

## Employment effects of longer working hours

Extending work hours may reduce employment in the short term but may increase it in the long term if hourly pay remains constant

Keywords: labor demand, standard hours

### ELEVATOR PITCH

Standard hours, a major component of total work hours, vary considerably across Europe. Many countries lowered their standard work hours during the 1980s and 1990s, attempting to boost employment by splitting up a fixed number of worker-hours among more workers. Germany has seen a partial reversal of the trend as several companies increased their standard hours to reduce their labor costs in the early 2000s. The employment effect of increased standard hours depends on the time horizon examined, how wages respond, whether employees collected overtime pay before the change, and the productivity of hours worked, among other factors.

### KEY FINDINGS

#### Pros

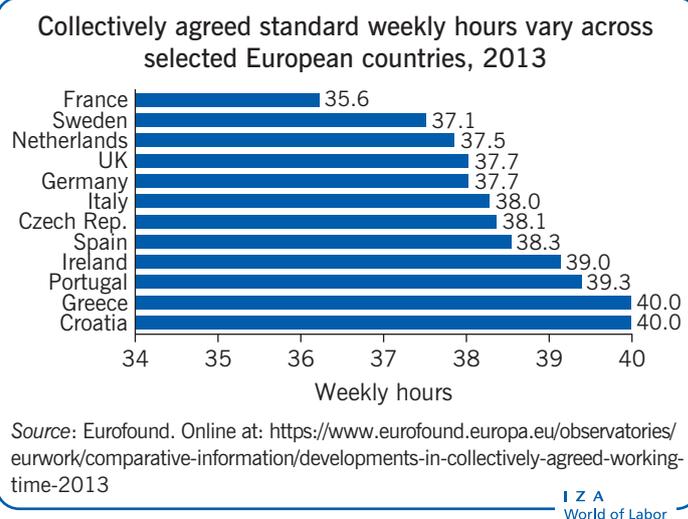
- ⊕ If monthly income remains constant, increasing standard hours reduces hourly wage costs.
- ⊕ Extending standard hours can reduce expensive overtime work.
- ⊕ If the increase in standard hours is not perfectly offset by a reduction in overtime (implying that total hours also go up), fixed labor costs are spread over more hours and capital can be utilized longer.
- ⊕ Increasing standard hours can have positive scale effects if the reduction in costs leads to an increase in output, boosting demand for labor.
- ⊕ The proportion of “non-productive” time devoted to starting up and finishing work likely falls when standard hours rise.

#### Cons

- ⊖ If production is fixed or not increased enough, fewer workers are needed to produce a certain output when standard hours rise.
- ⊖ Employees who work longer at constant monthly pay are worse off when standard hours rise.
- ⊖ Employees who work longer hours have less time for training when standard hours rise.
- ⊖ Increases in working time at constant pay may lead to disincentive effects.
- ⊖ If a job consists of a given package of weekly hours of work and monthly earnings, then an increase in standard hours has no effect because overtime hours and the hourly wage adjust to preserve the original package.

### AUTHOR’S MAIN MESSAGE

In the short term, when it is difficult to boost output, increasing standard hours is likely to have negative employment effects. Over a longer period, when output and capital can vary, positive employment effects are more probable if monthly pay remains unchanged. However, if hourly wages remain unchanged or decline, employees who had been working before the hours increase are worse off. Extending standard hours can also safeguard jobs in firms under competitive pressure. It may be advisable to have flexible arrangements that allow establishments to deviate slightly from collective bargaining agreements on work time.



## MOTIVATION

Work-sharing was an important and contentious policy issue in several European countries in the 1980s and 1990s. The policy was motivated by the idea that reducing the number of hours worked could boost employment by splitting up a fixed number of worker-hours among a larger number of workers. However, influential microeconomic studies have found no or even negative employment effects from such work-sharing policies [1]. The basic method for implementing this policy was to change the number of standard hours. In Germany and other European countries, aggregate standard hours agreed on at the sectoral level have remained remarkably stable since the turn of the century. Still, some companies in Germany increased standard hours in the first decade of the 2000s (Figure 1). It has been argued that these changes arose as a result of the companies' increasing power relative to unions in collective bargaining negotiations and companies' response to rising competition as a result of globalization [1]. There is no consensus in the public debate about the employment effects of these arrangements.

Figure 1. Examples of working time extensions in Germany

Company or sector	Year	Change in number of standard hours	
		From	To
Daimler-Chrysler	2004	35	39
Thomas Cook	2004	38.5	40
Siemens	2004	35	40
Continental	2005	35	40
Deutsche Bahn	2005	38	39
Pfleiderer	2005	35	38
Main construction sector	2006	39	40
MAN	2006	35	37
Volkswagen AG	2006	28.8	25–33 (corridor)
Subsidiaries of Deutsche Telekom	2007	34	38
Public sector, western Germany	2008	38.5	39

Source: Calculations based on Andrews, M., H. D. Gerner, T. Schank, and R. Upward. "More hours, more jobs? The employment effects of longer working hours." *Oxford Economic Papers* 67:2 (2015): 245–268 [1]; and author's research.

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## DISCUSSION OF PROS AND CONS

### Theoretical effects of an increase in standard hours

#### *Effects of fixed production and capital in the short term*

With production and capital more or less fixed in the short term, an extension of standard hours may lead to a reduction in overtime work. At best, actual hours worked remain unaffected and, therefore, so does the size of the workforce required to produce a certain amount of output.

In the case of firms that do not require overtime work, an extension of standard hours would result in an increase in actual hours worked per employee, and therefore fewer employees would be required to produce the same amount of output. This outcome is basically the

### Definitions of different types of working time

*Standard hours* refers to the stipulated weekly working time, determined by law, by collective bargaining agreement, or by individual contracts. Other commonly used terms are normal working time, standard working time, normal hours, and the standard work week. Standard hours are typically higher in firms that are not covered by collective bargaining agreements than they are in covered firms.

*Overtime hours* refers to hours worked in excess of standard hours; overtime hours can be paid (usually at an overtime premium) or unpaid.

*Actual hours worked* include both standard hours and overtime work, and so actual hours worked (on average) can exceed standard hours.

*Working time accounts* allow workers to work longer or shorter than the standard hours during some periods as long as their long-term average matches the agreed standard hours. Working time accounts, part of a general trend toward more flexibility in working time, are intended to enable employers to react quickly to market conditions and to give employees more control over their work-life balance. The system is more common in northern Europe and Germany than in other European countries.

work-sharing argument taken in the opposite direction. Even if employees are not fired as a consequence of an increase in standard hours, firms may curtail hiring new workers in the short term.

### ***Substitution effect within labor due to a change in marginal costs***

Even if output is fixed, employment might rise with an extension of standard hours because of a change in the relative marginal costs of hours and workers, following the neoclassical model of labor demand. Firms minimize their costs by choosing input levels at which the ratio of marginal costs of hours and workers equals the ratio of marginal productivities of hours and workers.

To see what happens, suppose that standard hours rise, the hourly wage is fixed, and the firm initially had overtime hours. At the initial employment-hours choice, an increase in standard hours reduces the marginal cost of employment since a smaller fraction of hours has to be compensated at an overtime premium rate. On the other side, the marginal cost of an hour remains unchanged. Therefore, a cost-minimizing firm substitutes workers for hours (theory even predicts that overtime falls by more than the increase in standard hours). However, for standard-hours-only (no overtime) firms, the neoclassical model predicts that an increase in standard hours will necessarily reduce employment (hours are substituted for workers) if output is held constant. Thus, even in this simplistic neoclassical labor demand model, a priori the employment effect of extending working hours is not clear [1].

### ***Scale effects in the medium term***

Irrespective of whether firms offer overtime, there is an additional scale effect in the medium term, when capital and output can vary freely. The substitution effect between hours and workers mentioned above leads to lower labor costs: firms offering overtime will have to pay less overtime premia, and standard-hours-only firms will have to pay lower fixed costs (costs per workers that are independent of working time, such as training, hiring and firing

costs, and fringe benefits). As a result, firms will raise output as well as substituting labor for capital. Together, the scale and substitution effects result in employment unambiguously rising in overtime firms, while in standard-hours-only firms, the employment effect depends on which effect dominates. Whether increasing standard hours raises employment in the whole economy therefore depends on the extent to which firms offer overtime.

If the increase in standard hours is not perfectly offset by a reduction in overtime (implying that total hours also go up), an additional scale effect arises because the operating time of capital (capital utilization time) increases in most cases. Thus, the capital service produced by a given capital stock goes up, which in turn raises the marginal product of labor.

### ***Change in hourly wages***

If firms keep monthly pay constant, the increase in standard hours implies a fall in hourly wages. In fact, increasing standard hours is generally a less controversial way to reduce hourly wages (and therefore easier for firms to implement) than directly cutting the wage rate. The reduction in wage costs induces firms to substitute labor for capital and to increase production, making a positive employment effect even more likely. Nevertheless, for standard-hours-only firms, whether employment rises is still ambiguous. A sufficient condition is that the rise in labor demand is not already satisfied by the increased working hours. This in turn depends on labor demand elasticity—the percentage increase in labor demand in response to a 1% cut in labor costs [2].

Consider the case for standard-hours-only firms with (a) constant output prices, (b) hours and workers as perfect substitutes, (c) no fixed costs of employment, (d) a constant capital stock with fixed utilization time, and (e) initially constant monthly wage costs (see [2] and [3] for similar examples). Note that conditions (c) and (d) imply that the firm is indifferent to how total working time is spread over employees and hours worked per employee.

Take the example of a firm that requires a total labor input (employees times hours) of 4,000 to produce a certain level of output, which it achieves with 100 employees working 40 hours. The elasticity of employment to hours worked would be  $-1$ . For example, a 2.5% increase in total labor input (to 41 hours) would reduce the optimal demand for workers by approximately 2.5% (now, only 97.5 workers are needed to produce the same amount of output). However, the increase in hours worked reduces hourly wages by approximately 2.5%, assuming that monthly income remains constant. At an elasticity of labor demand of  $-1$ , the demand for total hours would increase by 2.5% (from 4,000 to 4,100). Thus again, 100 workers (each working 41 hours) are needed, and the substitution and scale effect of the demand for workers cancel each other out. However, if the elasticity of labor demand is  $-0.8$  rather than  $-1$ , the substitution effect dominates and the demand for employees falls. The opposite happens if the elasticity is  $-1.2$ .

In other words, the labor demand elasticity has to exceed unity for positive employment effects to occur. When the constraint that monthly income must remain constant is relaxed, so that hourly wages adjust only partly, by  $r\%$  say, the required labor demand elasticity is  $1/r$ . There is considerable evidence on the reaction of labor demand to a change in wage costs [4]. In the long term, a 10% reduction in labor costs leads to an average 10% increase in total labor input (workers times hours). Over a shorter time horizon (when capital cannot be adjusted), however, a 10% reduction in labor costs leads to an average 3% increase in total labor input, so that in the case of an increase in standard hours the substitution effect dominates.

These numbers are only averages, however, and differ by worker characteristics, country, and other variables. Furthermore, an additional positive scale effect due to a longer operating time of capital may occur. In fact, as has been pointed out, an increase in working time unambiguously increases employment when capital operating time equals working time (assuming constant monthly pay per worker and a constant-return-to-scale production function) [3].

Although standard hours agreed on at the sectoral level in Germany have not changed since the beginning of the century, some companies applying such agreements have increased standard hours. For some industries, collective bargaining agreements concluded at the industry level between trade unions and employers allow establishments, under certain conditions, to deviate from collectively agreed standards on pay and working time. In the 2005 wave of the Institute for Employment Research's (IAB) Establishment Panel, 13% of establishments had such agreements, and 52% of them made such changes, usually in standard hours [1]. In the metalworking industry, for example, the collective agreement allows 13–18% (depending on the region) of the workforce to deviate from the standard 35-hour week and to work between 35 and 40 hours. In addition, under certain conditions, up to 50% of employees could work up to 40 hours. The agreement also stipulates that jobs must not be cut as a consequence of increasing the quota above 18% and that hours beyond 35 hours will be paid, but without an overtime premium (see Relevance of paid and unpaid overtime in Germany) [5].

Figure 2 provides some descriptive evidence for Germany on adjustments in monthly wages after a change in standard hours, based on data from the IAB Establishment Panel. Only 4% of surveyed private establishments reported a change (an extension or reduction) in standard hours between 2003 and 2004. Of those that increased standard hours, about 60% did not change monthly wages, while in just one of four establishments hourly wages remained constant, that is, employees were fully compensated for their longer working time.

It seems plausible to look at firm–union bargaining models to explain the change in hourly wages accompanying an increase in standard hours [6], because the increases in standard

### Relevance of paid and unpaid overtime in Germany

In Germany, the total volume of paid overtime hours was cut in half between 1991 and 2014, while unpaid work rose 16% and now exceeds the amount of paid overtime. In 2014, employees worked on average 21.1 paid overtime hours and 27.8 unpaid overtime hours. Paid overtime constituted just 1.6% of all hours worked (Wanger et al., 2015). Still, the actual volume of 0.8 billion overtime hours is equivalent—assuming equal productivity—to about 550,000 employees working standard hours. According to data from the IAB Establishment Panel, in 2011, 21% of private establishments paid overtime, and 55% of their employees actually worked paid overtime; 19% of all employees in the private sector worked paid overtime. The difference between collectively agreed standard hours per week and reported actual working hours (which includes paid and unpaid overtime but also factors like absence) is 2.7 hours, which is larger than in most other European countries (Cabrita and Galli da Bino, 2013).

Sources: Cabrita, J., and C. Galli da Bino. *Developments in Collectively Agreed Working Time 2012*. Dublin: European Foundation for the Improvement of Living and Working Conditions 2013.

Wanger, S., R. Weigand and I. Zapf. *Measuring Hours Worked in Germany*. IAB Discussion Paper No. 22, 2015.

Figure 2. Changes in standard hours and adjustment in monthly wages between 2003 and 2004 in German establishments (number of establishments)

Change in standard hours	Monthly wage adjustment			Total
	Fully	Partly	None	
None	—	—	—	11,898
Extension	83	52	187	322
Reduction	94	28	49	171

Source: Reported in Kramarz, F., P. Cahuc, B. Crepón, T. Schank, O. Skans, G. van Lomwel, and A. Zylberberg. "Labour market effects of work-sharing arrangements." In: Boeri, T., M. Burda, and F. Kramarz (eds). *Working Hours and Work-Sharing in the EU and USA: Are Europeans Lazy or Americans Crazy?* Oxford: Oxford University Press, 2008; part II [5]; based on IAB Establishment Panel data.

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hours in Germany often took place in large unionized firms. However, the response of hourly wages under collective bargaining agreements is difficult to predict. Among other factors, it depends on the difference between employees' actual working time and preferred working time, on the degree of coordination of wage bargaining, on trade union bargaining power, and on union objectives, namely the relative weight they put on employment and wages. Any response in monthly pay may also depend on the original level of working time. If original working time was low, monthly pay is less likely to increase very much (see [5] for a formal model). Therefore, all else being equal, it might be easier to increase employment by increasing standard hours in countries where working time is comparatively low. It should also be kept in mind that the existence of minimum wages may rule out a drop in the hourly wages of workers on the lower part of the wage distribution following an increase in standard hours. Finally, it is an open question how hourly wages respond in the long term.

### ***Fixed hours and a constant average wage***

This discussion started with a neoclassical labor demand model in which a firm takes the hourly wage as given. The section above introduced a scenario in which standard hours rise but the monthly wage remains unchanged, so that the hourly wage falls. This outcome could indicate the increasing bargaining power of firms, but it could also indicate union preference for employment over wages.

Another scenario is also possible, in which monthly wages and hours are jointly determined in long-term contractual agreements [7]. In other words, market equilibrium may be thought of as reflecting the satisfaction of joint preferences across employers and individual workers with labor demand equal to labor supply at all hours worked [8]. To preserve a given package of hours and earnings, firms and individual workers respond to regulatory measures (changes in overtime premia or standard hours) by adjusting the hourly wage rate and possibly overtime hours. Consider what happens when standard hours are increased. Keeping the hourly wage and total hours constant would reduce earnings because a smaller fraction of workers will receive an overtime premium because a smaller fraction of hours is compensated with an overtime premium. Thus, to maintain the agreed earnings, hourly wages will be adjusted upward and the increase in standard hours will have no effect on total hours and employment. This scenario differs from the one described previously, in which the hourly wage falls to keep monthly earnings constant when total hours rise. The effects of overtime regulation in the

US are found not to be fully consistent with either the labor demand model or with the fixed hours/average wage model [7]. One criticism of the fixed hours/average wage model is that only a fraction of workers work overtime and for those who do not work overtime an increase in standard hours will inevitably change hours worked.

### ***Changes in productivity***

The rise in standard hours may lead to a change in labor productivity, but it is unclear whether the last hour worked becomes more or less productive than before. On the one hand, fatigue or disincentive effects may come into play; on the other hand, the proportion of non-productive time devoted to starting up and ending the work day probably falls. Further muddying the picture, the effect of a change in productivity is unclear. On the one hand, if marginal productivity falls, more employees are needed to produce a given output, and the employment–hours elasticity at constant output decreases (in absolute terms), which implies that employees and hours cannot be substituted for each other one for one, as in the simplified example above. On the other hand, total labor productivity also falls, which typically reduces labor demand in the long term.

### ***Reduction in prices***

Firms may reduce prices as a result of the reduction in production costs following an increase in standard hours. The price reduction will stimulate domestic demand and strengthen the competitiveness of domestic firms, leading to job creation or at least job protection by inhibiting outsourcing to other countries. The improved competitiveness rests, of course, on the assumption that other countries do not react by also increasing working hours. In addition, the positive effect of lower wage costs is mitigated to some extent by the drop in prices, which leads to an increase in real wages.

### ***Labor supply responses***

Increased hours worked at a constant income reduces employee utility. Theoretically, a cut in hourly wages induces a substitution effect from market work to leisure because the opportunity costs (the foregone earnings) of free time have fallen; it also induces an income effect through rising labor supply to secure a certain income level. Even if the substitution effect dominates, this issue is quantitatively unimportant since the labor supply elasticity is typically found to be low (at least for men). In addition, labor supply is often set by collective bargaining not by individual workers (see above).

Increased working time may also leave employees with less time for training, unless it takes place during work hours, thus reducing the human capital of (some) employees in the long term.

### ***Substitution of market goods and services for home production***

Longer working hours and less leisure may induce people to reduce their home production and demand market goods and services as substitutes. This response will increase the demand for unskilled labor and reduce unemployment in this group (assuming their wages do not adjust perfectly) [9].

### *Job guarantees in exchange for extended working time*

Whatever the total employment effect, an alternative to extending standard hours might be that some firms shut down domestic production. In that case, an increase in standard hours is by definition beneficial for domestic employment. In fact, some firms offered employment guarantees to the existing workforce when they raised their standard hours. For example, in Germany, the Siemens electronics group and the car producer Daimler-Chrysler negotiated agreements with labor unions in 2004 for an increase in standard hours (see Figure 1). In return, Daimler-Chrysler assured their workers in Germany that their jobs would be protected until 2012, and Siemens rolled back its plan to move 2,000 jobs to Hungary. In both cases, remuneration was not increased [5]. Thus, firms that are under competitive pressure can use a combination of longer standard hours and constant monthly wages (which by definition increases a company's profit situation) to safeguard jobs.

### **Empirical evidence**

Empirical studies of the relationship between actual hours and standard hours typically find an elasticity close to one [1]. This finding suggests that there is little relationship between overtime and standard hours, thus favoring a substitution of hours for employees in the short term when standard hours are increased. Furthermore, this finding is inconsistent with the notion that a job consists of a given package of hours and earnings (in which case, overtime would fully compensate for a change in standard hours). However, most empirical studies have not estimated causal effects, and none have focused explicitly on the effect of an increase in standard hours.

By contrast, there is ample empirical evidence on the effects of cuts in the standard work week on employment. The general conclusion is that work-sharing does not increase employment and may even reduce it [5]. Studies investigating the effect of reductions in working time often find that the reductions are accompanied by increases in hourly wages, often to the extent of full wage compensation (constant monthly pay). A prominent example is the study for Germany by [10]. Obviously, this sort of wage adjustment would be a major obstacle to obtaining positive employment effects after a reduction in standard hours.

An exception to the lack of microeconomic evidence on the effect of increasing working time is a study for Germany using the IAB Establishment Panel to compare establishments that increased standard hours between 2002 and 2004 (the treatment group) with establishments that did not change them between 2001 and 2006 (the control group) [1]. Confirming theory, the study finds a statistically significant positive effect of increased standard hours on employment in overtime establishments but no effect in standard-hours-only establishments. In addition, the study finds that monthly wages on average did not change in establishments that increased standard hours [1].

### **LIMITATIONS AND GAPS**

While microeconomic studies are (under certain assumptions) able to identify causal effects, they can conduct only partial equilibrium analyses, which assume that the effects of changes in working time are limited to workers who are directly affected and that there are no externalities. Further, while it is tempting to assume that reductions and extensions of standard hours have opposite and symmetric effects (from which it would follow that extending standard hours has at least no negative employment effects), this is not necessarily the case.

For example, reductions in standard hours may have been accompanied by reorganizations in the production process or by the introduction of greater flexibility in working time, while the same may not be true for increases in standard hours.

However, there is almost no evidence on the employment effect of extending working hours. The German study was based on just 100 establishments, which chose to raise hours on their own [1]. To interpret the findings as a causal effect of an increase in standard hours on employment, it has to be assumed that firms did not adjust standard hours in response to a boost in demand and that employment trends would have been the same in both treatment and control establishments in the absence of the treatment (the increase in standard hours) [1]. Thus, the effects of increases in standard hours are difficult to evaluate because they have been rare and because most took place at the company rather than the industry level and were therefore not exogenously given. A notable exception in the private sector is the rise in standard hours from 39 to 40 hours set in the collective agreement of the main construction sector in Germany in 2006 (without an adjustment in monthly pay).

## SUMMARY AND POLICY ADVICE

Reducing standard hours in order to distribute a given amount of work over more employees has been a popular policy tool in several countries, in particular in the 1980s and 1990s. However, econometric evidence suggests that, at best, there were no positive employment effects, mainly because hourly wages were increased in order to leave monthly pay (nearly) unchanged. In the early 2000s, and bucking the trend, several firms in Germany increased standard hours. Theoretical studies show that several conditions must be met for an increase in standard hours to have positive employment effects. In particular, the time horizon is important. In the short term, when output is fixed, extensions in standard hours may even have detrimental effects on employment. In the long term, the outcome is more optimistic, and additional jobs may be created. However, the employment effects crucially depend on the response of hourly wages. If hourly wages fall, keeping monthly income constant, employees who had been working before the increase in hours are clearly worse off (they are working longer for the same pay), but employment is likely to rise. Irrespective of the quantitative effect of any employment increases, the reduction in labor costs should help to protect jobs in firms under competitive pressure. Generally, it may be advisable to incorporate flexibility into agreements covering working time, to allow firms to take into account the situation at the company level and to deviate (to some extent) from collective bargaining agreements, as has been implemented in sectoral agreements in Germany.

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## Competing interests

The IZA World of Labor project is committed to the *IZA Guiding Principles of Research Integrity*. The author declares to have observed these principles.

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