rates, 1850-1970.

(percent per annum)

Period	Rate of growth in: (1) Pupils enrolled per child of school age	(2) Days attended per year per pupil enrolled	(3)= (1)+(2) Days attended per child of school age
1850-60	0.70a	..	..
1860-70	-0.44a	..	..
1870-80	1.77a	0.34	2.11
1880-90	0.46b	0.62	1.08
1890-00	0.08c	1.37	1.45
1900-10	0.15c	1.32	1.45
1910-20	0.48c	0.70	1.18
1920-30	0.68c	1.65	2.33
1930-40	0.47c	0.59	1.06
1940-50	-0.16c	0.39	0.55
(1940-44)	(-1.39)c	(-0.63)	(-2.02)
(1944-50)	(0.66)c	(1.09)	(1.75)
1950-60	0.27c	0.14	0.41
1960-70	0.22c	0.23	0.45

Notes and sources to Table 5:

a: based on ratio of enrollments for all ages to population 5-19.
b: based on ratio of enrollments 5-17, public schools only, to population 5-17.
c: based on ratio of public plus non-public school enrollments 5-17 to population 5-17.

Sources: U.S. Bureau of Economic Analysis, Long-term Economic Growth, 1860-1970 (Washington: GPO, 1973), Series B36 and B39; and U.S. Bureau of the Census, Historical Statistics for the United States... (Washington: GPO, 1960), pp. 207, 213.

of the population through the schools. In particular, perhaps the deceleration in both expenditures and years of schooling attained simply reflects a natural limit on the share of our lives and funds that can be profitably spent on formal education. Perhaps by 1950 Americans had raised formal education to such a high level that the population cannot find good reason to make the median child spend more than 12 or 13 years in school, except for a very slow upward creep over the decades as teaching techniques improve and incomes rise. On this reasoning it is perfectly natural for the income elasticity of education to drop as a society becomes super-educated.

This argument about natural limits fails to fit another kind of evidence as well as does the argument that higher fertility puts a strain on educational inputs. The additional evidence comes not from a time series, but from a cross-section. G. S. Tolley and E. Olson (1971) recently examined the interrelationship between educational expenditures per pupil and incomes per adult (employee) over a cross-section of the states in the U.S. for 1960. Their main purpose was to sort out the simultaneity of the income-education relationship. They found that educational expenditures per pupil were strongly affected by two variables in particular. One was income per employee, which was in turn affected by urbanization, population density, racial mixture, nonhuman wealth, and the schooling of the adult population. The other, always negative and significant at the 1 percent level, was the ratio of pupils to employees. This ratio, which varied across states in response more to fertility differences than to differences in enrollment rates, again reflected the greater pressure imposed on family and taxpayer resources for given income levels by a larger share of school-aged children in the population. Nor can their cross-sectional result be dismissed as further evidence on the natural limits to formal schooling: the states for which a higher ratio of pupils to employees kept expenditures

down were states with lower average expenditures and lower average educational attainment.

VII. Conclusion

There seems to be good reason for believing that extra fertility affects the size and "quality" of the labor force in ways that raise income inequalities. Fertility, like immigration, seems to reduce the average "quality" of the labor force, by reducing the amounts of family and public school resources devoted to each child. The retardation in the historic improvement in labor force quality has in turn held back the rise in the incomes of the unskilled relative to those enjoyed by skilled labor and wealthholders.

These connections have been revealed by a comparison of trends in American income inequality with trends in fertility, immigration, and the growth in the size and quality of the labor force. Inequalities rose gradually on all fronts in the century before World War I, when the supply of unskilled labor was recurrently fed by large immigration inflows. As fertility continued to decline and immigration was shut off around World War I, inequalities in income began to contract and continued to do so until about the end of the Korean War. Since then income inequality has shown no clear upward or downward trend. It appears likely, from data on their numbers and schooling, that the passage of baby-boom children into the labor force will be one force countering any further equalization of incomes for the rest of the 1970s. The historical evidence in favor of these conclusions is not airtight, however. It is always possible to construct other, more elaborate, hypotheses to explain the swings in American

income inequality. Yet at some point simplicity is to be preferred, and the reasoning linking inequality to fertility and labor supply has fewer cumbersome working parts than others that happen to fit American experience.

If this reading of the macroeconomic evidence is correct, the case for collective policies to encourage birth restriction in countries with rapid population growth is strengthened. Greater equality in the distribution is a public good that political systems have great trouble purchasing directly through taxes and transfers. The social returns to a long-run investment in income through birth restriction, while quite distant, may be very high.

1. Again, see the survey results reported by Bumpass and Westoff (1970) and by Westoff and Ryder in their forthcoming book based on the 1970 National Fertility Survey.

2. It might seem that a decline in fertility might raise inequality through a third demographic effect, its tendency to raise the average age, and the dispersion in ages, of the population. In a skill-based twentieth century economy like the United States, earnings do rise steeply with age. Yet the aging of the population set in motion by a decline in fertility does not raise the inequality of lifetime income, which is more relevant to our concern over inequality.

3. The emphasis here is on the rate of change in the ratio of wage rates to profit rates and rates of return on property. The same reasoning does further suggest that lower fertility and slower growth of the labor force mean absolutely lower profit and property rates of return than otherwise. Yet, to anticipate an empirical problem, there is little reason to expect this influence on rates of return to show up nicely in the data even if the argument is sound. Rates of return are knocked around by so many forces that the influence of labor supply can easily escape detection. This is especially so since the labor supply restriction can cut down the actual amount of property accumulation, thereby cutting the denominator (capital stock) as well as the numerator (profits) in the ratio used to calculate average rates of profit. Thus, even though the behavior of absolute profit rates is consistent with the present hypothesis, their measurement is shaky enough to prevent using the profit rates themselves as a convincing test.

4. For evidence that property incomes and nonhuman wealth are less equally distributed than earnings and human capital in non-slave societies, see W. I. King (1915), Kuznets (1953), Lydall (1968, p. 150), Lydall and Lansing (1959), and Soltow (1965).

5. Throughout this paper the phrase "unskilled labor" is used as a shorthand for "labor that receives very low pay in some base year." The measurement of the total stock of unskilled labor that underlies some of the commentary here is the base-year wage rate for some large bottom class of wage-earners times the total man-hours in the labor force. That is, part of the pay to everyone in the labor force (or of what they would be paid if "fully" employed) is a return to the unskilled part of their labor, and any additional earnings are viewed as a return to their "skill."

6. Peter H. Lindert, "Family Inputs and Inequality Among Children," University of Wisconsin Institute for Research on Poverty Discussion Paper No. 218-74.

7. For a comparison of the mathematical properties of different measures of inequality, see Theil (1963) and Atkinson (1970).

8. In the example used here, it is presumed that the shift of population out of agriculture would reduce inequality, for constant rates of pay in each occupational class. That is likely to be the case as long as the previous farm incomes of the migrants were not above the farm average, and

as long as the nonfarm sector was already a significant share of the population. It cannot be concluded, however, that any migration of persons from lower to higher rates of pay will reduce inequality, even if the migrants' new rate of pay is below the overall average. Such migration can raise overall inequality in cases where the sector they are leaving (the farm sector here) dominates the economy and/or the migrants were better paid in that sector than were those who stayed behind. For a discussion of the conditions governing the net effect of migration on inequality see Simon Kuznets' treatment of the shift out of agriculture in his "Economic Growth and Income Inequality," American Economic Review, vol. 45, no. 1 (March 1955), pp. 1-28; and especially Henri Theil's section on "Maxwell's Demon on Ellis Island" in his Economics and Information Theory (Chicago: Rand McNally, 1963) pp. 114-120.

9. For annual series on the dispersion in per capita incomes in states and regions, see Smolensky (1963) and Theil (1963, p. 103).

10. See Jeffrey G. Williamson, "War, Immigration, and Technology: American Distributional Experience, 1913-1929," University of Wisconsin, Graduate Program in Economic History, Discussion Paper EH 74-24, April 1974.

11. On trends in wealth distribution between the seventeenth century and 1860, see Main (1971), Jones (1972), and Daniels (1973-74).

Soltow found no change in the concentration of Wisconsin wealth between 1864 and 1927 (or between 1927 and 1963)(p. 11). Yet the fact that Wisconsin income became less concentrated between 1913 and 1927 suggests that a closer look would find the state's wealth more concentrated in 1913 than before 1900 or after World War I.

12. For an exploration of the possible effects of policies related to the Civil War on the distribution of incomes, see Jeffrey G. Williamson, "What Should the Civil War Tariff Have Done Anyway?" University of Wisconsin, Social Science Research Institute, Discussion Paper no. 7323, 1973; and his "Watersheds and Turning Points: Nineteenth Century Capital Formation, Relative Prices, and the Civil War," University of Wisconsin, Graduate Program in Economic History, Discussion Paper no. 73-20, March 1973.

13. The net decline in inequality and pay ratios after World War I was even mirrored in the behavior of before-tax profit rates, shaky as estimates of these may be. The crude indirect estimates of industrial rates of profit by Phelps Brown and Browne (1968, pp. 429-430) dropped from an average of 11.8 percent for 1889-1913 to an average of 8.0 for 1921-1929. Stigler's rates of return for manufacturing show no net change from the 1920's to 1950-1958 (1963, p. 12). (Similar drops in inferred profit rates between prewar decades and the 1920's were registered for the UK and Germany by Phelps Brown and Browne.)

Mention needs to be made of two series that fail to yield a great compression of wage ratios between the pre-1929 period and the decade after World War II. One is the ratio of pattern shop wages to those for

common labor at the McCormick (International Harvester) works (Ozanne [1962], p. 293). For the periods 1860-1941 and 1946-1959 this series behaves like those in Table 2. But during World War II the McCormick patternmakers broke away from an industrial union and won a handsome increase relative to common labor. They never lost their new pay premium, even though the millwrights in the same plant lost their wartime premium after the war. What the McCormick series shows is simply the diversity of movements at the individual plant level: while all broader-based averages showed a compression of pay differentials during World War II, in this plant one skilled wage ratio jumped in the opposite direction.

The other ratio that fails to follow the great contraction of differentials is the ratio of nonfarm wage rates to that for farm labor. After World War I the wages of common industrial labor rose relative to those for farm labor, and the wider gap persists today. This means that cross-sectoral pay ratios using farm labor as the "unskilled" denominator have contracted much less since World War I than the series in Figures 2 and 3. This result, however, mixes the relative decline of agriculture in with skill differentials, and is not evidence that skilled wage differentials failed to decline.

14. See Jeffrey G. Williamson, "Prices and Urban Inequality,...1820-1948" (1974), for class-specific cost of living indices.

15. We lack good time series on pay ratios and measures of income dispersion for lower-income countries. The trend in income dispersion in India since independence is unclear, while the postwar trend in Puerto Rico, Argentina, Mexico, and Brazil appears to have been toward inequality (Paukert [1973], pp. 107-108; Fishlow [1972], pp. 399-402). These scraps of evidence, plus the observation that inequality seems positively correlated with real GNP per capita in a cross-section of lower-income countries (Paukert [1973]), offer weak evidence that the trend toward equality is a feature of high-income countries.

16. There may be other exceptions, but data problems prevent their identification. For some data on France and warnings against using them, see OECD (1965, pp. 34, 36) and Lydall (1968, pp. 188-190).

17. This deceleration in the growth of schooling for persons entering the labor force after 1965 is suggested both by Duncan's calculations based on attendance rates and by a direct examination of the school days attended per child of school age, which decelerated around 1950 (after a previous retardation during World War II). No deceleration is implied, on the other hand, by the figures on real educational <u>expenditures</u> per child of school age. As will be shown below, postwar prosperity has made it possible for expenditures per child to keep accelerating. Expenditures per child, however, are a measure of one kind of educational input, and are therefore less relevant to labor force quality than educational output measures like years or days of schooling attained.

18. It is hard to glean even superficial impressions about the rate of growth of the German labor force, or on what lies behind the apparent stability of the German skilled wage ratio, between the 1920's and the postwar years. The picture is clouded mainly by the partition of Germany, but also by Nazi wage controls and currency breakdown (which also compromises the comparison of 1924-1929 with the prewar era). For what long-run series we have on German labor force size and employment, see Walther G. Hoffmann, Das Wachstum der deutschen Wirtschaft seit der mitte des 19. Jahrhunderts (Berlin: Springer-Verlag, 1965).

19. Note that the exogenous force here is not the shift in demand itself but instead the whole set of forces, such as improved technology, that raise income per capita. The shift in demand away from agriculture would be the parameter only if one were interested in comparing the actual course of economic growth with a hypothetical world in which there were no Engel effects on demand shares for different sectors. The universality of Engel's Law makes such a counterfactual hypothesis uninteresting.

20. Again see Theil (1963), pp. 114-120, for a mathematical derivation of the conditions under which the migration from one sector to another raises inequality.

21. The government can also shift the labor-intensity of final demand with other policies besides its own purchases. Tax and tariff policies are good examples. For an investigation of the relevance of tax and tariff policies for income distribution in the wake of the Civil War, see the papers by Williamson cited in footnote 11 above.

22. Between 1947 and 1958 the shift in demand toward government came primarily at the expense of private consumption, with smaller reductions in the shares of investment and net exports. This Cold War pattern did not hold for World War II, when government purchases displaced a more evenly balanced mixture of consumption, investment, and net exports.

Over the longer period, e.g. 1900-1970, the rise in government purchases has also come more at the expense of consumption's share than at the expense of net exports or gross private domestic capital formation. The relative stability of investment's share of constant-dollar demand is the reason why the rise of government was not mentioned as a factor reducing the rate of capital accumulation.

23. See Appendix E of the authors forthcoming book on Fertility and Scarcity in America.

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