A Model of the Trends in Hours [§]

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** INCOMPLETE VERSION **

Abstract

During the first half of the 20th century the workweek in the United States declined, and the distribution of hours across wage deciles narrowed. The hypothesis proposed is twofold. First, technological progress, through the rise in real wages and the decreasing cost of recreation, made it possible for the average US worker to afford more time off from work. Second, changes in the distribution of wages and the cost of education explain the shifts in the distribution of hours. A model is built to explore whether such mechanisms can, quantitatively, account for the observations. The model is consistent with changes in the wage distribution, the rise in education, the share of expenditures devoted to recreation and the amount of GDP growth in the US during the first half of the century. Counterfactual experiments show that the rise in wages is the main contributor to the decline in hours.

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1 Introduction

Figure 1 offers a view of one of the trends that transformed the US economy over the course of the nineteenth and twentieth centuries: The reduction in the length of the workweek – the number of hours per week a worker spends on the market. In 1830, the average US worker spent about 70 hours per week working for a wage. From this time until the middle of the twentieth century, hours declined 40 percent. The trend is less pronounced during the second half of the twentieth century where, as pointed out by McGrattan and Rogerson (2004), hours exhibit a u-shape. They are declining from 1950 to 1970 and rising afterward. The trend in the workweek is unambiguous during the pre-1950 period. Thus, the present paper investigates hours per worker from 1900 to 1950, and asks what are the driving forces of this trend.

Figure 2 gives a disaggregated perspective on the same phenomenon. It reveals that the bulk of the decline in the workweek was driven by workers at the bottom of the distribution of wages.[1] More precisely, low-wage earners worked the longest week in 1900, but they reduced their hours faster than high-wage earners. The result was a contraction in the distribution of hours across wage groups. In 2000 the picture is quite different than in 1900 since high-wage earners are at the top of the distribution of hours. The current situation has already been pointed out in the literature. (See, for instance, Ríos-Rull (1993) and Aguiar and Hurst (2006)). Table 1 reports summary statistics for the distribution of hours of men workers. The figures in Table 1 are computed from the data used in Figure 2.

1870	1970	1990
1.25	1.07	0.92

Table 1: Ratio hours of 10th to 90th wage decile.

Observe the consistency between the time-series and cross-sectional relationship between hours and labor income, during the first half of the twentieth century. This consistency is lost as one contemplates the more recent half of the century. This fact is an additional reason why the period of interest, here, ends in 1950.

The trend in the length of the workweek is not specific to a particular sector of the economy as suggested by Figure 3. Similarly, it is not a phenomenon observed only in the United State as shown by Figure 4. Observe that, on the basis of Figure 3, one can venture

[1]The source for Figure 2 is Costa (1998, Table 2). This finding is robust to disaggregation by gender, industry and occupation. Does the distribution of daily hours translates into a similar distribution for weekly or annual hours? Did the 1890 low-wage worker have a long day at work because of a shorter week? Costa presents evidence that such is not the case. For instance, those who reported Sunday at work where more likely to have longer hours in the 1890s. Likewise for those who reported no reduction or increase in Saturday hours. Similarly, workers with 3 months of unemployment in a year worked less per day than workers with no unemployment during the year.

that changes in labor laws had a marginal impact on hours worked. Labor laws would have had to be similar in various countries and change at similar moments to generate the series represented here.[2] It is also interesting to note that, beside the reduction of weekly hours, households reduced their working time along other margins. Greenwood, Seshadri, and Yorukoglu (2005), for instance, show that they do less work around the house. They also work fewer weeks per year. (Lebergott (1976) reports that six percent of non-farm workers took vacations in 1901, 60% in 1950 and 80% in 1970). Finally, Kopecky (2005) reports that in the 1850s one could expect to spend about five percent of his adult life in retirement. By 2000 this number is above 25%.

1.1 The hypothesis

What could have been the driving forces behind such facts? The hypothesis proposed here is twofold: First, technological progress, through the rise of wages and the decrease of the cost of recreation made it easier and more attractive for US workers to spend time off from work. Second, changes in the distribution of wages account for the shifts in the distribution of hours. These mechanisms are now discussed in details.

Between 1900 and 1950, the real wage rate for the average US worker is multiplied by a factor three. This pattern is represented in Figure 5. The textbook analysis of labor supply suggests, then, that the income effect from the rise in wages dominated the substitution effect: Households used their income to purchase more free time.

Contemplate the decline in market hours from the perspective of the household production literature, as pioneered by authors like Mincer (1962) and Becker (1965). One important idea introduced in this literature is that some commodities are produced and consumed within the household, by combining time and other goods. Consider then the home production of "leisure services." Leisure services are enjoyed, for instance, from a bicycle ride in the country, time spent reading a book, listening to the radio, exercising in a fitness club, etc... Beside time, the production of leisure services requires another input which can be purchased on the market: a "leisure good," e.g., bicycles, books, radios, golf passes... One specificity of such goods is that they are meant to *use* time, not to save it. In this respect, they enter into the household production function quite differently than households appliances, such as washing machines, which are meant to save time. Leisure goods purchased on the market, e.g., a movie ticket, give rise to the production of leisure services which are not sold on the market. In other words, the household combines the leisure good with time to produce a service he attaches utility to. The latter is not sold, but rather consumed directly. In this respect, this is household production.

Leisure activities became cheaper and more popular throughout the twentieth century.

[2]Tomlins (2000) indicates that many hours-related law were passed in the late nineteenth and early twentieth century in the US, but no law constraining the hours of men was found to be constitutional.

	1890	1940	1950	1990
Wage ratio 90/10 decile	2.81	2.15	1.85	2.15

Table 2: Changes in the wage structure.

This is suggested by Figure 6, which shows that the price index for recreational expenditures was divided while the share of consumption expenditures devoted to recreation increased from three to more than eight percent. Finally, Owen (1969) reports econometric evidence that, beside real wages, the price of leisure goods significantly affects leisure time. More recently, Gonzales-Chapéla (2004) estimates labor supply functions using PSID data and also finds a significant effect of the price of recreation goods on labor supply.

Turn now to the question of the changes of the distribution of hours. The hypothesis, here, is that it contracted because, between 1900 and 1950, the distribution of wages contracted too. In other words, low-wage earners reduced their hours faster because they experienced faster wage growth. Goldin and Katz (2001) present evidence that the wage distribution was narrower in 1950 than at the the end of the nineteenth century. Summary statistics are presented in Table 2.[3] Such changes can be linked to the rise in education which took place throughout the twentieth century, and is illustrated in Figure 7. In 1910, less than ten percent of the 17-years old were high school graduates. In 1950, this number is about 60%. The flow of educated workers into the marketplace is likely to have reduced their wage growth relative to that of uneducated workers, generating the contraction in the wage distribution.

1.2 This Paper

This paper offers a model where preferences are defined over consumption, leisure goods and leisure time. Alternatively, one could define preferences on consumption and leisure services, where leisure services are produced with free time and leisure goods. There are two sectors. One employs skilled and unskilled workers to produce the consumption good. The other transforms the consumption good into a leisure good. Households live for one period and choose to purchase education to become skilled, or to remain unskilled. Thus, the model exhibits an endogenous wage dispersion. The driving forces of the of the economy are technology variables specific to skilled and unskilled labor, technology in the leisure good sector, and the cost of education. The model's parameters are calibrated to match some key statistics of the US economy in 1900. In particular, the model is consistent with the average level of the workweek, the dispersion of wages and hours,

[3] The numbers presented here are derived as follows. (i) 1890 and 1940: Goldin and Katz (2001, Table 2.1); (ii) 1950: From Goldin and Margo (1992, Table 1) one can derive that the wage ratio in 1950 is approximately 86% of what is was in 1940, thus $2.15 \times 0.86 = 1.85$. (iii) 1990: Goldin and Katz (2001) show that the dispersion today is the same as in 1940.

the share of recreation expenditures and the number of skilled workers (measured by the percentage of a generation with a high school degree) in the US in 1900. Then, the time varying parameters of the model are allowed to change in order to compute an equilibrium representing the US economy in 1950. This second equilibrium is constrained to exhibit the same number of skilled workers as in the US in 1950, the same change in the price of the leisure good relative to 1900 and the same amount of GDP growth. The average level of the workweek, the dispersion of wages and hours and the share of recreation expenditures are left unconstrained.

In its baseline calibration, the model generates a decline in the average level of the workweek of a magnitude similar to what is observed in the US data. At the same time, the distribution of hours contracts significantly. Counterfactuals experiments suggest that technological progress, associated with skilled workers is the main driving force behind this result. Because of the low share of leisure expenditures, the decline in the price of the leisure good has a negligible impact on the results.

2 The Model

2.1 Environment

The economy is inhabited by a measure one of agents alive for one period of time, and with preferences defined over a generic consumption good, c, a leisure good g and leisure time, ℓ. Agents are differentiated by their market ability, $a > 0$, which is distributed in the population according to the cumulative distribution function A. Assume that A is a log-normal distribution with mean μ_a and standard deviation σ_a. An agent can choose to purchase education, at a fixed cost e, to become a skilled worker. If he does not make this expense, he is labeled an unskilled worker. One unit of market time of worker a, skilled or unskilled, is worth a efficiency units of labor. A skilled worker receives a wage w_s per efficiency units of labor, while an unskilled receives w_u. The production of the consumption good requires two tasks to be accomplished: one is assigned to skilled workers and the other one to unskilled workers. Beside the consumption good sector, there is a firm which produces the leisure good and sells it at price p. This firm transforms the consumption good into the leisure good.

2.2 Households

Preferences are represented by the following utility function:

$$U(c, g, \ell) = \left[\alpha c^{\sigma} + (1-\alpha)\left(\mu g^{\rho} + (1-\mu)\ell^{\rho}\right)^{\sigma/\rho}\right]^{1/\sigma} \tag{1}$$

where $\alpha, \mu \in (0,1)$ and $\sigma, \rho < 1$. For convenience, denote the CES composite of g and ℓ by z. This composite can be interpreted as a household good, produced through the technology described by the inner CES aggregator in U. Leisure time, ℓ, and the leisure good g can then be thought of as intermediate inputs in the production of this good. Let us call z "leisure" for the sake of exposition. (It is understood that ℓ, leisure time, is a different object than leisure itself.) The parameters σ and ρ govern elasticities of substitution. More precisely, the elasticity of substitution between g and ℓ is $1/(1-\rho)$, while $1/(1-\sigma)$ is the elasticity of substitution between c and z. This particular specification is chosen because it allows a non-constant recreation's share of expenditure (see Figure 6). In the quantitative exercise below, the parameters of the utility function will be chosen such that the model is consistent with the 1900 value of this statistics.

Denote by $V_s(a)$ the value of an agent who decides to purchase education and by $V_u(a)$ the value of an agent who does not. The education choice is, therefore, summarized by

$$\max\{V_s(a), V_u(a)\}. \tag{2}$$

A skilled agent solves the following maximization problem:

$$V_s(a) = \max_{c,g,\ell} \; \{U(c,g,\ell) : c + pg + aw_s\ell + e = aw_s\} \tag{3}$$

while an unskilled solves

$$V_u(a) = \max_{c,g,\ell} \; \{U(c,g,\ell) : c + pg + aw_u\ell = aw_u\}\,. \tag{4}$$

Denote by $c_s(a)$, $g_s(a)$ and $\ell_s(a)$ the optimal decisions of a skilled agent with ability a. Define also $h_s(a) = 1 - \ell_s(a)$ as the optimal labor supply of this agent. Define $c_u(a)$, $g_u(a)$, $\ell_u(a)$ and $h_u(a)$ similarly. Finally, define $s_s(a) = pg_s(a)/(c_s(a) + pg_s(a) + e)$, the leisure share for a skilled agent, and $s_u(a) = pg_u(a)/(c_u(a) + pg_u(a))$ for an unskilled.

The rational for introducing heterogeneity across agents is the following: Education is costly, therefore educated agents tend to work more in order to pay for it. This would be a counterfactual implication of the model in the first part of the twentieth century. In the present specification, however, the hourly wage of an educated agent is aw_s, therefore agents with large ability levels (i.e., a large) are able to afford education and work less than others at the same time. In equilibrium, there is a threshold level of ability, a^*, below which agents remained uneducated. Agents with ability below, but close to, a^* will work less than educated agents with ability levels above but close to a^*. On average, however, uneducated agent will work more than educated agents.

2.3 Firms

The consumption good sector is represented by a single firm with constant-returns-to-scale technology, $F(s,u)$. The variables s and u represent the firm's demand for labor for the first and second task, respectively. Assume

$$F(s,u) = \left(z_s s^\theta + z_u u^\theta\right)^{1/\theta},$$

where $\theta < 1$ and $z_s, z_u > 0$. The parameter θ governs the elasticity of substitution between the two tasks, while z_s and z_u are factor-specific technological variables. The firm's optimization problem can be written

$$\max_{s,u} \left\{F(s,u) - w_s s - w_u u\right\}. \tag{5}$$

At an optimum, the demands for each type of worker are related by

$$\frac{z_s}{z_u}\left(\frac{s}{u}\right)^{\theta-1} = \frac{w_s}{w_u}, \tag{6}$$

thus, whenever productivity growth is faster in the first task than in the second, the ratio of efficiency units of labor hired in the first job increases faster than in the second, *ceteris paribus.*

Good g is produced by the leisure good sector with the constant-returns-to-scale production function $G(x) = z_g x$, where x represents inputs of the consumption good and z_g is a productivity parameter. The optimization problem of this sector writes

$$\max_{x} \left\{pG(x) - x\right\}. \tag{7}$$

At an optimum, the relative price of good g is $p = 1/z_g$.

2.4 Equilibrium

In equilibrium, agents with abilities higher than a certain threshold a^* choose to pay the cost of education and become skilled workers. Agents with abilities lower than a^* remain unskilled. The determination of a^* is endogenous. Given prices $\{p, w_s, w_u\}$ and a threshold a^*, the equilibrium equations on the markets for skilled and unskilled labor write

$$\int_{a^*} h_s(a) a dA = s \quad \text{and} \quad \int^{a^*} h_u(a) a dA = u,$$

respectively. The equilibrium condition on the leisure good market is

$$\int_{a^*} g_s(a)dA + \int^{a^*} g_u(a)dA = G(x).$$

Finally, the consumption good market is in equilibrium by Walras' law:

$$\int_{a^*} [c_s(a) + e]dA + \int^{a^*} c_u(a)dA + x = F(s, u).$$

To summarize, an equilibrium consists of (i) allocations for households, $c_s(a), g_s(a), \ell_s(a)$ and $c_u(a), g_u(a), \ell_u(a)$ for all a; (ii) allocations for firms, s, u, and x; (iii) prices w_s, w_u and p; and (iv) a partition of agents between those working the skilled job: $a > a^*$, and those working the unskilled job, $a < a^*$, such that

1. Agents choose their education optimally given prices, or $V_s(a^*) = V_u(a^*)$;
2. The allocations $c_s(a), g_s(a), \ell_s(a)$ solve problem (3) given prices;
3. The allocations $c_u(a), g_u(a), \ell_u(a)$ solve problem (4) given prices;
4. The allocations s, u solve problem (5) given prices;
5. The allocation x solves problem (7) given prices;
6. Markets clear.

3 Quantitative Analysis

3.1 Computational Experiment

The computational experiment is a comparative static exercise. Two equilibria are computed. One corresponds to the US economy in 1900 and the other to 1950. The time-invariant parameters of the model (preference and technology) are chosen using a priori information or are calibrated to match key statistics of the 1900 US economy. The time varying parameters (technological progress) are chosen to compute the second equilibrium. In this exercise, changes in the average level of hours worked and their distribution are left unconstrained. The relevance of the mechanisms proposed in Section 1.1 is evaluated on the ability of the model to replicate the key observations related to hours of work. The details of the experiment are now discussed.

The time-invariant parameters of the model are preference parameters: $\alpha, \mu, \sigma, \rho$, the substitution parameter for the market technology, θ, and the distribution parameters, μ_a

and σ_a. The time varying parameters are technology variables: z_s, z_u, z_g and the cost of education e.

Following Caselli and Coleman (2006), set $\theta = 1.0 - 1.0/1.24$. Choose $\mu_a = \sigma_a = 1/2$. Some robustness check are (TO BE) done with respect to these parameters. Finally, set the 1900 values of z_u and z_g to unity. Now, one has to choose values for the four preference parameters $\alpha, \mu, \sigma, \rho$ and the 1900 values of z_s and e. This is achieved by matching six statistics: the average level of hours, their distribution between skilled and unskilled, the skill premium, the percentage of skilled workers, the share of expenditures devoted to leisure goods, and the cost of education to GDP ratio. These statistics are computed, from the model, as described in Table 3. Note that the symbols A_s and A_u refer to the distribution

Free parameters	$\alpha, \mu, \sigma, \rho, z_s, e$	
Moments	Model's Counterpart	1900 Target
Average level of hours	$\int_{a^*} h_s(a)dA + \int^{a^*} h_u(a)dA$	0.58
Distribution of hours	$\int^{a^*} h_u(a)dA_u / \int_{a^*} h_s(a)dA_s$	1.25
Skill premium	$\int_{a^*} aw_s dA_s / \int^{a^*} aw_u dA_u$	2.81
Percentage of skilled	$1 - A(a^*)$	0.06
Share of leisure expenditures	$\int_{a^*} s_s(a)dA + \int^{a^*} s_u(a)dA$	0.03
Cost of education to GDP	$e(1 - A(a^*))/y$	0.01

Table 3: Free parameters and targets for the 1900 equilibrium

of abilities, conditional on being skilled and unskilled, respectively. Assuming that there are 100 hours available for work during the week, the target for the average number of hours is computed as the ratio of the workweek (58 hours) to 100. The distribution of hours is summarized by the ratio of hours of unskilled to skilled. The skill premium is measured by the average earnings per hour of a skilled worker, divided by that of an unskilled worker. The total cost of education is the price of education multiplied by the mass of skilled workers. Finally, the gross domestic product is the sum of expenditures on consumption and leisure goods and education. Table 3 also indicates the targeted values for each moment. Those have already been discussed in Section 1.

Once the 1900 equilibrium is computed, move on to 1950. This is accomplished by letting the exogenous driving forces change. Namely, let z_g increases so that the price of leisure goods decreases as it does in the US data. Let also the cost of education, e, changes so that the cost of education to GDP increases to three percent, its value in the US data in 1950. Finally, let z_s and z_u change so that the number of skilled workers increases to 60% and GDP is multiplied by 2.2. Both these values correspond to the actual changes observed in the US economy between 1900 and 1950. The average level of hours, their distribution, the skill premium and the share of expenditures devoted to recreation are left unconstrained. Table 4 summarizes the parameters and targets for the 1950 equilibrium.

Free parameters	z_s, z_u, z_g, e	
Moments	Model's Counterpart	1950 Target
Price of leisure good	$1/z_g$	35% decline relative to 1900
GDP	y	220% increase relative to 1900
Cost of education to GDP	$e(1 - A(a^*))/y$	3%
Percentage of skilled	$1 - A(a^*)$	60%

Table 4: Free parameters and targets for the 1950 equilibrium

The final calibration is reported in Table 5. Observe that preferences exhibits complementarity between consumption and leisure (the composite of leisure time and leisure good), since $\sigma < 0$. Leisure time and leisure good, however, are substitute as $\rho > 0$ indicates. Remember that, in the calibration exercise described above, the restrictions imposed by the 1900 distribution of hours and the recreation share of expenditures are driving this result. Observe also that the cost of education does not change substantially between 1900 and 1950. Therefore, the increasing cost of education to GDP ratio is due to the increase in the number of agents purchasing education, rather than to an increase in the cost itself. In the US data, the real price of tuition and related charges does not increase between 1900 and 1950.

Preferences	$\alpha = 0.88$, $\mu = 0.04$, $\sigma = -1.12$, $\rho = 0.01$
Technology	$\theta = 0.28$
Distribution of abilities	$\mu_a = 0.5$, $\sigma_a = 0.5$
1900	$z_s = 0.24$,$z_u = 1.0$, $z_g = 1.0$, $e = 0.25$
1950	$z_s = 1.06$,$z_u = 0.48$, $z_g = 1.53$, $e = 0.25$

Table 5: Baseline calibration

3.2 Results

Table 6 presents the results of the computational experiment described above. The model generates a decline in hours of a magnitude comparable with what is observed in the US data. Such decline is mostly driven by unskilled workers, as the contraction in the (model) distribution of hours shows. This contraction, in turn, is fueled by the contraction in the distribution of labor earnings which is not as important as what is actually observed, but is of a large magnitude. Observe that the share of expenditures devoted to leisure goods is increasing between the first and the second steady state.

		1900	1950
Average hours	model	0.58	0.46
	data	0.58	0.41
Distribution of hours	model	1.25	1.16
	data	1.25	1.07 (1970)
Skill premium	model	2.81	2.08
	data	2.81	1.85
Leisure share	model	3.0%	4.9%
of expenditures	data	3.0%	5.8%

Table 6: Baseline model: results

With such results in hand, one can now ask what are the most important driving forces behind the trends in the workweek and its distribution. This question can be answered through a series of counterfactual exercises. For instance, what would have happened if the price of the leisure good did not decline, while everything else remained the same as in the baseline calibration? Table 7 summarizes some results. It transpires, that the most important driving force behind the trends in hours is the technological progress associated with skilled workers. It increases from 0.2 to 1.0 in the baseline case (see Table 5). Thus, holding it constant amounts to shut down the source of economic growth in the model and, therefore, agents increase their work effort. (In the baseline calibration, z_u decreases between 1900 and 1950.) At the same time the distribution of hours contract, that is:

Experiment	Average hours	Distribution of hours	Skill premium	Number of skilled
Baseline model	0.46	1.16	2.08	60%
z_s constant	0.86	1.04	4.74	8%
z_u constant	0.30	1.23	2.02	40%
z_g constant	0.45	1.16	2.08	60%

Table 7: Counterfactual experiments, 1950 moments

skilled agents increase their work effort more than unskilled agents. Note that, the number of skilled agents hardly increases relative to the 1900 equilibrium and, since unskilled wages (per efficiency units of labor) decreases, the skill premium increases. When z_g is constant, the price of the leisure good does not decline. Observe that this hardly affects the results of the baseline calibration. This is an unexpected result, due to the relatively low share of expenditures devoted to recreation expenditures. On the basis of this experiment, it is probably fair to say that the rise in real wages is the main cause of the reduction in the workweek and that, changes in its distribution can be related to changes in the distribution of wages.

3.3 Robustness Analysis

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4 Concluding Remarks

This paper explores the trends in the workweek in the first half of the twentieth century: the decline in the average level of hours and the change in their distribution. The hypothesis under investigation is that technological progress is the engine of such changes. Technological progress affects wages and the price of recreation expenditures. In addition, the model exhibits an endogenous wage dispersion, generated by the possibility that some agent choose to purchase education while others do not. This allows one to relate the changes in the distribution of hours to changes in the wage distribution. The quantitative analysis of the model shows that real wage growth is the most important contributor to the decline in hours. Further, wage growth propelled by skilled wages, attracts agents into education and generates a reduction in the skill premium which, in turns generates a contraction in the distribution of hours.

In the second half of the twentieth century, the cross section relation between wages and hours is almost inverted compared to what it was in the first half of the century. This question is not addressed in the paper and can be an interesting area of investigation for future research.

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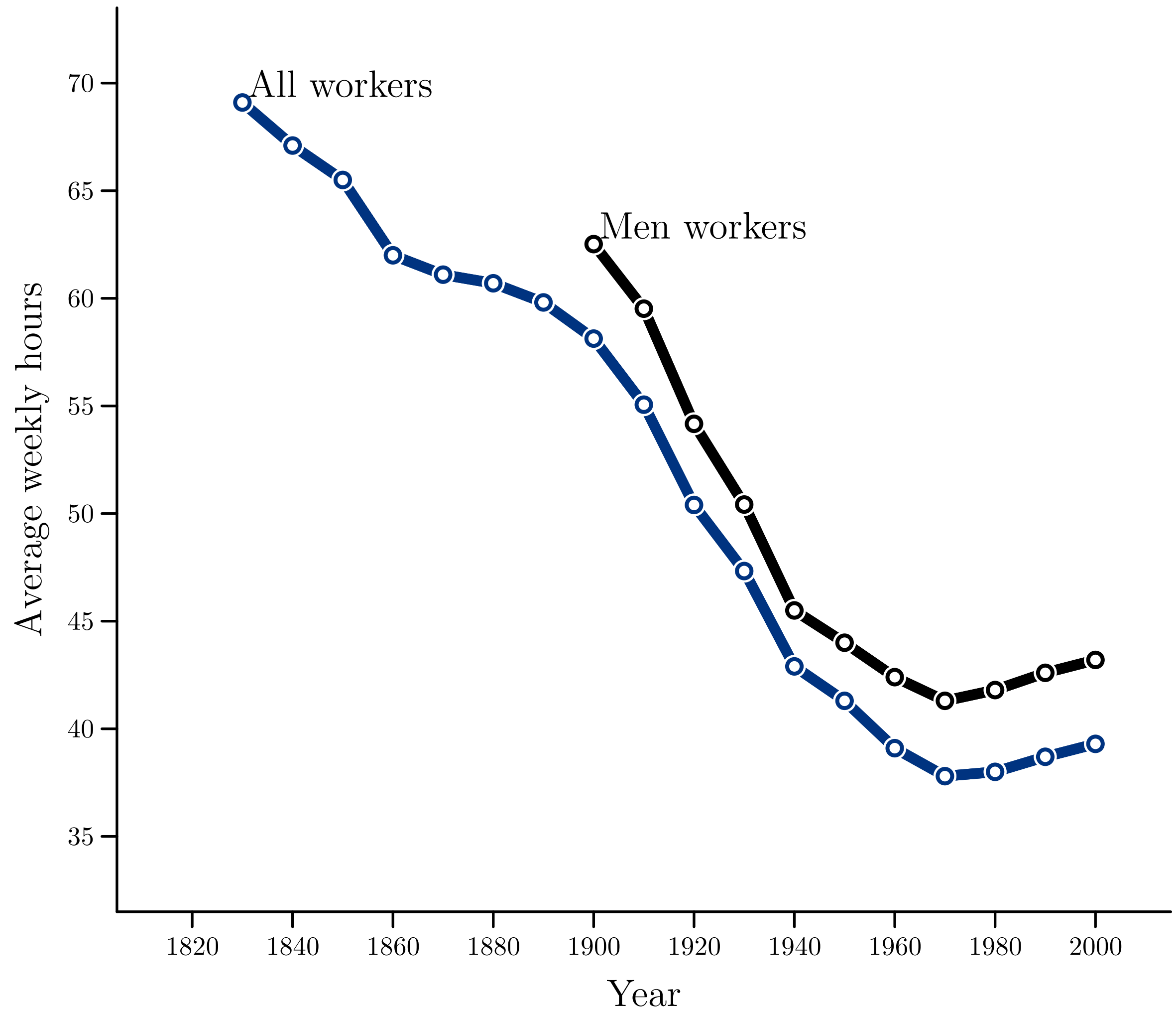

FIGURE 1: Average weekly hours worked, US, 1830–2000

Note – The source of data for total hours is Whaples (1990, Table 2.1, part A) for the period 1830-1880, Kendrick (1961, Tables A-IV and A-X) for the period for 1890–1940 and McGrattan and Rogerson (2004, Table 1) for the period 1950-2000. The series are spliced together in 1890 and 1950. The source of data for men hours is Whaples (1990, Table 2.1, part B) for the period 1900-1950 and McGrattan and Rogerson (2004, Table 2) for 1950–2000.

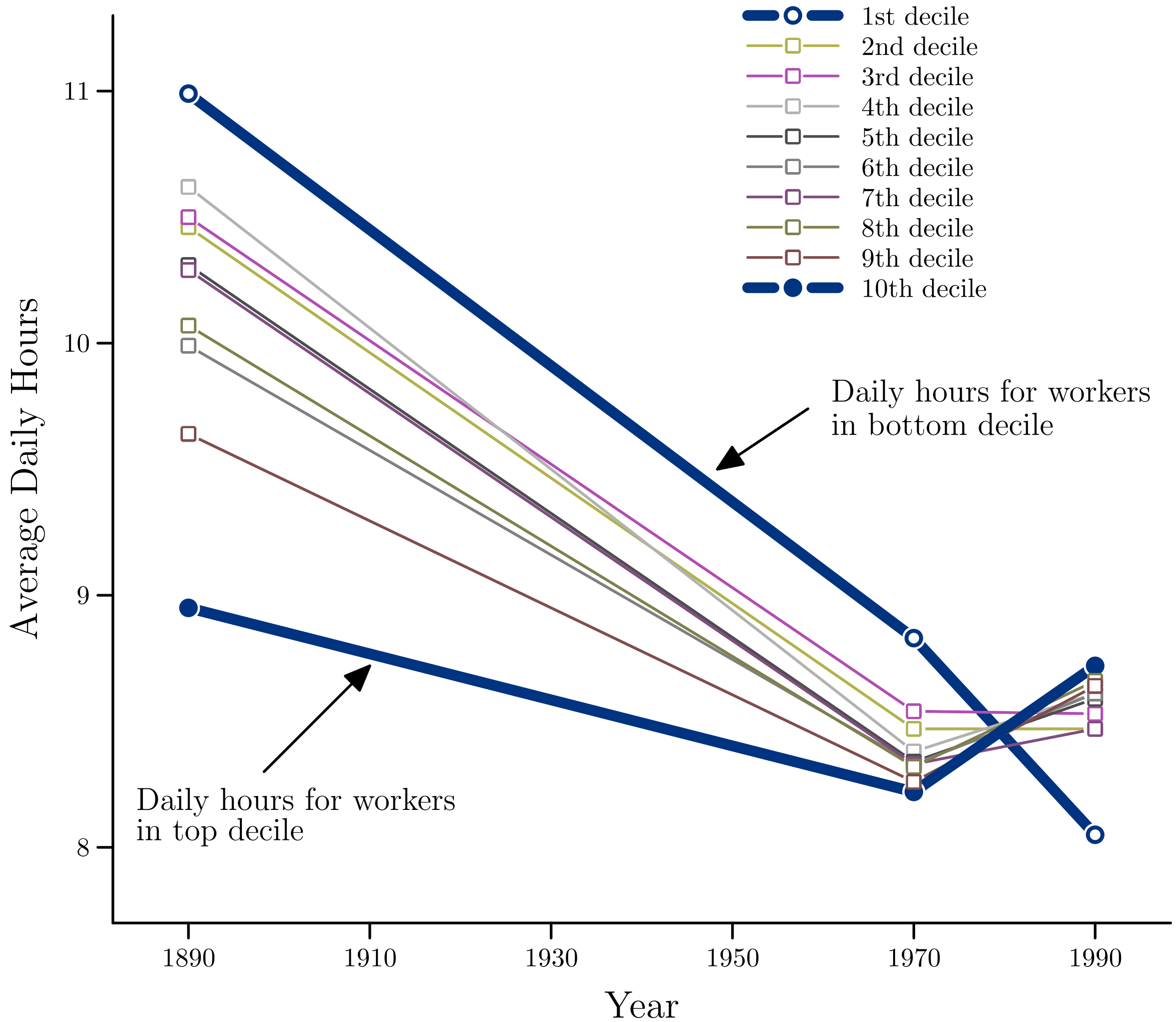

Figure 2: Daily hours per wage decile, US, 1890s, 1973 and 1991

Note – The source of this data is Costa (1998, Table 2). The data includes all workers in all sectors and at all occupations. Costa shows that if one disaggregate by sex or occupation or industry, the general pattern remains: There has been a contraction in the distribution of hours per wage decile.

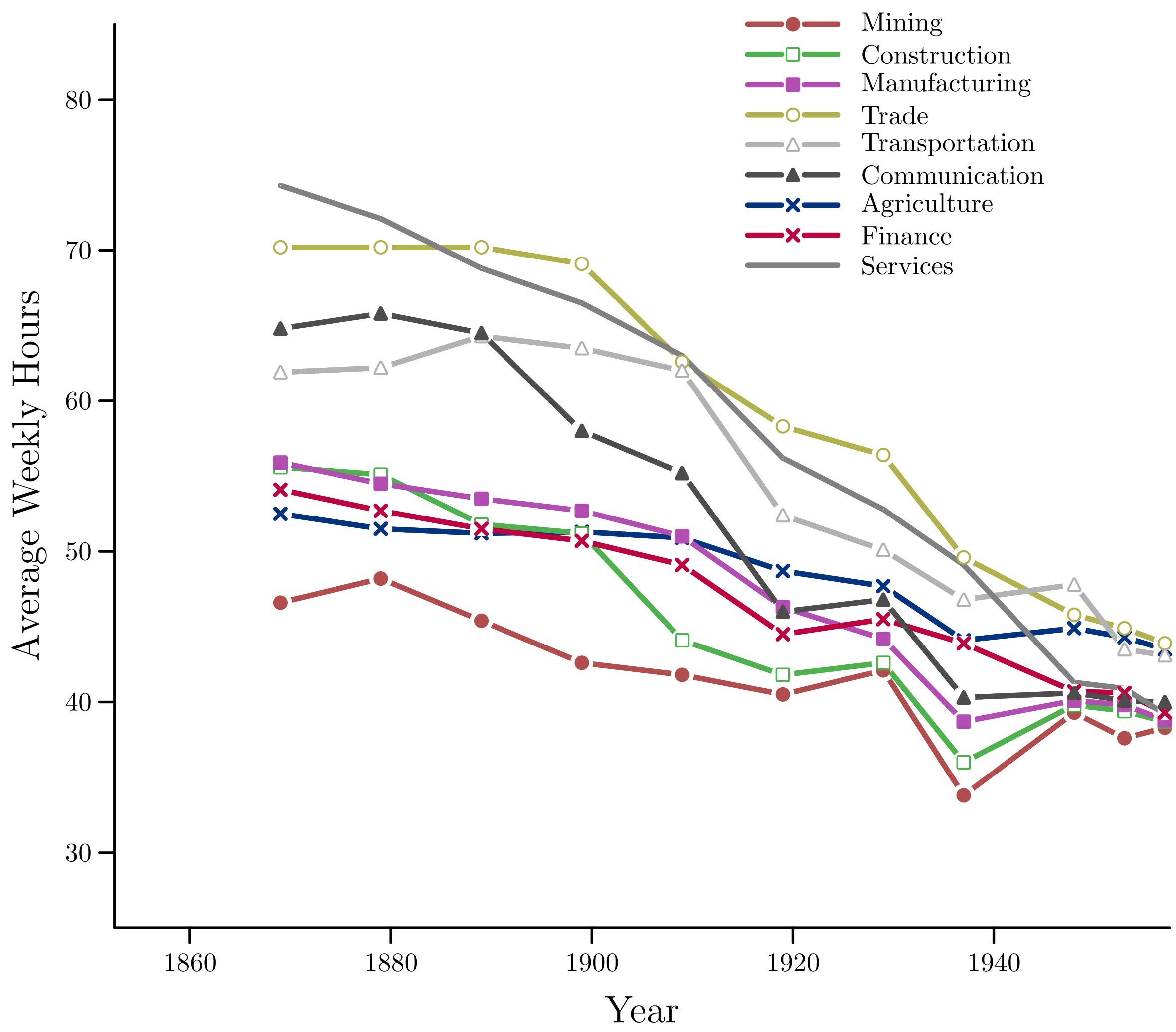

FIGURE 3: Average weekly hours in various sectors, US, 1869-1957

Note – The source of this data is Kendrick (1961, Table A IX)

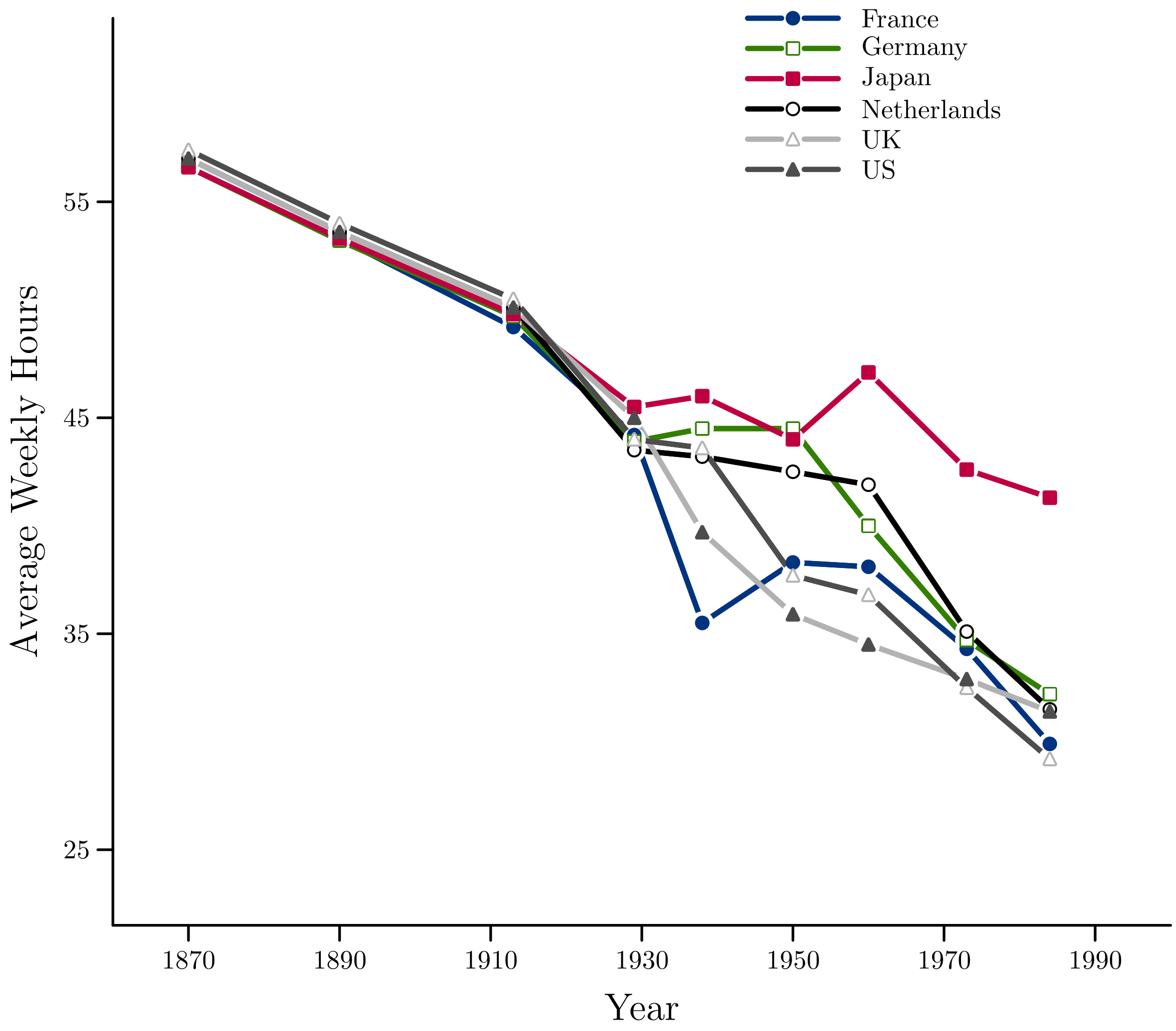

Figure 4: Average weekly hours per worker, various countries, 1870-1990

Note – The source of this data is Maddison (1987, Table A9).

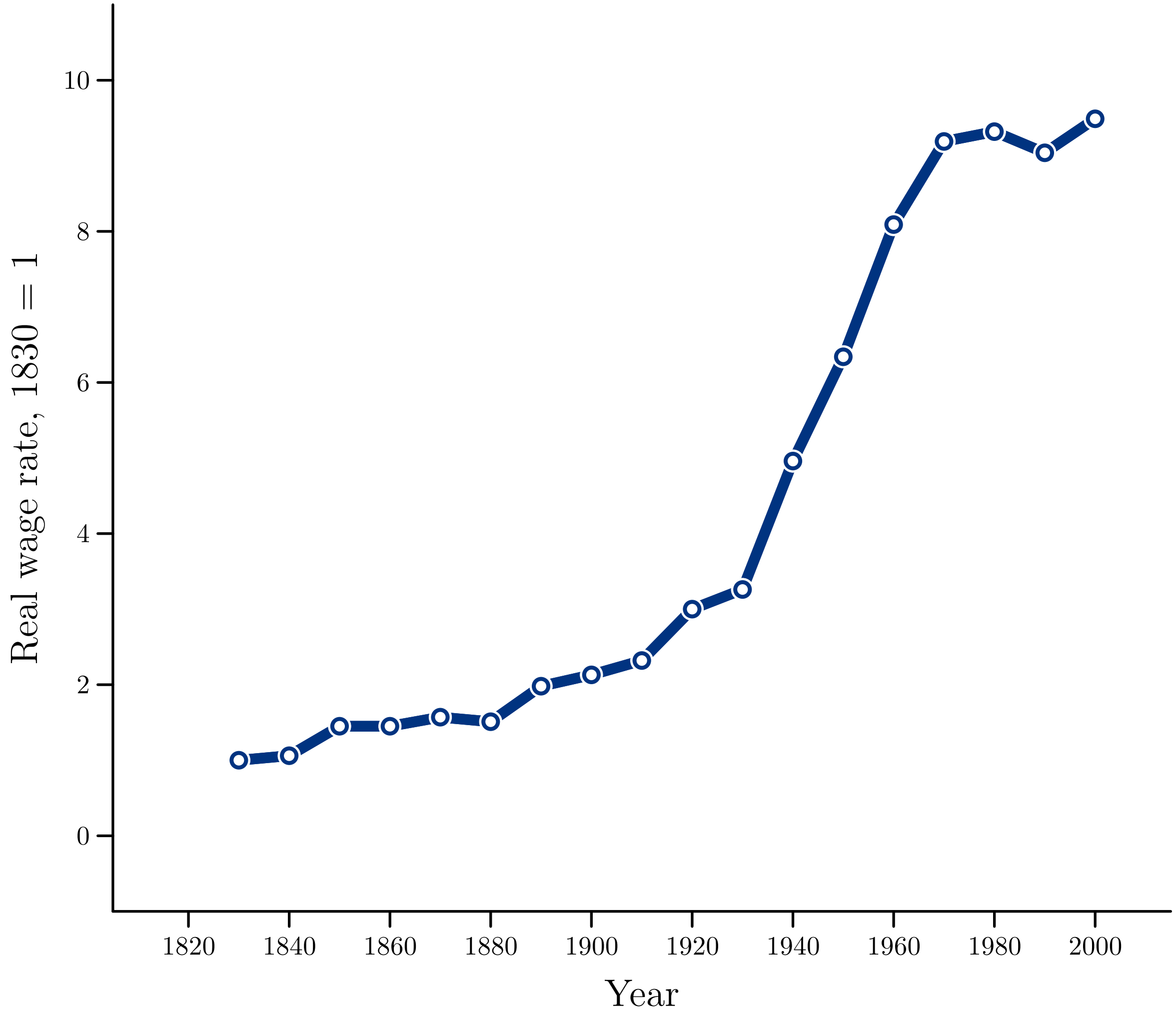

FIGURE 5: Real wage index, US, 19th and 20th centuries

Note – The source of real wages is Williamson (1995, Table A1.1) and Bureau of Labor Statistics.

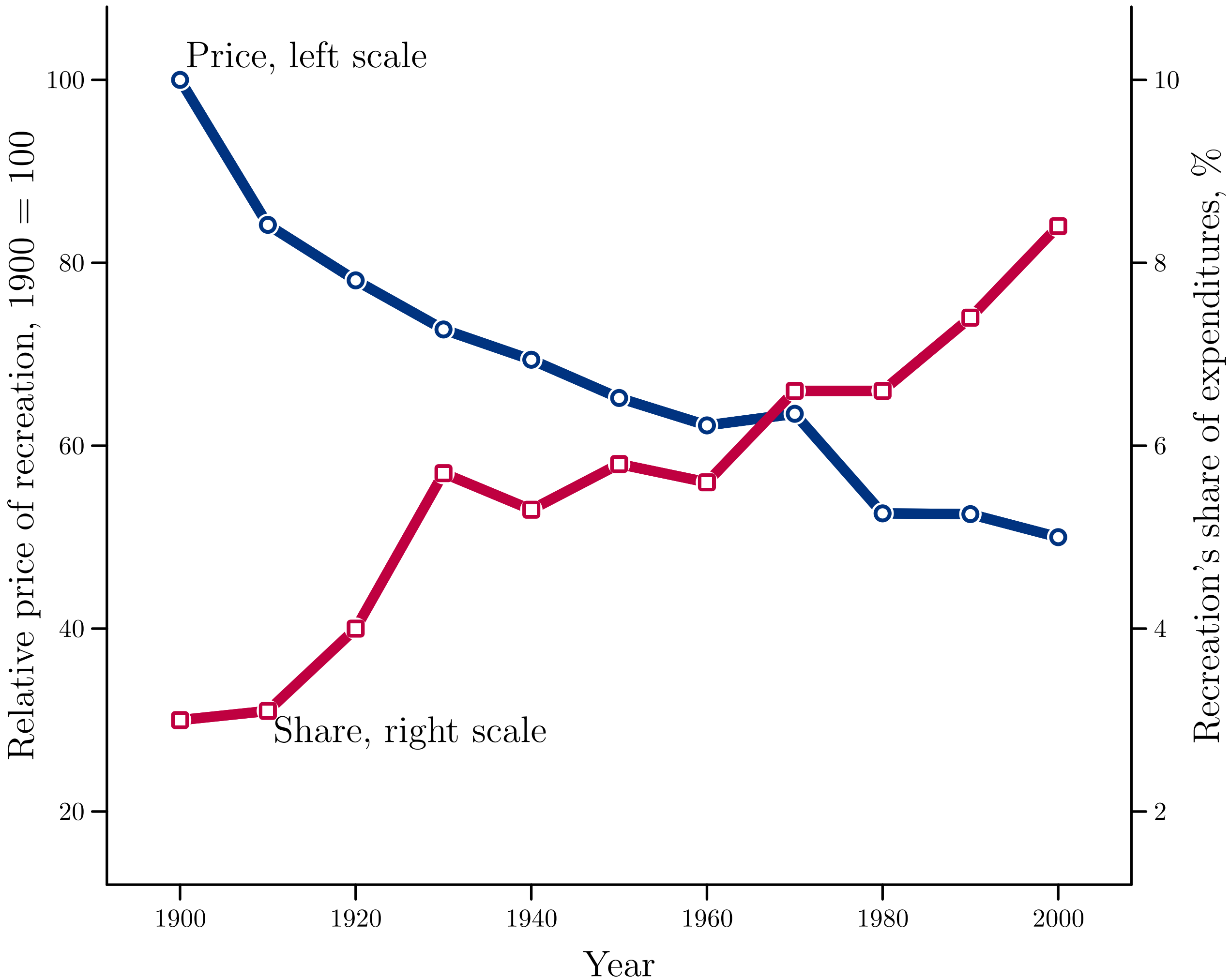

FIGURE 6: Relative price of leisure goods and recreation's share of expenditures US, 1900–2000

Note – The source for the price of leisure goods is Kopecky (2005). The source for the recreation's share of expenditures for the years 1900 to 1929 is contained in Lebergott (1996, Table A.1). After 1929 the data is taken from the Statistical Abstract of the United States.

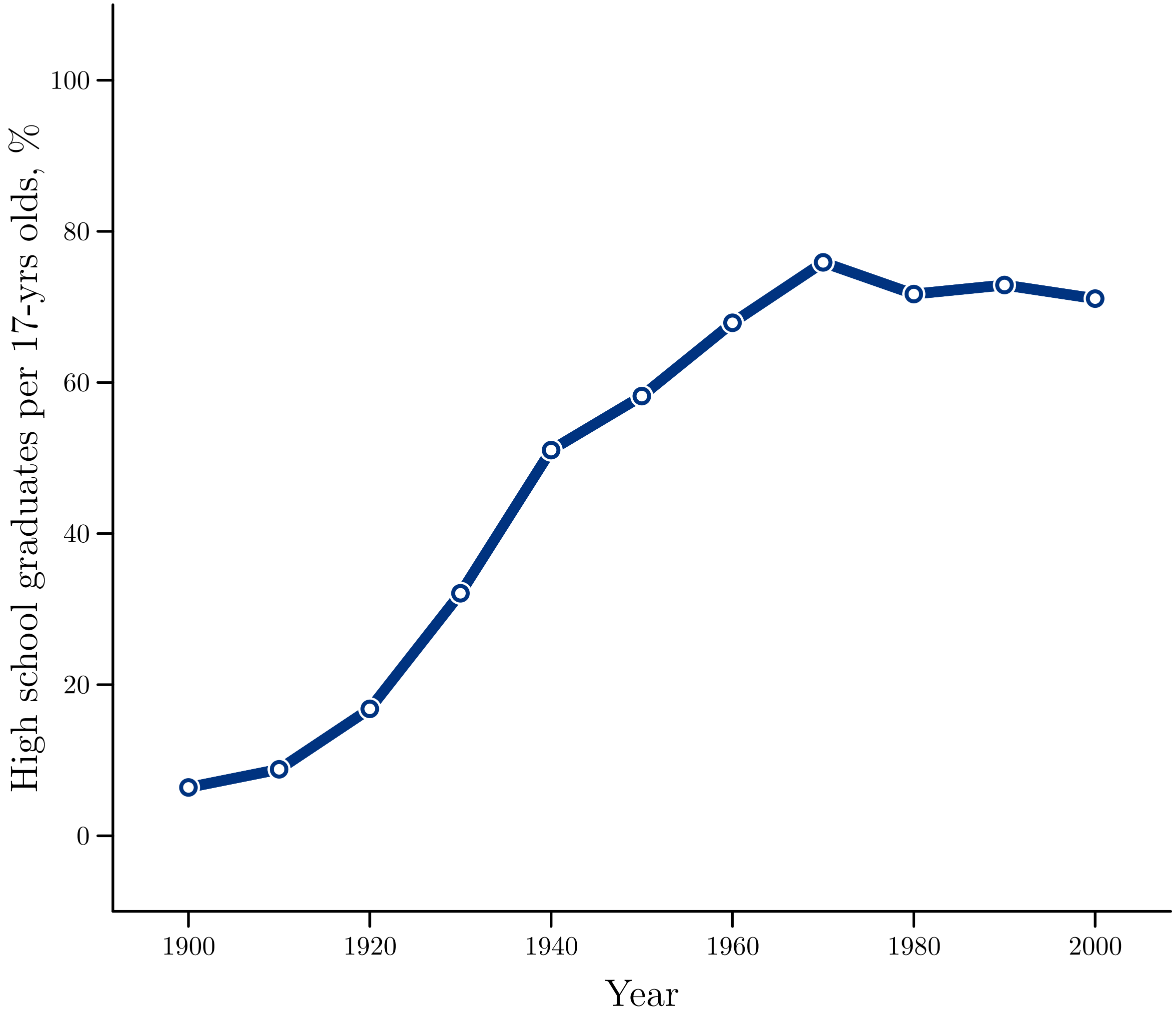

Figure 7: High school graduates per 17-yrs olds, US, 1900–2000

Note – The source for this data is the *Statistical Abstract of the United States*

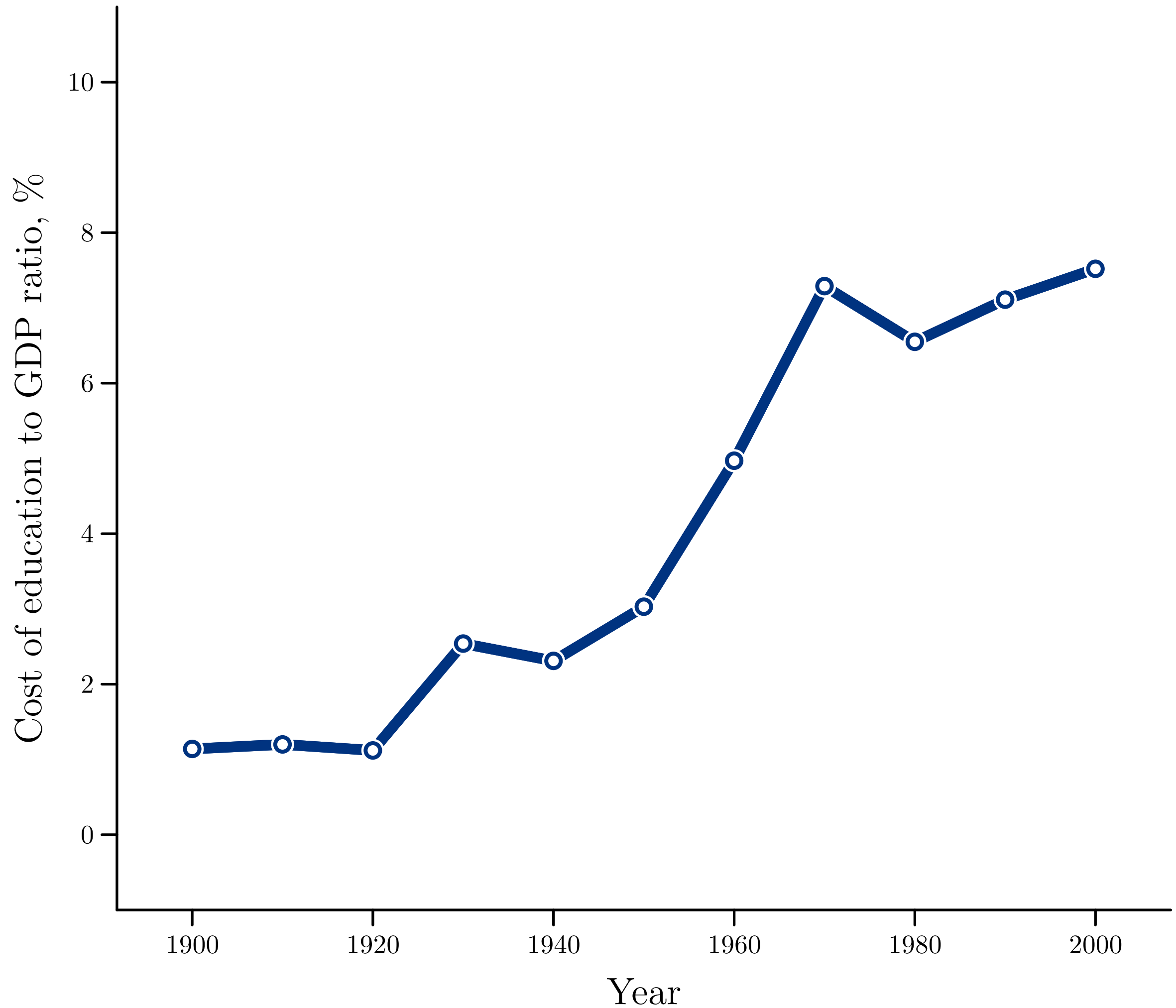

Figure 8: Cost of education to GDP ratio, US, 1900–2000

Note – The cost of education is computed as the total expenditures of educational institutions divided by GDP. The sources are the U.S. Department of Education, National Center for Education Statistics. <http://nces.ed.gov/programs/digest/d95/dtab030.asp>, <http://nces.ed.gov/programs/digest/d03/tables/dt029.asp> and <http://nces.ed.gov/programs/digest/d03/tables/dt030.asp>.