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ABSTRACT

Americans average 25.1 working hours per person in working age per week, but the Germans average 18.6 hours. The average American works 46.2 weeks per year, while the French average 40 weeks per year. Why do western Europeans work so much less than Americans? Recent work argues that these differences result from higher European tax rates, but the vast empirical labor supply literature suggests that tax rates can explain only a small amount of the differences in hours between the U.S. and Europe. Another popular view is that these differences are explained by long-standing European "culture," but Europeans worked more than Americans as late as the 1960s. In this paper, we argue that European labor market regulations, advocated by unions in declining European industries who argued "work less, work all" explain the bulk of the difference between the U.S. and Europe. These policies do not seem to have increased employment, but they may have had a more society-wide influence on leisure patterns because of a social multiplier where the returns to leisure increase as more people are taking longer vacations.

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1. Introduction

In the early seventies hours worked per person were about the same in the U.S. and in Western Europe (Europe in short). Today they are almost 50 per cent less in Europe than in the U.S. (Figure 1). Americans average 25.1 working hours per person in working age, Italians 16.7, French 18.0 and German 18.7. The average employed American works 46.2 weeks per year; the average French 40.5 the average Swede 35.4. While Americans work today just about as much as in 1970, Europeans work much less. Why?

Both academics and policymakers have recently focused on the decline in work hours in Europe. The former have been attracted by the remarkable size of this phenomenon and its relevance to long standing controversies in macroeconomics and public finance. The latter are particularly interested in whether the decline in European hours worked is causing a slowdown in growth. Figure 2 compares income per capita in U.S. and Germany versus hours worked in the U.S. and Germany and shows that the gap between U.S. and German GDP per capita appears to have widened after 1990 as the gap between U.S. and German hours worked has grown. However this paper is NOT, we repeat NOT about the cause of the differential in growth between U.S. and Europe, or whether hours worked is fully responsible for it. Our goal is to understand the evolution of working hours.[2] It should also be clear that when we say that Europeans work less we mean they work less for pay in the market place; unpaid home production is part of "non working time."

In a recent, provocative paper Prescott (2004) argues that "virtually all of the large differences between U.S. labor supply and those of Germany and France are due to differences in tax systems." Prescott calibrates a dynamic model of investment and labor supply; and shows that under what appear to be reasonable assumptions about parameter values, all of the difference between the U.S. and the major European countries can be explained by different marginal tax rates. Indeed the marginal income tax rate differences between the U.S. and Europe were much smaller in the 1970s, when labor supply differences were much smaller. Prescott's view is supported by the statistical evidence of Davis and Henreksson (2004) who use a panel of richer countries and find large labor supply responses to higher tax rates.

But Prescott's argument that taxes explain U.S./Europe differences relies critically on assumptions that ensure an elasticity of labor supply that is hard to reconcile with most standard estimates of labor supply elasticities. In the case of male labor supply, we are not aware of any within-country estimates of labor supply elasticities that are even in the same ball park as those used in the Prescott's calibration. For women, estimated labor supply elasticities are much closer to those used by Prescott (his assumptions still veer toward the upper limit of available estimates); however the reduction of hours worked is by no means a women-only phenomenon. Female labor force participation shows an increasing trend in most European countries since 1973 even though the U.S. shows an

[2] See Blanchard (2004) for a recent discussion of the European economy with a special emphasis on France. For a long term perspective on growth in Europe versus the US see Gordon (2004)

even faster growth of female participation; this is a case where the effect of marginal tax rates may indeed be very important. Prescott himself is well aware of this discrepancy between the traditionally estimated elasticities from "micro" evidence and the "macro" elasticity needed for his calibration exercise to work, but he offers little explanation of why the "micro" elasticities are wrong.

This paper examines two different hypotheses for the mismatch between macro and micro labor supply estimates. The same hypotheses also offer us different theories of the differences in hours worked between the U.S. and Europe. First, we consider the possibility that the macro-estimates are right in this context and the micro-estimates are misleading. Micro-estimates may be statistically correct, but they are inappropriate because they consider only the direct impact of taxation. One indirect effect of taxation is the government transfers that it funds. These transfers create an income effect that might induce lower work hours. This is one reason why Prescott's elasticities are so high, but there is little evidence suggesting income elasticities of the level that his work assumes.

A potentially more important reason why macro elasticities would be much higher than micro elasticities is that the presence of positive complementarities either in production, consumption or leisure would imply the existence of a social multiplier (Glaeser, Sacerdote and Scheinkman, 2003). For example, if the utility from not working is increasing in the number of people who do not work, macro-elasticities will both be greater than micro-elasticities and that macro-elasticities will be more appropriate for understanding the impact of policy differences.

The social multiplier is one way of making sense of the hypothesis that Europeans have a cultural predilection for leisure. Blanchard (2004) and others have noted that Europeans seem to have taken a good portion of their secular increase in income in less work while Americans have instead taken it in more consumption. Simply invoking different cultures to explain this fact is unconvincing: why did "culture" start diverging in the early seventies across the Atlantic so dramatically? Up to the First World War work hours per employee were actually lower in the U.S. than in most European countries including France and Germany (Huberman (2004)). Work hours per employee started to fall a bit more rapidly in Europe than in the U.S. but up until the late sixties work hours per employee were about the same in the U.S., and Europe including Germany and France (Huberman (2003)). Unless one invokes a "reversal of cultures," the purely cultural argument seems weak. A more convincing story is that as hours worked started to decline in Europe (perhaps because of taxation), people's utility from leisure increased and the social multiplier reinforced the decline created a "desire" for Europeans to vacation en masse.

Our second hypothesis is that the cross-sectional relationship between taxes and hours worked is just the result of omitted variables that are correlated with the tax rate and that also impact hours worked. In particular, unionization and labor market regulations are strongly correlated with both hours worked across countries and marginal tax rates. The importance of unionization and labor market regulation is not constant over time; on the

contrary it sharply increased with the structural shocks of the 1970s and 1980s, (Blanchard (2004) and Blanchard and Wolfers (2003)). It may also be related with the leftist surge of the late sixties, from the "May 68" in France to the "Autunno Caldo" (hot fall) of 1969 in Italy. Hunt (1998, 1999) documents how German and French unions pursued a policy of work sharing, demanding a reduction in hours worked as a response to raising unemployment, with slogans like "work less -- work all."[3]

Work sharing may make little sense as a national response to a negative economic shock, but at a single firm, a membership maximizing union may indeed find work sharing to be an attractive policy. Unions also demanded higher hourly wages to keep total income from falling, making it hard to support the same level of employment, thus creating a multiplicative effect on total hours worked per person. Large declines of hours worked in unionized sectors (the large majority of sectors in Europe) may also have triggered reduction in hours worked in other sectors for a social multiplier effect.

To distinguish between these two hypotheses, we begin in Section II of this paper with the basic facts on labor supply across countries. In Section III of the paper, we review the evidence on taxes and labor supply. The primary finding of this section is that if taxes were the only difference between the U.S. and Europe then labor supply elasticities would need to be much greater than those found in the micro literature. In Section IV, we consider the possibility that factors other than tax rates explain the differences between the U.S. and Europe. We begin with a simple model that suggests that the impact of unionization should increase after sectoral shocks, such as those that hit the U.S. and Europe in the 1970s and 1980s.[4] In an economy with free mobility, mean zero shocks that increase productivity in some sectors and decrease productivity in others will tend to increase average productivity; if the labor supply curve slopes up, this will increase hours worked. In a unionized economy, when unions in a declining industry try to keep their membership constant, this will lead to a decrease in hours worked. Under reasonable parameter values, the same shock that increases hours worked in a non-unionized economy will decrease hours worked in a unionized economy.

We examine these predictions empirically in several ways. First, we show that using a cross-section of countries without using any panel information, it is impossible to disentangle the impact of taxes, regulation and unions. Second, using a panel of countries and following Davis and Henreksson (2004), we find that the impact of taxes on labor supply disappears once we control for unionization or labor market regulation.[5] Third, using U.S. data, we show that the impact of union status on vacation and hours worked across states seems to be at least as large as the impact of tax rates across states. Fourth, we show, in an accounting sense, that legally mandated holidays can explain 80 percent of the difference in weeks worked between the U.S. and Europe and 30 percent of

[3] Genre, Salvador and Lamo argue that recent reductions in unionization in Europe (the last ten years) and in changes in unemployment benefits can explain the rising labor force participation of European women.
[4] Bertola and Ichino (1995) discuss the effects of unions in a model with sectoral shocks. More generally Ljungqvist and Sargent (2004) show how large firing costs generate high unemployment in the presence of negative shocks.
[5] Olovsson(2004) argues that income taxes can explain roughly ten percent of the difference in hours worked between the US and Sweden.

the difference in total labor supply between the two regions (See Table 4). On net, we think that this data strongly suggests that labor regulation and unionization appear to be the dominant factors in explaining the differences between the U.S. and Europe. We suspect that the effect of generous pension systems which reduced participation rates amongst elderly for older workers is also strong; a case in point is Italy.[6]

In Section V, we discuss whether the macro-elasticities are more appropriate than the micro-elasticities. Can a social multiplier explain the difference between the micro and macro labor supply estimates? Is it possible that income effects from higher tax rates act to make these tax elasticities much larger than standard labor supply elasticities? We believe that most so-called micro-elasticities already include some effect of the social multiplier. Moreover, what little available evidence suggests that the social multiplier can at most double the estimate labor supply elasticities. Thus, this section leaves us with the view that labor regulations and union policies are the dominant causes of hour's differences between the U.S. and Europe.

We conclude with an intriguing question. Are all these regulations and union policies (and taxation) suboptimal because they distort labor leisure decisions, or do they help solve a coordination problem? If a social multiplier exists because of complementarities in the consumption of leisure, then national policies that enforce higher levels of relaxation can, at least in theory, increase welfare. Perhaps everybody, on both sides of the Atlantic would like to work less but it is difficult to coordinate on a fewer hour's equilibrium in competitive market where all workers act individually. According to this view, all would like more vacation if their friends, spouses and relatives also had them, but no coordination device is readily available.

In Section VI we make an attempt at shedding some light on this question using data on life satisfaction. The individual level evidence shows a tight link between self-reported happiness and weeks of vacation. But these results are difficult to interpret because of omitted variables and reverse causality. Perhaps people who are more balanced in their approach to life are both happier and take more vacations. A more satisfying approach is to use the legislation on vacations that differs across countries and over time. Using a panel of countries we are able to use these mandated holiday differences as an instrument for weeks of vacation. We find that indeed places with more mandated vacations do seem to be a bit happier. The gap between this finding and any sort of policy recommendation remains vast.

2. The Data[7]

Table 1 illustrates the basic data on work hours for several European countries and the U.S., the source is OECD. The U.S. has the highest value for working hours per person per week: 25.1. The lowest is Italy with 16.7. Germany has 18.7 and France 18.0. The

[6] Davis and Henreksson interpret their tax rate estimates as including direct and indirect effects of taxation including effects that come through government spending.
[7] A detailed description of data sources is given in Appendix

UK has the second highest value with 21.4, and Ireland the fourth with 20.1, making it clear that the starkest comparison is between continental Europe and the U.S.

Differences in working hours per person can result from a combination of 3 factors: participation in the labor force and unemployment rates, number of days of vacation, and number of hours worked in a normal week (i.e. without holidays). Reduction in the hours worked per person related to the third effect may arise because full time workers work less or the share of part time workers increases. Notice how the U.S. has by far the longest number of weeks of work per year (46.2). It is second after Greece for numbers of hours worked in the normal week and it is sixth in terms of employment over population. These very rough data already highlight the importance of the amount of vacation time as an explanation of U.S. exceptionalism.

Table 2 splits the difference between U.S. versus France, Germany and Italy into the three components. A comparison of U.S. versus Germany and U.S. versus France shows that roughly one quarter of the total difference is explained by differences in working hours in a normal week. Part of the reduction in hours worked in a normal week is explained by increase in part time work, a point also raised by Bell and Freeman (1995) and Hunt (1998). Hunt (1998) reports that between the early seventies and the mid nineties part time workers increased as a share of all workers from 5.9 to 9.6 in France. Over the same period, the share of workers who worked part time increased from 10.1 to 12.6 percent in Germany.

The remaining three quarters of the difference is explained by a lower number of weeks worked and labor force participation. The former is slightly more important in both countries; it explains 44 per cent of the total difference in Germany and 39 per cent in France. Overall, the picture for France and Germany looks pretty similar, while Italy is different. For this country more than half of the difference is explained by employment rates, one third by vacation time and only a bit more than 10 per cent by hours worked in a normal week; this observation is also explained by the relatively small fraction of part time work in Italy.

Given the importance of vacation time, Table 3 provides a breakdown of weeks in a year spent at work and not at work in several countries. Germany and Italy have the two highest number of vacation weeks with 7.8 and 7.9 respectively. The U.S. has 3.9. In fact even though the U.S. is on the low side on all the categories of time spent not at work in this table, the difference in vacation time is especially striking. According to OECD data the U.S. has 20 fewer days of vacation and holiday than Italy and Germany and 15 fewer than France. Table 4 shows holidays and federally mandated vacation days in several countries. Table 5 displays the statutory and collectively agreed minimum paid leave in many countries. In the U.S. there is no statutory minimum. In France both statutory and agreed are 25 days while in Germany there are 20 statutory and almost 30 agreed. Italy has 20 and 28, respectively. Clearly the increase in mandatory vacation time in Europe relative to the U.S. is a major factor in explaining work hours.

We now turn to labor force participation. Figures 3 and 4 illustrate labor force participation for men and women since the early seventies in the same four countries. Men's participation dropped in all countries but less so in the U.S. Female participation increased tremendously in the U.S. but significantly less so in Germany and France. Female participation in Italy is much lower than in the other countries and in fact is an outlier in Europe. Recall from above that in Italy much more so than in Germany or France, the difference with the U.S. in hours worked per capita was due to employment participation; this chart shows that the effect comes primarily from women. [8]

Figure 5 shows participation rates for older workers, 55- 64. In the U.S., participation rates today are pretty similar to what they were in 1970. Participation rates are much lower in France and Italy where generous pension systems and early retirement age play a key role for individuals in this age group. The effect is less marked for Germany simply because the participation rate for this category in Germany was already quite low in the seventies. It is pretty clear that the effect on hours worked derived from lower participation in the labor force in Europe comes from mandatory retirement ages and pension systems. A case in point is Italy which has a particularly low participation of older workers. As noted by Giavazzi and Dornbusch (2000), Italy also has a very low participation of younger workers, who find entry barriers in the labor market and prolong their stay in school; the average completion rate of college in Italy is 27.8 years of age!

3. Taxation and hours worked

Given that hours worked fell so much from 1970 onward in Europe but not in the U.S., the explanation most likely has to do with some large change that occurred in Europe and not in the U.S. An obvious candidate is the large increase in the income tax rate in Europe compared with a much smaller increase in the U.S. There is probably little doubt that increasing marginal tax rates have reduced hours worked, especially through an effect on female participation in the labor force. But the question is whether the tax effect is enough to explain the current very large difference between Europe and U.S. both for men and women. The answer to this question obviously hinges on the elasticity of the labor supply to after tax salaries. [9]

3.1 Labor Supply Elasticities

Prescott (2004) argues that the entire difference between U.S. and Europe is due to taxes. He evaluates what elasticity of labor supply would be needed to explain the entire difference between hours worked in the G7 countries, and he shows that the differences

[8] The main reason for this is probably a very generous pension system with early retirement especially for women and even more so for women in the public sector (all teachers are in the public sector). Only recent reforms have partly corrected for that. Another explanation is the short supply of day care and cultural variables as well.

[9] Note that the tax increases which occurred in Europe were certainly expected to be permanent when introduced and we are looking at the steady state effect on the aggregate labor supply not at intertemporal labor elasticity.

between the U.S. and Europe can be explained by tax rate if he assumes a log-log utility function on consumption and leisure. Obviously leisure is used here in the broad sense of the term, that is any non market (and not taxed) activity such as home production, work in the black economy or, indeed, having fun.

The core element of the model is that it delivers a high labor supply elasticity with respect to the tax rate. This high labor supply elasticity, if true, also implies that reducing taxes in Europe would lead to very large gains in hours worked and welfare. Prescott also uses this evidence to suggest that indeed the elasticity of the labor supply must be much higher than what normally thought.[10] The key to his calibration is choosing a functional form where the average levels of hours works delivers a labor supply elasticity on its own, and that this functional form—which has little basis in the empirical labor supply literature—essentially drives his calibration.

Our discussion (and that of Prescott, 2004) treats hours of work as a continuous measure and ignores the important participation discussion. This is most appropriate for middle-aged males, and less appropriate for married women and either older or younger men. As such, since both our discussion and the original Prescott (2004) formulation avoid the added complexities of a participation decision, these equations should be seen as being primarily focused on the labor supply decisions of men who are in the labor force.

Prescott's model is a dynamic version of a classic separable utility labor supply model, where individuals choose "l" (the amount of labor supplied) to maximize: $U(C)+V(1-l)$, where C (or consumption) equals (1-t)wl+z, where t is the tax rate, w is the wage and z reflects unearned income. The term V(1-l) reflects the enjoyment from leisure, and the first order condition sets the marginal utility of leisure equal to the marginal benefits from extra income or $(1-t)wU'(C)=V'(1-l)$. The dynamic elements of the model are not critical for delivering the high labor supply elasticities in his calibration, so we will omit them in our analysis and focus on the more standard labor supply case.

Prescott (2004) assumes that some taxes are returned to consumers in the form of transfers or government services. This effect, which is included by Prescott, will tend to increase the labor response to higher taxes because it reduces the income effect of raising taxes. We can reflect this effect in the model by making unearned income a function of government revenues and assuming that $z=z_0+\delta t\overline{wl}$, where δ ranges between zero and one and reflects the fact that some revenues make it back to consumers. The value of $\overline{wl}$ represents national labor earnings. With this assumption, using the fact that in equilibrium $wl=\overline{wl}$, it follows that:

[10] For an analysis of the Great Depression in a similar spirit see Chari Keohe and Mc Grattan (2003); they argue that the can explain the unemployment of the American Great Depression with the tax wedge on labor. In their analysis the intertemporal elasticity of substitution plays a big role.

$$(1) \qquad \frac{\partial Log(l)}{\partial t} = \frac{1}{1-t}\left(-\frac{\partial Log(l)}{\partial Log(w)} + \delta\frac{(1-t)wl}{z}\frac{\partial Log(l)}{\partial Log(z)}\right)$$

The term $\frac{(1-t)wl}{z}\frac{\partial Log(l)}{\partial Log(z)}$ is often called the "marginal propensity to earn" (Pencavel, 1986). The term $\frac{\partial Log(l)}{\partial Log(w)}$ is the uncompensated labor supply elasticity and $\frac{\partial Log(l)}{\partial Log(w)} - \frac{(1-t)wl}{z}\frac{\partial Log(l)}{\partial Log(z)}$ is the compensated labor supply elasticity.

Equation (1) tells us that the size of δ is important because it determines whether compensated or uncompensated labor supply elasticities should be used when thinking about the impact of taxes on labor supply. If $\delta = 1$, then the tax elasticity is -1/(1-t) times the pure "compensated" labor supply elasticity, because in this case tax dollars are completely returned to consumers. In this case, taxation only changes the returns to labor; it does not reduce income. If $\delta = 0$, then the tax elasticity is -1/(1-t) times the uncompensated labor supply elasticity because in this case tax dollars are completely lost to consumers.

In the Prescott formulation $\delta = 1$ and government spending is valued by consumers just like income. This assumption helps to ensure a high labor supply elasticity. A second, ultimately less important, adjustment that Prescott (2004) makes to the standard model is to assume that wages are not fixed, but are determined also by labor demand. We can incorporate this effect into our model by allowing wages, w, to equal w(l) where w'(l)<0 to take into account downward-sloping labor demand. This effect will generally mute the impact of taxes on hours worked because as taxes reduce hours worked, wages will rise and keep some people in the labor market.[11]

The most critical aspect of the Prescott (2004) model is that individuals maximize a log-log (or in a static setting Cobb-Douglas) utility function: $Log(C) + \alpha Log(1-l)$. In this case when w'(l)=0 and $\delta = 0$, the elasticity of hours worked with respect to the wage is $\frac{\alpha z}{(1+\alpha)(1-t)wl}$. The most striking feature of the Cobb-Douglas utility is that one parameter, "α", determines down both the level of hours worked and the elasticity of hours worked with respect to the tax rate. With this functional form, Prescott's quite reasonable parameter assumptions, $\alpha = 1.54$, $wl = .6776 \bullet Y$, and and t=.5 (both midway between the U.S. and Germany), delivers a labor supply elasticity of .77. Since this elasticity excludes any general equilibrium effects it can be directly compared with usual estimates of labor supply elasticities. The Cobb-Douglas functional form is so powerful that without any assumptions directly related to labor supply elasticity, this function form

[11] Of course, if w'(l)>0 as in the case of some agglomeration economies, then this will cause the tax impact on hours worked to rise.

delivers a strikingly high labor supply elasticity. This high labor supply elasticity is the first prediction of the model.

Prescott himself uses the equation $l = \frac{1}{1 + \frac{\alpha C}{(1-\theta)(1-t)Y}}$, for his calculations and if C/Y is held constant (changes in this variable do not drive his results), the elasticity of labor supply with respect to the tax rate equals $-\frac{t}{1-t}(1-l)$. No knowledge of α is actually needed to determine the response of labor supply to taxes, which will generally be around .8 (a reasonable value of 1-l).

A second prediction of the model is that the labor supply will respond sharply to increases in unearned income. The Prescott assumptions suggest that the elasticity of labor supply with respect to unearned income, $\frac{\partial Log(l)}{\partial Log(z)}$, equals $\frac{-\alpha z}{(1+\alpha)(1-t)wl}$, which will also equal -.77. This elasticity can also be checked against the available income elasticity estimates.

A third prediction of the model is that labor supply elasticities should be quite different for individuals with large unearned income and small unearned income. For example, in Prescott's model, if C=(1-t)wl, the functional form predicts that there will be no impact of either taxes or wages on the supply of hours worked, because the price effect of higher wages or lower taxes is completely offset by the income effect making workers richer or poorer. As such, a third test of the model is to look at whether labor supply elasticities change significantly with unearned income.

We will begin the next section by asking whether the available information about labor supply elasticities is compatible with the Prescott (2004). Is there evidence that wage or tax rate elasticities are as high as his model suggests, or high enough to explain U.S./Europe differences? Is there evidence that elasticity of labor supply with respect to unearned income is close to one? Is there evidence that individuals with significant unearned income have much more elastic labor supply levels than individuals with little unearned income? While some of these tests do take us away from U.S./Europe differences, the heart of the Prescott explanation is that labor supply elasticities are extremely large with respect to the tax rate. It seems reasonable to ask whether the available evidence on labor supply elasticities supports this claim.

3.2 The basic evidence

At this point, we ask whether the available evidence supports the view that differences in hours worked between the U.S. and Europe can be explained by differences in tax rates. As discussed above, the OECD numbers tell us that average weekly hours worked are 25.1 in the U.S. and 18.3 (on average) in Germany and France. The Prescott numbers of

marginal tax rates suggests a difference .2 between the U.S. and those European countries. To explain this difference, there would have to be a tax rate elasticity of over 1.5 or since the wage elasticity is one minus the tax rate times the tax rate elasticity, this would require a labor supply elasticity of .75 (which is, of course, the labor supply elasticity implied by Prescott's simulation).

In Table 6, we repeat this calculation using our own data. Here, we compute the implied elasticity of the labor supply in the entire difference of hours worked in Europe (average of the 4 largest European economies) and U.S. were explained by the marginal tax rate. This elasticity to the tax rate is about -1.63 for hours worked per person, which implies an elasticity of the labor supply of about 0.92 (if 1/(1-t) equals .564). Our estimates suggest that a slightly higher elasticity is needed to explain the U.S./Europe difference primarily because of tax rate numbers are slightly different from those used by Prescott (2004).

As we have discussed above, using estimated labor supply elasticities with respect to the wage to understand labor supply elasticities with respect to the tax rate depends on two things: the labor demand elasticity, which will mute the impact of high taxes on hours worked, and the income effect of the government spending funded by the high taxes. As the first effect makes it harder for tax rate differences to explain hours of work differences, we will simply ignore this effect. However, we will focus on the potential income effects from higher tax-funded government spending. If taxes are spent on commodities that are highly valued by consumers, then compensated labor supply elasticities are appropriate, since taxes in this case have only price effects, and do not have a negative income effect. If government spending is essentially wasteful, then uncompensated demand elasticities are appropriate because higher taxes have both a price and an income effect. As such, we will present evidence on both elasticities.

We will also briefly consider two other predictions of the Cobb-Douglas functional form assumption that drives the Prescott calibration. One implication of this function form is that the elasticity of labor supply with respect to unearned income, or $\frac{\partial Log(l)}{\partial Log(z)}$ equals $\frac{-\alpha z}{(1+\alpha)(1-t)wl}$, or -.77. This elasticity can also be checked against the available income elasticity estimates. The Cobb-Douglas functional form also implies that labor supply elasticity should be wildly different for individuals with large unearned income and small unearned income. For example, in Prescott's model, if C=(1-t)wl, the functional form predicts that there will be no impact of either taxes or wages on the supply of hours worked, because the price effect of higher wages or lower taxes is completely offset by the income effect making workers richer or poorer. As such, another piece of evidence on whether the Cobb-Douglas functional form is a reasonable basis for calibration is whether labor supply elasticities change significantly with unearned income.

In the next section, we ask whether the available information about labor supply elasticities supports the view that labor supply differences between the U.S. and Europe can be explained by differences in tax rates. Specifically, we ask whether there is a

consensus that either compensated or uncompensated labor supply elasticities lie between .75 and .92. We will also ask whether the available evidence supports other predictions of the Cobb-Douglas utility function that drives Prescott's high labor supply elasticities. Is the elasticity of labor supply with respect to unearned income is close to one? Is there evidence that individuals with significant unearned income have much more elastic labor supply levels than individuals with little unearned income?

The Labor Supply Elasticity Literature

We begin in Table 7 by collecting a wide range of estimates (mostly from various issues of the Handbook of Labor Economics) of labor supply elasticities from different sources over the past 70 years. Pencavel (1986) reports labor supply elasticities (compensated and uncompensated) and the marginal propensity to earn. Blundell and Macurdy (1999) report uncompensated elasticities and the labor supply elasticity with respect to unearned income. To make these numbers comparable we have followed the assumption contained in Prescott (2004) and assumed a ratio of unearned income to earned after-tax income of 1.28. This follows from Prescott's assumptions that $wl = .6776 \bullet Y$ and if C/Y=.77, C=z+(1-t)wl, and t=.5 (midway between the U.S. and Germany), then z/(1-t)wl equals 1.28, so non-labor income is greater than labor income in his formulation.

This assumption means that we can multiply all marginal propensity to earn figures by 1.28 to find the elasticity of labor supply with respect to unearned income. We can also use the 1.28 ratio to the compensated income elasticity from the uncompensated labor supply elasticities and the income elasticities provided by Blundell and Macurdy (1999). Obviously, this procedure eliminates all sample specific variation in the ratio of unearned earnings to labor income, but it provides us with a convenient means of comparing a wide number of papers. Our use of the 1.28 ratio will lead to high estimates of income elasticities and low estimates of compensated demand elasticities. However, in only one case (Hausman and Ruud, 1984) will the choice of this parameter significantly change the compensated demand elasticity.

The first estimates at the top of the paper Douglas (1934), Winston (1962) and Finegan (1962) are done using aggregate data and provide us only with uncompensated elasticities. These three numbers are best seen as a reminder of the number of decades that economists have tried to estimate labor supply elasticities and that even the oldest estimates of these elasticities are quite modest. These early estimates of uncompensated elasticities range from -.07 to -.35. Somewhat strikingly, most of the later work on uncompensated labor supply elasticities for men falls within this range.

More modern work has relied on individual level data and has occasionally used the variation created by changed in the tax schedule. As the table shows, the majority of estimates of uncompensated labor supply elasticities are negative (labor supply declines as wages rise), but there are a minority of estimates that are weakly positive. If anything, these estimates seem to suggest a consensus estimate of zero as an uncompensated labor supply elasticity. The highest labor supply elasticity, .16, is found by Flood and Macurdy

(1992). Since tax rate elasticities, i.e. $\frac{\partial Log(l)}{\partial t}$, equal -1/(1-t) times labor supply elasticities, then this labor supply elasticity translates into a tax elasticity of .32 (assuming a 50 percent tax rate), which is still about one-half of the labor elasticity implied by the Prescott (2004) and less than one-half of the elasticity needed to explain the differences in labor supply between the U.S. and either France or Germany. The median uncompensated labor supply elasticity is closer to zero.

The second page of the table shows estimates of labor supply elasticities for women. While there appears to be an empirical consensus that uncompensated labor supply elasticities for men are quite low, there is no such consensus for estimates of elasticities among women. The median estimate among those reporters is about one. These assumptions are closer in line with Prescott's predictions. Furthermore, for this group, labor supply elasticities appear to be high enough so that differences in hours worked between the U.S. and Europe can indeed by explained by differences in the tax rate. As such, if there is a puzzle to labor supply differences between the U.S. and Europe, this puzzle really pertains mostly to men.

As we discussed above, since higher taxes are spent on transfers and services and since these transfers may be valued by consumers, uncompensated elasticities are not necessarily appropriate. As such, in the third column, we turn to compensated demand elasticities. In most cases, these compensated demand elasticities range from -.16 to .24. The experimental estimates from the Negative Income Tax experiments and from British experimental data also suggest an upper bound of .24 for compensated labor supply elasticities for men. Since .24 is the upper bound of the estimates, and since using compensated supply elasticities implies that government spending is all valued like income by workers, it seems reasonable to think that a somewhat lower number, like .18, is a more sensible benchmark elasticity. In that case, the elasticity estimate is about one half of the labor supply elasticity implied by Prescott's calibration and one-half of the elasticity needed to explain the differences between the U.S. and Europe.

It is worth pointing out that there are three studies in the table (Wales and Woodland (1979), Hausman (1981) and Hausman and Ruud (1984)) that deliver much higher compensated labor supply elasticities. In these cases, the high elasticities are produced by extremely high elasticities of labor supply with respect to income relative to almost any other work in this area. The income elasticity of labor supply estimated in these papers range from .81 to 1.03 while almost everyone else's estimates are below .5. Heckman (1993) presents a more detailed discussion of problems with these estimates.

We also tend to discount these estimates partially because they are so different than the other standard estimates and partially because they differ greatly from income elasticities estimated using exogenous income shocks. In the last panel of Table 6 we report the income elasticities of labor supply estimated by Imbens, Rubin and Sacerdote (2001) and Holtz-Eakin, Joulfaian and Rosen (1993). Unlike the other papers reported in the table, these two papers focus exclusively on income elasticities and more importantly, they both use plausibly exogenous income shocks for identification. Imbens, Rubin and Sacerdote

(2001) look at the impact of winning modestly sized lotteries on hours worked. Holtz-Eakin, Joulfaian and Rosen (1993) use variation coming from family inheritance. While neither study is perfect, both have far more compelling sources of exogenous income shocks than any of the other papers cited in the table.

Both papers find quite modest elasticities of labor supply with respect to income (-.03 and -.11). These findings are important for two reasons. First, these papers cast doubt on the empirical validity of the high compensated labor supply elasticities, which were high only because of income elasticities close to one. Second, these papers also cast doubt on the Cobb-Douglas utility function used by Prescott (2004). After all, one of the core implications of that functional form is that labor supply elasticities with respect to income will be extremely high.

A final implication of the Cobb-Douglas utility function is that labor supply elasticities will be very different for people with different levels of unearned income. While we are not aware of studies that solidly confirm this prediction, we are also unaware of studies that solidly reject this prediction. As such, it remains a topic for future research.

Overall, the empirical literature on labor supply elasticities suggests three things. First, for men uncompensated labor supply elasticities are close to zero. Second, given reasonable estimates of labor supply elasticities with respect to income, compensated labor supply elasticities are also relatively modest. Reasonable elasticity estimates suggest that at best one-half of the hours worked difference between the U.S. and Europe can be explained by differences in tax rates. Third, labor supply elasticities are much higher for women and as a result, tax rate differences can potentially explain all of the differences in hours worked between American and European married women.

Cross Country Evidence on Labor Supply and Taxes

At this point, we turn from the within-country evidence to the cross-country evidence on the connection between tax rates and hours worked. Figure 6 plots the marginal income tax rate versus hours worked for OECD countries and displays a significant and negative relationship between the two. Our tax variable is the OECD estimate for 2001 of the marginal tax rate on labor income. The appendix includes details on the construction of this variable. This finding is similar to recent results reported by Davis and Herenkson (2004) which use different tax variables.

In Table 8, for the sake of comparison with prior research, we report regressions of hours worked and taxes on two regressions from Davis and Herenkson (2004). In order to facilitate comparisons, we have regressed hours on tax rates. These figures are not directly comparable to the elasticities discussed above. In order to make these into comparable elasticities, we have divided these coefficient estimates by average hours worked in the sample and reported these implied elasticity estimates in brackets.[12] The

[12] The estimates of elasticities found by regressing the logarithm of hours worked on the tax rate are almost the same as the estimates found by regressing the level of hours worked on the tax rate and then dividing by average hours worked.

tax variables are obtained from Nickell and Nunciata (2001) and Schneider (2002). The details about these two tax series are given in Appendix 1.

For two of the three tax series used, the OECD one and the Schneider data, the correlation is significant; for the third one, the Nickel and Nunciata series the correlation is insignificant. The tax rate elasticity estimates in this table range from -.184 to -.865, which are somewhat higher than the elasticities that would be implied by within-country estimates, but still too low to explain all of the differences in hours worked between the U.S. and Europe. For example, using the -7.5 coefficient on the marginal tax rate in column one of this table, which is also reflected in Figure 6, we find that we can explain about 36 percent of the difference in hours worked between France and the U.S., 34 percent of the Italy-U.S. difference and 65 percent of the Germany-U.S. difference.

While this cross country evidence is suggestive, time series evidence is more mixed. As Davis and Herenkson (2004) also point out the decline of hours worked in Europe is pretty much monotonic from the mid seventies to today, while the increase in marginal tax rates were concentrated almost exclusively in the first part of the period, say up to the late eighties. [13] The famous 35 hours week in France implemented in 2000 is a case in point. This reform pushed by the union and agreed by a socialist government did not occur in a period of increasing tax rates.

Even though the data are scant, the time series or panel evidence seems much weaker than cross section evidence. Davis and Henreksson report that the coefficient on the marginal tax rate in a panel with country fixed effects is insignificant. In regression (1) and (2) of Table 9, we find that when we use a panel of countries and control for country-specific fixed effects, the impact of tax rates on hours works declines -7.5 to -1.9. The estimated tax rate elasticity declines from -.50 to -.18. This panel estimate is more in line with the within country estimates discussed above.

The punch line is pretty clear. If one looks at within country microeconomic evidence on the individual labor supply, one does not come even close to explaining the U.S. versus Europe differences in hours worked. However using cross country evidence the correlation between aggregate hours worked and tax rates is strong and if taken as a causal relationship explains a good portion (roughly one third to one half) of the difference in working hours per person. Time series panel evidence however, raises some red flags about this cross section evidence.

There are roughly two explanations for the divergence between within country and across country estimates of the labor supply estimates. One explanation (emphasized also by Davis and Herenkson (2004)) stresses omitted variables. High marginal labor tax rates are correlated with generous welfare systems, workplace regulations, unemployment compensation programs, powerful unions, generous pay as you go social security systems, etc. All of the above may depress working hours. Therefore the tax regressions reported above do not capture the real impact of taxes on labor supply and using macro-regressions significantly overstates the true impact of taxes.

[13] An exception is Italy where significant tax increases occurred in the nineties.

A second explanation is that within country and across country effects of taxes are different because of the existence of a social multiplier or because higher taxes provide services that are valued by consumers. A social multiplier in this context would exist if the marginal productivity of work (or leisure) increases with the number of one's compatriots who are also working (or relaxing). Those who argue that European culture explains high levels of European leisure are perhaps also suggesting a role for a social multiplier. This type of spillover predicts radically different micro and macro elasticities of labor supply (Glaeser, Sacerdote and Scheinkman, 2003) and suggests that macro estimates are indeed appropriate for considering the degree to which difference in tax rates explain differences in labor supply across space.

4. Unionization and Regulation

At this point, we turn to our first significant omitted variable—the level of unionization. Europe is far more unionized than the U.S. The share of the labor force that is covered by collective bargaining agreements is listed in Table 16 across countries. This ranges from less than 20 percent in the U.S. to more than 80 percent in Sweden, France and Germany. The strength of unions owes much to laws and politics. Even within the U.S., the 1936 Wagner Act invigorated U.S. unions and the average unionization rate in states with right-to-work laws is 8 percent while the unionization rate in states without these laws is 16 percent. Note how union strength reached a peak in most European countries in the late seventies/early eighties, precisely when the reduction in hours worked took off. Afterwards, union membership show small decline in Europe and a much faster decline in the U.S. (Boeri et al (2001)).

The large differences in unionization rates between the U.S. and Europe also reflect political differences between the U.S. and Europe that have made European politics far friendlier to unions than the U.S. Alesina and Glaeser (2004) argue that because of American racial fractionalization and European political instability (which is ultimately the result of two world wars), American politics is far less friendly to the left than European politics. Institutions such as proportional representation have been quite prone to favor the growth of communist parties and social democratic parties that championed unions. The correlation is clear: Figure 12 shows the strong positive correlation between proportional representation and the share of the labor force that is covered by collective bargaining agreements. By contrast, American federalism, a majoritarian system which makes it very hard for third parties to enter, separation of powers (especially the Senate and the Supreme Court) have all acted to limit the strength of private sector unions. For these political reasons, European Union density is much higher than union density within the U.S.

Most classic models of unions and wage setting suggest that unions will artificially restrict labor supply in order to raise wages. We might expect unions to impact labor supply in two ways. First, labor unions may keep wages artificially high and restrict employment. Second, labor unions might actively pursue policies of reduction in hours worked, like recently the (in) famous 35 hours week in France or increased vacation time.

We will address the role of labor market regulations in the next section. Before addressing labor market regulations, we will focus on the role that unions have through higher wages.

4.1 Unions, Work Sharing and Demand Shocks

As above, workers maximize $U(Y)+V(1-l)$, where Y denotes income and they have one unit of time to divide between work and leisure. We now abstract from consideration of taxes. There is a measure one of firms, all of which have dollar denominated output denoted $Af(ng(l))$, where A is productivity, f(.) is a concave function where f(0)=0, n reflects the number of workers and g(.) is a concave function of the number of hours worked by each worker, which equals l, and g(0)=0.

In a free market without unions, a firm will offer workers a (Y, l) pair that maximizes profits and ensures that workers will receive the reservation utility, which is denoted $\underline{U}$. This implies the first order conditions $\frac{g'(l)Y}{g(l)} = \frac{V'(1-l)}{U'(Y)}$ and $U(Y)+V(1-l)=\underline{U}>U(0)+V(1)$, which together determine both hours worked and salary. Note that "A" does not enter into either of these two equations: changes in industry specific productivity, if this does not impact the reservation wage, will not impact hours worked. The first order condition for the number of workers hired is $g(l)Af'(ng(l))=Y$. In equilibrium, if N is the total population, and there is measure one of identical firms with identical production technologies, then symmetry ensures that n=N. $\underline{U}$ is determined endogenously so that everyone will work.

We let l* denote number of hours worked that satisfy the firm's first order conditions so that n=N. To consider labor market regulations, we assume that there exists a binding hours worked constraint, denoted $\underline{l}$:

Proposition 1: Output per worker rises with $\underline{l}$, and output per hour falls with $\underline{l}$. When $\underline{l}$ is sufficiently close to l*, worker utility falls with $\underline{l}$, but for some higher levels of $\underline{l}$ worker utility is rising with $\underline{l}$. Firm profits fall with $\underline{l}$.

Regulations that limit work hours will decrease total productivity per worker, but will raise productivity per hour. This follows from the concavity of the production functions. Small impositions of hour's regulations will essentially redistribute from firms to workers and will raise worker utility. Large impositions of hour's regulations will eventually harm both workers and firms.

Following Blanchard and Wolfers (2003), we now turn to the impact of a sectoral shock to the economy. We do this by assuming that for one-half of the firms, productivity equals $A+\Delta$ and for the other half of the firms productivity equals $A-\Delta$. As discussed above, hours and wages will continue to be equal across firms, but the more productive

firms will have more workers. We let n^+ denote the employment of the more productive firms and let n^- denote the employment of the two sectors, and $2-n^+=n^-$.

Proposition 2: If $f(ng(l))=(ng(l))^{\alpha}$, then $\frac{\partial n^+}{\partial \Delta}>0$, $\frac{\partial Y}{\partial \Delta}>0$ and per worker productivity also rises with Δ. $\frac{\partial l}{\partial \Delta}>0$ if and only if $-\frac{YU''(Y)}{U'(Y)}<1$.

This proposition implies that in a free market where labor is mobile between sectors, a shock that increases the productivity of one sector and decreases the productivity of a second sector by an equal amount will increase total income and per worker productivity. This result is not surprising; it is the standard LeChatelier principle in action showing the due to optimizing responses productivity will rise with variance.

This dislocation increases productivity, but it only increases hours worked if $-\frac{YU''(Y)}{U'(Y)}<1$. This condition is necessary because it guarantees that the labor supply curve slopes up so that increases in productivity will lead to increased hours worked. If this condition doesn't hold, then workers will work shorter hours because of the income effect. The core implication of this model is that shocks will lead to a new allocation of workers, but if these shocks are mean zero, then this will lead to greater productivity and greater hours worked.

We now introduce unions into the model and first assume that productivity is everywhere equal to A. We assume that unions have the ability to set both l and Y, but the firm will then optimally choose the number of workers. This also ensures that the firm will always earn nonnegative profits, since setting n to zero and earning zero profits is always feasible.

While there are many possible methods of determining the union's maximization problem, we assume that the union has been allocated initially N members and its goal to first ensure that all N members continue to be employed by the firm and that the welfare of these N members are maximized. If the union maximizes $U(Y)+V(l)$, subject to the constraint that $Ag(1-l)f'(ng(1-l))=Y$, and n=N, then:

Proposition 3: Hours worked under unionization will be lower than hours worked under the free market. Productivity per worker will be lower and productivity per hours will be higher. Worker utility will be higher under unionization and firm profits will be lower under unionization.[14]

This result nicely fits with Blanchard's (2004) comparison of France (which he calls "Europe") and the U.S. In France, productivity per worker went up less than in the U.S., while productivity growth per hour rose much more in France. (This resulted in France

[14] Marimon and Zilibotti's [2000] union model delivers a similar result

reaching the US productivity per hour level by 2000). These results are unsurprising and serve mainly to remind us that unionization is an important omitted variable, which might also explain low work hours in European economies.

One question is whether unions in this case would also lobby for hours restraints. In this model, there would be little reason to do so. However, in a richer model where industries might compete in the product market or where unions might have trouble enforcing labor rules on new entrants, unions would have an incentive to ensure that the rules that come out of collective bargaining applied everywhere throughout the economy.

Finally, we turn to the impact of unions on hours worked in response to sectoral shocks. The core element in our model is that union objectives ensure that the number of workers in each firm will remain fixed at N. To achieve this, unions will treat the firms' first order conditions for hiring workers $((A+\Delta)g(l^+)f'(ng(l^+))=Y^+$ and $(A-\Delta)g(l^-)f'(Ng(l^-))=Y^-)$ as constraints. Unions will ensure there is no unemployment of adults within the union. If there are new workers (from new generations) this will generate unemployment among the young, which is after all a feature of the unionized European economies. These assumptions imply:

Proposition 4: Hours worked will fall in the declining industry and rise in the growing industry (i.e. $\frac{\partial l^-}{\partial \Delta}<0$ and $\frac{\partial l^+}{\partial \Delta}>0$) if and only if $-\frac{YU''(Y)}{U'(Y)}<1$. If $f(ng(l))=(ng(l))^{\alpha}$, $g(l)=l^{\gamma}$, $U(Y)=Y^{\sigma}$, V(l)=v(1-l), and $1>\sigma(1+\gamma\alpha)$, then $\frac{\partial l^+}{\partial \Delta}+\frac{\partial l^-}{\partial \Delta}<0$ so that average hours of work declines with Δ.

This proposition gives us the general result that a union that is trying to maintain membership will cut hours when its sector receives a negative shock. While there is no sense that restricting the number of hours raises employment at the economy level, at the firm level there is a truth to "work less; work all." Unions that want to keep the firm from firing workers will indeed reduce the number of hours worked per employee. Again, this result requires the condition, $-\frac{YU''(Y)}{U'(Y)}<1$, which ensures that the labor supply curve slopes up. This stands in contrast to the non-unionized result where sectoral shocks lead to a re-allocation of labor, more efficiency and generally more hours.

To derive a result on average hours worked in the economy, the proposition assumes specific functional forms for the key functions, and then finds that as long as $1>\sigma(1+\gamma\alpha)$, overall hours worked will decline with the size of sectoral shock. This condition ensures that labor supply, in the unionized world, is convex with respect to productivity, which in turn implies that the increase of hours worked in the successful sector is smaller than the decrease in hours worked in the unsuccessful sector.

These results do not characterize all unionized economies. Rather it shows that under reasonable parameter values, the impact of a sectoral shock on hours worked can be completely opposite in unionized and non-unionized economies. In a non-unionized economy, a sectoral shock that helps one sector and hurts another will generally lead to higher average productivity and greater hours worked. In a unionized economy, where labor movements across sectors are much more limited, a sectoral shock can easily lead to a decrease in hours worked because the negative impact on the hurt sector is greater than the positive impact on the strong sector.

4.2 Union Density, Regulations and Hours across Countries

As our first piece of evidence we turn to the connection between unionization and hours worked across countries. Figure 7 shows the strong negative correlation between hours worked and the percentage of the labor force that is covered by collective bargaining agreements. The raw correlation between these two variables is -54 percent. In fact, this correlation is at least as strong as the one described above for marginal tax rates, and in fact the two variables, marginal tax rates and unionization, are highly correlated 0.72.

The high level of correlation between unionization and tax rates supports the contention that the aggregate estimates of tax rate may be overestimating the true effect of tax rates because of omitted variables problems.

Table 10 shows regressions where we show the difficulties of separately identifying a union effect and an hours effect. In the first regression, we repeat the basic finding of a negative connection between tax rates and hours worked. This correlation is significant. In regression (2), we show that there is also a robust negative relationship between unionization and hours worked across countries. The correlation between unionization and hours worked is somewhat higher than the correlation between the marginal tax rates and hours worked. Regression (3) shows that neither variable is significant when both variables are included in the regression. The coefficient on marginal tax rates plummets, but the standard errors are quite high and we feel that these regressions ultimately tell us little about what the true impact of either unionization or tax rates is on hours worked.

In order to shed more light, we follow Davis and Henrekson (2004) and use both time series and cross sectional information. In Table 9, we present some suggestive panel regressions. The left hand side is hours worked per years per country. The years covered are 1960-1995 for up to 18 OECD countries. (The panel is not balanced). Column 1 includes the Nickell and Nunciata measure of the tax rate, plus country and year dummies; column 2 adds year and countries dummies. We believe that both controls are appropriate. In column 3, we include a measure of union density. This union density variable is significantly negative and including this variable causes the tax rate variable to become insignificant. Prescott (2004) emphasizes that the timing of tax rate changes in Europe seems to correspond with the relative decline in hours worked. However, the same can be said for changes in unionization and changes in labor market regulation. In regression (4), we include the Blanchard and Wolfers measure of employment protection. This variable also enters significantly and now the impact of the

tax variable becomes even smaller. If these results are taken at face value, it seems that either unions or labor market regulation is better at explaining U.S./Europe differences than the tax rate.

Two important caveats are in order. First, the variable "union density" is different from the more appropriate one that we used above which is union coverage, that is the portion of the employed that are covered by union agreements. Union density reflects union membership and it is less relevant here but we do not have time series on union coverage. However cross country evidence on recent data show that union coverage is more closely correlated with hours worked than union density; therefore we hypothesize that union coverage would have worked even better than union density in the panel regression. The second caveat is that we have panel data on marginal tax rates only from Nickel and Nunciata. Of the three marginal tax rate variables used above in cross sections, this is the one that works least well in terms of correlation with hours worked. Therefore we hypothesize that had we had the time varying measures of marginal tax rates the latter might have performed better in our panel regression.

In order to bring more evidence on this point we turn to evidence across the U.S. states. Figure 8 shows the number of weeks of vacation reported by respondent of the PSID versus the state income tax.[15] There is no correlation between the two. Figure 9 displays the correlation between the average days of vacation and the unionization rate. The correlation is positive.[16] In summary, the cross state evidence points in the direction of unionization more strongly than in the direction of marginal tax rates.

Table 11 shows the impact of different variables on weeks of vacation across the U.S. in the PSID. In the first regression, we show the impact of state income tax on weeks of vacation. The effect is significant and negative. In the second regression, we control for union membership. This has a comparably large effect. When both variables are included in the third regression, both are significant.

4.3 Institutional history

A few notes on the institutional history of hours worked and labor regulation may help. In France, up to the early seventies, hours worked of employed people where regulated by law (statutory rules) and not subject to negotiation between employers organizations and labor unions.[17] The key piece of legislation was the 1936 Law that fixed the 40 hours week. From the Second World War until the mid sixties the relatively weak unions focused on improving labor conditions. Starting in the mid sixties and especially from the mid seventies onward the reinforced union movement focused heavily of reduction of hours worked. In the late seventies lengthy rounds of negotiation on hours reduction between unions and employers organization finally came to a January 1981 agreement that reduced the working week to 39 hours. Until then the government had been relatively

[15] Note that hours worked per capita at the state level are not available
[16] Boal and Pencavel (1994) in a careful study of the mining industry in West Virginia conclude that in the 1920's days of work were 25 per cent higher in the non union sector relative to the union sector.
[17] For a discussion of the institutional history of hours worked in France see Gauvin (1993)

neutral with respect to these negotiations, but the new Socialist Government in 1982 clearly took the side of the unions. In a series of laws (1982, 1986 1987) the government issued regulations that either forced or created strong incentives for employers to reduce working hours by increasing mandatory vacations, making it harder to use overtime, etc. Note how Figure 1 shows a sharp drop of work hours per person around 1982. At the same time the pressure for a 35 hour week was mounting. The 35 hour week was indeed introduced in 2000.

In Germany the reduction in hours worked started right after the Second World War and continued with a pretty stable trend. Hours worked fell from 2315 per person in 1950 to about 1750 in 1975 (Bosch (1993)). Note however how the starting point was higher than in France; in Germany the 1938 statutory law fixed at 48 the maximum number of weekly hours. Up until 1975 the reduction in working hours was accompanied by rapid increase in productivity per hour but this changed with the first oil shock. At the time of the large increase in unemployment which followed the first oil crisis of 1973, unions pursued a policy of "work less work all," that is a policy of reduced work hours at the same total wage or even higher wage per hour to compensate for lower total hours worked. An aggressive union movement (more than 11,000 million days of strikes in the ten years following 1975) focused very heavily on reduction of work hours holding total pay constant. (Hunt (1998, 1999)) The unions' stated policies were based on the assumption that the total amount of work to be performed was somehow fixed, and therefore sharing it amongst more individuals would increase employment.

The slogan "work less work all" in different languages echoed in the unions' marches in most of Europe. Hunt (1998) reviews in detail the labor literature that examined the effects of a reduction of standard hours and actual working hours and concludes that the effect was basically one for one in Germany and France, that is the reduction in standard hours did not translate in more overtime. She also presents evidence that suggests that reduction in the hours worked of the male worker reduced the hours actually worked by the spouse, even after controlling for the standard hours of the spouse, an indication of a family multiplier effect. [18] A "household production" model would instead imply an inverse relationship between hours worked in the market and at home between the two members of the family.

Reduced work hours at given total wages obviously increases the cost of labor input per hour, leading to input substitution. The result has been a reduction of employment in hours sharing sectors. The same author (Hunt (1999)) studies wage settlements in Germany after 1985 and she concludes that "the union claim of full wage compensation" was justified, namely the hourly wage [increased] enough to offset the actual decline in working hours.

In Italy the working hours regulations that lead to an increase in vacation days were the result of negotiation between Confindustria (the association of manufacturers), the unions and the Government in an active role of mediator. Following the Autunno Caldo (hot fall)

[18] Interestingly she finds that this effect is smaller for women with a university degree, consistent with the view that in these cases the woman's career goal may take precedence over the family multiplier effect.

of 1969, unions were galvanized and reached their maximum strength in the post war period. At the same time a surge in the vote share of socialist and communist parties lead to a shift of the political balance toward the left. The 15 years that followed 1969 saw a constant reduction of working time through a series of labor agreements (Garonna and Reboni (1993)).

Contrary to these European experiences, no significant regulations in the U.S. dictate anything about work hours for individuals older than 16 and, as discussed above, the coverage of labor union agreement is much less than in Europe.

The effect of unions on working hours goes above and beyond the direct negotiations on the work week and vacations. In Europe, labor unions have a major political role in promoting and defending the welfare state in general and public pension systems in particular (Alesina and Glaeser (2004)). Because of the large influence of older workers in the union movements, the latter have been especially keen if promoting more and more generous pensions schemes from the sixties onward and more recently have strenuously defended them against reform geared toward reestablishing fiscal balance. In 1995 in both France and Italy, union opposition to pension reforms lead to a withdrawal of the reform in the former and the collapse of the government in the latter. Recently France went through a month of heavy social unrest in opposition to a relatively minor pension reform geared toward eliminating privileges for public employees. There is indeed a strong correlation between welfare spending in general and pension spending as a share of GDP and measure of union density (Boeri et al. (2001)). In many European countries unions are directly involved in the management of pension systems and unemployment compensation schemes. This role often creates obstacles to policy reforms towards restraints, and favors a benefit creep.

The generosity of the retirement system obviously affects labor participation of the elderly, which is one factor that explains lower work hours per person on the two sides of the Atlantic. As Boeri et al. (2001) put it "today more than every second older man between the age of 54 and 65 has already retired from the labor force."

A related factor is the unions' tendency to favor pre retirement schemes to avoid unemployment; if a large plant has to close often unions negotiate pre retirement for older workers. Management and unions often find this agreement easy to achieve since those paying the bills (the taxpayers) are not sitting at the negotiating table.[19]

The preference of unions for generous publicly provided pension schemes has to do with the political bias in union organization toward the older members of the unions; a bias that also makes unions relatively uninterested in the problem of youth unemployment. Boeri et al (2001) present a strong correlation between union density and youth unemployment. In Italy households composed of relatively young retirees and unemployed youth in their late twenties are common. The presence of youth unemployment also leads to an extension of time spent in school.

[19] One of the latest examples of this in Italy was the negotiations leading to a bailout of Alitalia.

Other union policies might have indirectly affected hours worked. For instance, think of rigidity in the use of manpower and use of overtime. Firing costs may have lead entrepreneurs to switch to capital intensive technologies. The use of early retirement to allow for plant closings are polices that may directly or indirectly reduce work hours and/or employment. [20]

Labor unions have also fought hard for increasing unemployment compensation, which in turn raise wage pressure and may reduce employment. (Nickell (1998)). We cannot even begin to review the literature of the employment effect of unemployment insurance, the magnitude and even the sign of it is debated and politically charged.

Finally note that the unionization story may also encompass the argument put forward by Bell and Freeman (1995). They argue that Americans work more because wages are less compressed in the U.S. relative to Europe and therefore the incentive to work harder and being promoted are stronger. One of the key explanations of different degrees of wage compression is certainly union polices and the degree of unionization.[21] More generally Bell and Freeman (1995, 1999) highlight the role of inequality as an explanation of work hours. In Figure 11 we plot a correlation between inequality and work hours; we emphasize correlation because causality could go either way if longer hours are associated with more variance of working time across families.

This correlation highlights once gain one basic theme of this paper. Hours worked have fallen especially in continental European countries characterized by strong unions, extensive welfare coverage, high taxation and prevalence of social democratic governments, all factors that also reduce inequality (see Alesina and Glaeser (2004)). Hours worked have not fallen in the U.S. and (to a lesser extent in the UK and Ireland) because these are countries with less extensive welfare, less intrusive regulations, less powerful union movements and more inequality. The bottom line is that hours worked fell in countries that can be characterized by the Continental European model and did not fall in the countries with the American model (with Britain and Ireland in between) The point here is the fact that a host of variables move together in the two types of countries.

4.4 But Why?

Why did unions in Europe choose to fight for lower work hours? Our model implies that when faced with sectoral shocks, unions that are interested in maintaining their membership will cut hours worked. The heart of this explanation is that unions either care about maintaining size because size drives their political power, or because union dues are a function of the number of workers, or because unions are under political

[20] An enormous literature that we cannot even begin to summarize discusses the effect on European employment level of various labor market rigidities. This is of course a heavily politically charged topic, but it would be hard to find a mainstream economist who would argue that labor market rigidity has no effect on employment levels in Europe.

[21] For a broad review of the literature on unions in general and on the effect of unions on wage compression see Boeri et al (2001) and also Card (2001)

pressure from their members not to let individual members get laid off. The explanation given by the model fits well with the openly stated policy of work sharing. In a period of reduction of employment, the idea of "work less work all" was everywhere in union pamphlets and was chanted in union marches. Had the unions accepted a constant hourly wage that might have worked, but union members tried to have their cake and eat it too, as Hunt (1998, 1999) convincingly has documented. That is unions in Germany and France managed to impose lower hours with equal or increasing pay, leading to an increase in salary per hour. That led to a reduction in employment.

There are certainly other explanations for the unions' policies that are also worth addressing here. One answer in line with the taxation story is that union members pressed the union to lower work hours in response to the increase in marginal tax rates, an argument in line with Prescott (2004). Even though in the union rhetoric it is hard to find any reference for this motivation to demands for reduction in hours worked, certainly increases in taxes and reduction of take home pay may affect wage demands (Alesina and Perotti (1997), Daveri and Tabellini (1997), Boeri et al (2001)) leading to higher pre tax wages and lower employment levels.

Another explanation is that the unions helped coordinate a demand for lower hours due to an income effect, an argument in line with Blanchard (2004). That is, the unions simply responded to the increasing income level of their members who demanded more leisure. In this sense the unions served the purpose of overcoming the transaction costs associated with individual bargaining and provided a voice for workers, an argument in line with the view of unions' role by Freeman and Medoff (1984)). This role particularly makes sense if there are positive complementarities in the enjoyment of leisure activity. In that case, private decisions about work and leisure will lead to too much work.

A final explanation is that in a period of inflation (the seventies and eighties) and increasing unemployment, demands for increases in real wages might have been politically unpalatable. Given the heavy government intervention and politically salient nature of union negotiations in Europe, political packaging of union's demand is very important. Asking for large wage increases with unemployment and inflation might have been impossible, but asking for higher hourly wages by holding constant total wages and reducing hours worked was more politically feasible especially using the powerful rhetoric of "work less work all since there are so many unemployed who want to work".

Given the potential adverse effects of shorter work hours on employment, Booth and Schiantarelli (1986) concluded that it is a "puzzle" why in the seventies and eighties labor unions pushed for lower hours.

5. Social Multipliers and Culture

In this section, we review the possibility that the macro-estimates are more appropriate than the micro-estimates. There are two principal reasons why this might be true. First, higher taxes might not have the negative income effects that we would normally associate with lower wages. As we have discussed above, even the supposedly compensated labor

supply estimates are not large enough for this to explain the U.S./Europe differences. Second, there might be complementarities across people in leisure or production that create a social multiplier.

5.1 The Social Multiplier

In this section, we present a simple social multiplier argument and discuss whether the available evidence on the magnitude of the social multiplier in the context of labor supply could explain the discrepancy between micro and macro estimates of labor supply.

The basic starting point of a social multiplier model is to assume that the marginal productivity of either work or leisure is increasing in the amount of leisure consumed by one's peers. We will assume that utility is separable between income and leisure, so that individuals maximize $U((1-l)(1-t)w)+V\left(1-l,1-\hat{l}\right)$ where the notation is as above, except that $\hat{l}$ is the average amount of hours worked within the community. The presence of a social multiplier implies that $V_{12}\left(1-l,1-\hat{l}\right)>0$. This cross-partial might reflect social interactions during leisure activities, or it might reflect a decreased stigma from relaxing. We assume that U(.) is concave and $V_{11}\left(1-l,1-\hat{l}\right)<0$.

If the wage rate is common to the entire community and if the community is homogeneous, then the impact of a wage change on the labor supply of the entire community will equal $\frac{-(1-t)^2 wU''((1-l)(1-t)w))-V_{11}\left(1-l,1-\hat{l}\right)}{-(1-t)^2 wU''((1-l)(1-t)w))-V_{11}\left(1-l,1-\hat{l}\right)-V_{12}\left(1-l,1-\hat{l}\right)}$ times the impact of a wage change on the labor supply of the individual. If U(.) is linear and $V\left(1-l,1-\hat{l}\right)=v_0(1-l)-v_1(1-l)^2+v_2(1-l)(1-\hat{l})$, then this social multiplier equals $\frac{2v_1}{2v_1-v_2}$. For an interior solution to be a social optimum, $v_1>v_2$ so in this case, the social multiplier must be less than two.

There are two issues raised by the existence of a social multiplier. First, it can potentially justify the use of macro rather than micro elasticities. Of course, the micro-elasticities are themselves often produced by the use of aggregate variables, such as changes in the tax rates. Estimates based on national tax supply changes will include some impact of the social multiplier. To get from the estimated micro-elasticities of .2 to the macro-elasticity of .8, the social multiplier would have to be about 4. Second, the existence of a social multiplier might mean that government regulations (or higher taxes) that reduced working hours are socially efficient. If $V_2\left(1-l,1-\hat{l}\right)>0$, then private labor supply decisions will lead to too much work relative to the social optimum.

We present two forms of evidence on the social multiplier in labor supply decisions. First, we present anecdotal evidence on social interactions in leisure and relate these to debates about culture in Europe vs. the U.S. Second, we present limited evidence on the actual size of the social multiplier in labor supply.

5.2 The Social Multiplier and the Culture of Leisure in the U.S. and Europe

Some observers of the U.S. and European situations have suggested that differences in hours of works reflect the difference between a European culture of leisure and American workaholism. One variant of this view is that these differences reflect long-standing cultural differences, which are perhaps rooted in America's puritan Calvinist heritage. It is certainly true that New England's Puritan settlers avidly struck long-standing religious holidays off the calendar (including Christmas) and thereby increased their total work days significantly.

But while this theory has a certain charm, it has much trouble with the labor histories of the U.S. and Europe as shown in Figure 1. As this figure clearly shows, as late as the 1960s, Europeans worked longer hours than Americans. Working Saturdays was more common in Europe, and even long summer vacations were not particularly more common in Europe than in the U.S. Indeed, the August vacation cannot be a long-standing part of mainstream European culture, because after all August is a prime working month in every agricultural community in the northern hemisphere. Figure 10 shows the lack of correlation between percent Protestant and hours of work across countries. While it may seem today that differences in work patterns are eternal aspects of European and American lifestyles, these differences are modern in vintage.

Using data from the PSID we tested whether cultural measures (being Protestant) were important within the U.S. Table 11 shows that being Protestant does not influence hours worked, while being a union member does. The state maximum income tax rate is insignificant. Data from Germany, shown in Table 12, using the GSOEP are similar: while being protestant is irrelevant, being a union member is very important in explaining weeks of vacation.

But although it is a mistake to think that Europe/U.S. labor supply differences reflect long-standing cultural differences, there may be some truth to those who argue for the importance of a culture of leisure in Europe. The essence of the cultural view is that because everyone takes long vacations in Europe, it is more pleasurable to take those vacations. In part, this is because one's friends and relatives are also on vacation and it is enjoyable to relax with one's friends. In part, increasing returns to provide leisure infrastructure may mean that Europe has developed better infrastructure for enjoying a month-long August holiday.

Of course, these arguments are essentially variants on the social multiplier view—one person's leisure increases the returns to other people's leisure. The European anecdote is hardly unique; there is a great deal of anecdotal evidence supporting the idea that there are positive complementarities across people in the enjoyment of leisure time. At this point, we consider three different examples of these complementarities which support the idea of a significant social multiplier: the weekend and work timing more generally, the

literature on agglomeration economies and labor force participation decisions among subgroups of the population.

One of the strongest pieces of evidence in favor of complementarities across either leisure or work is the extent that an overwhelming share of the population takes its two days of leisure during Saturday and Sunday. There are extremely good reasons—saving commuting for example or spreading capital over more workers—why there would be advantages from spreading staggering work so different people take different days off during the week. Nonetheless, in both Europe and the U.S. there is a remarkable consensus on taking Saturday and Sunday off. While taking Sunday off may be seen as part of a long-standing Christian religious observance, as rising incomes lead to more leisure time, it was not obvious what the second day would be and for a while it seemed just as likely that Monday would represent the second day of vacation (Rybczynski, 1992). Surely, it would have been quite possible for one-half of the population to take Monday and Sunday off and one-half of the population to take Saturday and Sunday off. Nonetheless, there was a strong convergence to a common two day weekend despite the many disadvantages of crowding commutes and infrastructure usage more generally during five days and leaving this infrastructure underutilized during the other two days. In European countries with small amounts of religious observance, it is hard to think that Sunday remains as a leisure day except for its role as a focal point, and it would not have power as a focal unless there were complementarities in leisure (or work) across individuals.

Similar comments could be made about work hours and vacation days more generally. The share of the population that works between 9 and 5 in the U.S. is extremely high relative to the benefits that would be gains from staggering commuting more evenly over the day. Likewise, people tend to group holiday times together both during the winter and summer holidays. These anecdotes do suggest that people like to rest at the same time that others are resting, or conversely to work when others are working. This is certainly one form of evidence supporting the existence of a social multiplier either in work or in leisure.

A second form of evidence is the work that has been done on agglomeration economies in productivity (e.g. Ciccone and Hall, 1996). This work has tried to document that productivity increases when people are surrounded by others who are productive. This sort of effect has been used by Hall and others to explain business cycle fluctuations. In the previous framework, this type of effect would be included by assuming that W(.) is a function of aggregate labor supply and this would also produce a social multiplier, without any complementarities in leisure.

A third piece of evidence which appears to support the significance of social multipliers is the remarkable difference on labor force participation rates across demographic subgroups within areas. For example, Table 13 shows the labor force participation rates for adult males (aged 30-50), adult females (30-50) and young males (20-30) in a set of 15 different countries. The differences across these populations are quite striking. Among young males, the labor force participation rate ranges from .37 in Belgium to .72

in the Netherlands and UK. Among adult females, the labor force participation rate ranges from .48 in Italy to .77 in Sweden.

Tax rates and labor market regulations explain some of these differences, but another possible reason is the complementarities across work or leisure within these subgroups. One fact that suggests that labor market regulation is not the only explanation of these differences is the lack of correlation across the subgroups. For example, the correlation between labor force participation rates of young men and adult women is only 74 percent. Leisure complementarities are also a plausible explanation. It is less unpleasant to be an unemployed youth, if your friends are similarly unemployed. Adult women working outside the formal labor market find it easier to function when they have peers who are in a similar situation. Glaeser, Sacerdote and Scheinkman (1996), show that excess variance is one piece of evidence that supports the existence of positive complementarities across people. There is indeed high variance across subgroups across space in labor force participation, which also supports the existence of such complementarities in the labor supply decision.

A fourth piece of evidence is shown in Table 11. Here we compare non-union workers in right-to-work states and non right-to-work states. Right-to-work states have much lower unionizations and as a result fewer union workers who take longer vacations. If the social multiplier view is right, then non-unionized workers in right-to-work states will take shorter vacations because they work around more non-unionized workers who are taking shorter vacations. This is exactly what the table shows. Even non-union workers in right-to-work states take shorter vacations.

Thus, there is a small body of evidence that shows that there may well be social multipliers in the context of taxes. This may mean that macro-elasticities are appropriate. However, the cross-national evidence given above still suggests elasticities that are too small to explain the U.S./Europe differences. Our preferred specifications which examine a country panel and control for unions and labor market regulation show very modest effects. These estimated elasticities, which should presumably include any social multiplier effects, still explain only a small amount of the U.S./Europe differences.

6. Aren't vacations a great thing?

Assume for a moment that unionization and regulation were indeed a major cause of the drop in hours worked in Europe. As economists, we tend to view departure from perfect competition as producing inferior equilibria, and generally we are right. Thus, we should see unions and regulations as infringing on the ability of people to work more and enforcing a sub optimal low hour's equilibrium. However, it may be the case that these regulations serve as a coordination device to achieve a low work hour's equilibrium that is desirable because of social multipliers effect but difficult to reach individually. It is hard to obtain more vacation for yourself from your employer and even harder, if you do, to coordinate with all your friends to get the same deal and go on vacation together.

Needless to say it is very difficult to assess which of the two is right. As a first pass we looked at measures of life satisfaction and hours worked for European countries.[22]

Table 14 uses data from GSOEP a German survey in which the left hand side is a measure of life satisfaction. Column 1 shows a significant effect of hours worked on happiness in the 1990 survey: fewer hours worked more life satisfaction. Note that in this regression we DO NOT include a measure of income of the respondent; everybody should be happier working less holding income constant! Column 2 shows very similar results for 2000. In column 3 we include individual fixed effects. The value of the parameter on hours worked drop to about ¾ of what it was in 1990 and it is borderline insignificant (t stat about 1.7). This evidence taken together is at least suggestive that working less makes Germans happier even NOT holding income constant.

In Table 15 we use data from Eurobarometer on country members of the European Union. The first regression shows a negative relationship between hours worked across countries and life satisfaction. This shows the same negative effect as seen in the country data. Of course, reverse causality might still be at work. To address this possibility, in regression (2), we instrument for hours worked using collective bargaining agreements. In this regression, we continue to find a negative relationship between hours worked and life satisfaction across countries. In the third regression, we repeat this procedure for a panel of countries and find a similar negative relationship even with country and year fixed effects.

This evidence at least suggests that Europeans seem to be happy to work less and less. Whether they internalize the macroeconomic effect of working less, like relative shrinking of the size of their economies relative to emerging countries, decadence in the relative prominence of Europe as an economic superpower, is of course a different matter.

7. Conclusions

Our punch line is that Europeans today work much less than Americans because of the policies of the unions in the seventies, eighties and part of the nineties and because of labor market regulations. Marginal tax rates may have also played a role, especially for women's labor force participation, but our view is that in a hypothetical competitive labor market without unions and with limited regulation, these tax increases would not have affected hours worked as much. Certainly micro evidence on the elasticity of labor supply is inconsistent with a mainly tax based explanation of this phenomenon, even though "social multiplier effects" may "help" in this respect.

A very hard question to answer is whether labor unions and labor regulation introduce distortions that reduce welfare or whether they are a way of coordinating on a more desirable equilibrium with fewer hours worked. Since answering this question is difficult

[22] The pros and cons of using data on life satisfaction have been widely debated in the literature; see for instance Blanchflower and Oswald (2004). We do not address these issues here.

and the question is heavily politically charged, we won't be surprised if the debate will continue for a long time with heated tones.

Appendix 1: Data Sources

1) Labor Force Participation and Hours and Weeks Worked Statistics

Our data on hours worked, usual weekly hours, and vacation days come from the OECD database available at:

http://www1.oecd.org/scripts/cde/members/LFSDATAAuthenticate.asp

These statistics are by country and year. Full documentation is also available at this site. The data are reported by individual member countries and are drawn from the standard labor force surveys in place for each country (e.g. the CPS for the United States.)

Dr. Giuseppe Nicoletti at the OECD statistical office (Giuseppe.NICOLETTI@oecd.org) generously provided us with detailed breakdowns of labor force participation by country-year-age cells. He also provided us with the decomposition of 52 weeks per year into weeks worked, holiday and vacation weeks, absences due to non-holiday/ vacation, absences due to sickness and maternity leave. (See Table 3.)

Data on federally mandated and collectively agreed days of vacation are from the European Industrial Relations Observatory On-Line and their report *called Working Time Developments*. This report is available at

http://www.eiro.eurofound.ie/2004/03/feature/tn0403108f.html

Lastly, it is worthwhile noting that most of the data shown in Chapter 1 can also be found in the yearly edition of the OECD Labour Force Statistics and the Statistical Annex of the OECD Employment Outlook.

2) The tax data

Our OECD tax data come from the OECD Tax Database available at

http://www.oecd.org/document/60/0,2340,en_2649_34533_1942460_1_1_1_1,00.html

Full documentation is available at this site. The data are described by the OECD as follows. "This is the income tax and social security contribution rates for a single person without dependent, at various multiples (67%, 100%, 133%, and 167%) of the APW [average production wage]. The results, derived from the OECD Taxing Wages framework (elaborated in the annual publication Taxing Wages), use tax rates applicable to the tax year beginning in calendar year 2001. The results take into account

basic/standard income tax allowances and tax credits, but exclude universal family cash transfers (included in Taxing Wages). The Marginal tax rates are derived on the basis of a unit increase in gross wages, with the exception of the marginal Total tax wedge calculation which considers an increase in gross labor costs (gross wages + employer SSC) resulting from a unit increase in gross wage earnings. The sub-central personal tax rates used in this table correspond to those used in Taxing Wages (rates applicable in a typical manufacturing area or a weighted average of sub-central rates for the country as a whole).".

We used the marginal tax rate at 100% of the average production wage.

We obtained the Schneider (2002) and Nickell and Nunciata (2001) tax data from Davis and Herenkson (2004). Nickell and Nunciata (2001) tax rate is computed using the London School of Economics CEP-OECD data base, which draws on OECD and other sources. Their tax wedge number is the sum of three component: 1) an "employment tax wedge" which is equal to employer contributions to social security welfare plans and private pensions divided by total employers' compensations; 2) a direct tax wedge" which is equal to employees' contribution to social security plus households income taxes divided by current receipts of households; 3) and an "indirect tax rate" equal to indirect taxes less subsidies divided by private final consumption expenditures". Nickell and Nunciata have a panel of 20 OECD countries and cover the years 1960-1995. Their data are available in the Labor Market Institutions Database (Nickell and Nunciata [2001]).

The Schneider (2002) tax data are the sum of household income tax rates, sales/VAT tax rates, and employer plus employee social security tax rates. The data appendix in Davis and Henrekson (2004) provides extensive discussion of both data sources.

3) Other Data Items

The proportional representation measure comes from Milesi, Perotti and Rostagno (2000) and was generously provided by the authors.

Union coverage by country is from the *OECD Employment Outlook*, chapter 5.
http://www.oecd.org/dataoecd/3/52/2409993.pdf

Data for the Blanchard Wolfers (2000) employment protection measure is contained in the Nickell Nunziata Labor Market Insitutions Database. Percent protestant by country is calculated from the World Values Survey Data.

U.S. State unionization rates are from the Bureau of Labor Statistics (BLS) website. Right to work states are coded from the data at http://www.nrtw.org/rtws.htm. State tax rates are from the states joint tax center at http://www.taxadmin.org/ and cross checked with data from the Tax Policy Center run by The Brookings Institution and the Urban Institute. Data are available at
http://www.taxpolicycenter.org/TaxFacts/tfdb/TFTemplate.cfm?topic2id=90

Individual level regressions use data from the German Socio-Economic Panel and the Panel Study of Income Dynamics. GSOEP data are from the 1984-2002 data assembled by the Department of Policy Analysis and Management at Cornell University. Data for the PSID are pulled from their online data site at http://simba.isr.umich.edu/. For both data sets we use data for male heads of household ages 18-64 for the most recent year available.

Appendix 2

Proof of Proposition 1: If l is fixed at $\underline{l}$, then the relevant first order conditions is $Ag(\underline{l})f'(Ng(\underline{l})) = Y$. Per worker productivity equals $Af(Ng(\underline{l}))/N$ and the derivative of this with respect to $\underline{l}$ is positive. Per hour productivity equals $Af(Ng(\underline{l}))/\underline{l}N$ and the derivative of this with respect to $\underline{l}$ equals: $A\left(\underline{l}Ng'(\underline{l})f'(Ng(\underline{l})) - f(Ng(\underline{l}))\right)/\underline{l}^2 N$ which is negative if and only if $1 > \frac{\underline{l}g'(\underline{l})}{g(\underline{l})}\frac{Ng(\underline{l})f'(Ng(\underline{l}))}{f(Ng(\underline{l}))}$, which follows from concavity of g(.) and f(.), and that g(0)=0 and f(0)=0. The derivative of total worker utility with respect to $\underline{l}$ is $Ag'(\underline{l})\left(f'(Ng(\underline{l})) + g(\underline{l})Nf''(Ng(\underline{l}))\right)U'(Y) - V'(1-\underline{l})$. When $\underline{l} = l^*$, this expression simplifies to $Ag'(\underline{l})g(\underline{l})Nf''(Ng(\underline{l}))U'(Y)$ which is strictly negative. So in a region around l*, the derivative will remain negative. For $\underline{l} = 0$, utility equals U(0)+V(1) which is worse than the no regulation outcome, so at some point, utility must rise with $\underline{l}$. The derivative of profits with respect to $\underline{l}$ is $-N^2 Ag'(\underline{l})g(\underline{l})Nf''(Ng(\underline{l})) > 0$.

Proposition 2: If $f(ng(1-l)) = (ng(1-l))^\alpha$, then $\frac{\partial n^+}{\partial \Delta} > 0$, $\frac{\partial Y}{\partial \Delta} > 0$ and $\frac{\partial l}{\partial \Delta} < 0$ if and only if $-\frac{YU''(Y)}{U'(Y)} < 1$. Per worker productivity also rises with Δ.

Proof of Proposition 2: The following conditions specify the economy $\frac{g'(l)Y}{g(l)} = \frac{V'(1-l)}{U'(Y)}$ and $(A+\Delta)g(l)f'(n^+ g(l)) = (A-\Delta)g(l)f'(n^- g(l)) = Y$. If $f(ng(l)) = (ng(l))^\alpha$, then the two first order conditions for labor imply that $n^+ = \frac{2(A+\Delta)^{\frac{1}{1-\alpha}}}{(A+\Delta)^{\frac{1}{1-\alpha}} + (A-\Delta)^{\frac{1}{1-\alpha}}}$ and differentiating this with respect to Δ yields $\frac{\partial n^+}{\partial \Delta} = \frac{4A(A+\Delta)^{\frac{\alpha}{1-\alpha}}(A-\Delta)^{\frac{\alpha}{1-\alpha}}}{(1-\alpha)\left((A+\Delta)^{\frac{1}{1-\alpha}} + (A-\Delta)^{\frac{1}{1-\alpha}}\right)^2} > 0$. Using this result, differentiation then produces $\frac{\partial Y}{\partial \Delta} = \frac{g'(l)V'(1-l) - g(l)V''(1-l) - g''(l)YU'(Y)}{g'(l)\left(U'(Y) + YU''(Y)\right)}\frac{\partial l}{\partial \Delta}$. Differentiation of

$$2\alpha\left(\left(A+\Delta\right)^{\frac{1}{1-\alpha}}+\left(A-\Delta\right)^{\frac{1}{1-\alpha}}\right)^{1-\alpha}=Y(g(l))^{-\alpha},$$ implies

$$\frac{\left(A+\Delta\right)^{\frac{\alpha}{1-\alpha}}-\left(A-\Delta\right)^{\frac{\alpha}{1-\alpha}}}{\left(A+\Delta\right)^{\frac{1}{1-\alpha}}+\left(A-\Delta\right)^{\frac{1}{1-\alpha}}}+\frac{\alpha g'(l)}{g(l)}\frac{\partial l}{\partial\Delta}=\frac{1}{Y}\frac{\partial Y}{\partial\Delta}.$$

Substituting this in:

$$\frac{\partial l}{\partial\Delta}=\frac{\left(A+\Delta\right)^{\frac{\alpha}{1-\alpha}}-\left(A-\Delta\right)^{\frac{\alpha}{1-\alpha}}}{\left(A+\Delta\right)^{\frac{1}{1-\alpha}}+\left(A-\Delta\right)^{\frac{1}{1-\alpha}}}\frac{g'(l)Y\left(U'\left(Y\right)+YU''\left(Y\right)\right)}{\left(\begin{array}{l}g'(l)(1-\alpha)V'\left(1-l\right)-g(l)V''\left(1-l\right)-\\ g''(l)YU'\left(Y\right)-\alpha g'(l)\dfrac{V'\left(1-l\right)YU''\left(Y\right)}{U'\left(Y\right)}\end{array}\right)},$$ which is positive if

and only if $-\frac{YU''\left(Y\right)}{U'(Y)}>1$ and

$$\frac{\partial Y}{\partial\Delta}=\frac{\left(A+\Delta\right)^{\frac{\alpha}{1-\alpha}}-\left(A-\Delta\right)^{\frac{\alpha}{1-\alpha}}}{\left(A+\Delta\right)^{\frac{1}{1-\alpha}}+\left(A-\Delta\right)^{\frac{1}{1-\alpha}}}\frac{Y\left(g'(l)V'\left(1-l\right)-g(l)V''\left(1-l\right)-g''(l)YU'\left(Y\right)\right)}{\left(\begin{array}{l}g'(l)(1-\alpha)V'\left(1-l\right)-g(l)V''\left(1-l\right)-\\ g''(l)YU'\left(Y\right)-\alpha g'(l)\dfrac{V'\left(1-l\right)YU''\left(Y\right)}{U'\left(Y\right)}\end{array}\right)}$$

which is always positive. .

Per worker productivity is equal to Y/α so that is rising with Δ as Y is rising with Δ.

Proof of Proposition 3: The hours worked under the free market is characterized by the equation: $\phi(l)=\frac{V'\left(1-l\right)}{U'\left(Ag(l)f'(Ng(l))\right)Af'(Ng(l))g'(l)}=1$, and the hours worked under the unionized scenario is characterized by $\phi(l)=\frac{V'\left(1-l\right)}{Af'(Ng(l))g'(l)U'\left(Ag(l)f'(Ng(l))\right)}=1-ng(l)\frac{f''\left(ng(l)\right)}{f'\left(ng(l)\right)}>1$. Differentiation gives us that: $\phi'(l)<0$, so l must be lower in the unionized economy than in the non-unionized economy. If l is lower, then it must be true that productivity per worker is lower in the unionized economy. Productivity per hour is $\frac{Af(Ng(l))}{N(l)}$ and we have already shown that concavity ensures that this is rising with l. Worker utility must be higher since the union could have chosen the (Y, l) combination chosen by the free market, but in maximizing worker utility, it chose not to. Firm profits must be lower since the firm could have chosen the (Y, l) combination chosen by the union but it preferred not to. .

$\frac{\partial l^-}{\partial \Delta} > 0$ and $\frac{\partial l^+}{\partial \Delta} < 0$ if and only if $-\frac{YU''(Y)}{U'(Y)} < 1$. If $f(ng(1-l)) = (ng(1-l))^{\alpha}$, $g(1-l) = (1-l)^{\gamma}$, $U(Y) = Y^{\sigma}$ and V(l)=vl, then $1 > \sigma(1+\gamma\alpha)$, $\frac{\partial l^+}{\partial \Delta} + \frac{\partial l^-}{\partial \Delta} > 0$ so that average hours of work declines with Δ.

Proof of Proposition 4: Define the unions objective function as $W(l,\Delta) = V(1-l) + U((A-\Delta)g(l)f(Ng(l)))$. Differentiation and using the implicit function theorem to define $l(\Delta)$ then yields: $W_l(l(\Delta),\Delta) = 0$, and differentiating again gives us that:

$\frac{\partial l^-}{\partial \Delta} = \frac{-g'(l^-)\left(f(Ng(l^-)) + Ng(l^-)f'(Ng(l^-))\right)\left(U'(Y^-) + YU''(Y^-)\right)}{-W_{ll}}$ which is negative if and only if $U'(Y^-) + YU''(Y^-) > 0$, since $W_{ll} < 0$ for second order conditions to hold. The situation is exactly symmetric for the case of $\frac{\partial l^+}{\partial \Delta} > 0$.

If $f(ng(l)) = (ng(l))^{\alpha}$, $g(l) = l^{\gamma}$, $U(Y) = Y^{\sigma}$ and V(l)=v(1-l), then the unions first order condition becomes: $v = \alpha^{1+\sigma}\gamma\sigma A^{\sigma} l^{\alpha\gamma\sigma-1} N^{\sigma\alpha-\sigma}$, or $l = \left(v^{-1}\alpha^{1+\sigma}\gamma\sigma A^{\sigma} N^{\sigma\alpha-\sigma}\right)^{\frac{1}{1-\alpha\gamma\sigma}}$. In this case, average leisure in the economy equals $1 - \left(v^{-1}\alpha^{1+\sigma}\gamma\sigma N^{\sigma\alpha-\sigma}\right)^{\frac{1}{1-\alpha\gamma\sigma}}\left((A+\Delta)^{\frac{\sigma}{1-\alpha\gamma\sigma}} + (A-\Delta)^{\frac{\sigma}{1-\alpha\gamma\sigma}}\right)$ and the derivative of this with respect to Δ equals $\frac{\sigma}{1-\alpha\gamma\sigma}\left(v^{-1}\alpha^{1+\sigma}\gamma\sigma N^{\sigma\alpha-\sigma}\right)^{\frac{1}{1-\alpha\gamma\sigma}}\left((A-\Delta)^{\frac{\sigma}{1-\alpha\gamma\sigma}-1} - (A+\Delta)^{\frac{\sigma}{1-\alpha\gamma\sigma}-1}\right)$ which is positive because $(A+\Delta)^{1-\frac{\sigma}{1-\alpha\gamma\sigma}} > (A-\Delta)^{1-\frac{\sigma}{1-\alpha\gamma\sigma}}$ when $1 > \sigma(1+\gamma\alpha)$.

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Table 1
Hours Per Person Per Week and Employment Ratios By Country

E/P, Weeks per Year, Usual Hours use OECD data. Hours per person per week is calculated as the product of E/P*weeks/52*usual hours. OECD data on weeks and usual hours provided by the Secretariat and use same sources as OECD Employment Outlook 2004. OECD data on E/P are from http://www1.oecd.org/scripts/cde. US data on usual hours and weeks worked are from Luxembourg Income Study. We use usual hours and weeks worked for **all employed** including part time. Table 3A uses full time employees.

Country	Weekly Hours Per Person	Employment/ Pop	Weeks per Year (Employed)	Usual Weekly Hours (Employed)
Belgium	17.92	0.643	40.0	36.29
Denmark	20.63	0.761	38.9	36.27
Finland	19.73	0.688	38.5	38.75
France	17.95	0.636	40.5	36.21
Germany	18.68	0.656	40.6	36.48
Greece	20.10	0.576	44.6	40.71
Ireland	20.10	0.659	43.7	36.29
Italy	16.68	0.565	41.0	37.42
Netherlands	17.25	0.734	38.4	31.79
Norway	19.94	0.774	36.0	37.25
Portugal	16.98	0.523	41.8	40.37
Spain	18.14	0.576	42.2	38.85
Sweden	19.06	0.735	35.4	38.10
United Kingdom	21.42	0.721	40.5	38.19
United States	25.13	0.719	46.2	39.39

Table 2
Hours Differences Between US, France, Germany, United Kingdom

The first panel shows the total hours worked per week per person aged 15-64. The next panels decompose the total differences into the differences in labor force participation, weeks worked, and usual weekly hours. The fraction explained column uses the accounting identity that total hours=lfp*weeks worked*hours per week. Total hours worked and employment data use OECD data. Usual hours are from the Luxembourg Income Study. Weeks worked is calculated as the residual.

		Fraction of Hours Difference Explained
Total Hours Per Week Per Person		
US	25.13	
France	17.95	
Germany	18.68	
Italy	16.68	
US-France	7.18	1.00
US-Germany	6.45	1.00
US-Italy	8.45	1.00
Employment/Pop 15-64		
US	0.72	
France	0.64	
Germany	0.66	
Italy	0.57	
US-France	0.08	0.36
US-Germany	0.06	0.31
US-Italy	0.15	0.59
Weeks Worked Per Year		
US	46.16	
France	40.54	
Germany	40.57	
Italy	40.99	
US-France	5.62	0.39
US-Germany	5.59	0.44
US-Italy	5.17	0.29
Usual Weekly Hours per Worker		
US	39.39	
France	36.21	
Germany	36.48	
Italy	37.42	
US-France	3.18	0.25
US-Germany	2.91	0.26
US-Italy	1.97	0.13

Table 3
Breakdown of 52 Weeks into Weeks Worked, Holiday and Vacation Weeks, and Other Leave

Source: reprinted from OECD Employment Outlook 2004. This entire table is taken directly from the OECD. Sickness and maternity leave estimates are adjusted for an estimated 50% underreporting rate. This is for full time employees and thus weeks worked differs slightly from Table 3.

	Annual weeks worked	Holidays and vacation weeks	Full-week absences due to non holiday reasons	Part-week absences due to non holiday reasons	Absences due to sickness & maternity
Austria	39.5	7.3	2.6	0.4	2.3
Belgium	40.3	7.1	2.2	0.5	2.0
Switzerland	42.6	6.1	1.5	0.7	1.1
Germany	40.6	7.8	1.8	0.3	1.5
Denmark	39.4	7.4	2.2	1.0	1.9
Spain	42.1	7.0	1.3	0.4	1.2
Finland	38.9	7.1	2.4	1.5	2.1
France	40.7	7.0	2.0	0.4	1.8
Greece	44.6	6.7	0.3	0.2	0.2
Hungary	43.9	6.3	0.9	0.1	0.8
Ireland	43.9	5.7	1.2	0.2	0.9
Italy	41.1	7.9	1.7	0.3	0.9
Luxembourg	41.9	7.5	1.3	0.1	1.1
Netherlands	39.6	7.6	2.0	0.8	2.0
Norway	37.0	6.5	4.0	1.1	3.5
Poland	43.5	6.2	1.2	0.3	0.9
Portugal	41.9	7.3	1.4	0.2	1.2
Sweden	36.0	6.9	3.8	1.7	3.7
United Kingdom	40.8	6.6	1.5	1.5	1.6
United States	46.2	3.9	.94		.96

For US data we calculate weeks of vacation and illness for full time heads in the PSID. We calculate weeks of holidays using Federal and stock market holidays. We allow other non-holiday absences to the be the residual.

Table 4
Breakdown of Days Off Into Holidays, Federally Mandated Days of Vacation, Additional Days of Vacation

Here we attempt a further breakdown of OECD "holiday plus vacation time" into holidays, statutorily required vacation, and additional vacation. The first column shows the OECD holiday and vacation weeks number*5. The second column shows our survey of holidays which includes the union of federal holidays, stock market holidays, and days when most stores are closed. Column (3) shows federally mandated vacation days as reported in the EIRO report "Working Time Developments 2003." The last column is column (1) minus (2)+(3). The fact that we get negative additional days for France may indicate that either the OECD total days figure is too low for France or the EIRO mandated number is too high.

	Holiday and Vacation Days Total (From OECD)	Holidays (Authors Compilation)	Federally Mandated Vacation (EIRO Data)	Additional Vacation Days
Germany	39	16	20	3
France	35	16	25	-6
Italy	39.5	16	20	3.5
United States	19.5	12	0	7.5

Table 5
Statutory Minimum and Agreed Upon Annual Paid Leave (Vacation)
By Country

Country	Statutory	Collectively agreed
Austria	25	25
Belgium	20	nd
Denmark	25	30
Finland	20	25
France	25	25
Germany	20	29.1
Greece	20	23
Hungary	20	nd
Ireland	20	20
Italy	20	28
Luxembourg	25	28
Netherlands	20	31.3
Norway	21	25
Poland	20	nd
Portugal	22	24.5
Romania	20	24
Spain	22	nd
Sweden	25	33
UK	20	24.5

Source: EIRO: 'Working time developments - 2003', March 2004

Table 6
Implied Elasticity of Labor wrt Income Using US Europe Differences in Hours Worked and Marginal Tax Rates

(Europe Average includes Germany, France, UK, Italy)

	Marginal Tax Rate	Weekly Hours Per Person 15-64
United States	34.5%	25.13
Europe Average	52.7%	18.68
US-Europe	-18.2%	5.92
Log(US Hours)-Log(Europe Hours)		0.297
Implied Elasticity		-1.629

Table 7
Estimated Hours –Wage Elasticities (Handbook of Labor Economics)

Author	Estimation Method	Uncompen-sated Elasticity	Income Elasti-city	Compen-sated Elasticity
Men or Aggregates				
Douglas (1934)	Cross sectional regression using average wages and hours across 17 U.S. industries for 1890, 1914, 1926	-.1 to -.2		
Winston (1962)	Cross sectional regression of average hours on average wages across 31 countries	-.07 to -.10		
Finegan (1962)	Cross sectional regressions of average hours on average wages across 300+ occupations in 1940, 1950 US Census data	-.25 to -.35		
Ashenfelter and Heckman (1973)*		-.16	-.34	.12
Kniesner (1976)*	Cross sectional micro regressions. NLS data for 1965. Married men.	-.17	-.01	-.16
Wales and Woodland (1979)*	PSID Married men. 226 individuals. Use non-linear programming to fit cross section of hours and wages to a labor supply model derived from a CES utility function and hours budget constraint.	.14	-.90	.84
Atkinson and Stern (1980)*	UK Family Expenditure Survey Data. Use cross sectional variation to identify parameters in several types of utility functions.	-.16	-.09	-.09
Ashworth and Ulph (1981)*	They impose a GCES utility function with piecewise linear budget constraint on an unnamed UK micro data set.	-.13	-.46	.23
Hausman (1981)	Structural model	0 to .03	-.95 to -1.03	
Blundell and Walker (1982)	Estimates structural model of	-.23	-.46	.13

	utility in which individuals choose consumptions goods and leisure. Married men in 1974 UK Family Expenditure Survey Data.			
Blomquist (1983)**	Structural model	.08	-.03	
Hausman and Ruud (1984)*	1976 PSID. Maximum Likelihood estimation of an indirect utility function.	-.08	-.81	.55
MaCurdy et al. (1990)**	Structural model	0	-.01	.01
Triest (1990)	1983 PSID. Cross section with non-linear budget constraint from the multiple tax brackets.	.05		
van Soest et al (1990)**		.12	-.01	.13
Flood and MaCurdy (1992)**	Structural with IV	.16	-.1	.24
Kaiser et al (1992)**		-.004	-.28	.21
Ashenfelter (1978)	North Carolina-Iowa rural Negative Income Tax Experiment	0.21	.026	0.19
Hausman and Wise (1977)	NJ-PA NIT	0.10	-.013	0.11
Johnson and Pencavel (1984)	Seattle-Denver income maintenance experiment	0.02	-0.218	0.19
Married Women Only				
Hausman (1981)**	Structural model	.995	-.121	1.08
Arrufat and Zabalza (1986)**		2.03	-.02	2.05
Blundell et al. (1988)**		.09	-.26	.29
Triest (1990)**		.97	-.33	1.23
van Soest et al (1990)**	Structural model	.79	-.23	.97
Blomquist and Hansson-Brusewitz (1990)**	1981 Level of Living Survey. Tobits and FIML regression of hours worked on tax rate. Use cross sectional variation in the wage and tax rate.	.79	-.24	.98
Arellano and Meghir (1992)	UK LFS and FES 1983. Multi-equation model estimated with maximum likelihood.	.29 to .71	-.13 to -.40	.5 to .82
Kaiser et al (1992)**		1.04	-.18	1.18
Keane and Moffitt (1995)**		1.94	-.21	2.1
Kuismanen (1997)**	Finnish Labor Force Survey. Married women 25-60. Cross sections for 87,89, 91, 93. Use cross sectional variation in tax rates.	.01	.11	-.07
Income Elasticity Estimates				

Imbens, Rubin and Sacerdote (2002)	Natural Experiment (winners and non-winners)	-.11
Holtz-Eakin, Joulfaian, and Rosen (1993)****	Natural Experiment using variation in inheritance	-.03

*In these rows, we have translated marginal propensities to earn into income elasticities by multiplying by 1.28.

** In these rows, we have calculated compensated demand elasticities by assuming that the ratio of unearned income to after tax income is 1.28.

*** The Holtz-Eakin et al number is conditional on the family still having positive earnings after

Table 8
Annual Hours Worked Per Person Regressed on Marginal Tax Rate
Comparison of Our Results to Davis Henrekson Results

Column (1): our data from OECD 2002
Column (2) Davis Henrekson OECD 1995 hours data on Nickell Nunciata tax measure.
Column (3) Same as (2) excluding Switzerland
Column (4) Davis Henrekson OECD 1995 hours data on Schneider tax measure.
Column (5) Same as (4) excluding Switzerland.

Number in square brackets is the implied elasticity of hours wrt the tax rate. We convert dH/dT to the elasticity of hours wrt taxes by dividing by the mean annual hours worked (roughly 1073 in our data and 1069 in the Davis et al data).

	(1) Annual Hours (OECD 02)	(2) Annual Hours (Davis, OECD 95)	(3) Annual Hours (Davis, OECD 95) Exclude Switzerland	(4) Annual Hours (Davis, OECD 95)	(5) Annual Hours (Davis, OECD 95)
Marginal Tax Rate (OECD 02)	-7.542 (3.013)* [-0.699]				
Nickell Nunciata Tax Rate		-3.905 (4.061) [-0.366]	-1.969 (4.263) [-0.184]		
Schneider Tax Rate				-9.251 (2.442)** [-0.865]	-8.890 (2.940)* [-0.832]
Constant	1,422.535 (142.731)**	1,279.898 (223.197)**	1,159.847 (238.503)**	1,643.272 (154.463)**	1,618.385 (190.274)**
Observations	22	14	13	14	13
R-squared	0.239	0.072	0.019	0.545	0.454

Standard errors in parentheses
* significant at 5%; ** significant at 1%

Robustness comments: Inclusion of Switzerland is important for result using Nickell Nunciata data (column 2), but not using Schneider. Our data do not contain Switzerland.

These are all cross sectional results. Using Nickell Nunciata data, Davis and Henrekson show that point estimates are similar in a panel but statistical significance disappears.

Table 9
Effect of Tax Rates and Employment Regulations on Annual Hours Worked: Country Level Data

The tax rate, union density, and employment protection data are from the Nickell Nunziata Labor Market Institutions Database. Tax rates are expressed in percentage points (e.g. 50.1) and represent the sum of direct taxes (i.e. income tax), indirect taxes (VAT?), and employment taxes (i.e. social security). The mean tax rate for 1995 for Europe is 54.3 and the tax rate for the U.S. for 1995 is 46.0.

Annual hours are per person 15-64 and are taken from the OECD. Mean annual hours for the European countries for 1995 is 1160 with a standard deviation of 134 hours. Annual hours for the U.S. for 1995 is 1431. The employment protection measure was created by Blanchard and Wolfers and ranges from 0-2 with 2 being the strictest employment protection. Union density is expressed as a decimal and has a mean of .42. Years covered in the panel are 1960-1995 for up to 18 OECD countries.

Number in square brackets is the implied elasticity of hours wrt the tax rate. We convert dH/dT to the elasticity of hours wrt taxes by dividing by the mean annual hours worked (roughly 1073 in our data and 1069 in the Davis et al data).

	(1) Annual Hours Per Person 15-64 (1995 Cross Section)	(2) Annual Hours Per Person 15-64	(3) Annual Hours Per Person 15-64	(4) Annual Hours Per Person 15-64
Tax Rate	-5.396	-1.889	-0.682	-0.368
(Nickell Nunziata)	(2.646)	(0.825)*	(0.814)	(0.764)
	[-0.503]	[-0.176]	[-0.064]	[-0.034]
Union Density			-270.625	-383.780
			(47.873)**	(48.044)**
Employment Protection Measure (Blanchard Wolfers)				-244.392
				(37.216)**
Constant	1,472.929	1,465.960	1,491.721	1,776.665
	(142.020)**	(43.113)**	(41.318)**	(58.147)**
Country Dummies?		X	X	X
Year Dummies?		X	X	X
Observations	18	358	358	358
R-squared	0.206	0.909	0.918	0.928

Table 10
Cross Sectional Regressions of Annual Hours On Tax Rates

Here we regress OECD Annual Hours on OECD Tax Rate Data, an OECD measure of coverage by the union bargaining and the Perotti measure of the proportional representation at the federal level. (See Glaeser et al 2002 for more detail). We limit the sample to the fourteen countries for which we have the union coverage measure. Union density (members/ total employed population) is more widely available but probably less useful since for example France has a union density of 10 percent, yet 95 percent of French employees are covered by collective bargaining. When we run the regression in column (1) for our larger sample of 22 countries (not restricting the sample by availability of union coverage) we find a similar coefficient on the marginal tax rate. But the coefficient is statistically significant at the 95 percent level.

Number in square brackets is the implied elasticity of hours wrt the tax rate. We convert dH/dT to the elasticity of hours wrt taxes by dividing by the mean annual hours worked (roughly 1073 in our data and 1069 in the Davis et al data).

	(1) Annual Hours (OECD 02)	(2) Annual Hours (OECD 02)	(3) Annual Hours (OECD 02)	(4) Annual Hours (OECD 02)
Marginal Tax Rate (OECD 02)	-7.705*		-3.572	2.479
	(3.850)		(5.493)	(6.330)
	[-0.718]			
Union Coverage		-3.688	-2.556	-3.620
		(1.656)*	(2.432)	(2.690)
		[-0.344]	[-0.238]	[-0.337]
Log Proportionality				-15.749
				(31.476)
Constant	1,434.202	1,329.592	1,419.759	1,217.072
	(189.345)**	(125.336)**	(189.028)**	(217.461)**
Observations	14	14	14	13
R-squared	0.250	0.292	0.319	0.356

Standard errors in parentheses
* significant at 5%; ** significant at 1%

Table 11: Effects of Protestant, Union Membership, State Tax Rates, Age on Weeks of Vacation: PSID

Full Time Employed Heads of Household in the PSID. 2001 Data from the PSID.

	(1) Head's Weeks of Vacation	(2) Head's Weeks of Vacation	(3) Head's Weeks of Vacation	(4) Head's Weeks of Vacation	(5) Head's Weeks of Vacation
State Maximum Income Tax	-0.033		-0.036	-0.045	-0.038
Rate	(0.016)*		(0.015)*	(0.016)**	(0.021)
Union Member		0.821	0.830	0.764	0.810
		(0.110)**	(0.110)**	(0.098)**	(0.197)**
Union*Right to Work State				-0.146	-0.765
				(0.362)	(0.368)*
Non-union*Right to Work State				-0.232	-0.172
				(0.090)*	(0.157)
Protestant					0.126
					(0.101)
Age 30-39	0.197	0.158	0.167	0.172	0.143
	(0.136)	(0.139)	(0.138)	(0.139)	(0.153)
Age 40-49	0.426	0.352	0.359	0.363	0.289
	(0.106)**	(0.108)**	(0.107)**	(0.109)**	(0.159)
Age 50-59	0.657	0.583	0.585	0.588	0.434
	(0.150)**	(0.146)**	(0.146)**	(0.148)**	(0.184)*
Age 60+	1.247	1.182	1.193	1.198	0.812
	(0.302)**	(0.297)**	(0.295)**	(0.296)**	(0.339)*
Log (Wage)	0.650	0.601	0.600	0.578	0.587
	(0.086)**	(0.084)**	(0.085)**	(0.084)**	(0.110)**
Has 4+ Years College	0.509	0.594	0.589	0.580	0.522
	(0.117)**	(0.114)**	(0.112)**	(0.112)**	(0.135)**
Has 4+ Years High School	0.310	0.267	0.268	0.280	0.149
	(0.113)**	(0.113)*	(0.111)*	(0.113)*	(0.144)
Constant	-0.368	-0.470	-0.279	-0.075	-0.187
	(0.237)	(0.201)*	(0.237)	(0.265)	(0.300)
Observations	4941	4941	4941	4941	1791
R-squared	0.075	0.086	0.087	0.089	0.070

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

Table 12: Effects of Protestant, Union Membership Age on Weeks of Vacation: GSOEP

Full Time Employed Heads of Household in the GSOEP. 2001 Data from the GSOEP.

	(1) Head's Weeks of Vacation	(2) Head's Weeks of Vacation	(3) Head's Weeks of Vacation
Protestant	-0.024		
	(0.064)		
Union Member		0.595	0.560
		(0.049)**	(0.048)**
Age 30-39			0.388
			(0.063)**
Age 40-49			0.482
			(0.064)**
Age 50-59			0.582
			(0.070)**
Age 60-64			0.851
			(0.114)**
Constant	5.233	5.102	4.706
	(0.033)**	(0.024)**	(0.051)**
Observations	3258	5945	5945
R-squared	0.000	0.025	0.041

Standard errors in parentheses
* significant at 5%; ** significant at 1%

Table 13: Labor Force Participation By Country Age-Group Cells

OECD 2002 Data.

country	LFP Men 15-64	LFP Women 15-64	LFP Men 15-24
Australia	0.815	0.660	0.696
Belgium	0.726	0.554	0.373
Denmark	0.838	0.758	0.705
Germany	0.787	0.642	0.524
Ireland	0.783	0.573	0.531
Italy	0.745	0.479	0.414
Luxembourg	0.765	0.534	0.400
Netherlands	0.839	0.671	0.720
Norway	0.839	0.766	0.651
Portugal	0.793	0.650	0.524
Spain	0.804	0.537	0.524
Sweden	0.809	0.770	0.529
Switzerland	0.887	0.739	0.707
United Kingdom	0.837	0.694	0.722
United States	0.830	0.701	0.655

Table 14: Relationship Between Happiness and Weeks of Vacation in the GSOEP

Full Time Employed Heads of Household in the GSOEP. Dependent variable is a life satisfaction question that ranges from 0-10 with 10 being the highest level of satisfaction. The mean of the dependent variable is 7.16 with a standard deviation of 1.77. Columns (1) and (2) are cross sectional regressions for 1990 and 2000. Column (3) is a panel regression with individual fixed effects.

	(1) Life Satisfaction (1990 Cross Section)	(2) Life Satisfaction (2000 Cross Section)	(3) Life Satisfaction (Panel with Individual f.e.)
Head's Weeks of Vacation	0.050	0.088	0.037
	(0.021)*	(0.011)**	(0.022)
Age 20-29	-0.499	-0.196	-0.396
	(0.207)*	(0.122)	(0.218)
Age 30-39	-0.697	-0.340	-0.683
	(0.206)**	(0.118)**	(0.233)**
Age 40-49	-0.668	-0.477	-1.018
	(0.208)**	(0.118)**	(0.245)**
Age 50-59	-0.594	-0.396	-1.367
	(0.216)**	(0.121)**	(0.261)**
Age 60-64	0.000	-0.293	-1.744
	(0.000)	(0.145)*	(0.310)**
Constant	7.742	7.167	7.975
	(0.212)**	(0.122)**	(0.246)**
Observations	1779	7003	8782
R-squared	0.010	0.012	0.914

Standard errors in parentheses
* significant at 5%; ** significant at 1%

Table 15: Relationship Between Happiness and Annual Hours of Work in a Across Countries

Annual hours worked are per person 15-64 and are from the OECD. Life satisfaction numbers are means taken from Eurobarometers data. At the person level, life satisfaction took on values of 0,1,2,3 corresponding to not at all satisfied, somewhat, satisfied, and very satisfied. At the country level, the dependent variable has a mean of 2.00 and a standard deviation of .26. Years included are 1995-1972. Countries included are Belgium, Denmark, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain, United Kingdom. Column (1) is the cross section for 1992. Column (2) is the cross section in which we instrument for hours worked with the level of vacation days collectively agreed (via collective bargaining) to at the country level, and column (3) is the panel with country and year effects.

	(1) Life Satisfaction (Cross Section)	(2) Life Satisfaction (Cross Section IV) Instrument with Collectively Agreed Vacation Days	(3) Life Satisfaction (Country Panel w/ Year Dummies)
Annual Hours Per Person 15-64	-0.00128 (0.00046)*	-0.00126 (0.00061)	-0.00054 (0.00018)**
Constant	4.20131 (0.77456)**	4.15603 (1.02109)**	2.94359 (0.31369)**
Country Dummies?			X
Year Dummies?			X
Observations	12	10	129
R-squared	0.43	0.43	0.95

Standard errors in parentheses
* significant at 5%; ** significant at 1%

Table 16: Percent Covered By A Collective Bargaining Agreement

OECD Employment Outlook 2004.

Country	Union Coverage
Australia	80
Austria	98
Belgium	90
Canada	38
Finland	95
France	92
Germany	90
Japan	23
Netherlands	71
New Zealand	67
Norway	75
Portugal	79
Spain	68
Sweden	83
Switzerland	53
United Kingdom	47
United States	18

Figure 1
Annual Hours Worked Over Time

OECD data. Annual hours per employed person. Annual hours are equivalent to 52*usual weekly hours minus holidays, vacations, sick leave.

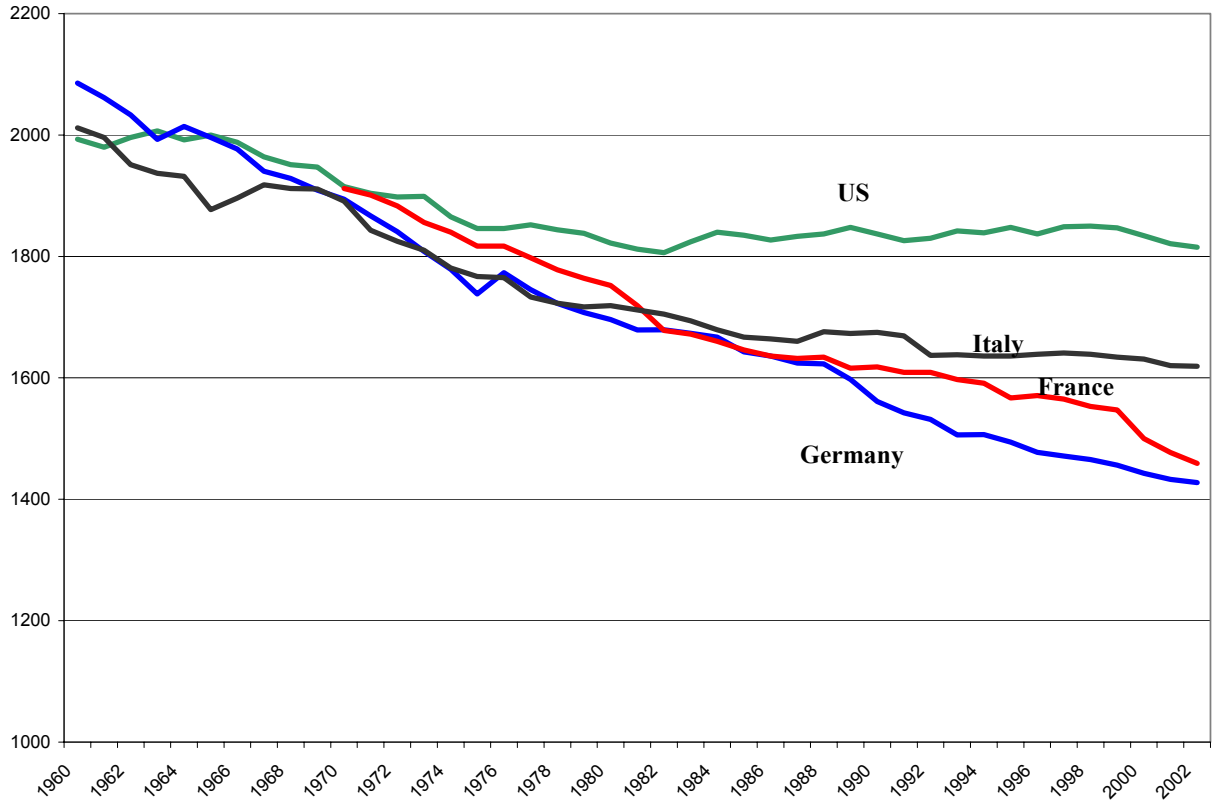


Figure 2: Hours Worked Over Time Versus GDP Over Time

OECD data. Annual hours per employed person.

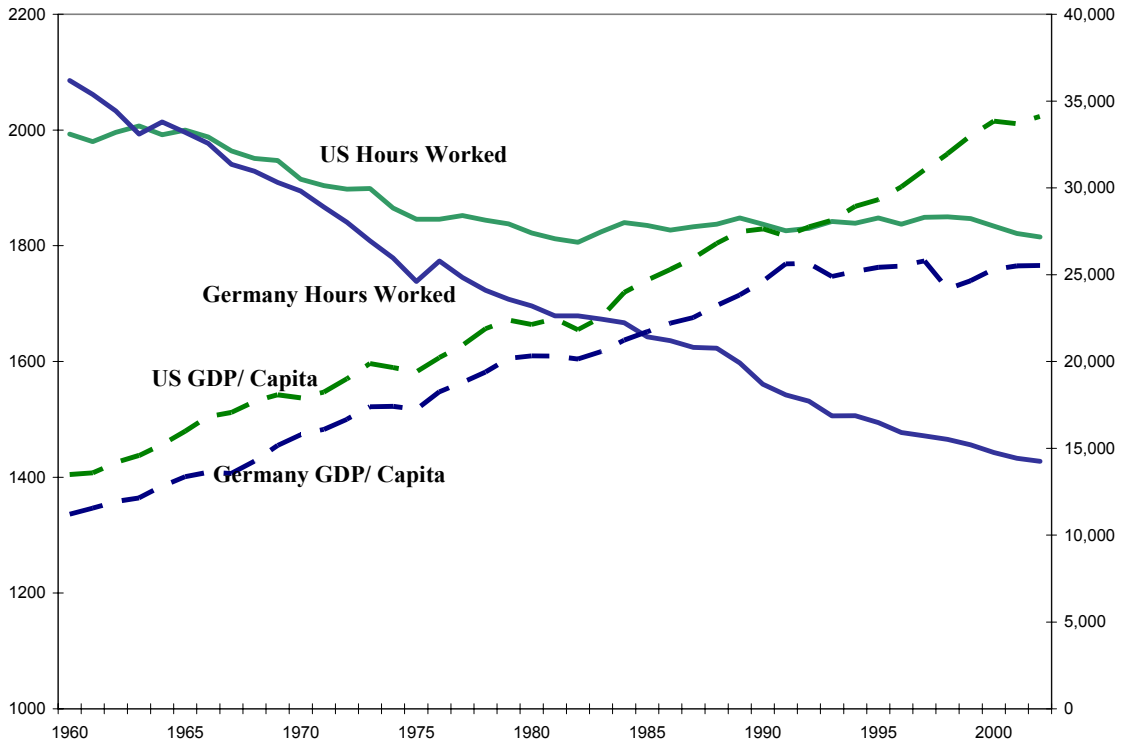


Figure 3
Men's Labor Force Participation Over Time

OECD data. Men ages 15-64.

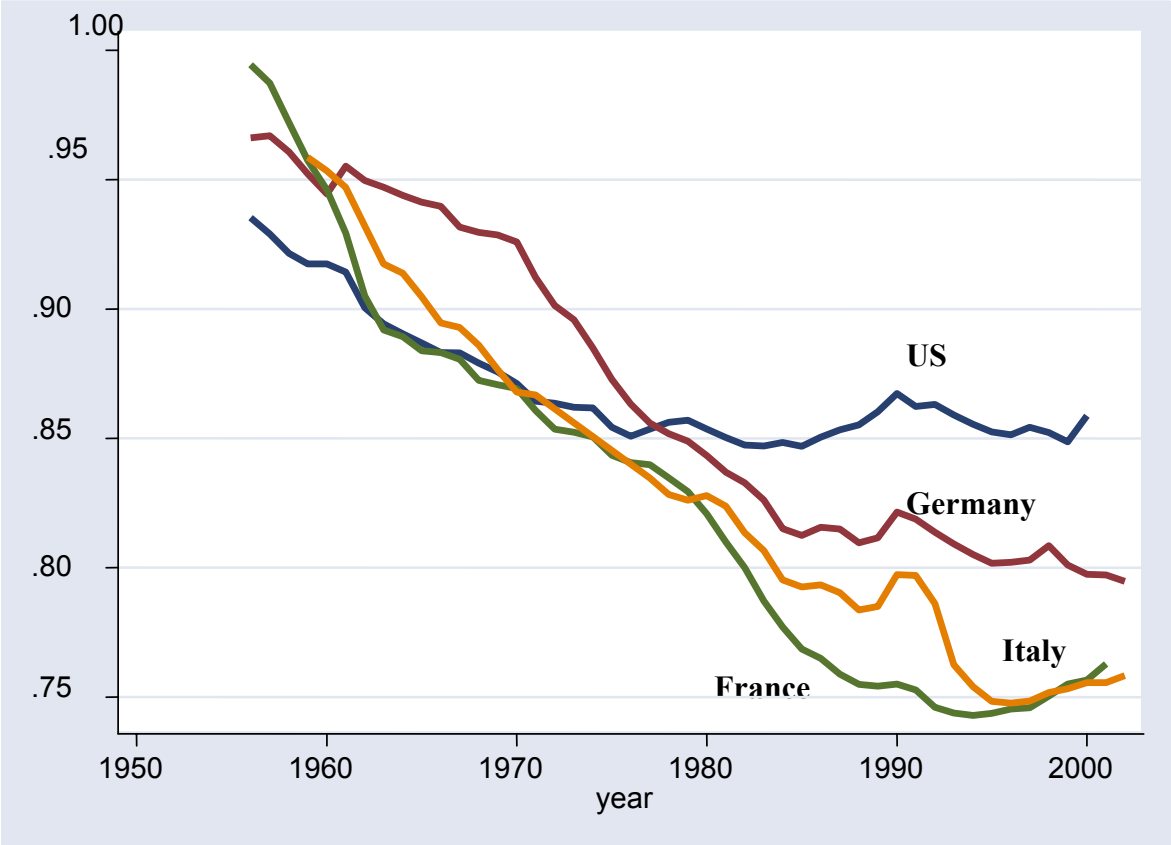


Figure 4
Women's Labor Force Participation Over Time

OECD data. Men ages 15-64.

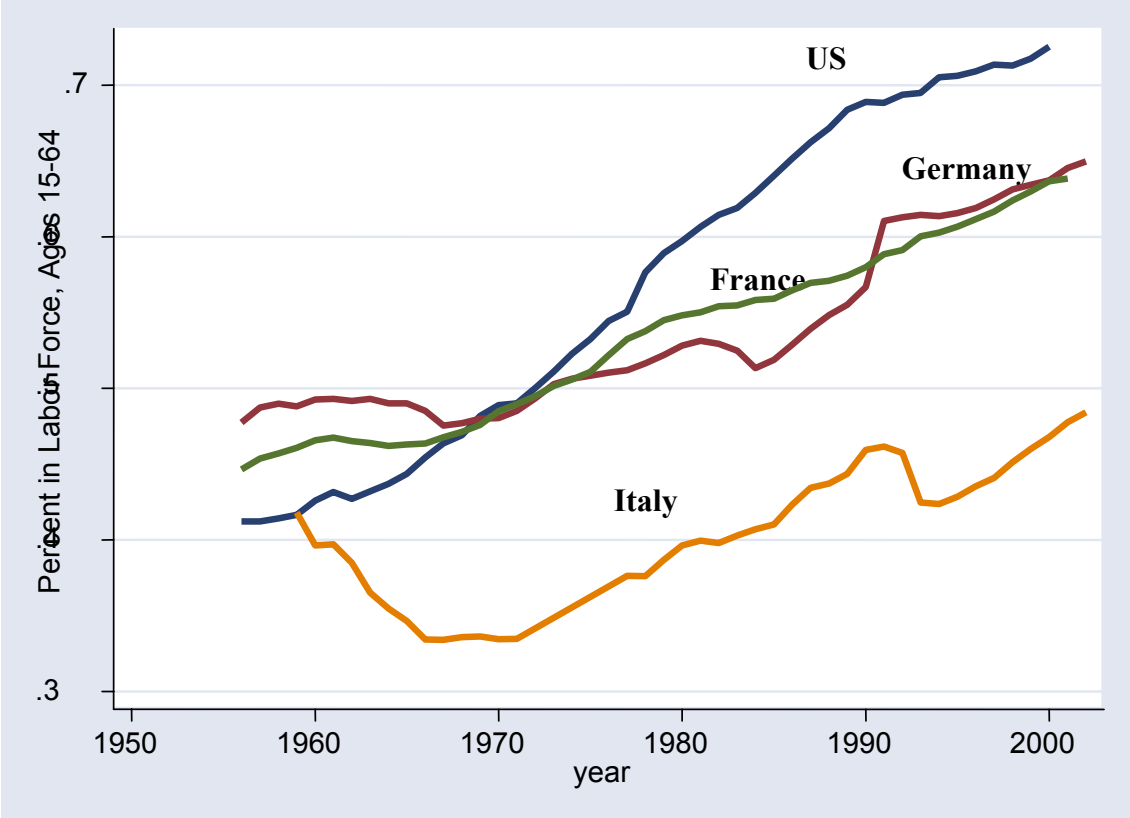


Figure 5
Labor Force Participation People 55-64

OECD Data. Lines from top to bottom in 2003 are US (blue), Germany (red), France (green), Italy (Orange)

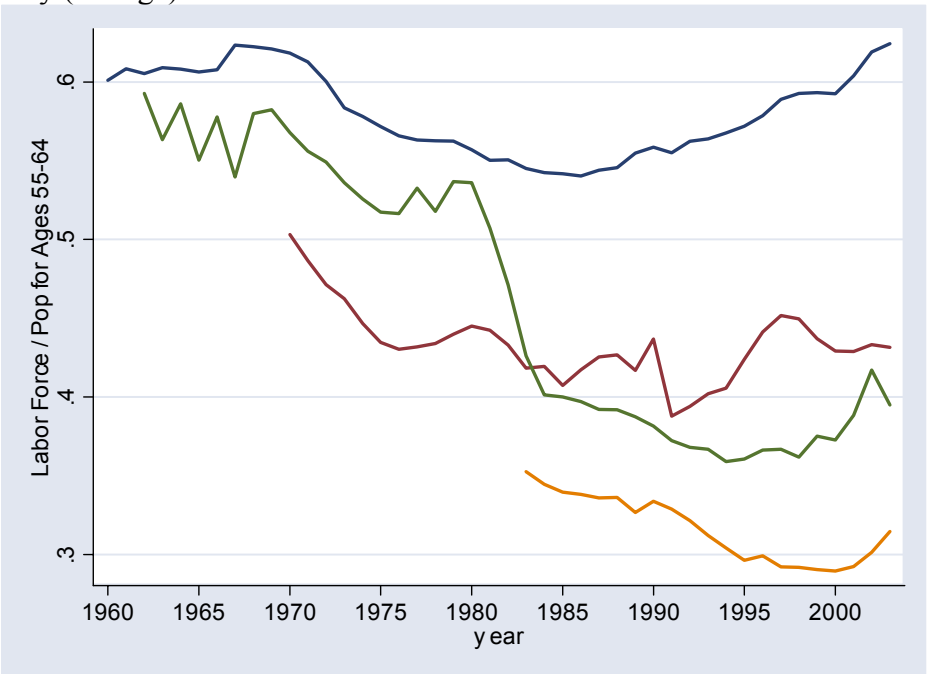


Figure 6
Weekly Hours Per Person Versus Marginal Tax Rate

OECD data. Y axis shows total weekly hours worked per persons 15-64.

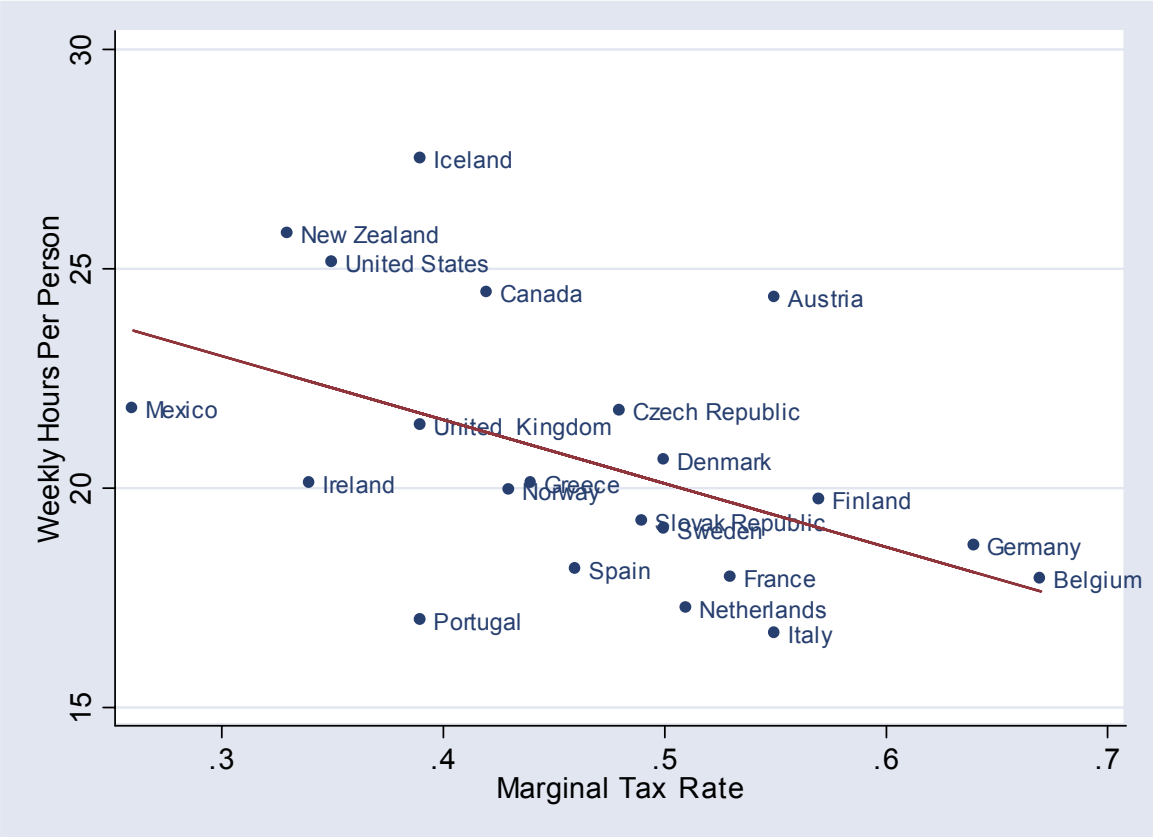
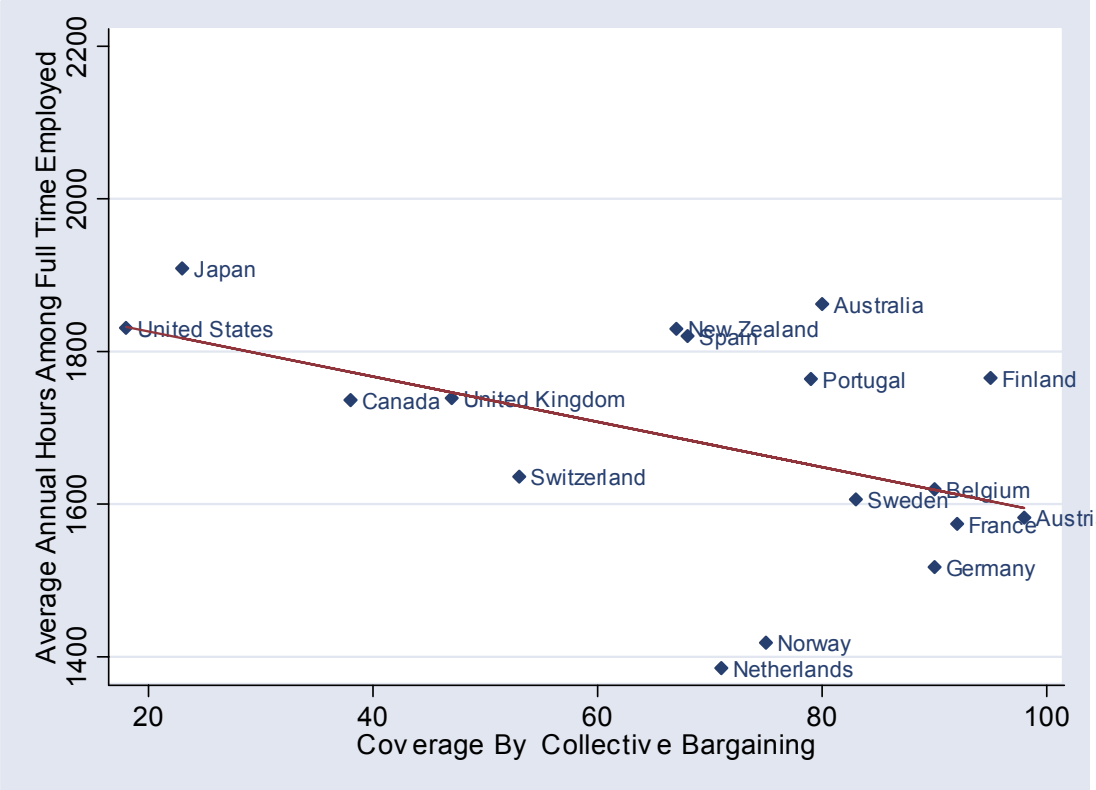
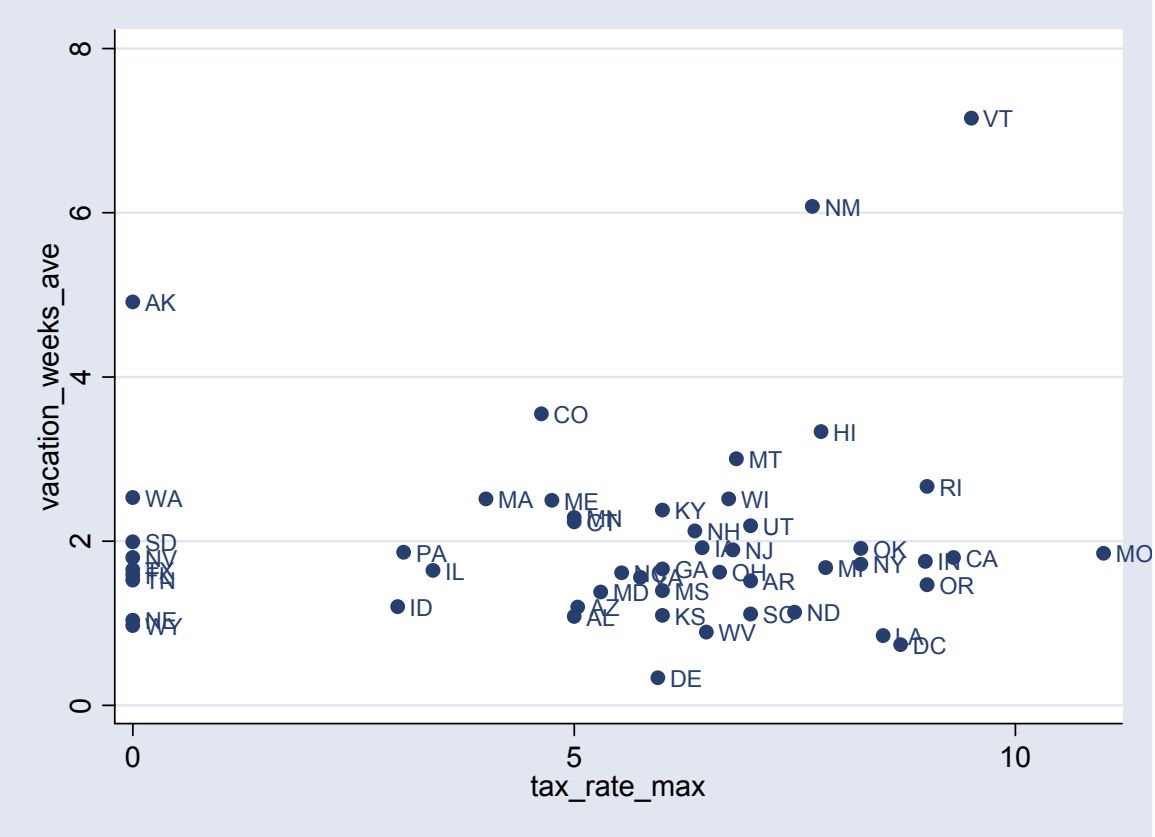


Figure 7
Hours Worked Versus Percent Covered By A Collective Bargaining Agreement



Source: Coverage data are taken from OECD Employment Outlook 1994.

Figure 8
State Income Tax Rate Versus Average Weeks of Vacation From Work Reported by Household Head (PSID)



Tax rate is highest income tax rate levied by the state in 2003. (From state tax dept's joint website http://www.taxadmin.org/)

Figure 9
Average Days of Vacation Versus Unionization Rate (BLS Measure of Union Rate)

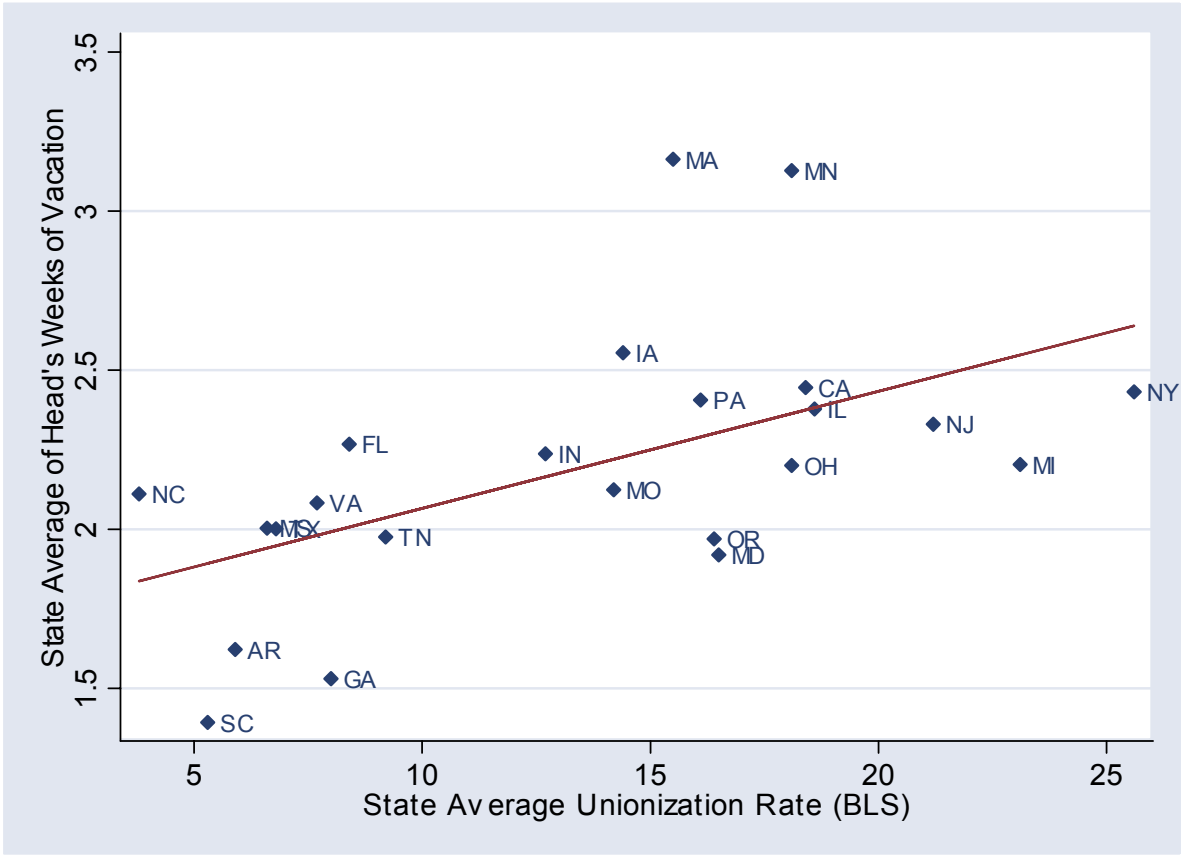


Figure 10
Average Hours Worked Versus Percent Protestant

Hours worked data are from OECD data. Protestant share is calculated from World Value Survey data.

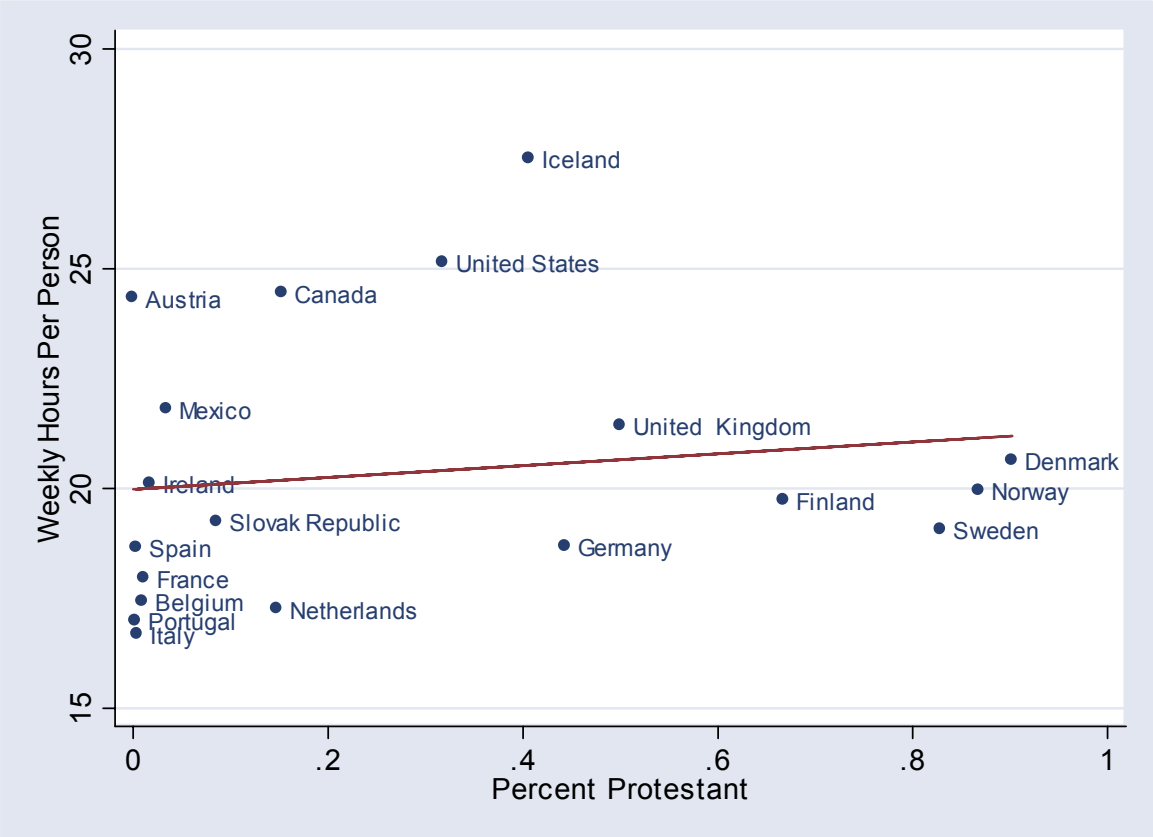


Figure 11
Weekly Hours Per Person Versus Gini

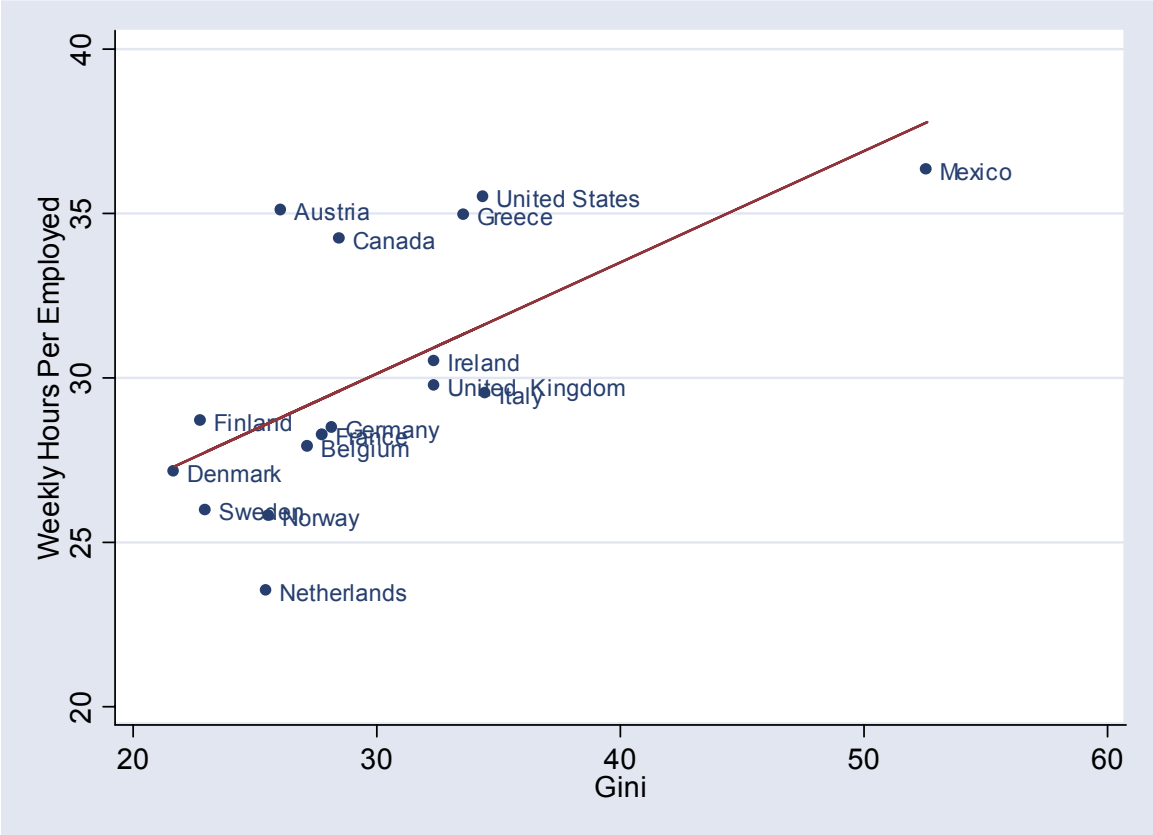


Figure 12
Coverage By A Collective Bargaining Agreement Versus Perotti Log Proportional Representation Measure