Explaining the Decline of Child Labor in Pennsylvania Silk Mills, 1899-1919

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Courtesy of Pennsylvania State Archives.

Sauquoit Silk Mills, Philadelphia.

A controversial feature of American industrialization in the late nineteenth and early twentieth centuries was the employment of children under sixteen years of age. Nowhere did industry employ more children than in Pennsylvania. By 1899, silk mills had become the chief industrial employers of children in the state; 20% of silk mill operatives were boys and girls under sixteen. During the early twentieth century, however, the importance of child labor greatly declined: by 1919 children made up less than 8% of the Pennsylvania silk workforce.

Four hypotheses confront historians seeking to understand this relative decline in the employment of children.[1] Most widely cited is the "income hypothesis," which credits rising incomes with reducing working families' need for the earnings of their children.[2] The "legislation hypothesis" attributes the decline to enactment of state and federal child-labor laws.[3] The "technology hypothesis" maintains that improved machinery displaced

unskilled child workers.[4] The "preference hypothesis" contends that working families increasingly chose to keep their children in school and out of the mills, unprompted by legal or economic changes.[5]

There is no consensus about why the employment of children in Pennsylvania's silk mills decreased. Despite judgments that child labor declined "largely" or "chiefly" because of one factor or another, no rigorous scholarship has assessed their relative impacts. This paper aims to provide that assessment.

First, I document both the extent and the relative decline of child labor in the Pennsylvania silk industry.[6] Next I test the four hypotheses about that decline with evidence on children's wages. This evidence indicates that changes in the demand for and the supply of child labor operated with equal strength. Thus no single explanation can account for all or even most of the decline of child labor in Pennsylvania silk during the early twentieth century. I adduce additional evidence that contradicts the income hypothesis. Indeed, it may be that none of the existing explanations is entirely satisfactory.

The Extent of Child Labor in the Silk Industry

Pennsylvania ranked first in the industrial employment of children at each federal manufacturing census from 1880 through 1914; in 1919 it was second, just behind Massachusetts. By the turn of the century, silk mills had replaced glass manufactures as the chief industrial employers of children in the state, a position the industry maintained through 1919.[7] Silk mills were concentrated in Lackawanna, Lehigh, and Luzerne Counties;[8] here, silk mills employed more children than all other factories combined.[9]

The typical child silk worker was a fourteen- or fifteen-year-old girl. Throughout the 1910s, girls outnumbered boys by about two to one in the silk mills.[10] In 1907 (the only year for which detailed information about both age and gender is available), over 70% of boys and girls in the industry were fourteen or fifteen years old; less than 5% of girls, and less than 10% of boys, were under thirteen.[11]

Children filled the least-skilled, lowest-paid occupations in the silk mills. Half of all girls tended spinning frames or were winders (who tied broken threads); many other girls were reelers (who transferred spun silk from bobbins to reels where it was made up into skeins for dyeing). More than one-third of all boys worked as bobbin carriers, taking spools of silk from one machine to another; other important boys' occupations were spinning and reeling.[12] Very few children held the highest-skilled, best-paid jobs such as weaving, warping (preparing threads for the loom), and twisting-in (joining the end of a new warp which is ready for the loom to the end of the preceding warp). Children were most important in throwing mills (which pro-

duced thread from raw fiber) and least important in mills which produced silk ribbons.[13]

Federal census data sketch the rise and fall of child labor in Pennsylvania industry from 1870 to 1919. Reports of the state Department of Internal Affairs and (after 1912) the state Department of Labor and Industry fill in the gaps between census years, producing a nearly complete annual series of child silk workers from about 1900 to 1915 (see Table 1).[14] In the early years of the silk industry in northeastern Pennsylvania, the share of young silk workers grew steadily.[15] From 1880 onward, children made up a much larger percentage of the workforce in silk than in Pennsylvania industry generally. The proportion of silk operatives under sixteen peaked around 1900, at about 20%.[16] Children also made up a substantially larger share of the silk workforce in Pennsylvania than in other states.

Between 1900 and about 1912, the proportion of silk workers under sixteen gradually declined, though the absolute numbers continued to rise.[17] Between 1912 and 1915 both the proportion and number of children in the silk workforce fell sharply. By 1919, children under sixteen had dropped to slightly more than one-third the 1899 percentage; even so, the number was about the same in 1919 as in 1899.

The decline in child labor appears to have been spread over almost all occupations filled by children. More than three-fourths of silk mill children worked in the spinning department throughout the 1899-1919 period; spinners under sixteen fell steadily from 30% in 1899 to 11% in 1919. An even steeper decline occurred in the category of general unskilled labor; children's share fell from 38% in 1899 to 2% in 1919. Only in weaving did children's share remain constant: 4 to 5% of weavers were under sixteen throughout the period.[18]

As the importance of child labor in silk declined, adult men and women assumed larger roles. The percentage of women over sixteen increased from 55% in 1899 to about 62% in 1919; the percentage of males over sixteen rose from about 25% to about 30%. The number of women in Pennsylvania's silk mills increased 215% between 1899 and 1919, while the number of men increased 230%.[19]

Hypotheses About the Decline

The "legislation hypothesis" maintains that legal restrictions in Pennsylvania and elsewhere greatly curbed the employment of children.[20] Pennsylvania joined the early-twentieth century parade of states enacting legal restrictions on the employment of children in industry. The Factory Act of 1905 raised the minimum legal age for factory employment from thirteen to fourteen.[21] The Child Labor Law of 1909 reduced the maximum daily (from 12 to 10) and weekly (from 60 to 58) hours children could work. The

Child Labor Law of 1915 further reduced maximum daily and weekly hours to 9 and 51, respectively, and toughened enforcement.[22] Factory inspectors were authorized to penalize employers who violated these standards. Penalties included fines of $10 to $500 per violation (the maximum fine was lowered to $200 in 1915), or up to 90 days' imprisonment, or both.[23]

State restrictions on child labor also included compulsory schooling. An act of 1897 prohibited the employment of children under sixteen unless they could read and write or had attended school for sixteen weeks during the previous year. The Child Labor Law of 1915 greatly toughened these requirements: children ages 14 to 15 could be employed legally only if they had completed six years of schooling and then only if they attended "continuation schools" eight hours per week until they turned sixteen.[24]

National legislation first appeared in 1916, when Congress passed the National Child Labor Act, prohibiting the interstate shipment of goods produced by children under fourteen. The measure was short-lived, however, as the United States Supreme Court ruled it, and a similar measure of 1919, unconstitutional.[25]

The Pennsylvania Bureau of Women and Children typifies those who praised the impact of state and federal restrictions. The Bureau concluded that the decrease in the proportion of working children after 1900 "was brought about chiefly" through the 1905 and 1909 legislation.[26] The Bureau also attributed "much of the decrease in the number and proportion of employed children in 1920" to the Child Labor Law of 1915 and declared that "largely as a result of the higher standards of the 1915 law the proportion of children gainfully employed was lower in 1920 than at any other time during the past fifty years."[27]

The "technology hypothesis" maintains that improved machinery displaced child workers. United States Senate investigators argued that technological change reduced the proportion of children in silk mills in two ways. First, new machinery ran at higher speeds, enabling one worker to produce as much as two had before. Second, new machinery combined two operations into one. For example, the combined doubler and spinner, designed in 1895, spun silk and combined the spun filaments into a single strand in one continuous operation. Both kinds of technological change enabled silk mills to turn out a set amount of work with fewer operatives. Since these changes in machinery occurred primarily "in occupations in which children have always been largely employed" — winding and spinning — they "reduce[d] the proportion of children employed in the industry."[28]

A variant of the technology hypothesis holds that improved machinery required a better-trained, more-skilled, and more-reliable workforce. The higher speed, increased complexity, and larger size of new machines may have rendered their operation beyond the capabilities of most children.

Walter Trattner, for example, argues that "[n]ew machines which needed skilled labor to operate them were making child labor increasingly uneconomic."[29]

The "income hypothesis" holds that rising incomes reduced families' need for the earnings of their children. In the late nineteenth and early twentieth centuries, working families may have depended on the wages of their children to supplement the earnings of the head of the household; only in this way could they reach a level of comfort or even subsistence. As family incomes rose, the earnings of children became less crucial; thus families became less willing, all else being equal, to send their children into the mills.

Several economic and social historians have examined the connection between family income and child labor for late-nineteenth century Pennsylvania. Claudia Goldin and Michael Haines employ data from the 1880 Pennsylvania manuscript census to explore why children worked; both find that children whose fathers earned low wages were more likely to work than those whose fathers were well paid.[30] Thomas Keil and Wayne Usui, using manuscript census data from several anthracite counties for 1850 to 1900, conclude that child labor increased between 1880 and 1900 because "mine workers experienced a deterioration in their economic position."[31] These studies, then, suggest that rising incomes would reduce child labor.

The "preference hypothesis" asserts that child labor declined because people changed their minds about sending their children into the mills. Bonnie Stepenoff argues that reformers, although unsuccessful in obtaining effective child-labor legislation before 1910, nonetheless "managed to convince working fathers and struggling mothers that, no matter how hard it was to support their families, adolescent children needed and deserved a scholastic education."[32] Thus child labor could decrease even in the absence of changing machinery, effective legislation, or rising incomes.

Testing the Hypotheses: Children's Wages

Previous attempts to sort out the various hypotheses have had only limited success. For example, Stepenoff notes that while the numbers of 11 to 13 year-olds working in the silk mills of Carbondale fell dramatically between 1900 and 1910, so did the number of 14-year-olds, who were still legally employable. This, she argues, contradicts the legislation hypothesis but is consistent with changed attitudes.[33] However, both changing technology and rising income also could explain the decrease in 14-year-old workers, so that this evidence does not have much discriminatory power.

Hypotheses about the decline of child labor can be divided into two groups. The legislation and technology hypotheses maintain that the demand for child labor fell: mill owners became less willing to hire child workers. Child-labor laws made mill owners reluctant to hire children

because of potential fines and/or imprisonment; improved machinery reduced the number of workers needed, in the occupations that children filled, to produce a given amount of output, or was too complex for children to operate. The income and preference hypotheses, on the other hand, hold that the supply of child labor fell: families became less willing to send their children into the mills. Rising incomes reduced families' dependence on their children's earnings; child-labor reformers changed people's minds, convincing parents to send their children to school rather than to work.

The implications of the demand-side hypotheses differ from those of the supply-side hypotheses. If the demand for child labor fell, then children would have competed for the smaller number of available jobs by offering their labor at lower wages. If instead the supply fell, then mill owners would have competed for the smaller number of children who were willing to work by offering higher wages (that is, families which had become less willing to send their children to work would have required higher "bribes"). In short, the legislation and technology hypotheses predict that children's wages in the silk industry would have fallen after 1900; the income and preference hypotheses predict that they would have risen.

The actual course of wages after 1900 thus provides direct evidence on the reason(s) for the decline of child labor. More precisely, the relative wages of children — i.e., children's wages compared to men's and women's wages — are the necessary evidence. Relative wages isolate the impact of factors (such as legislation and family income) which uniquely affected children.

The Pennsylvania Department of Internal Affairs and, after 1912, the Department of Labor and Industry collected data on men's, women's, and children's wages for most years from 1898 through 1915. These data reveal that average daily wages for children in the silk industry rose over the period, though not steadily (see Table 2).[34] However, relative wages were constant. Despite the 67% increase in children's wages between 1898 and 1914, children's daily wages remained at about one-third of men's and about three-fifths of women's daily wages.[35] The constant relative wage of children indicates that demand and supply factors acted with equal force in reducing child labor.

The sharp increase in children's relative wage in 1915 is puzzling. Unfortunately, wage data after 1915 are unavailable: the Pennsylvania Department of Labor and Industry discontinued the collection of detailed industrial wage data. It is impossible to know whether children's relative wages remained at the higher level or continued to rise, or whether the 1915 figure is an aberration. It may be that the surge in European demand for American goods during World War I increased the demand for labor, perhaps especially for children. Indeed, a National Child Labor Committee survey undertaken in 1918 found that school enrollments in Lehigh and

Lackawanna Counties were half their normal levels, "apparently as a direct result of war conditions."[36] Yet both the number and percentage of children in the silk workforce fell from 1914 to 1915, opposite the expected result of an increased demand.

The wage evidence, then, is clear: no single factor was "largely" or "chiefly" responsible for reducing child labor in Pennsylvania silk, at least through 1914. Supply and demand operated with equal force. The wage evidence does not tell us, however, which demand-side factors and which supply-side were at work. A closer look at the hypotheses is thus in order. In particular, data are available which permit a detailed look at the most widely-cited of the four hypotheses, rising income.

Testing the Income Hypothesis

Three conditions must hold for the income hypothesis to be correct. First, children must have contributed substantially to family income. Second, how much a child worked must have depended on family income. Third, the incomes of families of child silk workers must have been rising. This section shows that while the first two conditions were met, the third was not.

In 1907, as part of a wide-ranging survey of the condition of children working in industry, United States Senate investigators visited three dozen silk mills in Pennsylvania.[37] They gathered information from more than one thousand children about their wages, work experience, and family conditions. These data reveal that children contributed a substantial share of family income: on average, families with at least one child working in a silk mill received about one-fifth of their total labor income from children under sixteen (see Table 3). Most of that contribution came from fourteen- and fifteen-year-olds; those under fourteen accounted for only about 5% of family income.[38]

Did children from lower-income families work more days than children from higher-income families? Three kinds of evidence suggest that they did. First, a National Child Labor Committee survey of wage-earning girls in Wilkes-Barre, Luzerne County, in 1914 found that the most frequent reason girls gave for leaving school to enter the mills was "necessity."[39]

A second place of evidence comes from comparing families with and without working fathers. As shown in the last two sections of Table 3, fourteen- and fifteen-year-olds whose fathers contributed no income to the family (because of death, desertion, injury, or unemployment) had higher earnings than did children of working fathers. These children's higher earnings were the result of working about 43 more days during 1907.[40] To some extent, then, lower-income families did call upon their children to work more. Of greater importance for these families, however, was the earnings of

offspring sixteen and older.

A more precise appraisal of the relationship between family income and child labor can be obtained by estimating the labor supply function of children. The number of days a child worked (i.e., the amount of labor supplied) likely depended upon factors such as age, gender, household responsibilities, potential earnings, and (according to the income hypothesis) the family's need for the child's earnings. A child's household responsibilities may be approximated by the number of siblings under ten years old; that is, the presence of young siblings may have increased household duties of older children. The daily wage rate represents the child's potential earnings; higher rates of pay may have encouraged children to work more days. Fathers' earnings (divided by the number of family members) and the number of siblings over sixteen (who presumably were in the labor force) indicate the need for additional earnings from children; low fathers' earnings and/or few older siblings may have caused children to work more days. Home ownership (and the presumably greater family wealth that accompanied it) may have reduced a family's need for child labor.[41] Data on each of these variables, as well as each working child's age and gender, are available from the 1907 United States Senate survey.[42]

Multiple regression analysis of the data yields the following estimate of children's labor supply function:[43]

Days worked per Year = -31.0 +11.9 x (Age) + 0.8 x (Sex)
(5.5) (0.2)
- 0.006 x (Young siblings) + 136.4 x (Daily Wage)
(0.005) (10.6)
+ 2.8 x (Own Home) -7.6 (Old Siblings)
(0.7) (4.2)
- 0.1 x (Father's Earnings)
(2.2)

The regression results indicate that age had a statistically significant impact on child labor: a one-year increase in age increased days worked in a year by about twelve, all else being equal. The statistically insignificant coefficient on the gender variable indicates that boys worked no more days than girls, all else being equal. Similarly, neither the presence of younger siblings nor home ownership affected a child's labor supply. The large and statistically significant coefficient on the wage variable indicates that children whose skills commanded a higher daily wage worked more days than did children whose pay was lower.

The variables directly relevant to the income hypothesis are fathers' earnings and the presence of older siblings. The statistically significant and negative coefficients on these two variables reveal that children from higher-income families worked fewer days, all else being equal, than did children

from lower-income families. An additional sibling aged sixteen and older reduced the days a child worked by about seven. Most important for the income hypothesis, higher fathers' earnings reduced the number of days a child worked.[44] This income effect was rather small, however: a 10% rise in fathers' earnings per family member on average reduced the number of days a child worked by just 0.3%.[45]

The Wilkes-Barre survey, the comparison of families with and without working fathers, and the multiple regression analysis of children's labor supply all indicate that family income did affect a child's labor supply decision. This evidence is consistent with the income hypothesis and suggests that rising family incomes could have contributed to the decline of child labor. The crucial question then becomes: did incomes rise?

The trend in incomes of the families of silk mill children can be approximated by the trend in earnings in the anthracite coal industry. Though the overlap between Pennsylvania's silk mill and anthracite regions was not exact, it was substantial. Luzerne and Lackawanna Counties ranked first and second in the state in tons mined in 1911; they also ranked third and first, respectively, in number of silk mills in that year.[46] In the United States Senate 1907 survey, 39% of fathers of child silk workers listed occupations in mining; undoubtedly some of the additional 40% who gave their occupation as "laborer" also worked in mining-related jobs or had their wages influenced by anthracite wages.[47] The 1914 survey of wage-earning girls in Wilkes-Barre noted that more miners had children in the silk mills than other men.[48]

Anthracite miners' earnings (adjusted for inflation) were no higher in 1916 than they had been in 1903-1905 (see Table 4). Indeed, the first decade of the century was marked by a somewhat erratic fall in real earnings. (A similar pattern prevailed for adult male earnings in the silk industry.) Not until 1917 did anthracite workers' earnings rise. Though the annual earnings figures in Table 4 are the averages of many individuals in different occupations, the wage gains in anthracite after 1916 appear to have accrued to most occupations: between 1916 and 1919, hourly rates (adjusted for inflation) increased about 10% for company miners, 20% for inside laborers, and 10 to 25% for outside laborers (such as firemen and machinery repairmen). Contract workers fared less well: daily rates (again, adjusted for inflation) rose about 10% for contract laborers, but fell 25% for contract miners.[49]

Comparison of the data in Table 4 and Table 1 indicate that the increase in average earnings of anthracite workers came after the sharp decline of child labor in the silk industry had already occurred. From 1912 to 1915, when child labor was falling, average anthracite earnings were flat. Thus, while children from lower-income families did indeed work more than did children from higher-income families at a given moment, the

income hypothesis cannot be correct over time for the simple reason that family incomes were not rising when child labor was falling.

Testing Other Hypotheses

Between 1899 and 1919, child labor in Pennsylvania silk mills declined at about the same rate as child labor in all industries in the state (Table 1). The 1919 percentage of the silk workforce under sixteen was 37% of the 1899 figure; the 1919 percentage of the total industrial workforce under sixteen was 38% of the 1899 figure. The common rate of decline suggests that a common factor (or factors) caused the decline of child labor in industry, including silk, across the state.

Such a common rate of decline is inconsistent with the technology hypothesis. If new silk machinery, such as the combined doubler and spinner, displaced child workers from the industry, then the rate of decline of child labor in silk should differ from the rate of decline in industry generally. Only in the unlikely event that child-displacing machinery was introduced at the same time and pace across all industry would the rates of decline be the same.

A comparison of the silk industry in Pennsylvania with the silk industry nationwide also suggests that technological change was not a leading cause of child labor's decline. Clearly, child silk workers were more prominent in Pennsylvania than elsewhere (Table 1). However, the rate of decline of child labor over the 1899-1919 period was considerably more rapid in Pennsylvania than in other states' silk industries. Since technological advances in one state presumably could have been adopted elsewhere, the rate of decline of child labor should have been similar across states. The dissimilar rates of decline suggests that something more than child-displacing machinery must have caused the decline of child labor in Pennsylvania.

These comparisons across industries and states are, however, consistent with the legislation hypothesis. Since Pennsylvania's child-labor laws applied equally to all industry in the state, legislation should have reduced child labor at the same rate across industry. And since the stringency of child-labor laws varied by state, the steeper decline of silk child labor in Pennsylvania than elsewhere does not contradict the legislation hypothesis.

Nonetheless, child-labor legislation does not appear to explain the decline in child labor. Child labor fell slightly after enactment of the Factory Act of 1905. On the other hand, it is difficult to detect any impact of the 1909 Child Labor Law in the annual series of child labor (Table 1). Indeed, the percentage of children in the silk workforce was higher two years after passage of the law than before. Most telling, however, is the sharp decline in child labor from 1912 to 1915, which preceded the Child Labor Law of 1915. The 1915 Law had little impact.

Finally, it is not easy to test the preference hypothesis directly. Testimony from working families themselves would help support this hypothesis. But as early as 1889, a survey of working men revealed that 56% of respondents opposed child labor altogether, while only 18% gave it unqualified support.[50] Thus there may not have been much scope for changing preferences after 1910 or so. In any event, the wage evidence clearly indicates that changing preferences alone could not have accounted for the observed decline of child labor.

Conclusion

Pennsylvania industry employed more children than industry in any other state from 1880 through 1914. Within Pennsylvania, more children worked in silk than any other industry. Understanding the decline of child labor in Pennsylvania silk thus is important for understanding the decline of child labor in other industries and other states. The evidence presented here shows that both supply and demand contributed to the decline and that no single factor explains all or even most of child labor's decline in Pennsylvania silk mills between 1899 and 1919. It is difficult to pinpoint the reasons why supply and demand for child labor fell. The most widely-cited explanation, that of rising income, is inconsistent with the evidence. The evidence of cross-state and cross-industry comparisons also is inconsistent with the technology hypothesis, and it is hard to find support for the legislation hypothesis in the timing of child labor's decline. While our understanding of child labor's decline is not yet complete, the constant relative wage of children implies that reductions in demand and reductions in supply were equally important.

Table 1

Children Under 16 in Industry, 1870-1919

U.S. Silk	PA Silk		PA Industry			
	Number	%	Number	%	Number	%
1870	1,386	20.8	15	1.6	19,232	6.9
1880	5,566	17.8	319	10.0	29,667	8.7
1890	2,866	5.8	1,293	13.9	22,419	4.1
1898			3,926	19.3		
1899	6,413	9.8	4,249	20.2	33,135	4.5
1904	7,366	9.2	4,734	17.6	34,451	4.5
1906			4,087	15.5		
1907			4,185	14.8		
1908			4,492	13.9		

1909	8,143	8.0	4,674	13.9	29,107	3.3
1910			4,280	12.8		
1911			5,465	15.0		
1912			5,445	14.6		
1913			5,004	11.6		
1914	7,880	7.2	4,984	10.8	27,009	2.9
1915			3,537	8.2		
1919	6,584	5.2	4,343	7.5	19,032	1.7

Sources:
US Silk: all years —U.S. Census of Manufactures.
PA Silk: 1870, 1880, 1890, 1899, and 1919 — U.S. Census of Manufactures; 1898, 1904-1912 — Pennsylvania Department of Internal Affairs, *Annual Reports,* Part III, Industrial Statistics; 1913-15 — Pennsylvania Department of Labor and Industry, *Annual Reports,* Part I, Statistics of Production-Wages-Employees.
PA Industry: all years — U.S. Census of Manufactures.

Table 2

Daily Wages in Pennsylvania Silk Mills, 1898-1915

Men	Women	Children	Children/Men		Children/Women
1898	$1.22	$0.71	$0.39	.32	.55
1904	1.61	0.91	0.52	.32	.57
1906	1.67	0.94	0.60	.36	.64
1907	1.77	0.99	0.62	.35	.67
1908	1.35	0.71	0.47	.35	.66
1909	1.58	0.84	0.52	.33	.62
1910	1.68	0.91	0.56	.33	.62
1911	1.83	1.08	0.72	.39	.67
1912	1.84	1.07	0.67	.36	.63
1914	2.09	1.13	0.65	.31	.58
1915	1.95	1.10	1.01	.52	.92

Sources: 1898-1912 — Pennsylvania Department of Internal Affairs, *Annual Reports,* Part III: Industrial Statistics; 1914-1915 — Pennsylvania Department of Labor and Industry, *Annual Reports,* Part I: Statistics of Production-Wages-Employees.

Table 3

Components of Family Labor Income, 1907

	All Families (n=925)		Father Working (n=767)		Father not Working (n=158)	
	Earnings	%	Earnings	%	Earnings	%
Father	$419.22	49.0	$505.58	56.2	$ 0.00	0.0
Mother	11.12	1.3	4.14	0.5	44.96	7.0
Children:						
16 Plus	258.07	30.2	228.27	25.3	402.74	63.1
14-15	126.17	14.7	121.95	13.5	146.66	23.0
under 14	40.98	4.8	40.41	4.5	43.75	6.9
Total	$855.57	100.0	$900.36	100.0	$638.11	100.0

Note: Sample is families with at least one child working in a silk mill.
Total income excludes income from boarders or sale of assets.
Source: Calculated from U.S. Senate, *Report,* vol. IV, pp. 470-519.

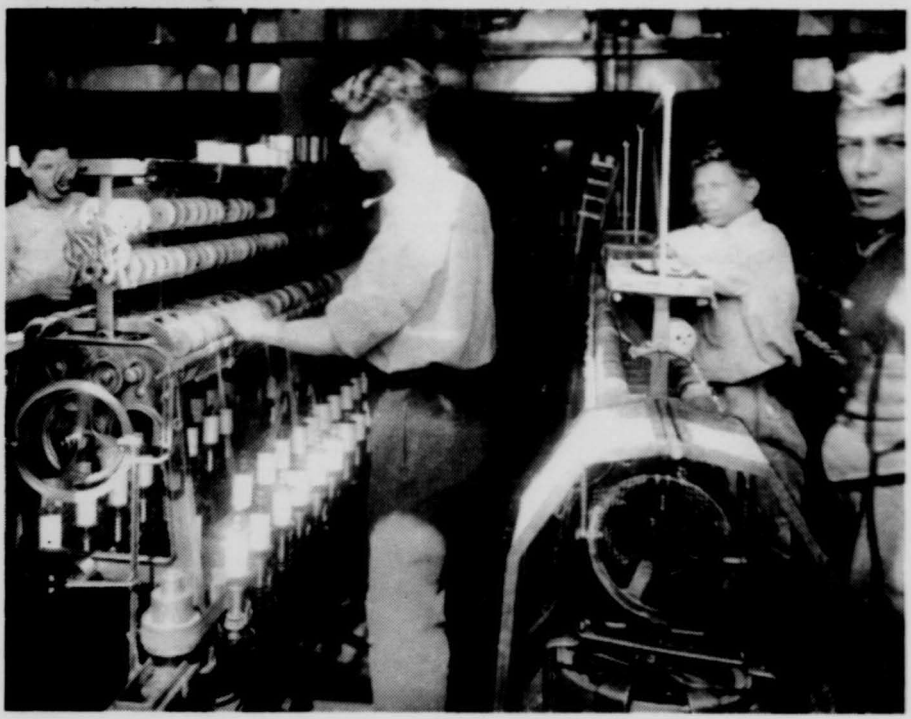
Table 4

Adult Male Earnings, 1898-1919

	Anthracite	Silk
1898		$372
1900	$321	
1901	389	
1902	260	
1903	464	
1904	555	413
1905	503	453
1906	462	376
1907	502	406
1908	440	332
1909	460	388
1910	472	385
1911	480	394
1912	463	398
1913	481	
1914	454	420
1915	493	404
1916	477	
1917	569	
1918	654	
1919	611	

Sources:
Anthracite: U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970* (Washington, D.C., 1975), p. 166, Series D-742.
Silk: 1898-1912 — Pennsylvania Department of Internal Affairs, *Annual Reports,* Part III: Industrial Statistics; 1914-1915 — Pennsylvania Department of Labor and Industry, *Annual Reports,* Part I: Statistics of Production-Wages-Employees.
Nominal figures are adjusted for inflation (using 1890-1899 as the base year) by the consumer price index in U.S. Bureau of the Census, *Historical Statistics,* p. 212, Series E-185.

Courtesy of Pennsylvania State Archives.



Boys Throwing Silk, Saquoit Silk Mfg. Co., 1918.

Notes

1. Clark Nardinelli, *Child Labor and the Industrial Revolution* (Bloomington: Indiana University Press, 1990) considers these same hypotheses in explaining the decline of child labor in industrialized countries generally. Martin Brown, Jens Christiansen, and Peter Philips, "The Decline of Child Labor in the U.S. Fruit and Vegetable Canning Industry: Law or Economics?" *Business History Review* 66 (Winter 1992) pp. 723-770, examine these hypotheses for the canning industry.

2. For example, Sarah H. Atherton, *Survey of Wage-Earning Girls Below Sixteen Years of Age in Wilkes-Barre, Pennsylvania, 1915* (New York: National Child Labor Committee, 1916); Claudia Goldin, "Household and Market Production of Families in a Late Nineteenth Century American City," *Explorations in Economic History* 16 (January 1979) pp. 113-131; Claudia Goldin, "Family Strategies and the Family Economy in the Late Nineteenth Century: The Role of Secondary Workers," in Theodore Hershberg (ed.) *Philadelphia: Work, Space, Family, and Group Experience in the Nineteenth Century* (New York: Oxford University Press, 1981) pp. 277-310; Michael Haines, "Poverty, Economic Stress, and the Family in a Late Nineteenth-Century American City: Whites in Philadelphia, 1880," *ibid.* pp. 240-276; Thomas Keil and Wayne Usui, "The Family Wage System in Pennsylvania's Anthracite Region: 1850-1900," *Social Forces* 67 (September 1988) pp. 185-207.

3. For example, Pennsylvania Bureau of Women and Children, "A History of Child Labor Legislation in Pennsylvania," *Special Bulletin No. 27* (Harrisburg: 1928).

4. For example, U.S. Senate, *Report on Condition of Woman and Child Wage-Earners in the United States,* volume IV, *The Silk Industry* (Washington: Government Printing Office, 1911).

5. Bonnie Stepenoff, "Child Labor in Pennsylvania's Silk Mills: Protest and Change, 1900-1910," *Pennsylvania History* 59 (April 1992) pp. 102-121.

6. "Child labor" is here defined as the industrial employment of boys and girls under sixteen years of age. Beginning in 1900, the federal census used sixteen as the age dividing children from adult workers. Reform groups such as the National Child Labor Committee sought to prohibit the industrial employment of children under sixteen. Few reformers protested the employment of sixteen-year-olds in industry; similarly few protested the employment of children of any age in agriculture. See Walter Trattner, *Crusade for the Children* (Chicago: Quadrangle Books, 1975), and Viviana Zelizer, *Pricing the Priceless Child: The Changing Social Value of Children* (New York: Basic Books, 1985).

7. U.S. Bureau of the Census, *Twelfth Census of the United States,* vol. VII, Manufactures, pp. cxxix-cxxxii; *Thirteenth Census,* vol. VIII, *Manufactures,* p. 270; *Fourteenth Census,* vol. VIII, *Manufactures,* p. 296. The silk industry both employed more children and had a higher percentage of its workforce under sixteen than any other industry in the state.

8. Lackawanna (33 mills), Lehigh (32), and Luzerne (23) Counties ranked first, second, and third in the number of silk mills in 1911. The three counties combined had 43% of all silk mills in the state; see Pennsylvania Secretary of Internal Affairs, *Annual Report,* 1911, Part III (Harrisburg: 1912) p. 414. The federal Census of Manufactures in 1914 showed a similar concentration of mills in these counties (vol. II, p. 128). Philadelphia also was home to many silk mills throughout this period. In 1900, Philadelphia had twice as many silk mills as Lackawanna or Lehigh Counties, yet Lehigh's value of output was still highest in the state (*Twelfth Census,* vol. IX, *Reports on Selected Industries,* p. 213).

9. U.S. Senate, *Report,* vol. IV, p. 27.

10. U.S. Bureau of the Census, *Thirteenth Census of the United States,* vol. X, *Manufactures,* p. 171; *Fourteenth Census,* vol. X, *Manufactures,* p. 232. The Census did not report boys and girls separately before 1910. Similarly, annual state industrial reports enumerated boys and girls separately only in 1913-1915; again, girls outnumbered boys by slightly more than two to one. In the mills surveyed in 1907 for the U.S. Senate *Report,* girls outnumbered boys nearly six to one (p. 54).

11. Computed from U.S. Senate, *Report,* vol. IV, pp. 471-519. The percentages are for children; i.e., less than 5% of girls

under sixteen were under thirteen.

12. *Ibid.*, pp. 54-55.

13. *Ibid.*, p. 71.

14. State industrial data were collected and published on a nearly annual basis by the Secretary of Internal Affairs. The reports are frustratingly silent on how and from what sources the data were gathered. Nonetheless, the annual state reports appear to be quite comprehensive, though smaller mills are somewhat underrepresented: the state reports include about 70% of the establishments and more than 90% of the total number of wage-earners and value of output shown in federal Census records for the same years. In 1913 a restructuring of state agencies gave the newly-created Department of Labor and Industry responsibility for collecting these data; after 1915 the Department abandoned the collection of detailed wage and employment data in favor of monitoring trade union issues.

15. The percentage of the workforce under sixteen is somewhat understated in Census data prior to 1900. Before 1900, the Census defined children as "boys under sixteen and girls under fifteen"; beginning in 1900, the definition was "boys and girls under sixteen." The understatement prior to 1900 is slight, however, as fifteen-year-old girls "probably would not constitute more than three percent of the total females" (U.S. Senate, *Report,* pp. 31n, 32). Supposing that fifteen-year-olds were three percent of adult women, the percentage of the workforce under sixteen becomes 15.6% for 1890 (rather than 13.9%) and 11.7% for 1880 (rather than 10%). The changing Census definition of children certainly does not account for the observed trends in child labor 1880-1900. After 1900, both Census and state reports define children as "boys and girls under sixteen."

16. According to the 1907 U.S. Senate survey, children made up 23.2% of the Pennsylvania silk workforce. However, this survey overstates the importance of child labor, as throwing mills were overrepresented. Children made up 30% of the throwing mill workforce, a much higher percentage than in broad silk or ribbon mills. See U.S. Senate, *Report,* vol. IV, p. 14.

17. Bonnie Stepenoff ("Child Labor," p. 114) notes that the average age of silk workers in Carbondale, Lackawanna County, rose from sixteen to twenty between 1900 and 1910 and thus argues that child labor declined. However, the average age of the workforce is only an indirect measure of the extent of child labor. More useful is the percentage of workers who were children, i.e. under sixteen years of age. Computations on the Census data reported by Stepenoff ("Child Labor," p. 107) show that the number of children working in Carbondale's silk mills declined both absolutely (from 112 to 45) and as a percentage of the workforce (from 45% to 19%) between 1900 and 1910. The decline of silk child labor thus appears to have been much steeper in Carbondale than elsewhere in the state.

18. Computed from U.S. Bureau of the Census, *Twelfth Census of the United States,* vol. IX, *Special Reports on Selected Industries,* pp. 212, 228; Bureau of the Census, Bulletin 74: *Census of Manufactures, 1905: Textiles,* pp. 187, 192; *Thirteenth Census,* vol. X, *Reports for Principal Industries,* p. 155; *Census of Manufactures, 1914,* vol. II, p. 130; *Fourteenth Census,* vol. X, *Manufactures,* p. 220.

19. See sources listed in Table 1.

20. For nationwide application of the legislation hypothesis, see Trattner, *Crusade,* esp. p. 159, and U.S. Bureau of the Census, *Fourteenth Census of the United States,* vol. IV (Washington: Government Printing Office, 1923), esp. p. 475. Daniel Nelson, *Managers and Workers: Origins of the New Factory System in the United States, 1880-1920* (Madison: University of Wisconsin Press, 1975) maintains that legislation was effective even when enforcement was incomplete or nonexistent, because manufacturers worried that open defiance would bring forth tighter restrictions and enforcement (p. 137).

21. By 1910, every northern industrial state had established fourteen as the minimum age for factory employment.

22. For a thorough discussion of Pennsylvania's child labor laws through 1925, see Pennsylvania Bureau of Women and Children, "A History."

23. Laura Scott, *Summary of Laws in Force, 1910: Child Labor* (American Association for Labor Legislation: New York, 1910) pp. 25, 42-43.

24. Pennsylvania Bureau of Women and Children, "A History," p. 8.

25. The 1916 Act also imposed an eight-hour daily maximum for children under sixteen. See Elizabeth Sands Johnson, "Child Labor Legislation," in John R. Commons *et al., History of Labor in the United States,* vol. 3 (New York: Macmillan, 1935) pp. 437-442.
26. Pennsylvania Bureau of Women and Children, "A History," p. 22.
27. *Ibid.,* pp. 22-23.
28. U.S. Senate, *Report,* pp. 42-43. Nelson, *Managers and Workers,* similarly argues that "machinery reduced or eliminated the demand for child labor" in U.S. industry generally (pp. 137-138).
29. Trattner, *Crusade,* p. 159.
30. Goldin, "Household and Market Production"; Goldin, "Family Strategies"; Haines, "Poverty."
31. Keil and Usui, "Family Wage System," pp. 204-205.
32. Stepenoff, "Child Labor," p. 101. Zelizer, *Pricing the Priceless Child,* argues that during the first decades of the twentieth century, children became "sacralized" — by the 1930s, U.S. families valued children for emotional rather than economic reasons (p. 209).
33. Stepenoff, "Child Labor," p. 115.
34. Part of the increase was due to inflation. In real terms, children's wages rose by 21% between 1898 and 1914. See Table 4 for reference to the price index used.
35. The distribution of man, woman, and child workers among the various branches of the silk industry remained constant over this period. Similarly, the distribution of children among various occupations remained roughly constant — about 75% of all child operatives worked in spinning from 1899 to 1919. Thus neither of these factors influenced relative wages.
36. Ruth McIntire, "American Children and the War," *Child Labor Bulletin 7* (November 1918) pp. 178-194; quote on p. 179. Also see Trattner, *Crusade,* pp. 134, 138.
37. The mills chosen were "representative of the industry, including some that showed the best conditions, some that showed the worst, and some in which average conditions prevailed." U.S. Senate, *Report,* p. 14.
38. Average income among the families of cotton mill children in North and South Caroline was almost identical to that of the average Pennsylvania silk mill family. However, Carolina mill families received more than one-third of their total labor income from children under sixteen and correspondingly less from fathers (27% of family income). Calculated from U.S. Senate, *Report,* vol. I, pp. 852-903.
39. Atherton, *Wage-Earning Girls,* pp. 18-20.
40. The average wage for fourteen- and fifteen-year-olds was 57.5 cents per day. To earn $146.66 - 121.95 = $24.71 more required 24.71/.575 = 43 more days labor. This does not mean that each child of an unemployed father worked 43 days more than each child of an employed father; rather, a family with an unemployed father got a total of 43 more work days from all of its children combined.
41. Alternatively, children in these families may have worked more to help pay off the purchase. See Steven Herscovici, "Ethnic Differences in School Attendance in Antebellum Massachusetts," *Social Science History* 18 (Winter 1994) pp. 471-496, and Joel Perlmann, "Working-Class Home Ownership and Children's Schooling in Providence, Rhode Island, 1880-1925," *History of Education Quarterly* 23 (1983) pp. 175-193 for discussion.
42. A drawback of the survey is that it recorded data only for children at work and only for those families with at least one child working. Restricting the analysis to working children may bias the results. However, John Pencavel, "Labor Supply of Men: A Survey," in Orley Ashenfelter and Richard Layard (eds.) *Handbook of Labor Economics* (New York: North-Holland, 1986) pp. 3-84, reports that there is "no evidence from empirical studies of male labor supply (whether old, young, or prime-age men) that documents grievous biases from a strategy of restricting estimation to the sample of workers and of not making any correction for this deliberate nonrandom selection of the observations" (p. 55).
43. The multiple regression analysis is based on data for 1083 children working in the silk industry; data are from U.S. Senate, *Report,* vol. IV, pp. 470-519. The dependent variable is the number of days worked by the child in 1907. "Age" is the child's age at last birthday. The variable "sex" is a dummy variable, set equal to one for boys

and zero for girls. "Young siblings" is the number of siblings under ten; "Old siblings" is the number of siblings sixteen and older living at home. "Own home" is a dummy variable, set equal to one if the child's family owns its home and zero otherwise. The variable "daily wage" is the child's daily wage, equal to annual earnings divided by the number of days worked. "Father's Earnings" is the annual earnings of the child's father, divided by the number of people in the family. The adjusted coefficient of determination is .17; absolute values of t-statistics are in parentheses.

44. The average father in this sample earned $410; the range was from $0 to $2000 (the standard deviation was $253).

45. This calculation is based on the coefficients of the regression equation and mean values for father's earnings per family member ($59.29) and days a child worked (199.3).

46. Pennsylvania Department of Internal Affairs, *Annual Report,* 1911, pp. 261, 414.

47. Percentages calculated from U.S. Senate, *Report,* vol. IV, pp. 470-519.

48. Atherton, *Wage-Earnings Girls,* p. 11.

49. Bureau of Applied Economics, Inc., *Wages in Various Industries and Occupations* (Washington, 1920) pp. 5-6. The nominal increases are adjusted for inflation as in Table 4. The increases in earnings may be attributable to the effects of World War I.

50. See Pennsylvania Department of Internal Affairs, *Annual Report,* 1889, Part III (Harrisburg: E. K. Myers, 1890) pp. E1-E13. It was possible, of course, for workingmen to oppose child labor and still send their children into the mills.