

Is there a link between hours worked and pressure on the environment?

Cross-country evidence from Europe

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Introduction

The accelerating climate emergency and deepening ecological degradation require not only rapid decarbonisation but also structural changes to the way economies organise production and consumption. While most policy strategies have focused on substituting fossil fuels with renewable energy, there is mounting evidence to suggest that technological transition alone may be insufficient to achieve net-zero targets within planetary boundaries. Given that economic activity is embedded within broader social and ecological systems, with intrinsic linkages between labour markets and the environment (Ostrom 2009), meaningful climate mitigation will also demand measures beyond the energy sector – including those related to labour markets and the organisation of working time.

A growing body of research highlights the potential role of working time reduction as a complementary climate mitigation instrument. The core premise is that long working hours are associated with higher production, income and consumption levels which, in turn, put further pressure on the environment by driving energy use and the emission of greenhouse gases. Lower working time could reduce such pressure through multiple channels, among others by encouraging less carbon-intensive lifestyles including through reduced commuting or the establishment of sustainable consumption patterns. At the same time, shorter working hours are shown to be associated with improvements in wellbeing (Lepinteur 2019), potentially aligning social and environmental objectives.

Using data from 30 European countries¹ over recent decades, this Technical Brief provides a brief empirical assessment of the relationship

1. Countries sampled in the empirical analysis include the 27 Member States of the European Union, along with Norway, Switzerland and the United Kingdom.

between hours worked and several environmental indicators, including carbon dioxide emissions (CO₂), carbon or ecological footprints and energy use. The key empirical findings indicate a stable and significant positive association between the two. In other words, countries with longer average working hours tend to exhibit higher environmental strain, even when holding key structural features constant and accounting for sectoral composition, energy intensity and renewable energy shares across the countries under study. However, the results also show that a country's energy mix, industrial structure and productivity patterns strongly influence the environmental pressures to which it is subject. This suggests that working time reforms must be integrated into comprehensive structural and energy transition policies if meaningful results are to be achieved.

The next section provides a brief background to the emerging research on working hours and the environment. The following two sections provide empirical analysis, consisting of a descriptive part followed by analytical findings based on a macro-econometric estimation framework which extends existing studies with a more fine-tuned methodological approach. The last section provides concluding remarks and directions for further research.

Emerging research on the intersection of working time and the environment

Research investigating the determinants of environmental sustainability and ways to reduce environmental pressures – particularly greenhouse gas emissions, biodiversity loss and pollution – has historically been rooted in ecological fields with limited integration of socioeconomic or labour market perspectives, although this has been changing. For example, early economic frameworks by Grossman and Krueger (1995) introduced the notion of the environmental Kuznets curve, which posits a dynamic relationship between income and environmental degradation (an inverse-U curve). Under this framework, economic growth initially worsens environmental outcomes during early industrialisation. However, once a country reaches a higher level of development, environmental pressures begin to decline. This occurs as richer nations adopt cleaner technologies, shift from heavy manufacturing to service economies and possibly respond to public demand for stronger environmental regulation, although it can also reflect high-income countries outsourcing pollution-heavy manufacturing abroad. Against this backdrop, growing scientific consensus on the anthropogenic drivers of climate change² has prompted the engagement of social science more broadly, including attention to labour market policies, to address the environmental challenges.

Relatedly, one emerging area of research examines working time reduction as a potential tool for alleviating environmental pressures, facilitated by the improved and widely available cross-national data which exists on various environmental indicators (Schor 2005; Knight et al. 2013). Working time

2. See various reports by the Intergovernmental Panel on Climate Change (IPCC), for example the most recent from 2023 <https://www.ipcc.ch/report/sixth-assessment-report-cycle/>

reduction – defined as decreasing the hours worked over a given period such as per day, week or year, with or without proportional pay adjustments – has been widely studied in labour economics, sociology and organisational theory for its effects on employment (Victor 2008), productivity (Garnero et al. 2022) and worker wellbeing (Lepinteur 2019). While studies often find small to moderate employment effects (Victor 2008; Garnero et al. 2022), an increasing set of studies highlights that reduced working time leads to increased job satisfaction, better work-life balance and lower stress levels (Lepinteur 2019; Hanbury et al. 2023).

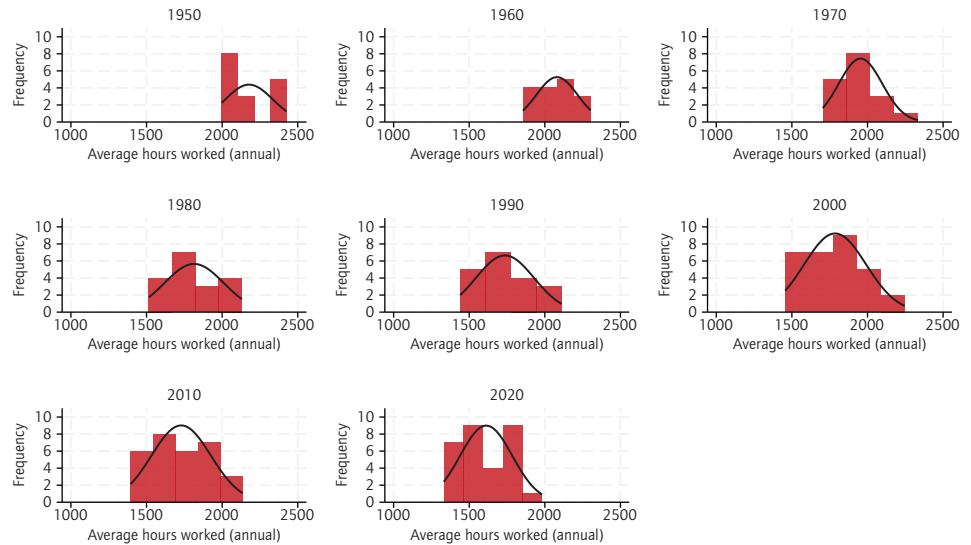
Empirical research linking working time reductions to environmental outcomes has evolved across several levels of analysis: individual, household, regional and cross-national. Evidence at the individual level consistently points to improvements in job satisfaction, more sustainable lifestyles such as lower clothes consumption or decreased commuting (Neubert et al. 2022) and greater work-life balance in general. In contrast, longer working hours may increase workplace energy use, commuting-related emissions and consumption levels. Household-level studies generally find that longer working hours are associated with higher carbon emissions and energy use often related to commuting patterns (Nässén and Larsson 2015; Fremstad et al. 2019). Regional analyses in the United States similarly identify a positive relationship between average working hours and state-level CO₂ emissions (Fitzgerald et al. 2018). At the same time, the strength of the association depends heavily on contextual factors, such as industry structure, institutions and lifestyle patterns, making the overall relationship multifaceted.

Cross-national studies – primarily focused on high-income Organisation for Economic Co-operation and Development countries – mostly show that longer working hours are associated with higher ecological or carbon footprints, energy consumption and sustainability intensity indicators (Knight et al. 2013; Fitzgerald et al. 2024). Although methodologies, periods studied and country coverages vary, the accumulated evidence points to a relatively positive association between reduced working time and environmental pressures, while also highlighting the need for broader geographical coverage, lengthier time periods, additional control variables (e.g. energy mix) and a deeper methodological refinement.

Major trends on hours worked and environmental pressure indicators in Europe

Over the period 1950-2020, average annual working time across European countries slightly exceeded 1,800 hours. However, this average figure is quite far from that found during the first decades of the second half of the 20th century. Figure 1 displays how average hours worked have declined markedly over time: from more than 2,200 hours in 1950 to around 1,600 hours in 2020.

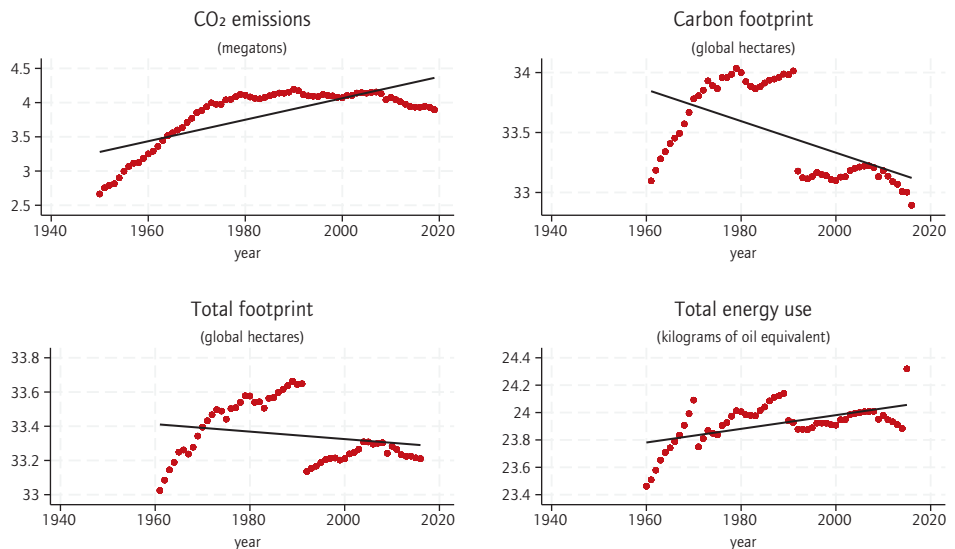
Figure 1 Distribution of average hours worked in Europe by decade



Source: own calculations based on data from the Conference Board Total Economy Database (1950-2020).

As regards environmental indicators – most of which started to become available from 1960 – Figure 2 displays a mostly increasing path until the 1990s, after which CO₂ emissions plateaued and slightly declined, while carbon or ecological footprint measures fell more noticeably. Total energy use continued to rise – albeit at a slower pace than earlier decades – until the 2010s before beginning to decrease thereafter.

Figure 2 Trends in key environmental pressure indicators

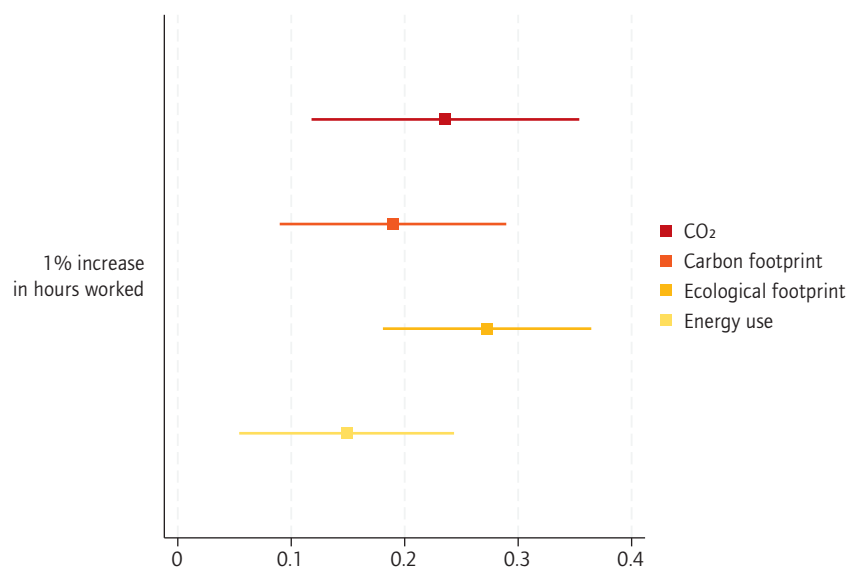


Source: own calculations based on data for CO₂ emissions (measured in megatons) from the Global Carbon Budget (1950-2020); total carbon and ecological footprints data (both measured in global hectares) from the Global Footprint Network (1960-2020); and data on total energy use (measured in kilograms of oil equivalent) from the World Bank (1960-2020). Time breaks are observed around the early 1970s (the oil crisis) for total energy use and around the early 1990s (the dissolution of the former Soviet Union) for the footprint and energy use variables. Linear fits are added to the logarithmic trends of the respective environmental variables.

Key empirical associations linking hours worked and environmental impact

Empirical analysis builds on the theoretical environmental impact model, originally developed by Ehrlich and Holdren (1971) and later reformulated by Dietz and Rosa (1994). This framework views environmental impact as the product of three multiplying factors: population size, affluence (e.g. GDP) and technology. Because these factors multiply rather than add together, a rise in any single factor amplifies the effect on the environment of the others. Furthermore, since GDP per capita can be expressed as the product of hourly productivity, average hours worked and employment share, as proposed by van Ark (2002), the latter components could be directly inserted into the environmental impact model to obtain a relationship between working hours and environmental outcomes, along with other structural variables such as population or employment share (for more details on this link, see Akgüç 2026).

Figure 3 **Coefficient estimates of hours worked across environmental indicators (baseline specifications)**



Note: the coefficient plots displaying the estimated effect of a 1% increase in hours worked across outcome variables (along with their 95% confidence intervals) are based on the panel data estimation of a two-way dynamic fixed effects model (hence including first lagged dependent variables).

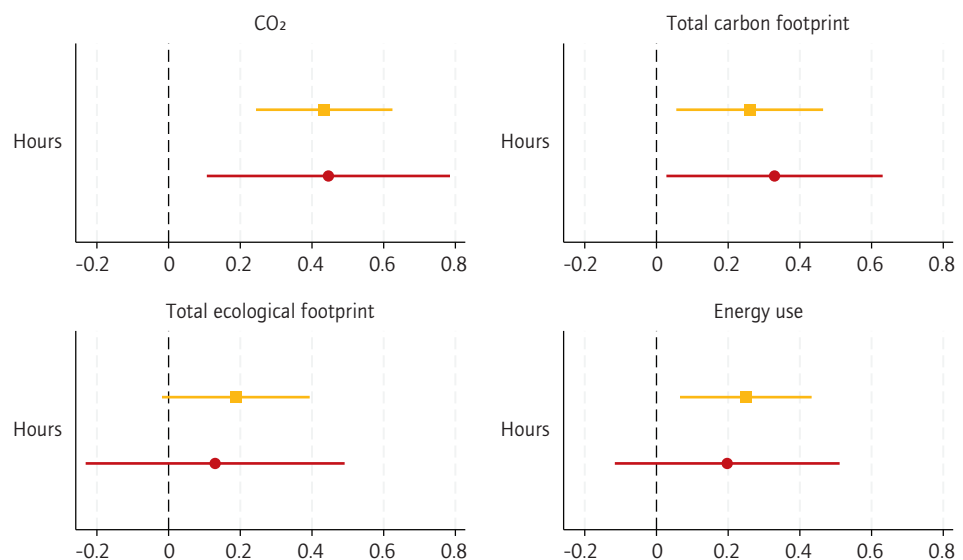
Source: own calculations based on data from Global Carbon Budget (CO₂ emissions), Global Footprint Network (carbon and ecological footprint), World Bank (energy use), The Conference Board (annual hours worked) and Penn World Tables (GDP output, population and employment).

The baseline results connecting aggregate hours worked with environmental impacts indicate a robust and positive association between annual hours worked and environmental pressures; more specifically, longer working hours are significantly linked to higher CO₂ emissions, total carbon as well as ecological footprints and energy use. As summarised in Figure 3, the empirical estimates suggests that a 1% increase in annual hours worked is associated with a 0.27% rise in total ecological footprint and a 0.24% rise in CO₂ emissions.

Significant and positive – albeit smaller – effects of increases in hours worked are estimated for the carbon footprint and total energy use indicators. These initial results appear to suggest that reductions in working time are associated with lower environmental pressures.³

The following analysis builds on the baseline model by adding extra variables controlling for other factors in two steps: first by adding the rate of urbanisation, the sectoral composition of the economy and energy intensity (data on all of which are widely available for recent decades); and then second by additionally controlling for energy intensity and the renewable energy share, as these variables are very likely to be associated with environmental pressures. While the rate of urbanisation and sectoral composition are relatively standard variables often included in earlier studies (e.g. Knight et al. 2013), the energy intensity or its mix is often overlooked in the literature (also related to data limitations), despite the former's critical role in emissions or energy use. Data on the share of renewable energy is missing for earlier periods, however, limiting the sample size drastically and reducing the reliability of the estimated effects. To balance data availability with statistical power, this analysis adopts a staggered approach.

Figure 4 **Coefficient estimates linking hours worked to environmental indicators (augmented specifications)**



Notes: the coefficient plots displaying the estimated effect of a 1% increase in hours worked (along with their 95% confidence intervals) are based on the panel data estimation of a two-way dynamic fixed effects model (hence including first lagged dependent variables). Specifically, estimates indicated with square symbols (the upper ones in orange) are augmented specifications including the shares of the service sector (% of GDP) and urbanisation compared to baseline, while those indicated with circle symbols (the lower ones in red) are results which include the latter variables as well as energy intensity and share of renewable energy.

Source: own calculations based on data from Global Carbon Budget (CO₂ emissions), Global Footprint Network (carbon and ecological footprint), World Bank (energy use, urbanisation, sectoral share of GDP), The Conference Board (annual hours worked), Penn World Tables (GDP output, population and employment) and Eurostat (energy intensity [nrg_ind_ei] and share of energy from renewable sources [nrg_ind_ren]).

3. Additional directional asymmetry tests run on each model confirm these types of flipped interpretations from the perspective of the reduction of hours worked.

Figure 4 provides an overview of the estimated effects of hours worked on the four environmental indicators listed earlier, distinguishing the two steps of the augmented specifications.⁴ In the augmented models, the positive relationship between hours worked and both CO₂ emissions and carbon footprint remains significant and becomes even larger than the baseline results – a 1% increase in hours worked implies an increase in CO₂ emissions of more than 0.4% and one of approximately 0.3% in carbon footprint. Factoring in the renewable energy share reduces the apparent impact of working hours on some environmental indicators since it decreases overall environmental pressures (particularly in energy use). However, working time remains a significant driver of CO₂ emissions and carbon footprint, regardless of the energy mix.

No significant relationship is found between hours worked and total ecological footprint in these augmented models, although a positive and significant link is estimated between hours worked and energy use (e.g. a 0.25% increase in energy use in response to a 1% increase in hours worked), yet the latter relation is no longer significant when the share of renewable energy is included. This is probably suggestive of the energy composition of a country mattering more to overall energy use than how long its people work.

Conclusions

This Technical Brief provides new and robust empirical evidence linking working hours to environmental indicators across 30 countries in Europe in the past several decades. The main results suggest that longer working hours are positively associated with higher environmental pressures as measured by CO₂ emissions, carbon and ecological footprints and total energy use. Relying on the theoretical environmental impact framework and extending it with additional structural variables and refined estimation techniques, it shows that the relationship remains strong in the face of different model specifications. Based on these findings, it is conceivable to think that working time reduction could complement existing climate policies. However, the results also underscore that energy mix, sectoral structure and productivity dynamics play a critical role in shaping environmental outcomes, indicating that working time reforms would need to be embedded within broader structural and energy transition contexts to be most effective.

Despite the robustness of the estimated empirical relationships, the analysis stops short of establishing causality. For example, lower emissions might not be directly caused by shorter working hours; instead, they might reflect a natural stage of economic growth in which higher income countries combine shorter working hours with technology to drive reductions in environmental pressures. This would be consistent with a (steeply) declining environmental Kuznets curve. Moreover, in light of current productivity trends and varying national capacities, the feasibility and environmental impact of working time

4. In detailed estimations (not reported here), it is found that energy intensity is strongly associated with most environmental pressures, while the renewable energy share shows a significant mitigating effect. Other structural variables, including employment share and population size, are also related to environmental pressures, while a larger service sector is linked to lower environmental impacts in some specifications.

reforms may differ across countries. Future research should therefore look into establishing impact assessments of working time reduction reforms or trials, investigating their potential rebound effects and examining how institutional design (e.g. wage adjustments, sectoral coverage, voluntary versus statutory reductions) conditions the environmental outcomes. The evidence is that working time reduction is a promising and unexplored, albeit context-dependent policy instrument – and thus one that warrants careful experimentation and integration into a broader policy mix aimed at aligning productivity growth, wellbeing and climate mitigation strategies.

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