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# Varieties of the rat race: Working hours in the age of abundance

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# VARIETIES OF THE RAT RACE. WORKING HOURS IN THE AGE OF ABUNDANCE

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## ABSTRACT

We ask why working hours in the rich world have not declined more sharply or even risen at times since the early 1980s, despite a steady increase in productivity, and why they vary so much across rich countries. We use an internationally comparable database on working hours (Bick et al., 2019) and conduct panel data estimations for a sample of 17 European countries and the United States over the period 1983-2019. We find that high or increasing top-end income inequality, decentralized labor relations, and limited government provision of education and other in-kind services contribute to long working hours. Our results are consistent with the hypothesis that upward-looking status comparisons in positional consumption ("Veblen effects") contribute to a "rat race" of long working hours that is more or less pronounced in different varieties of capitalism.

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# Varieties of the rat race.
# Working hours in the age of abundance*

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**Abstract**

We ask why working hours in the rich world have not declined more sharply or even risen at times since the early 1980s, despite a steady increase in productivity, and why they vary so much across rich countries. We use an internationally comparable database on working hours (Bick et al., 2019) and conduct panel data estimations for a sample of 17 European countries and the United States over the period 1983-2019. We find that high or increasing top-end income inequality, decentralized labor relations, and limited government provision of education and other in-kind services contribute to long working hours. Our results are consistent with the hypothesis that upward-looking status comparisons in positional consumption ("Veblen effects") contribute to a "rat race" of long working hours that is more or less pronounced in different varieties of capitalism.

Keywords: Working hours, Veblen effects, income inequality, varieties of capitalism

JEL Classifications: D31, J20, P16, P50

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# 1 Introduction

When asked "What is the smallest amount of yearly income a family of four would need to get along in your local community?", families in the United States in 1950 responded, on average, 68 percent of the median income for that type of family at that time. By 1980, after three decades of robust and broad-based real income growth, this ratio had fallen to only 53 percent (Figure 1 a). During 1950-1980, although families revised their estimate of required minimum income upward, actual income growth by far outpaced the growth of this "get-along income". And in the 1970s, the growth in real get-along income even came to a complete halt (Figure 1 b). The average family of four in the United States seemed to have reached a point of relative saturation in terms of meeting basic material needs.[1]

The three postwar decades were also marked by a remarkable reduction in average work hours, not only in the United States but in virtually all industrialized countries (Figure 2 b and c).[2] Work hours in the United States decreased by about 200 hours per year, or five full work weeks, for the average worker. Hours worked per working age person also decreased significantly, although somewhat less than hours worked per worker, as an increasing share of the population entered the labor force. In neoclassical economics terms, leisure time behaved like a "normal good". That is, the income effect of rising hourly wages appeared to outweigh the substitution effect in the demand for leisure, as workers' income and leisure increased simultaneously (Bick et al., 2018). It almost appears that, as Keynes (1930) famously predicted, after an unprecedented period of productivity growth triggered by the Industrial Revolution, the rich world was ready to enter the "age of leisure and of abundance", in which "we prefer to devote our further energies to non-economic purposes."

And yet, since the 1980s, the relative material saturation of the 1970s appears to have given way to a new and growing sense of neediness among large segments of the population. The level of income that families consider minimally necessary to get along has risen at high and increasing rates during that period (Figure 1 b), exceeding 70 percent of actual median income in recent years (Figure 1 a).

Average hours worked no longer decreased in the United States after 1980, but increased until the early 2000s, before leveling off. Annual hours worked per working age person even rose steadily, by about 150 hours, from 1980 to 2000, a trend interrupted only by two deep recessions followed by a "jobless recovery" in the 2000s. Working hours in other industrialized countries show broadly similar trends over time, but with some differences in the extent and timing of these developments. While hours worked per worker continued to decrease in some European countries

[1] The aforementioned trends are very similar for median and mean subjective minimum income.

[2] We use the terms working hours, work hours, and hours worked interchangeably.

after the 1980s, this trend also slowed or even reversed in these countries, especially around the early 2000s (Figure 2 b and c).

The present paper is motivated by two main questions. First, how can we explain the puzzling re-emergence of subjective material neediness and the interruption, or slowdown, of the trend toward lower working hours in the rich world since the early 1980s? And second, why do average working hours continue to vary so widely across rich countries at similar productivity levels? Both observations require explanation in light of the well-documented pattern in the literature that average working hours are generally higher in low-income countries than in high-income countries, have decreased over time in the rich countries prior to the 1980s, and are lower for workers with higher wages than for workers with lower wages in most countries (Bick et al., 2018). While recognizing that aggregate work hours are influenced by a variety of interrelated factors, in this paper we focus on upward-looking status comparisons, or Veblen effects, in a context of high or rising income inequality.

Since the early 1980s the share of aggregate income going to top income households has increased. This increase occured earlier and the level of top-end income inequality has been persistently higher in the United States than in European countries (Figure 2 a). If non-rich workers emulate consumption norms set by the rich, as Veblen (1899) famously argued, it can be expected that the desire, or subjectively perceived need, to work long hours depends positively on top-end income inequality (see also Bowles and Park, 2005; Oh et al., 2012). Following the terminology developed by Hirsch (1976), consumption, for which income derived from work is a prerequisite, can be characterized as a "positional good", whereas leisure time is a "non-positional good". High relative consumption is more visible than high relative leisure and, unlike the latter, signals high social status in a capitalist society. While longer working hours can be seen as a way for non-rich households to "keep up with the rich", they also involve an element of a "rat race", which the Merriam-Webster dictionary defines as "the unpleasant life of people who have jobs that require them to work very hard in order to compete with others for money, power, status, etc."

Within the industrialized world, the United States stands out as the country with not only the strongest increase and the highest level of top household income shares, but also a comparatively small welfare state, a strong reliance on private markets for the provision of positional goods and decentralized labor relations. From a Veblenian perspective, these factors can be expected to contribute to longer work hours. While public provision of positional goods, such as education, may limit the scope of "expenditure cascades" (Frank et al., 2014), centralized bargaining over wages and working time may allow for partial internalization of positional externalities (see Oh et al., 2012 for a related argument). It is, therefore, instructive to compare trends in working time across industrialized countries with different welfare state institutions and labor relations.

In this paper, we analyze the importance of income inequality in understanding the evolution of working hours in different varieties of capitalism and welfare state regimes in the period since the early 1980s. We make use of a new database, constructed by Bick et al. (2019), which includes previously unavailable, internationally comparable information on work hours for European countries and the United States. Using the classical typology introduced by Esping-Andersen (1990), we can distinguish between Anglo Saxon countries with liberal welfare states, continental European countries with conservative welfare states, and Scandinavian countries with social democratic welfare states. We conduct macroeconomic panel data estimations to analyze how hours worked are related to income inequality, centralization of wage bargaining, and social transfers, while controlling for other standard explanatory variables commonly used in the literature.

We find that top household income shares are positively related to hours worked per worker and per working age person. This relationship holds both for pooled panel data estimations and for fixed effects estimations. These findings suggest that working hours are driven by the perceived need to "keep up with the rich", which has intensified in many countries since the 1980s and is stronger in the Anglo Saxon countries compared with the European countries. This result is also consistent with the observation that the inequality of working hours is higher in countries with higher top-end income inequality, where working hours increase (more strongly) with wages. In line with upward-looking status comparisons, high average working hours in countries with high top-end inequality appear to be driven by long work weeks of workers in the higher echelons of the wage distribution. We also find that centralized wage bargaining and government social transfers in kind (but not in cash) are negatively related to hours worked. Transfers in kind, unlike cash transfers, appear to mitigate status competition through conspicuous consumption. Finally, we look specifically at the importance of education as a positional good. We find that the extent to which the education sector is organized through private markets is associated with longer working hours for workers with high levels of education, but not for workers with lower levels of education.

Our findings are similar when using either hours worked per worker or hours worked per working age person, when controlling for the female employment rate. Cross-country differences in gender-specific labor force participation and in the gender inequality of working hours are hard to account for in a macroeconomic panel framework, as they seem to be related to deeply rooted social norms. But they can explain, to a large extent, the special case of the Scandinavian countries, which combine relatively long hours per working age person (but relatively short hours per worker) with low levels of income inequality, a high degree of wage bargaining centralization, and high taxes.

Taken together, our results, while not lending themselves to clear-cut causal identification, offer an explanation for the evolution over time and cross-country differences in working hours

from a comparative political economy perspective. This puts into perspective the widely held view in the neoclassical economics literature that cross-country differences in working hours are primarily due to income and substitution effects reflecting (exogenous) individual preferences and work disincentive effects related to the tax system.

The remainder of this paper is organized as follows. Section 2 discusses related literature. Section 3 presents important stylized facts about the evolution of working hours in different groups of countries, before we present and discuss the estimation analysis in Section 4. Section 5 concludes.

## 2 Competing explanations of working hours

In the neoclassical economics literature, working hours are determined by individual labor supply decisions in the long run. A higher real wage, based on real productivity increases, raises the opportunity cost of leisure (substitution effect), but also makes it possible to achieve a same level of income with fewer working hours (income effect). The most up-to-date and most authoritative analysis of the hours-income elasticity across and within countries is Bick et al. (2018). They show that across countries aggregate hours worked vary inversely with per capita income across the development spectrum and that within most countries higher-wage individuals work shorter hours than lower-wage individuals. Interestingly, in the United States the hours-wage relationship for employed workers also used to be negative or flat, but it turned positive in the mid-1970s for women and in the early 1990s for men (see also Aguiar and Hurst, 2007). While in 1979 the prevalance of long workweeks ($\geq$ 50 hours) was higher among the bottom two hourly earnings quintiles than in the top quintile, in the 2000s it was by far highest in the top quintile and lowest in the bottom quintile of male workers in the United States (Kuhn and Lozano, 2008). In recent decades, the hours-wage slope became larger also in other high-income countries (Conran, 2017). Bick et al. (2018) do not consider the possibility that these changes in the hours-wage relationship may be related to Veblen effects in a context of high top-end income inequality. Rather, they hypothesize that cross-country differences in the within-country hours-income relationship likely are due to differences in the tax-transfer system.

In an influential paper, Prescott (2004) argues that virtually all of the large differences in working hours between the United States and Europe are due to differences in tax systems. The idea is that high marginal income taxes in Europe reduce the opportunity cost of leisure time. The unique focus on taxation was criticized on several accounts in subsequent contributions. Alesina et al. (2005) argue that the large macroeconomic labor supply elasticities estimated by Prescott (2004) may actually in part be due to the government transfers funded by income taxes, rather than just by the direct work disincentive effect of such taxes (see also Rogerson, 2007). If anything,

according to Alesina et al. (2005), labor supply elasticities appear to be high enough to explain differences in working hours among women, but not among men, across rich countries. Moreover, labor tax rates likely are correlated with other variables affecting working hours, such as union density and wage bargaining institutions. Oh et al. (2012) argue that because the most rapid decrease in work hours happened mostly before the Second World War, when only a very small fraction of the general public paid any labor income taxes in today's industrialized countries, it is unlikely that taxation was the key factor for the decrease. More recent works using the neoclassical framework zoom in on specific demographic subgroups. For instance, Chakraborty et al. (2015) and Bick and Fuchs-Schündeln (2018) rely on non-linear labor income taxation and the tax treatment of married couples to explain the differences in labor supply of married couples across countries.

The relevance of Veblen effects for understanding the long-term evolution of working hours across industrialized countries throughout the 20th century has been documented by Bowles and Park (2005) and Oh et al. (2012), who conduct panel data estimation analyses using country-level data for a small number of countries over a long time span. They find that measures of top-end income inequality are more closely related to working hours than broad measures such as Gini coefficients, which is consistent with Veblen's emphasis on upward-looking status comparisons. Burgoon and Baxandall (2004) also find a positive relationship between broad measures of personal income inequality (Gini coefficients) and hours worked. Schor (1998) and Frank et al. (2014) present evidence of Veblen effects for the United States. Bell and Freeman (2001) find a positive relationship between wage inequality and working hours and explain longer working hours in the United States, compared with Germany, by the higher degree of wage dispersion in the United States. However, they attribute this relationship to incentives effects, as implied by tournament or winner-take-all models of wage inequality, rather than positional externalities. To the best of our knowledge, no study has analyzed Veblen effects, or the inequality-hours worked relationship more generally, for the recent past based on internationally comparable working time data.

Our analysis is also inspired by institutionalist accounts of "varieties of capitalism" (Hall and Soskice, 2001) and "worlds of welfare capitalism" (Esping-Andersen, 1990). Hall and Soskice (2001, p.21) note that "in liberal market economies, the adult population tends to be engaged more extensively in paid employment and levels of income inequality are high. In coordinated market economies, working hours tend to be shorter for more of the population and incomes more equal." However, the underlying reasons for the relationship between income inequality and hours worked are not altogether clear in the original exposition of the Varieties of Capitalism (VoC) approach by Hall and Soskice (2001). Also, the conventional view that coordinated market economies (CMEs) are more immune to adverse shifts in income distribution than liberal market

economies (LMEs) was recently called into question by the emergent growth model perspective following Baccaro and Pontusson (2016). Behringer and van Treeck (2021) argue that persistent differences in institutions, against a global trend of liberalization and de-unionization since the early 1980s, help explain why LMEs experienced much stronger rises in top household income shares, but smaller decreases in the economy-wide wage share, than CMEs, despite similar increases in broad measures of income inequality such as the Gini coefficient of household income. Moreover, the increase in top-end personal income inequality was conducive to the emergence of an LME-specific growth model which Baccaro and Pontusson (2016) refer to as "consumption-led growth financed by credit". To the extent that "trickle-down consumption" (Bertrand and Morse, 2016), or "expenditure cascades" (Frank et al., 2014), in LMEs are driven by non-rich household trading-off (non-positional) saving for (positional) consumption expenditures, they are consistent with Veblen effects in the determination of working hours. From a VoC perspective, then, it can be expected that the higher degree of wage bargaining centralization and lower top household income shares alleviate the "rat race" in CMEs. Even at a given level of income inequality, collective bargaining may allow for a partial internalization of the positional externalities linked to long individual working hours and correspondingly high personal consumption expenditures.

Burger (2018) analyzes extreme working hours (> 50 hours per week) across different welfare state regimes in Western Europe and the United States. She focuses on the importance of government regulations in explaining working hours and emphasizes the notion that individual choices are constrained by labour market policies, collective bargaining institutions and new labour market structures. Although she does not allow for a direct effect of income inequality on extreme working hours in her empirical analysis, her summary of data on extreme work hours from the Luxembourg Income Study and the Multinational Time Use Study reveals that extreme work hours are most prevalent in countries with high-end income inequality, especially among high-skilled workers.

The relatively high working hours per working age person in Scandinavian countries, which have higher taxes, lower inequality and higher wage bargaining centralization than continental European countries, pose a challenge to both neoclassical and Veblenian explanations of working hours. The study by Burgoon and Baxandall (2004) bears some similarities to our approach as they identify three "worlds of working time", in line with Esping-Andersen's distinction of social democratic, liberal and conservative worlds of welfare capitalism. Based on (not fully harmonized) country-level data, they develop a narrative explaining why hours worked per employee and per person are high in liberal countries, but low in conservative Christian democratic countries, whereas social democratic countries combine relatively low hours per worker with relatively high hours per person. According to Burgoon and Baxandall (2004), the explanation for this finding lies

primarily with publicly funded child care services encouraging female labor market participation. If this leads to more women (and men) working part-time, higher public child care expenditures will lead to higher hours per person, but lower hours per worker.

However, understanding the causal impact of family policies on gender outcomes including working hours is a very difficult task (Olivetti and Petrongolo, 2017). For instance, Ragan (2013) argues on the basis of a household production model that government subsidies of services like daycare that substitute for home work are quantitatively important for explaining longer market work hours and shorter home work hours in Scandinavia compared with continental Europe, despite higher labor taxes in the Scandinavian countries (see also Rogerson, 2007). Kleven et al. (2020), by contrast, argue that family policies have essentially no effect on gender inequality in the labor market. A first challenge for empirical studies of family policies is the complexity and limited cross-country comparability of family legislation. Clearly, country-level comparisons can only look at rather broad spending categories (e.g. cash versus in-kind social benefits). A second challenge is determining cause-and-effect relationships. For example, more egalitarian gender norms may induce both various family policies and higher female labor force participation. An empirical approach that attributes the entire increase in women's working hours to family policies will overstate their impact. In their careful review of the literature, Olivetti and Petrongolo (2017) conclude that the policies with the strongest evidence for reducing gender disparities seem to be early childhood spending and in-work benefits. In other words, in-kind benefits, such as high-quality child care, that make it easier to be a working mother may matter more than the cash payments that new parents receive while out of the labor force.

# 3 Stylized facts

**Data**. Until recently, a notorious problem in comparative analyses of working hours was the lack of harmonized data on hours worked across countries (Pilat, 2003). National Labor Force Surveys differ with respect to the sampling of reference weeks over the year, as hours worked exhibit a strong degree of (country-specific) seasonality, and tend to underestimate vacation days (Bick et al., 2019). Hence, strictly speaking, national Labor Force Survey data and cross-country databases such as OECD Employment Outlook should be used only for analyzing the evolution of working hours over time, and not for cross-country comparisons (OECD, 2022). The Total Economy Database published by the Conference Board, which we used for the long time series on working hours shown in Figure 2 above, makes an attempt at harmonizing the OECD data which remains, however, rather incomplete (see Bick et al., 2019). However, an important contribution to the literature was made by Bick et al. (2019) who produced harmonized estimates of hours worked

for European countries and the United States derived from national Labor Force Surveys for the period 1983-2015. All data on country-level working hours discussed in this Section and used in the econometric analysis are based on an updated version of the database presented by Bick et al. (2019). In addition, we use information on weekly work hours along the within-country wage distribution from Bick et al. (2018).

Data on labor market institutions are taken from the Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts (ICTWSS). All macroeconomic data, including government social transfers, is based on OECD Statistics. Labor income tax rates are taken from an updated version of the database constructed by McDaniel (2007). Data on income inequality are taken from the World Inequality Database (WID) for the top household income shares, and from the Standardized World Income Inequality Database (SWIID) for the Gini coefficient of household disposable income. A detailed description of all variable definitions and sources of the data presented in this Section and used in the estimations is provided in Table A2 in the Appendix.

**Hours worked and income inequality**. Figure 3 a-d shows time averages of average annual work hours per worker (per working age person) against time averages of the Gini coefficient of household disposable income and pre-tax top household income shares, respectively, for the period 1983-2019. While the linear relationship between hours worked per worker with income inequality across social democratic (low levels of inequality), conservative (medium levels of inequality) and liberal economies (high levels of inequality) is consistent with Veblen effects, the U-shape relationship between hours worked per working age person and inequality seems to confirm the literature's view that "Scandinavia is different".

In Figure 3 e and f, we can see that the slope of the hours-wage relationship within countries is steeper at higher levels of wage inequality in our sample of 18 countries. Specifically, in the United States, which is the largest country representing the liberal world of welfare capitalism, the wage-hours schedule follows a steep concave shape, as hours worked increase continuously from about 27 hours per week in the lowest wage decile to 38 hours in the highest wage decile. In Germany, the classic example of a conservative welfare state, hours worked per week are roughly constant for the first through fifth wage decile at about 33 hours, before increasing in the upper half of the wage distribution to reach an average of about 35 hours in the highest decile. In Sweden, the largest social democratic country, average hours worked are essentially the same for all income deciles, fluctuating around 30 hours per week.

**Hours worked by gender and education**. Figures 4 and 5 show average hours worked per worker

and per working age person for the United States in comparison with unweighted averages for the conservative and social democratic countries in our sample. Hours worked per worker (per working age person) in the United States were markedly above the European average already in the early 1980s and have further diverged from it especially until the early 2000s. Average work hours of male and female workers in the United States have increased during the 1980s and 1990s, and leveled off in the early 2000s, before dropping abruptly in the Great Recession and recovering since (Figure 4).

Average hours per worker in Europe have decreased during the 1980s and 1990s, before leveling off in the 2000s. Average hours per working age person have been more stable in the 1980s and 1990s, but started increasing in the conservative countries in the early 2000s. Hours worked per worker (per working age person) in the conservative countries have converged from above (below) to the relatively stable level of hours worked per worker (per working age person) in the social democratic countries. The main force for convergence between the conservative and the social democratic group has been the strongly rising female employment-to-population ratio in the conservative countries throughout the sample period, which has led to a strong increase in hours worked per working age woman, despite a simultaneous fall in hours worked per female worker (until the early 2000s) (Figure 4 e and f).

Note that the overall evolution of working hours in the United States and Europe is matched by the evolution of top-end income inequality (Figure 2 c). Top household income shares in the United States increased most strongly from the early 1980s until the mid-2000s (when working hours increased), and in Europe remained roughly constant during the 1980s (when working hours decreased or remained roughly constant) and started increasing in the mid-1990s or early 2000s (when working hours stopped decreasing or increased).

As can be seen in Figure 5, average work hours per worker increase with the level of education in the United States, but they are more homogenous across education levels in the European countries. Since employment-to-population ratios have fallen in the United States during the 2000s, average hours worked per working age person at medium and low levels of education in the United States have come close to the levels observed in the social democratic countries during the 2010s. However, average hours worked per working age person with high levels of education have been persistently higher in the United States than in Europe.

**Labor market and welfare state institutions**. The strong positive relationship between hours worked and the Gini coefficient of household disposable income (Figure 3 a) suggests that hours worked are related both to pre-tax income inequality (Figure 3 b) and government redistribution through welfare state institutions. Moreover, labor market institutions likely affect both broad

measures of income distribution and working hours.

Figure 6 shows different measures reflecting different labor market and welfare state arrangements across countries. Wage bargaining is most centralized in the social democratic countries, and more centralized in the conservative countries than in the United States (Figure 6 a).

Whereas government social cash transfers to households are roughly similar, as a percentage of GDP, across the three country groups, social transfers in kind are substantially higher, as a percentage of GDP, in the European countries than in the United States (Figure 6 b). Total government transfers are roughly similar in conservative and social democratic countries, but whereas cash transfers dominate in the former, in-kind transfers are higher in the latter group of countries.

Figures 6 c and d zoom in on different sub-categories of (public and private) social expenditures, revealing further persistent institutional cross-country differences, as well as some important evolutions over time. The tertiary education system relies much more strongly on private expenditures in the United States (about 60 percent of combined public and private spending) than in the conservative countries (roughly 20 percent) and the social democratic countries (roughly 10 percent) (Figure 6 c).

Government expenditure on early childhood education and child care as a percentage of GDP has been substantially higher in the social democratic countries than in the conservative countries and the United States throughout the sample period (Figure 6 d). However, since the early 1990s that gap has narrowed somewhat as governments progressively introduced early childhood education and child care programs in the conservative countries. In the United States, such spending is more limited and geared towards cash benefits (income tax credits) rather than the in-kind benefits (government-sponsored daycare centers and pre-schools) prevalent in most European countries. Although no attempt will be made in our empirical analysis to explain female labor force participation, we show public expenditures on early childhood education here because they are correlated with a number of other variables reflecting family policies, which together are correlated with both gender norms and female labor force participation (Fabrizio et al., 2020). Apparently, it is primarily the relatively long working hours of women and greater gender equality in working hours that explain the relatively long working hours per person despite relatively short working hours per employee in the Scandinavian countries.

# 4 Estimation analysis

## 4.1 Estimation strategy

To gain deeper insight into the relevance of the rat race hypothesis, we conduct a macroeconomic panel data analysis for a sample of 18 advanced economies over the period 1983-2019.[3] Our approach is similar to Bowles and Park (2005) and Oh et al. (2012) who estimate labor supply models using panel data for ten countries and annual observations for the periods 1963-1998 and 1967-1995, respectively. In addition to covering a larger number of countries for a more recent period, our analysis has the advantage of using internationally comparable working time data, allowing us to more fully exploit the cross-country variation in average hours worked.

We estimate a baseline model, focusing on top-end income inequality as an explanatory factor for average working hours, and an extended model, additionally including a number of institutional variables. In a first step, we estimate the following model (Equation 1):

$$H_{i,t} = \beta_0 + X_{i,t-1}\Gamma + \beta_1 TIS_{i,t-1} + u_{i,t} \tag{1}$$

where $H_{i,t}$ is the natural logarithm of hours worked per worker in country i at time t. $X_{i,t-1}$ is a set of explanatory variables that are expected to be related to hours worked. $TIS_{i,t-1}$ is the top 1 percent household income share. The explanatory variables are lagged by one period to address concerns on the possible feedback from changes in hours worked on the explanatory variables. $u_{i,t} = \mu_i + \delta_t + \varepsilon_{i,t}$ is a composite error term, which in some specifications includes country fixed effects, $\mu_i$, and time fixed effects, $\delta_t$, in addition to an error term, $\varepsilon_{i,t}$. Whether fixed effects should be included in the estimates for working hours is controversial (see, e.g., the discussion by Rogerson in Alesina et al., 2005). Bowles and Park (2005) argue that year fixed effects may capture the possible influences of changes in preferences (or other determinants of work hours) possibly reflecting the diffusion "post materialist values." However, the implicit assumption here would be that in each period, working hours are equally affected in all countries by such changes in preferences or values (or by some other unnamed factors). Similarly, country fixed effects may be included to take account of persistent cultural and institutional differences and other country-specific unobserved influences on working hours. All models are estimated using GLS with a panel-wide AR(1) correction to deal with autocorrelation.

We expect $\beta_1 > 0$ in the presence of Veblen effects. Given that the top 1 percent of the income

[3]The following countries are included in the sample: Belgium, Czech Republic, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom, and the United States.

distribution are practically absent in national Labor Force Surveys, from which our dependent variable is derived, we can plausibly assume that the income inequality variable is exogenous to the hours worked variable in our estimations. The other explanatory variables, $X_{i,t-1}$, include: real GDP per hour worked, which should be negatively related to working hours (if income effects dominate substitution effects in the demand for leisure); real GDP growth, with an expected positive coefficient (capturing short-term business cycle and labor demand fluctuations); union density (with a theoretically ambiguous sign as trade unions may have a general preference for shorter hours, but also for limiting precarious part-time work); the female employment rate (which we treat as an exogenous variable to account for gender norms and is expected to be negatively related with average hours worked per worker); and the labor income tax rate, with an expected negative coefficient (reflecting work disincentive effects). We follow McDaniel (2007) in the calculation of average tax rates on labor income. Even although neoclassical labor supply theory indicates that the relevant tax rate be the marginal tax rate, it is impossible to collect accurate data on marginal effective tax rates across countries. However, the literature suggests that using tax rates as calculated according to different procedures yields similar results, especially when models are estimated with country fixed effects (where estimation coefficients capture the effects of changes in tax rates over time within a country) (see Ohanian et al., 2007).

In a second step, we estimate the following model (Equation 2):

$$H_{i,t} = \beta_0 + X_{i,t-1}\Gamma + \beta_1 TIS_{i,t-1} + \beta_2 CENT_{i,t-1} + \beta_3 TKIND_{i,t-1} + \beta_4 TCASH_{i,t-1} + \varepsilon_{i,t} \qquad (2)$$

where $CENT_{i,t-1}$ is a measure of wage bargaining centralization. We may expect $\beta_2 < 0$, if centralized bargaining helps internalize the positional externalities which may occur with more decentralized bargaining over work contracts. $TKIND_{i,t-1}$ and $TCASH_{i,t-1}$ stand for government transfers in kind and in cash, respectively. A negative sign for $\beta_3$ and $\beta_4$ can be expected, because government transfers benefit workers and are a substitute for monetary purchasing power, thus reducing labor supply. In the absence of Veblen effects, workers might value monetary social transfers, which can be spent according to individual preferences, more highly than in-kind transfers. A stronger effect of in-kind transfers can be expected, if such public services as a government-sponsored education system limit the scope of positional spending through private markets.

Note that the extended model is estimated without country fixed effects. Adding country dummy variables to the regressions models would essentially remove the variation stemming from persistent differences in labor market and welfare state institutions across countries. Rather, we

expect that the institutional variables in the extended model to a large extent pick up the country fixed effects included in the baseline model.

### 4.2 Results

Table 1 shows the results of our baseline model, based on Equation 1. In Column 1, we show the results of a specification without fixed effects. Hours worked per worker are regressed on GDP per hour worked, GDP growth, union density, the female employment rate, the labor income tax rate, and the top 1 percent household income share. The estimated coefficients on the right-hand side variables have the expected signs and are statistically significant. A higher level of real GDP per hour worked is associated with shorter working hours, suggesting that income effects are strong, compared with substitution effects. A higher real GDP growth rate raises working hours, in line with business cycle effects. Higher union density is associated with shorter work hours, as is a higher female employment rate, reflecting shorter work hours for female workers compared to male workers (or shorter work hours for men with higher female employment rates). Higher tax rates reduce working hours, while higher top income shares are linked to longer working hours.

The models shown in Columns 2 and 3, respectively, exclude the top income share and the tax rate, leaving all estimated coefficients essentially unchanged. Columns 4-6 of Table 1 report the results of models including country and time fixed effects. While the taxation variable contributes more to the model fit (R-squared, root mean squared error) than the inequality variable in the models without fixed effects (Columns 2 and 3), the estimated coefficient on the labor income tax rate is no longer significantly different from zero in the models including country fixed effects (Columns 4 and 6). A similar finding is reported by Oh et al. (2012). The estimated coefficient on the top income share is considerably smaller than in the models without country fixed effects, but it remains highly significant. The estimated effect of top-end income inequality is similar to that reported by Oh et al. (2012) and large in economic magnitude. For example, according to the fixed effects model in Column 4, an increase in the top 1 percent income share by 10 percentage points increases average working hours by 1.7 percent.

We conduct a number of robustness checks, as reported in Table A1 in the Appendix. The results are robust to using the top 5 percent household income share instead of the top 1 percent household income share (Columns 1 and 2 in Table A1). When we exclude the formerly communist countries (Czech Republic, Hungary, Poland) which are characterized by comparatively low levels of top-end income inequality and long working hours, the estimated coefficient on the top 1 percent household income share increases from 0.298 to 0.370 in the model without fixed effects, and from 0.132 to 0.208 in the model with country and time fixed effects (Columns 3 and 4 in Table A1). Estimating models including hours worked per working age person instead of hours

worked per worker produces qualitatively very similar results, as reported in Table A1 (Columns 5 and 6).

In Table 2, we show results for a series of extended estimation models where hours worked per worker again are the dependent variable and measures of wage bargaining centralization and social expenditures are added to the baseline model as right-hand-side variables. The models presented in Table 2 are estimated without fixed effects, because adding country dummy variables to the regression models would essentially remove the variation stemming from persistent differences in labor market and welfare institutions across countries.[4] Rather, the institutional variables correlate strongly with the coefficients on the country dummy variables in the models from Columns 4 and 6 in Table 1, so that the institutional variables in the extended models largely account for the country fixed effects in the baseline specification from Table 1.[5] As Table 2 shows, hours worked are negatively related to wage bargaining centralization (Column 1) and social in-kind transfers (Columns 4 and 5), but unrelated to social monetary transfers (Columns 3 and 5). In the model including all those institutional variables, the coefficient on the top 1 percent household income share is very similar in size as in the models including country fixed effects from Table 1 (Columns 4 and 6).

Table 3 shows results for estimation models in which hours worked by workers with different levels of education (low: less than high school degree, medium: high school degree, high: college degree) were used as the dependent variable.[6] We also included private spending on tertiary education (in percent of GDP and in percent of private and government spending on tertiary education) as a right-hand-side variable in the regression models, to account for the extent to which the tertiary education system is financed through private markets as opposed to public financing. While the top 1 percent household income share is significantly and positively related to hours worked per worker of all education levels, higher private education spending is significantly associated with longer working hours only for workers with a higher level of education. Further heterogeneity is present with respect to the negative effects of taxation and female employment on average work hours (both effects are stronger for workers with low education). The differential effects of the education variables on working hours (increasing in the level of education) are even stronger when we use hours per working age person, instead of hours per worker, as the dependent

[4]The results reported in Table 2 are robust to including time fixed effects.

[5]This is consistent with the rather different estimated coefficient on union density in models without fixed effects (negative significant) and including fixed effects (positive insignificant), suggesting that the country fixed effects may be capturing some of the institutional differences associated with the degree of unionization. Notice also that union density is insignificant in most models shown in Table 2, where persistent cross-country institutional differences are captured by the centralization of wage bargaining and social transfers variables.

[6]Note that data availability for education expenditure is rather limited for a number of countries. Switzerland is not included in these estimations, due to lack of data.

variable.[7]

### 4.3 Discussion

Taken together, the empirical analysis is consistent with the hypothesis that Veblen effects are a relevant factor in explaining differences in working hours across countries as well as their evolution through time. In particular, our analysis suggests an alternative to the tax-based explanation of the hours worked gap between the United States and the European countries in the tradition of Prescott (2004). While labor taxes, which are higher in Europe than in the United States, are negatively related to hours worked in the models without country fixed effects, top household income shares, which are lower in Europe than in the United States, are positively related to hours worked, and this latter relationship unlike the former is robust to the inclusion of country fixed effects.

Taking Veblen effects into account could provide an answer to two related puzzles that have so far remained unanswered in the literature: Why does the overall negative correlation between national productivity levels and working hours observed in a broad cross-country comparison not hold for the richest countries? And why has the correlation between individual wages and individual working hours, which was negative until the 1970s, weakened or even turned positive since the 1980s? Bick et al. (2018) document these striking exceptions to the overall negative productivity-working hours relationship. They speculate that the positive relationship between hours worked and wages and between education and hours worked in the rich countries, which contrasts with a negative or flat relationship in poor countries, could be explained by the larger size of the welfare state in rich countries. More generous welfare states in rich countries might create disincentives for workers to participate in the labor market or work long hours. However, this hypothesis cannot explain why the hours-wage relationship has turned from flat or negative to positive over time in the United States, and why the hours-wage relationship varies so much across rich countries (Figure 3 e and f). Clearly, it can be expected that Veblen effects stemming from a rising top 1 percent household income share are most prevalent among workers with relatively high wages immediately below the top of the distribution, who can still realistically compete with top income households for status. In contrast, for households further down in the wage distribution, "keeping up with the rich" has become more remote to the extent that top-end income inequality has increased. Moreover, the stronger negative correlation between in-kind benefits and hours worked than between cash benefits and hours worked supports the plausibility of Veblen effects. While cash benefits combined with, say, a fully private education system, would do little to mitigate the rat race, the decommodification of education through a public education system reduces the

[7]These results are not shown but are available from the authors upon request.

scope for positional expenditures more directly. It stands to reason that parents with high educational attainment and high income compete financially for good private schools, but parents with lower educational attainment and low income have no perspective of paying for private schools anyway. As Burger (2018) reports, the prevalence of extreme work hours (> 50 hours per week) has increased most strongly among high-skilled workers across rich countries. This is consistent with our finding that private education spending is correlated with the hours worked by workers with high educational attainment, but not with the hours worked by workers with low educational attainment. In line with this hypothesis, Cai and Heathcote (2022) find that observed increases in income inequality in United States can explain more than half of the observed rise in average net tuition since 1990 and that rising income inequality has also depressed college attendance. Our findings are also consistent with the notion that workers compete for the best-paid jobs in tournament-style labor markets and that this competition includes a commitment to work long hours, as suggested by Bell and Freeman (2001). However, winner-take-all labor market alone cannot explain the differential effects of in-kind and cash social transfers.

Although this is plausible, the question remains whether our results can be interpreted causally as evidence of Veblen effects explaining working hours. Alesina et al. (2005) also report a negative correlation between a broad measure of inequality (the Gini coefficient of household disposable income) and working hours across countries, but argue that the causality may also go from working hours to income inequality, if longer hours are associated with more variance of working time across families (see also Checchi et al., 2016). However, our use of the top 1 percent income share is plausibly immune to reverse causality, as the top 1 percent income group of households, based on tax returns data, are hardly represented in the Labor Force Surveys which are the source of the hours worked data. Alesina et al. (2005) also argue that strong unions, extensive welfare coverage, and high taxation are all factors that also reduce inequality so that the negative correlation between income inequality and hours worked actually may be driven by those factors rather than income inequality per se. Disentangling the individual contributions of the different explanatory variables to the variance of hours worked should indeed be viewed with some caution. Yet, our regression analysis shows that income inequality remains a significant explanatory factor even when controlling for union density, wage bargaining centralization, and social transfers.

We should note a few limitations inherent in the data used in the empirical analysis. Firstly, our treatment of labor income taxation is limited by data availability, and hence we may understate the importance of taxes in determining variations in working hours across countries and over time. This is especially true with regard to differences in taxation of married couples (joint versus separate taxation). In the absence of appropriate data on marginal tax rates for demographic subgroups (and acknowledging the difficulty of measuring, let alone explaining, the effects of family policies

on hours worked by women), we treat the female employment rate as an exogenous variable. Bick and Fuchs-Schündeln (2018) highlight the importance of marginal income tax rates for explaining cross-country differences in hours worked for married women. However, from a macroeconomic perspective, tax incentives for married women are unlikely to explain broad labor supply patterns.[8]

Secondly, although education can be interpreted as a rough proxy for lifetime (or permanent) income, the education categories for which information on working hours are available are rather broad. This is problematic as the education-income nexus varies across countries. For example, vocational education is more widespread in CMEs, even among higher wage earners, which tends to make education a less positional good (Di Stasio et al., 2016). By contrast, higher education is more widespread in LMEs across much of the income distribution, but with strong fragmentation between elite and non-elite universities. As emphasized in the classic work by Hirsch (1976), the overall rise of the average level of education may shift the focus of the "competition for credentials" away from the quantity of education (formal education level) towards its quality (perceived reputability of the degree-awarding institution). It would therefore be instructive to conduct sub-sample analyses for hours worked by wage group and more specific education categories. However, such granular information are not available in sufficient quality for a macro panel data analysis.

Thirdly, the dataset for hours worked only covers paid work (as well as unpaid work in businesses), but it does not cover home-produced services, such as child care and other parenting activities, which are notoriously hard to measure but potentially important in understanding Veblen effects. For instance, as Doepke et al. (2019) show, the intensity of parenting styles correlates positively with income inequality. While the higher working hours of workers with high levels of education in countries with a high degree of income inequality likely is linked to positional spending on private schooling by ambitious parents, there is also evidence that more educated parents spend more time with their children. Ramey and Ramey (2010) discuss the puzzling finding that highly educated parents in the United States increased the amount of time they allocated to child care at the same time that their own market returns have skyrocketed since the 1980s. They argue that since college-educated parents have a comparative advantage in college preparation, rivalry leads them to increase preparation time by a greater amount than less-educated parents. Consistent with Veblen effects, this literature suggests that highly educated workers in particular have an incentive to both work longer hours and engage in more time-consuming college preparation for their children in a context of high top-end income inequality. Similarly, analyzing the evolu-

[8]For example, the differences between the yearly hours worked per male and female workers are of similar magnitude in the United Kingdom and in Germany (about 400 hours in both countries), despite very different income tax codes (joint taxation in Germany, separate taxation in the United Kingdom).

tion and distribution of leisure in the United States based on time use surveys, Aguiar and Hurst (2007) find that the increase in leisure (excluding child care) between 1965 and 1985 was similar for individuals of different educational attainment. Post 1985, on the other hand, less educated adults experienced significantly larger gains in leisure compared to those with a college education or more. Again, this finding matches well with the evolution of top-end income inequality and is consistent with the argument developed in this paper. In the absence of comprehensive data on time use, however, the question of how Veblen effects affect total leisure time (excluding time spent on paid work and time spent working on home-produced services) across different demographic groups in different countries remains open.

# 5 Conclusion

In this paper, we discussed the importance of income inequality and social status comparisons (Veblen effects) for understanding why working hours in the rich world have not decreased more strongly and continue to vary substantially across countries since the early 1980s. The slowdown, or even reversal in some countries during some periods, of the decreasing trend in average working hours in the rich countries since the Second World War is puzzling, against the well documented negative productivity-working hours relationship in United States (pre-1980) time series data and in broad cross-section comparisons of rich and poor countries. Veblen effects may contribute to explaining both the persistence of long working hours despite continuous productivity growth in the rich world in the past four decades or so, as well as the cross-country differences in hours worked in different varieties of capitalism, or worlds of welfare capitalism.

The results of our macro panel data analysis are consistent with the hypothesis that high levels of top-end income inequality, decentralized labor relations, and limited government provision of education and other in-kind services contribute to a rat race of long hours. Thus, Veblen effects may explain why the "age of leisure and of abundance" predicted by Keynes (1930), which may have been within reach in the 1970s, seems to have receded into the distance again with the rise in inequality since the 1980s, first and most clearly in the United States and, with some delay and cushioned by welfare state institutions, also in Europe.

We discussed a number of limitations to our analysis that present challenges for future research, including the relationship between Veblen effects and the impact of labor taxation on hours worked by demographic subgroups, particularly women; a more in-depth examination of the country-specific relationship between wages and hours worked using household data; and a more comprehensive analysis of Veblen effects which includes the domestic production of (educational) services in the context of time-use data.

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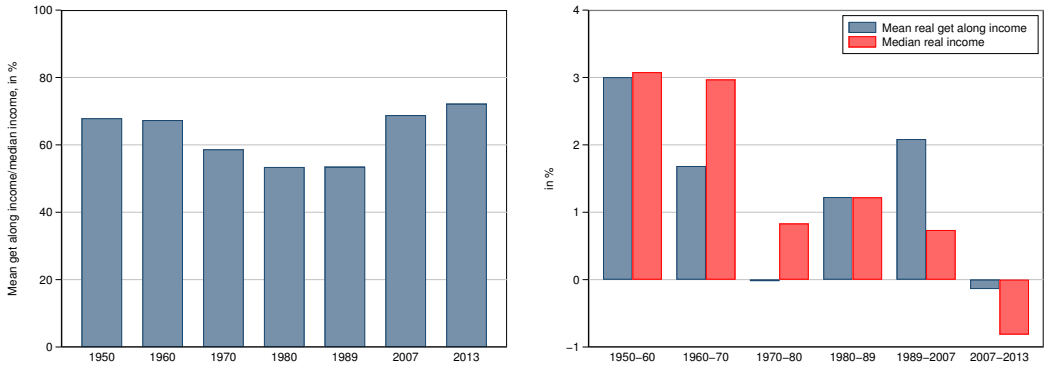
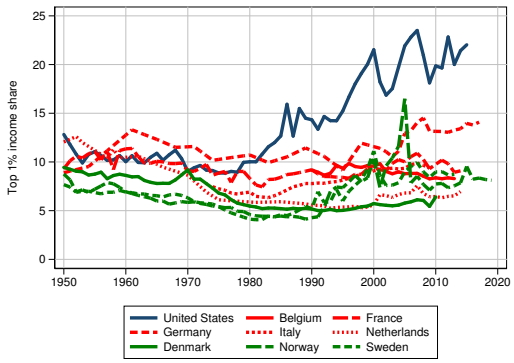



(a) Get-along income in % of actual income

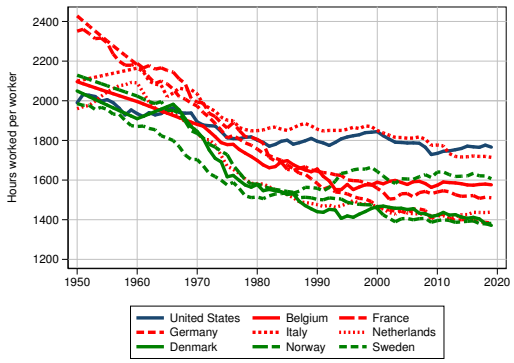
(b) Annual growth of get-along and actual income

*Note*: Minimum income is based on responses to Gallup poll question (Vaughan, 2004; Jones, 2007; Saad, 2013): "What is the smallest amount of yearly income a family of four would need to get along in your local community?" Mean and median income are calculated from Current Population Survey (CPS), Historical Tables, F-8.

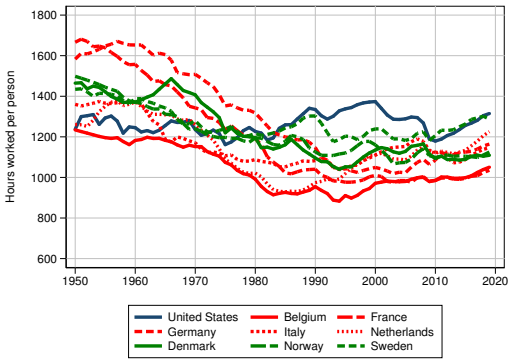
Figure 1: Actual and get-along income, United States




(a) Top 1% income share

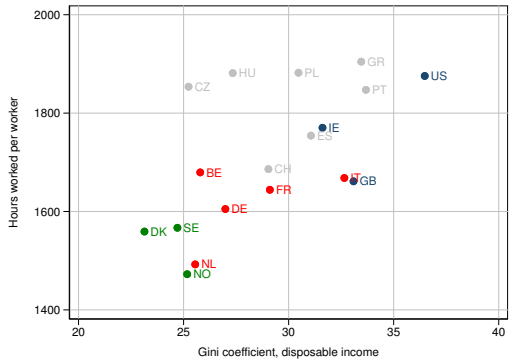



(b) Hours worked per worker



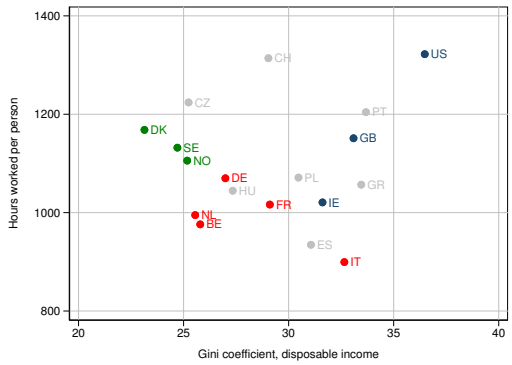

(c) Hours worked per person

Figure 2: Long-run trends in top-end income inequality and working hours

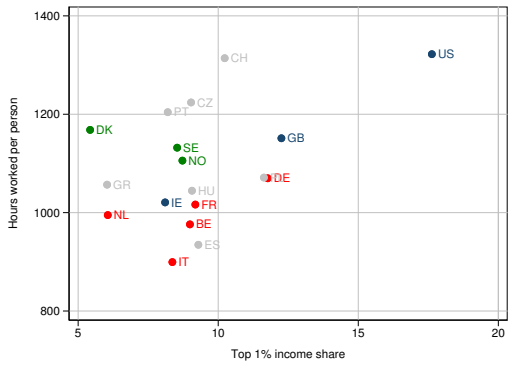



(a) Hours worked per worker vs. Gini coefficient

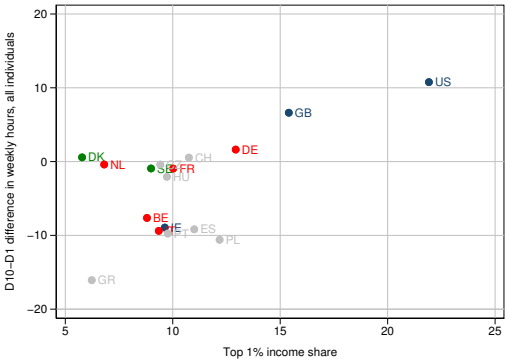
(b) Hours worked per worker vs. top 1% income share



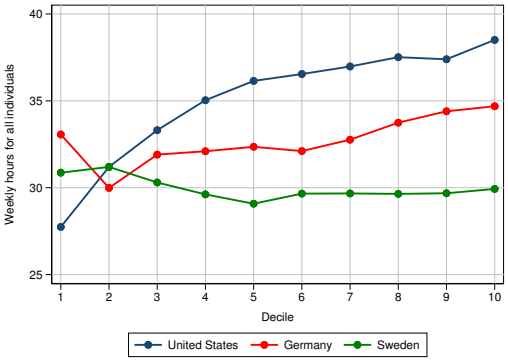

(c) Hours worked per person vs. Gini coefficient




(d) Hours worked per person vs. top 1% income share



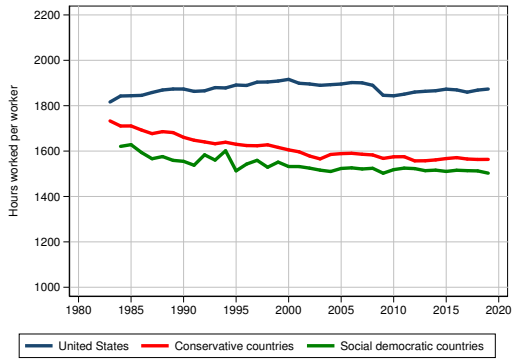

(e) D10-D1 hours differential vs. top 1% income share



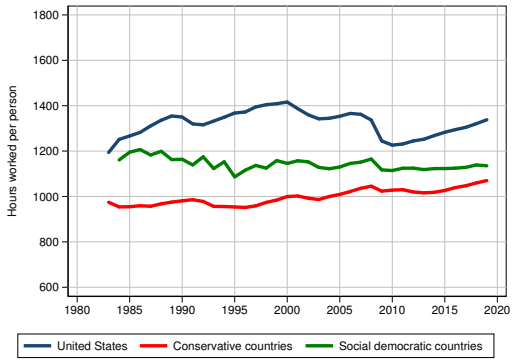

(f) Work hours by wage decile

*Note*: Figures (a)-(d) use country-specific time averages for the longest available time span during the period 1983-2019. Figures (e)-(f) use typical weekly hours from paid employment plus self-employment from the mid-2000s; see Bick et al. (2018).

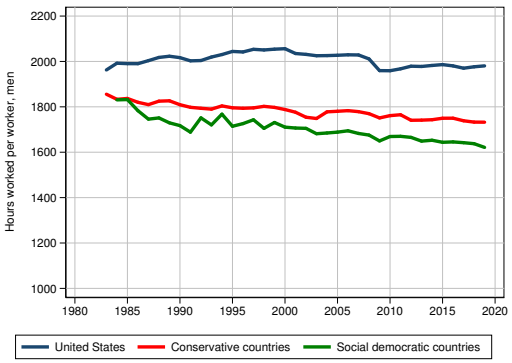
Figure 3: Cross-country differences in working hours and income inequality



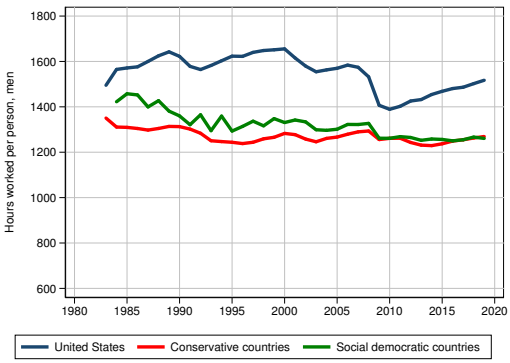

(a) Hours worked per worker



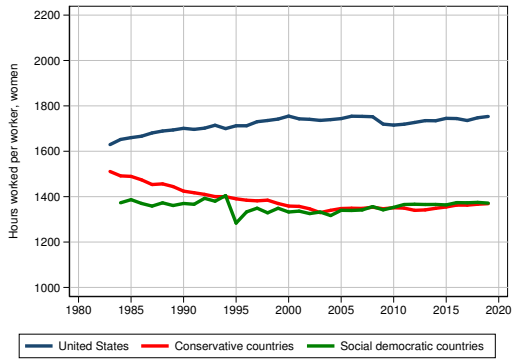

(b) Hours worked per person



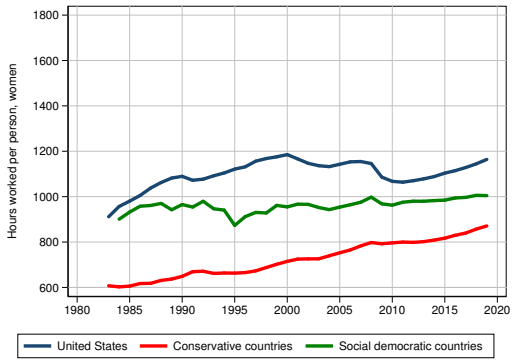

(c) Hours worked per male worker




(d) Hours worked per man



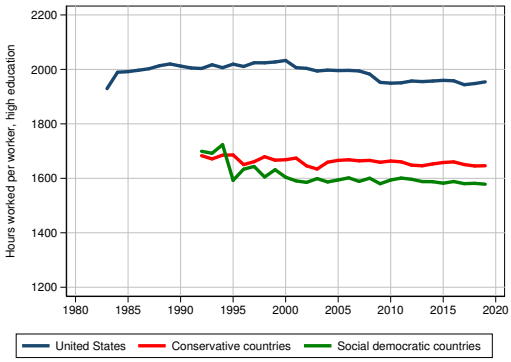

(e) Hours worked per female worker



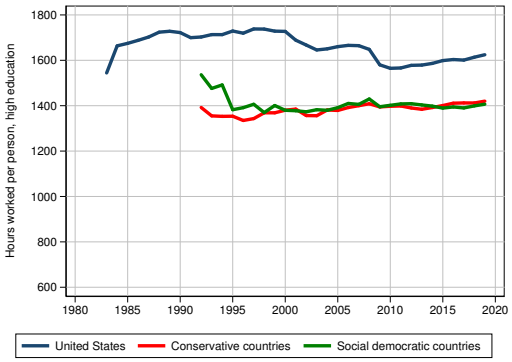

(f) Hours worked per woman

*Note*: Conservative countries: Belgium, France, Germany, Italy, Netherlands. Social democratic countries: Denmark, Norway, Sweden.

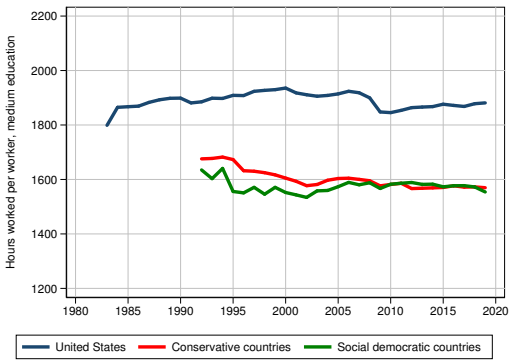
Figure 4: Average hours worked per worker and per working age person, by gender



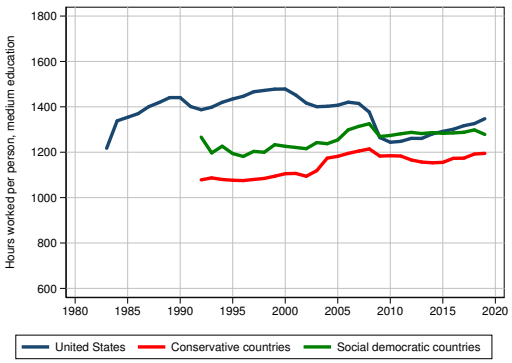

(a) Hours worked per worker, high education



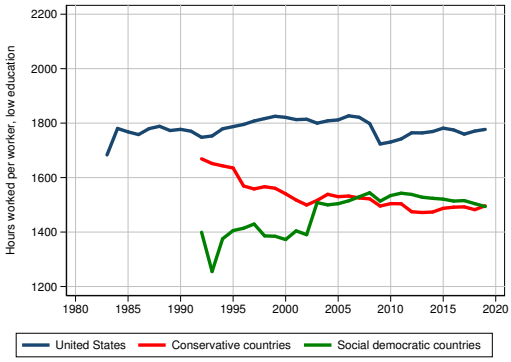

(b) Hours worked per person, high education



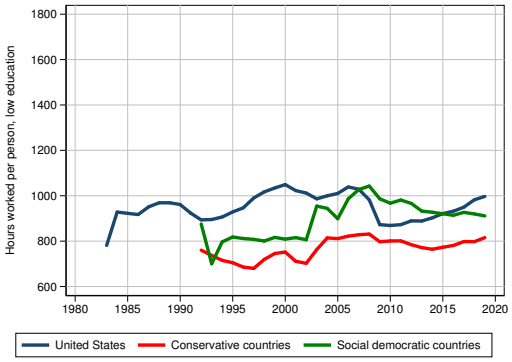

(c) Hours worked per worker, medium education




(d) Hours worked per person, medium education



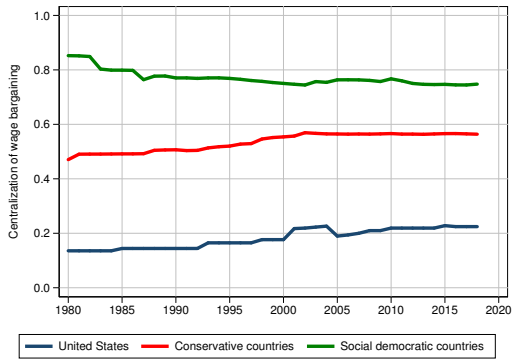

(e) Hours worked per worker, low education



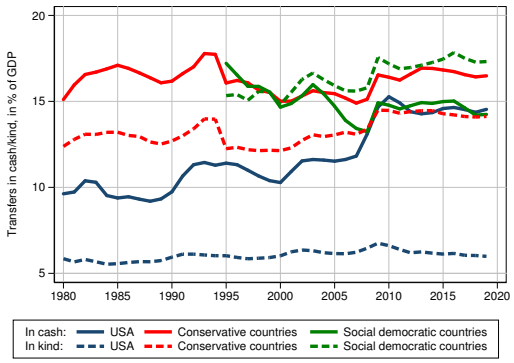

(f) Hours worked per person, low education

*Note*: Conservative countries: Belgium, France, Germany, Italy, Netherlands. Social democratic countries: Denmark, Norway, Sweden.

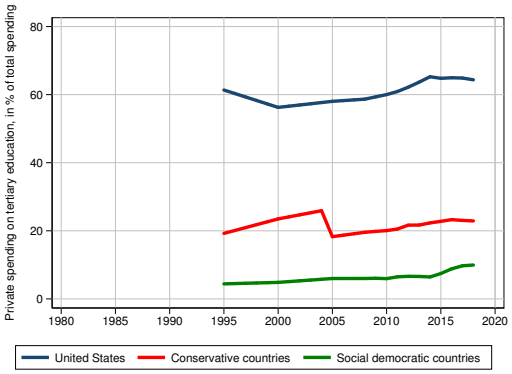
Figure 5: Average hours worked per worker and per working age person, by education level



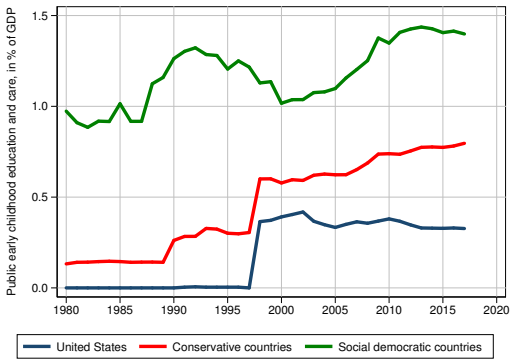

(a) Centralization of wage bargaining




(b) Social transfers in kind and in cash




(c) Private education expenditures




(d) Public early childhood expenditures

*Note*: Conservative countries: Belgium, France, Germany, Italy, Netherlands. Social democratic countries: Denmark, Norway, Sweden.

Figure 6: Different measures of labor market and welfare state institutions

Table 1: Hours worked

| | Dependent variable: Ln(Hours worked per worker) | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Ln(GDP per hour worked) | -0.132*** | -0.131*** | -0.143*** | -0.071*** | -0.140*** | -0.098*** |
| | (0.013) | (0.011) | (0.013) | (0.017) | (0.014) | (0.029) |
| GDP growth | 0.087*** | 0.101*** | 0.111*** | 0.094*** | 0.100** | 0.123*** |
| | (0.030) | (0.032) | (0.032) | (0.029) | (0.042) | (0.043) |
| Union density | -0.049*** | -0.074*** | -0.062*** | 0.052 | -0.039** | 0.029 |
| | (0.018) | (0.016) | (0.018) | (0.038) | (0.018) | (0.038) |
| Female employment rate | -0.239*** | -0.216*** | -0.190*** | -0.235*** | -0.283*** | -0.267*** |
| | (0.028) | (0.026) | (0.028) | (0.029) | (0.030) | (0.041) |
| Labor income tax rate | -0.308*** | -0.361*** | | -0.035 | -0.319*** | -0.032 |
| | (0.045) | (0.045) | | (0.060) | (0.044) | (0.062) |
| Top 1% income share | 0.298*** | | 0.349*** | 0.166*** | 0.268*** | 0.132** |
| | (0.068) | | (0.075) | (0.058) | (0.070) | (0.059) |
| Constant | 8.161*** | 8.199*** | 8.080*** | 7.804*** | 8.190*** | 7.930*** |
| | (0.047) | (0.043) | (0.046) | (0.080) | (0.053) | (0.130) |
| Country fixed effects | No | No | No | Yes | No | Yes |
| Year fixed effects | No | No | No | No | Yes | Yes |
| Observations | 429 | 429 | 429 | 429 | 429 | 429 |
| Countries | 18 | 18 | 18 | 18 | 18 | 18 |
| R-squared | 0.743 | 0.706 | 0.644 | 0.957 | 0.760 | 0.960 |
| RMSE | 0.043 | 0.045 | 0.050 | 0.017 | 0.041 | 0.017 |

*Note*: The dependent variable is the natural logarithm of hours worked per worker. All regressions are estimated by GLS with a panel-wide AR(1) correction. Heteroskedasticity robust standard errors are reported in parentheses. All explanatory variables are lagged by one period. *, **, and *** denotes significance at 10%, 5%, and 1% levels, respectively.

Table 2: Hours worked, wage bargaining and government transfers

| | Dependent variable: Ln(Hours worked per worker) | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Ln(GDP per hour worked) | -0.121*** | -0.131*** | -0.133*** | -0.128*** | -0.119*** |
| | (0.013) | (0.012) | (0.012) | (0.013) | (0.013) |
| GDP growth | 0.084*** | 0.056* | 0.090*** | 0.050 | 0.056* |
| | (0.031) | (0.034) | (0.035) | (0.031) | (0.034) |
| Union density | -0.028 | -0.028 | -0.043** | -0.011 | 0.008 |
| | (0.019) | (0.019) | (0.017) | (0.021) | (0.021) |
| Female employment rate | -0.232*** | -0.296*** | -0.298*** | -0.265*** | -0.252*** |
| | (0.027) | (0.029) | (0.030) | (0.030) | (0.032) |
| Labor income tax rate | -0.287*** | -0.286*** | -0.359*** | -0.254*** | -0.254*** |
| | (0.044) | (0.056) | (0.055) | (0.051) | (0.056) |
| Top 1% income share | 0.246*** | 0.277*** | 0.297*** | 0.224*** | 0.178*** |
| | (0.067) | (0.069) | (0.068) | (0.067) | (0.066) |
| Centralization of wage bargaining | -0.048*** | | | | -0.041*** |
| | (0.015) | | | | (0.015) |
| Social transfers in % of GDP | | -0.159** | | | |
| | | (0.068) | | | |
| Social transfers in cash in % of GDP | | | 0.008 | | 0.070 |
| | | | (0.115) | | (0.127) |
| Social transfers in kind in % of GDP | | | | -0.473*** | -0.476*** |
| | | | | (0.122) | (0.135) |
| Constant | 8.130*** | 8.226*** | 8.217*** | 8.199*** | 8.168*** |
| | (0.047) | (0.046) | (0.045) | (0.048) | (0.046) |
| Fixed effects | No | No | No | No | No |
| Observations | 429 | 372 | 372 | 372 | 372 |
| Countries | 18 | 18 | 18 | 18 | 18 |
| R-squared | 0.749 | 0.804 | 0.793 | 0.825 | 0.828 |
| RMSE | 0.042 | 0.039 | 0.040 | 0.037 | 0.037 |

*Note*: The dependent variable is the natural logarithm of hours worked per worker. All regressions are estimated by GLS with a panel-wide AR(1) correction. Heteroskedasticity robust standard errors are reported in parentheses. All explanatory variables are lagged by one period. *, **, and *** denotes significance at 10%, 5%, and 1% levels, respectively.

Table 3: Hours worked by educational level and private spending on tertiary education

| | Dependent variable: Ln(Hours worked per worker) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Education group | | | | Education group | | | |
| | All | Low | Medium | High | All | Low | Medium | High |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Ln(GDP per hour worked) | -0.162*** | -0.140*** | -0.154*** | -0.136*** | -0.158*** | -0.132*** | -0.150*** | -0.137*** |
| | (0.010) | (0.013) | (0.012) | (0.012) | (0.011) | (0.014) | (0.012) | (0.014) |
| GDP growth | 0.104*** | 0.026 | 0.091** | 0.104*** | 0.057 | -0.015 | 0.032 | 0.050 |
| | (0.033) | (0.060) | (0.037) | (0.040) | (0.039) | (0.067) | (0.040) | (0.050) |
| Union density | 0.004 | 0.023 | 0.002 | -0.016 | -0.006 | 0.012 | -0.002 | -0.024 |
| | (0.019) | (0.029) | (0.022) | (0.022) | (0.021) | (0.032) | (0.024) | (0.025) |
| Female employment rate | -0.329*** | -0.541*** | -0.273*** | -0.018 | -0.310*** | -0.537*** | -0.271*** | 0.039 |
| | (0.030) | (0.045) | (0.035) | (0.036) | (0.032) | (0.048) | (0.036) | (0.038) |
| Labor income tax rate | -0.286*** | -0.719*** | -0.321*** | 0.026 | -0.355*** | -0.781*** | -0.385*** | -0.016 |
| | (0.057) | (0.075) | (0.066) | (0.066) | (0.062) | (0.084) | (0.068) | (0.076) |
| Top 1% income share | 0.323*** | 0.382** | 0.310*** | 0.210** | 0.373*** | 0.409*** | 0.347*** | 0.298*** |
| | (0.081) | (0.163) | (0.084) | (0.094) | (0.081) | (0.152) | (0.081) | (0.098) |
| Private spending on tertiary education in % of GDP | 3.459*** | 0.438 | 2.496* | 7.230*** | | | | |
| | (1.245) | (1.760) | (1.401) | (1.534) | | | | |
| Private spending on tertiary education in % of total spending | | | | | 0.039 | -0.016 | 0.028 | 0.131*** |
| | | | | | (0.027) | (0.040) | (0.031) | (0.037) |
| Constant | 8.299*** | 8.441*** | 8.261*** | 7.942*** | 8.296*** | 8.435*** | 8.266*** | 7.919*** |
| | (0.039) | (0.052) | (0.046) | (0.044) | (0.044) | (0.056) | (0.051) | (0.049) |
| Fixed Effects | No | No | No | No | No | No | No | No |
| Observations | 265 | 265 | 265 | 265 | 241 | 241 | 241 | 241 |
| Countries | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 |
| R-squared | 0.849 | 0.806 | 0.805 | 0.684 | 0.834 | 0.809 | 0.796 | 0.661 |
| RMSE | 0.037 | 0.052 | 0.040 | 0.041 | 0.041 | 0.053 | 0.043 | 0.046 |

*Note*: The dependent variable is the natural logarithm of hours worked per worker. All regressions are estimated by GLS with a panel-wide AR(1) correction. Heteroskedasticity robust standard errors are reported in parentheses. All explanatory variables are lagged by one period. *, **, and *** denotes significance at 10%, 5%, and 1% levels, respectively.

# A Appendix

## A.1 Robustness

Table A1: Hours worked: robustness

| Dependent variable | Ln(Hours worked per worker) | | | | Ln(Hours worked per person) | |
|---|---|---|---|---|---|---|
| | Top 5% income share | | w/o Eastern Europe | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Ln(GDP per hour worked) | -0.134*** | -0.099*** | -0.121*** | -0.172*** | -0.112*** | -0.118** |
| | (0.013) | (0.029) | (0.013) | (0.026) | (0.018) | (0.053) |
| GDP growth | 0.092*** | 0.124*** | 0.069** | 0.155*** | 0.325*** | 0.448*** |
| | (0.030) | (0.043) | (0.030) | (0.041) | (0.053) | (0.086) |
| Union density | -0.044** | 0.039 | -0.031* | 0.030 | -0.056** | -0.064 |
| | (0.018) | (0.039) | (0.018) | (0.043) | (0.026) | (0.063) |
| Female employment rate | -0.232*** | -0.266*** | -0.263*** | -0.298*** | 0.762*** | 0.798*** |
| | (0.028) | (0.041) | (0.028) | (0.039) | (0.046) | (0.068) |
| Labor income tax rate | -0.305*** | -0.030 | -0.359*** | -0.083 | -0.419*** | -0.352*** |
| | (0.045) | (0.062) | (0.045) | (0.062) | (0.067) | (0.103) |
| Top 5% income share | 0.252*** | 0.120** | | | | |
| | (0.058) | (0.055) | | | | |
| Top 1% income share | | | 0.370*** | 0.208*** | 0.399*** | 0.238** |
| | | | (0.067) | (0.057) | (0.096) | (0.094) |
| Constant | 8.135*** | 7.911*** | 8.132*** | 8.236*** | 7.098*** | 7.144*** |
| | (0.048) | (0.132) | (0.049) | (0.121) | (0.065) | (0.234) |
| Fixed effects | No | Yes | No | Yes | No | Yes |
| Observations | 425 | 425 | 378 | 378 | 429 | 429 |
| Countries | 18 | 18 | 15 | 15 | 18 | 18 |
| R-squared | 0.737 | 0.960 | 0.720 | 0.959 | 0.812 | 0.940 |
| RMSE | 0.043 | 0.017 | 0.042 | 0.020 | 0.052 | 0.029 |

*Note*: The dependent variable is the natural logarithm of hours worked per worker (hours worked per working age person). All regressions are estimated by GLS with a panel-wide AR(1) correction. Heteroskedasticity robust standard errors are reported in parentheses. All explanatory variables are lagged by one period. *, **, and *** denotes significance at 10%, 5%, and 1% levels, respectively.

## A.2 Variable definitions and data sources

Table A2: Description of data

| Variable | Description | Source |
|---|---|---|
| *Hours worked* | | |
| Hours worked per worker | Annual hours worked per employed (by gender, age, and education) | Bick et al. (2019) |
| Hours worked per person | Annual hours worked per working age person (by gender, age, and education) | Bick et al. (2019) |
| Hours worked per worker by decile | Weekly hours worked by decile (paid + self-employment) | Bick et al. (2018) |
| Hours worked (long series) | Annual hours worked per (employed) person | TED + OECD |
| *Income distribution* | | |
| Top income shares | Top income shares of fiscal income | WID |
| Gini coefficient | Gini coefficient of household disposable income | SWIID |
| *Labor market and welfare state* | | |
| Centralization of wage bargaining | Summary measure of centralization of wage bargaining | ICTWSS |
| Social benefits to households | Social transfers in % of GDP (by category) | OECD |
| Private spending on tertiary education | Private spending on tertiary education in % of GDP (or total spending) | OECD |
| Early childhood education and care | Public spending on early childhood education and care in % of GDP | OECD |
| *Other variables* | | |
| GDP per hour worked | GDP per hour worked, constant 2015 prices and PPPs, US dollars | OECD |
| GDP growth | GDP, volume, annual growth rates, in % | OECD |
| Union density | Trade union density | ICTWSS |
| Female employment rate | Employment rate for the population aged 15-64 by gender | Bick et al. (2019) |
| Labor income tax rate | Average tax rate on labor income | McDaniel (2007) |

*Note*: ICTWSS=Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts; OECD=OECD Statistics; SWIID=Standardized World Income Inequality Database; TED=The Conference Board Total Economy Database; WID=World Inequality Database.

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