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Working less for more? A systematic review of the social, economic, and ecological effects of working time reduction policies in the global North

Hugo Hanbury^a , Patrick Illien^{a,b} , Eva Ming^a , Stephanie Moser^a , Christoph Bader^a 
and Sebastian Neubert^a 

^aCentre for Development and Environment, University of Bern, Bern, Switzerland; ^bDepartment of Environmental Systems Science, ETH Zürich, Zürich, Switzerland

ABSTRACT

The increasingly studied effects of working time reductions (WTR) on social, economic, and ecological sustainability depend on how these reductions are conceptualized in terms of implementation level, form, extent and accompanying wage compensation. Very little research on WTRs considers more than one sustainability dimension or explores different conceptualizations of WTRs. We thus seek in this article to differentiate the effects of diverse conceptualizations of WTR policies within and across all three sustainability dimensions by conducting a systematic review of longitudinal and (quasi-)experimental research on the ecological, social, and economic effects of WTRs. The studies we reviewed on social sustainability ($n=18$) suggest that WTRs have generally well-substantiated positive effects on well-being, health, and work-family conflict. Regarding economic effects ($n=14$), however, the findings are mixed: WTRs appear to have small, positive employment effects and unclear productivity effects, on one hand, as well as negative career-trajectory effects, on the other. The only study reviewed concerning ecological sustainability suggests that WTRs have a positive effect on the environment. Research on different conceptualizations of WTRs is scarce but suggests that WTRs might be most beneficial when implemented with a substantial reduction in working hours, on the national or organizational level, in the form of fewer rather than shorter working days, and accompanied by progressive wage compensation. Based on these findings, we also outline a research agenda to address the knowledge gaps in this important field of study.

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Introduction

A growing body of research suggests that working time reductions (WTRs) could help mitigate a variety of challenges that post-industrial societies in the global North currently face across all three sustainability dimensions: social, economic, and environmental. Referring to these dimensions, scholars have described WTRs as providing a “triple dividend” (e.g., Bader et al. 2020; Buhl and Acosta 2016). Regarding the social dividend, the literature suggests that WTRs can significantly improve well-being and health, for example by decreasing burnout risks (Neubert et al. 2022) or alleviating work-family conflict (Anttila, Nätti, and Väisänen 2005). Regarding the economic dividend, there are indications that WTRs could increase employment rates if work resulting from reductions among certain employees is re-allocated to other unemployed or underemployed individuals (Antal 2014; Jackson and Victor

2011). Regarding the ecological dividend, WTRs may reduce environmental burdens on two levels: at the national level, countries in the global North featuring lower average annual working hours also have lower environmental impacts (Schor 2008) at the individual level, employees with fewer working hours tend to have a lower carbon footprint (Fremstad, Paul, and Underwood 2019).

Besides being discussed in academic circles, WTRs have entered the public discourse in various countries of the global North, culminating in concrete policy changes in various contexts. Resulting policy changes have included society- or sector-wide reductions to the standard full-time workweek in countries such as Austria, France, Germany, Portugal, and Sweden (Persson, Larsson, and Nässén 2022), as well as diverse organizational or communal-level experiments in Nordic countries comprising reductions to standard daily work hours (Barck-Holst et al. 2021; Anttila, Nätti, and Väisänen 2005).

CONTACT Hugo Hanbury  hugo.hanbury@unibe.ch  Centre for Development and Environment, University of Bern, Bern, Switzerland

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Exactly which positive or negative effects emerge from WTRs—and to what extent—depends on the conceptualization of WTR policies though. WTRs can vary by extent (e.g., a 35-hour workweek vs. a 28-hour workweek); implementation level (e.g., national or regional, or social partnerships, or organizational, or individual)¹; form (e.g., reduction of daily, weekly, monthly, yearly, or biographical working hours); as well as accompanying measures, such as the degree of accompanying wage compensation (e.g., progressively weighted to benefit lower-earners more or applied across the board). The myriad of combinations of these conceptual elements of WTR policies results in an array of conceptualizations, which in turn have implications regarding the effects of WTRs on the three dimensions of sustainability.²

Despite the importance of these variations in policy design, very few studies examine the effects of WTRs that (1) jointly consider multiple sustainability dimensions (exceptions include Buhl and Acosta (2016)) or (2) explicitly differentiate between conceptualizations of WTRs (exceptions include Anttila, Nätti, and Väisänen 2005; King and van den Bergh 2017). Instead, most studies tend to focus either on one specific or a generic conceptualization of WTRs. As a result, to date, it has not been possible to generalize findings on the effects of WTR policies according to different conceptualizations. Hence, there is also a lack of research exploring what conceptualizations of WTRs could maximize their positive effects across all three sustainability dimensions, while minimizing possible negative effects.

The present study aims to help address these research gaps by means of a systematic review that differentiates the effects of various conceptualizations of WTRs within and across all three sustainability dimensions. The introduction at hand is followed by a description of the methods that were applied in order to conduct this systematic review. The subsequent section of this article presents the results of our systematic review, which are then discussed according to the various conceptual elements of WTRs in the fourth section of this article. In the fifth and final section conclusions are drawn based on our results on the effects of WTRs across all three sustainability dimensions and according to the various conceptual elements of WTRs in the form of working hypotheses and, in connection with this, a research agenda is outlined that should advance the state of research on WTRs in a way that promotes their contribution to mitigating challenges that post-industrial societies of the global North face in all three sustainability dimensions.

Materials and methods

In our systematic review, we searched for longitudinal and (quasi-)experimental studies examining the effects of WTRs on one or multiple outcomes related to the three dividends, i.e., social, economic, or ecological benefits.

Data collection and preparation

Search strategy, criteria, and screening

Due to the causal emphasis of the research topic—namely, the assumption that WTR policies cause social, economic, and ecological effects—and in order to increase the reliability of the conclusions drawn from our analysis, our primary focus was on longitudinal and (quasi-) experimental studies.³ In the case of the latter this usually consisted of studies that explicitly measured the effects of a specific conceptualization of one or more WTR policies, as opposed to only analyzing the effects of shifts in working hours. Our search terms comprised working time or WTR, on one hand, and topics related to the three possible dividends, on the other (e.g., positive effects on well-being, health,⁴ gender, work-family conflict, employment, productivity,⁵ career outcomes, and environmental impacts). The two search strings are detailed in the [Supplemental Material](#) accompanying this article. As the debate on WTR policies has mainly occurred in post-industrial countries of the global North, we limited our focus to data collected in studies implemented in Australia, Canada, Europe, New Zealand, and the United States after 1959, as well as countries of the former Soviet Union conducted after 1991. For consideration, the resulting articles had to be published after 1999 and written in English or German. We performed our search using the databases Scopus and Web of Science and generated 3,628 results, excluding duplicates.

We followed up our initial literature-search process with three screening phases (title screening, abstract screening, and full text screening), in which inclusion and exclusion criteria were applied. Prior to the screening phases, the first three authors and the last author independently screened the titles and abstracts of an initial random sample of ten sources, subsequently discussing and comparing individual choices to develop a shared understanding of how literature sources should be categorized. We subsequently repeated this process with a random sample of 100 sources to ensure the reliability of our methodological procedure. To check the soundness of our data, only sources based on quantitative empirical data—namely studies published in peer-reviewed

journals or working papers and reports—were considered for selection. Therefore, studies with simulation models and qualitative or theoretical studies were excluded from our sample. Finally, to guarantee a certain degree of generalizability of our results, only studies exploring WTR policies that could be applied to the general population—as opposed to WTR policies whose conceptualizations inherently only apply to a part of the general population, such as people in specific life phases in the form of early retirement schemes or parental leave—were included in our review. For a full overview of our inclusion and exclusion criteria, see the [Supplemental Material](#) accompanying this article. [Figure 1](#) presents a PRISMA flow chart of the complete search and screening process. Our final sample comprised 30 articles (see [Appendix 1](#)).

Data analysis

The main analytical categories used to compare the various studies were as follows: the extent, implementation level, form, and accompanying wage compensation of the WTR policies concerned; the

independent and dependent variables, specific methods, and sample sizes of the respective studies; and the direction and extent of the assessed effects of WTR policies. We only included frequently reported conceptual elements of WTR policies in our analyses, resulting in, for example, shorter workdays or shorter workweeks representing the only two forms of WTRs that we considered.

Results

In the following, we present the results of the 30 studies we identified that met our inclusion criteria. An overview of the relevant studies can be found in [Appendix 1](#). For each dividend, we preliminarily characterize the studies identified, then present the evidence found for various reported effects. In a final step, we discuss the evidence regarding differences in various social subgroups. [Table 1](#) presents a synopsis of the evidence found. For each effect in the three sustainability dimensions, the table summarizes the strength, direction, and amount of evidence of various conceptualizations of WTRs (i.e., whether the described effect derives from a single or several studies).

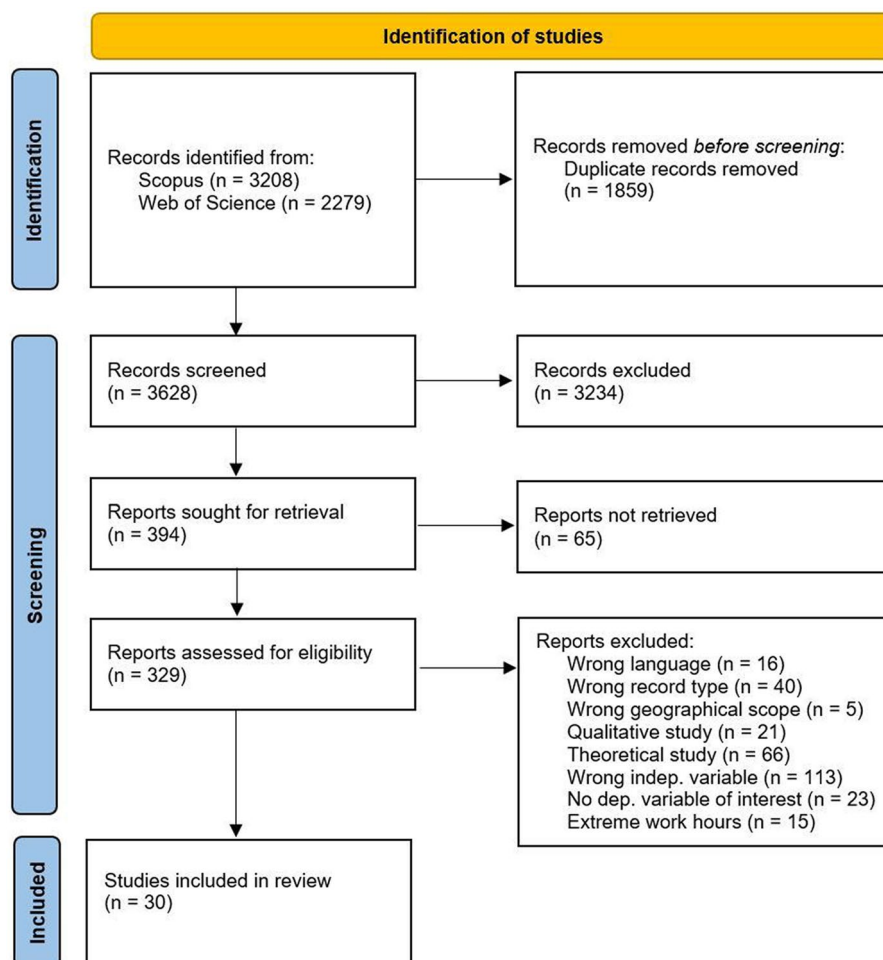


Figure 1. PRISMA flow chart.

Table 1. Overview of effects of WTR conceptualizations.

Dividend	Outcome	Extent (per week)		Implementation level			Form		Wage compensation			
		<6 hours	≥6 hours	National	Organizational	Individual	Fewer hours per day	Fewer days per week	Full	Partial	None	
Social	Well-being	+	+++	+	+++	0 +	+++			+	0 +	
	Health	?	+	? +	+	-	+			+	-	
	Work-family conflict	+	+++	+	+++	+	+	+++		+	+	
Economic	Employment	0 +		0 +	+					0 +	+	+
	Productivity	+			+		-	0		+	-	
	Career outcomes			-		-						-
Ecological	Low resource use					+						+

Note. Darkness and boldness of symbols show evidence strength; effects with only one study are shown in light grey; effects with two studies are shown in dark grey; effects with at least three studies indicating the same direction of effect are shown in **black and bold**.

++: large positive effect; +: small to moderate positive effect; -: small to moderate negative effect; 0: nonsignificant effect; ? : debated effect/effect with different direction for different subgroups. A vertical line (|) indicates that the studies in question have found effects in different directions illustrated by the symbols on both sides of the vertical line.

Social dividend

The studies of our sample that relate to the social dividend focused on the subtopics of *employee well-being*, *health*, and *work-family conflict*. Overall, the social dividend features the strongest evidence base of our systematic review sample—deriving from 18 studies—and exhibits the most pronounced effects of WTR policies. With the exception of one study (Australia: Craig and Churchill 2019), all the research was conducted in Europe and the majority was based on primary data (secondary data: Berniell and Bietenbeck 2020; Buhl and Acosta 2016; Craig and Churchill 2019; De Raeve, Jansen, and Kant 2007; Gash, Mertens, and Gordo 2012; Lepinteur 2019; Sánchez 2017). In all cases, the unit of analysis comprised individuals (i.e., employees) and the sample size range was 29–8,240. The studies using primary data were conducted in single- or multi-organization WTR (quasi-)experimental trials, whereas the studies using secondary data were mostly longitudinal in construction, looking either at groups affected differently by WTR policies (Berniell and Bietenbeck 2020; Lepinteur 2019; Sánchez 2017) or assessing longitudinal changes following individual WTRs (Buhl and Acosta 2016; Craig and Churchill 2019; De Raeve, Jansen, and Kant 2007; Gash, Mertens, and Gordo 2012). As an exception, Gronlund and Oun (2018) studied the effects of a transition from full- to part-time work in Sweden using cross-sectional data.

Well-being

The sample concerning employee well-being comprised seven studies examining a range of outcomes (satisfaction with work hours, leisure satisfaction, job satisfaction, life satisfaction, negative emotions, recovery and quality of life). In terms of

implementation level, one study analyzed the effects of WTR at the national level in Portugal and France and found small positive effects (Lepinteur 2019). Four studies examined the effects of WTR trials in Sweden on an organizational level, finding that compared to a full workday of roughly eight hours, a six-hour workday led to more satisfaction with work hours and with the amount of time for social activities and friends (Akerstedt et al. 2001), less negative emotions on workdays and weekends, as well as more restorative sleep (Barck-Holst et al. 2017), less emotional exhaustion (Barck-Holst et al. 2021), and more time for recovery (Schiller et al. 2018). Lastly, individual WTRs did not lead to significant changes in life satisfaction in a general sample (Buhl and Acosta 2016), but increased life satisfaction for women when combined with staying in the same job (Gash, Mertens, and Gordo 2012; effects only measured for women). Gash, Mertens, and Gordo (2012) suggest that the latter phenomenon is explained by the likelihood of WTRs being voluntarily higher if an individual WTR is implemented in the same institutional settings.

Studies on WTRs with a larger extent appear to find larger effects than those on WTRs with a smaller extent (see Table 1). WTRs on a national and organizational level appear to be somewhat more effective at improving well-being than those on an individual level, although it must be stated that the latter is based on only one study. Concerning the form of the WTRs, the WTR policies in Portugal and France did not clearly stipulate what form the WTR should take when implemented. By contrast, the organizational WTR trials conducted in Sweden were mostly implemented as six-hour days and showed positive results. Finally, all national and organizational WTR policies analyzed in this sample

included full-wage compensation and showed positive effects. The two studies researching individual WTRs likely did not include wage compensations and exhibited only mixed results. Notably, these different conceptual elements were strongly related (e.g., all studies on individual WTRs excluded wage compensation), complicating comparisons of different conceptualizations.

Health

Nine studies examined WTR effects on the health outcomes of employees (e.g., sleep, stress, smoking, body-mass index, self-reported health, sickness absence, diverse health symptoms). On the national level, Berniell and Bietenbeck (2020) found a small positive effect of the French work-week reform on self-reported health and smoking behavior, while Sánchez (2017) did not find overall positive health effects of WTRs in France and Portugal. On the organizational level, four studies on Sweden's WTR trials found that WTRs lead to improved health in the form of positive effects on heart and respiratory symptoms, mental fatigue, and sleep quality (Akerstedt et al. 2001; trial duration: 12 months); on stress, fatigue, and sleep quality (Barck-Holst et al. 2017; Schiller et al. 2017; trial duration 20 months and 9 months, respectively); and on neck/shoulder pain (but not on backpain) as well as exhaustion (Wergeland et al. 2003; trial duration: 12–18 months). Additionally, two studies looked at a WTR trial in Stockholm and found no clear health effects for a reduction of two hours per week (von Thiele Schwarz, Lindfors, and Lundberg 2008; von Thiele Schwarz and Hasson 2011). Finally, one study looked at individual WTRs and found no significant effects on self-reported health for men, but a negative effect on self-reported health and distress for women (De Raeve, Jansen, and Kant 2007).

As noted above, the conceptual dimensions of all WTRs were highly interrelated with, for example, all the national and organizational level WTR policies including full-wage compensation, in contrast to the one study looking at an individual WTR, which likely did not include wage compensation for those reducing their working hours. At the same time, studies on WTRs with a high extent found stronger effects than those on WTRs with a small extent. Again, the WTR trials in Sweden were mostly implemented as six-hour workdays and the four studies found positive effects. No studies looked at other forms of WTRs. Finally, WTRs accompanied by wage compensation produced positive health effects, while those without wage compensation produced a negative net effect.

Work-family conflict

Five studies in our sample examined the effects of WTR policies on work-family conflict outcomes (work-family conflict, work-family interference, parental stress, subjective adequate time for family, and work-family balance). Overall, all studies suggest WTRs lead to a reduction in work-family conflict. On a national level, the introduction of the 35-hour week in France in 1998 and 2000 resulted in roughly 60% of those affected reporting that their work-family balance had improved (Fagnani and Letablier 2004; it is unknown whether the work-family balance of the other 40% of respondents remained the same or deteriorated). On an organizational level, work-family conflict among employees who reduced their working hours in Finnish commune-level WTR experiments in the 1990s was reduced to a higher degree than was the case with the control group (Anttila, Nätti, and Väisänen 2005) and participants in a Swedish trial reported having adequate time for family more frequently (Akerstedt et al. 2001). On an individual level, two studies found that reducing personal work hours significantly reduced parental stress and work-family conflict in various subgroups (Gronlund and Oun 2018; Craig and Churchill 2019).

Overall, WTRs with a high extent appear to have stronger effects on work-family conflict—although our sample size for examination of this domain was rather small, making interpretation difficult. Further, organizational level WTRs appear to have larger effects than those on other implementation levels. Findings on the effects of different forms of WTRs on work-family conflict appear mixed. On one hand, Fagnani and Letablier (2004) suggest that reducing weekly working hours improves work-family conflict more than reducing daily or annual working hours. On the other hand, Anttila, Nätti, and Väisänen (2005) found that reducing daily working hours—for instance shifting to a six-hour workday—led to greater improvements in work-family conflict than other WTR forms. This ambiguity may very well be because the WTR conceptualizations of concern differ to a high degree, namely in terms of the degree to which they are binding and their implementation level, which in turn has a bearing on the degree to which various social subgroups such as genders are affected and therefore the scope of the studies' samples. Once again, the WTR implementation level and degree of wage compensation were closely linked, as both studies on the national and organizational level included at least partial—if not full—wage compensation, and pointed to positive effects on work-family conflict. Meanwhile, both studies on the individual level displayed positive effects in the absence (we

assume) of wage compensation, making the isolated effect of wage compensation unclear in this domain.

Subgroup analyses

The studies reviewed above reveal that various societal subgroups are affected in different ways by WTRs. In terms of socio-professional status, the subgroup analyses showed that the health effects of WTRs in France and Portugal were more noticeable, or stronger, among blue-collar workers (Berniell and Bietenbeck 2020; Lepinteur 2019). This appears to agree with the positive effects found in Swedish trials that included mostly employees working in social services and rather stressful occupations. At the same time, two of three studies on work-family conflict that took study participants' socio-professional status into consideration found that for employees with high job demands—such as upper-level white-collar employees—WTR-based reductions in work-family conflict were smaller or even inverted (Anttila, Nätti, and Väisänen 2005; Gronlund and Oun 2018), with the third study only finding a small influence on work-family conflict (Fagnani and Letablier 2004).

In terms of gender and in the case of Portugal and France, the positive well-being and health effects of WTRs were stronger for women than men (Lepinteur 2019; Sánchez 2017). One study that looked exclusively at women also found positive effects on their life satisfaction—though only when, as mentioned above, women stayed in the same job (Gash, Mertens, and Gordo 2012). The latter finding was also reflected in Swedish WTR trials that consisted primarily of female employees. In regard to work-family conflict, all relevant studies that distinguished gender found stronger benefits for mothers than fathers (Craig and Churchill 2019; Fagnani and Letablier 2004; Gronlund and Oun 2018).

Also of note is that beside societal subgroups, other factors exhibit a significant influence on the effects of WTRs. For example working conditions—including nonstandard working times, lack of job control, and male-dominated work environments—can dampen or even reverse the benefits of WTRs regarding work-family conflict (Gronlund and Oun 2018; Fagnani and Letablier 2004).

Economic dividend

The economic dividend of WTRs was revealed to be a contentious topic with three key dimensions at the heart of the debate: employment, productivity, and career outcomes. In total, 14 studies in our final sample included outcome variables related to the economic dividend. They were mainly based on

secondary data (exceptions were von Thiele Schwarz, Lindfors, and Lundberg 2008 and von Thiele Schwarz and Hasson 2011) from Europe (exception was Tracey and Polachek 2020 who analyzed secondary datasets from the United States) and generally focused on individual employees or firms as the main unit of analysis, with sample sizes varying widely, from a few hundred (von Thiele Schwarz and Hasson 2011) to around half a million (Chemin and Wasmer 2009). While the studies relating to employment and productivity effects used a wide array of econometric methods to compare before and aftereffects or different groups of employees, those centered on career outcomes solely employed longitudinal methods to examine the effects of labor-force transitions. Only two studies were based on a randomized experiment (von Thiele Schwarz, Lindfors, and Lundberg 2008; von Thiele Schwarz and Hasson 2011) and the majority relied on observational data.

Employment

The employment dimension comprised eight studies focusing on outcomes such as layoffs and (un)employment rates. At the national implementation level, Crépon and Kramarz (2002) found that the reduction in maximum work hours per week from 40 to 39 hours in France in 1982 increased unemployment among employees who had previously been employed 40 hours or who had worked overtime. However, the authors did not estimate the effect of shortening the workweek on *aggregate* employment levels. In 2000, France introduced another reduction in the standard workweek—this time to 35 hours. At the same time, wages were prohibited from being cut in response. The results of this policy change appear to be more positive. Both Estevão and Sá (2008) and Chemin and Wasmer (2009) did not detect any significant shifts in overall employment levels (though Estevão and Sá 2008 did find increased turnover rates); Du, Yin, and Zhang (2013) found that the national annual unemployment rate was actually *reduced* by 1.58% and real GDP growth rate *increased* by 1.36% between 2000 and 2007. With respect to Portugal's wage-compensated reduction of the standard workweek from 44 to 40 hours in 1996, Raposo and van Ours (2010a, 2010b) found that it reduced job elimination and they underline the benefits of accompanying measures, such as the calculation of weekly hours based on a four-month average to adjust the workforce. At the organizational level, Tracey and Polachek (2020) and Herzog-Stein, Lindner, and Sturn (2018) found that active labor-market policies (e.g., short-time work⁶) helped

reduce layoffs in the United States and Germany, respectively. No studies researched employment effects of individual reductions in working hours.

As all the WTRs in our review sample were of a rather small extent, we could not draw any conclusions regarding the effect of this conceptual element on employment. In addition, we could not identify any evidence regarding implementation level or different forms of WTRs, as the WTR form was usually not specified in the studies. At the same time, wage compensation at least did not prevent the national level WTRs in France and Portugal from having positive effects on employment.

Productivity

Only three studies focused on productivity effects, and they showed contradictory results. At the organizational level, Devicienti, Grinza, and Vannoni (2018) found that a higher share of part-time employees working *shorter days* reduced firm productivity in Italy, while part-time employees working *fewer days* per week had no significant negative effect. By contrast, Von Thiele Schwarz et al. (2008) and von Thiele Schwarz and Hasson (2011) examined the effects of a randomized controlled trial involving a 2.5 hours weekly work reduction among Swedish dentistry employees and found that self-rated productivity increased compared to the control group. There were no studies that looked at the impact of WTR policies on productivity at the national or individual implementation level, so no conclusions can be drawn regarding productivity based on the implementation level of WTRs. The evidence did not suffice to make any interpretations regarding the effects that the extent of WTRs have on productivity. The small sample sizes of the studies also preclude generalizations regarding the productivity effects of wage compensation—found in the Swedish study, but not in the Italian study. Nevertheless, both studies highlight the benefits of accompanying measures in addition to wage compensation. While a 2.5-hour weekly reduction in work hours left productivity unchanged in von Thiele Schwarz and Hasson's study (2011), the productivity effect was negative in the control group—but positive when the work reduction was combined with mandatory physical exercise. Regarding part-time work, Devicienti, Grinza, and Vannoni (2018) found that the use of legal clauses permitting Italian employers to adjust the working times of part-time employees (with two days of notice and financial compensation) serves as an effective support tool for employers to significantly curb productivity losses associated with part-time work.

Career outcomes

Overall, the three included studies looking at career outcomes—operationalized as job chances, downgrading of job quality and skill use, and downward mobility—suggest that in the absence of other support mechanisms or broader societal changes the implementation of WTRs (or merely giving people the right to reduce their working hours) has a negative impact on the career outcomes of those involved. This insight only applies to women because two of the three studies in question only analyzed female employees (Connolly and Gregory 2008; Dex and Bukodi 2012) and the third study that took both men and women into consideration assessed a very specific setting (Fernandez-Kranz and Rodriguez-Planas 2021). Hence, it is difficult to make any assertions regarding how far WTRs effect the career outcomes of men.

At the national level, Fernandez-Kranz and Rodriguez-Planas (2021) found that the employment protection issued to Spanish employees with children younger than six years of age who have asked for a shorter workweek due to family responsibilities led to substantial disadvantages for women of childbearing age in terms of hiring, promotion, and the likelihood of their job contracts being terminated (regardless of whether they actually had children or not) in comparison to men of the same age or women of non-childbearing age. At the individual level, depending on which study one refers to, 14.0–48.5% of women who transitioned from full- to part-time work experienced some form of “downgrading” (Connolly and Gregory 2008; Dex and Bukodi 2012). None of the included studies reported on the extent of the WTRs, comprised a WTR policy at the organizational level, or referred to any form of wage compensation, precluding conclusions regarding these conceptual elements.

Subgroup analyses

The employment effects of WTRs appear very heterogeneous, varying greatly according to, for example, the type of job, hours worked, and gender of participants. Crépon and Kramarz (2002) found that minimum-wage employees who worked 40 hours per week were particularly harmed by France's mandatory shortening of the workweek. However, we note that this quite possibly was not inherently because of their status as minimum-wage employees, but rather because of a law that enforced their full wage compensation in the context of the WTR made them slightly more expensive than minimum-wage employees hired after the WTR. By contrast, Raposo and van Ours (2010a) found that employees who already

worked fewer than 40 hours per week prior to the policy change were more likely to lose their jobs than employees whose hours were directly affected by the new WTR policy. Estevão and Sá (2008) found that hourly wages and transitions out of employment increased more for men than for women. At the firm level, Tracey and Polachek (2020) found that a short-time compensation program in the United States had significantly positive effects for businesses that exhibited cyclical employment fluctuations and a reliance on layoffs, but showed no effect for stable firms. Overall, it is difficult to draw any general conclusions from the diverse results outlined above.

Regarding differences in productivity effects, the evidence base is even weaker. Devicienti, Grinza, and Vannoni (2018) looked at gender differences in their analysis and found that in Italy women comprise about 79% of part-time workers.

Findings on the role of people's socio-professional level in the relationship between WTRs and career outcomes are mixed. According to the research of Fernandez-Kranz and Rodriguez-Planas (2021), particularly low-skilled women of childbearing age working for small companies were negatively affected by the introduction of employment protection for employees with children under the age of six who had asked to work part-time. In contrast, both Dex and Bukodi (2012) and Connolly and Gregory (2008) found that the likelihood and duration of career-related downgrading was significantly higher among intermediate or highly skilled female employees compared to women with lower occupational skills or those who transitioned from part-time to full-time work.

In addition, studies in our sample indicated that various characteristics of the work environment may have an influence on the relationship between WTRs and career outcomes. For example, all three studies that took the share of part-time employees in job sectors into consideration found that a higher share of part-time work in a particular sector reduces the likelihood of downgrading for individual employees who transition to part-time work (Fernandez-Kranz and Rodriguez-Planas 2021; Connolly and Gregory 2008; Dex and Bukodi 2012). In contrast, other work environment-related factors were shown to increase the likelihood of downgrading. These issues included working in a small company (Fernandez-Kranz and Rodriguez-Planas 2021), switching employers while transitioning from full- to part-time work (Connolly and Gregory 2008), or having a high share of men in particular occupations (Dex and Bukodi 2012). In this context, it must be noted that some combinations of the factors that have a bearing on the effect

of WTRs on downgrading may exacerbate their influence. For example, high-skilled (female) employees working in male-dominated occupational sectors carry a higher risk of occupational downgrading than if they worked in female-dominated sectors (Dex and Bukodi 2012).

Ecological dividend

Only one study in our review sample addressed the possible ecological dividend of WTR policies (Buhl and Acosta 2016) as other longitudinal studies were conducted at the macro-economic level and occurred without a WTR (e.g., Fitzgerald, Schor, and Jorgenson 2018; Shao and Shen 2017). This particular study employed longitudinal, secondary, individual-level data of an unknown sample size collected in Germany. It looked at changes in workloads based on the individual decisions of employees—in other words, WTRs lacking wage compensation and no specific policy conceptualization. Nevertheless, we included the study due to its longitudinal nature, even if no insights could be obtained regarding the form of WTRs in the sample or their extent. This investigation found that a (marginal) decrease in working hours led to a (marginal) increase in non-working time, which, in turn, resulted in an *increase* in the amount of resources used per hour. However, if we also take the cross-sectional data and analyses of the same study into consideration, it appears that the decrease in resources used due to income losses was larger than the aforementioned increase, leading to a net positive ecological effect. No subgroup analyses were conducted that could provide indication of the circumstances under which these effects are stronger or weaker.

Discussion

Social, economic, and ecological effects of WTRs

We conducted a systematic review of longitudinal and (quasi-)experimental studies looking at the effects of WTRs and different conceptualizations of WTR policies on various outcomes regarding social, economic, and ecological sustainability—the so-called three dividends. Our results suggest that WTRs positively influence employees' well-being, health, and work-family conflict. They appear to have a small, but possibly positive, effect on employment, however their effects on productivity seem to have no clear direction. In contrast, they appear to have a harmful effect on the career outcomes of women (see Table 1; their effect on men's career outcomes is unknown

based on the systematic review at hand). Finally, the results indicate positive ecological effects, but the evidence for this effect is thin.

In terms of possible social benefits, the effects identified in our review sample echo the findings of prior research (that did not meet our inclusion criteria), for example, regarding the benefits of shorter working hours for employees' well-being and health (Ahn 2016; Hamermesh, Kawaguchi, and Lee 2017; Jansen-Preilowski, Paruzel, and Maier 2020; Voglino et al. 2022), as well as work-family conflict (Higgins, Duxbury, and Johnson 2000; Hill et al. 2004; Hughes and Parkes 2007; Russell, O'Connell, and McGinnity 2009).

In terms of economic benefits, cross-sectional studies and studies from other regions that were therefore not included in this systematic review, support the notion of zero to small positive effects of WTRs on overall employment levels (Gonzaga, Filho, and Camargo 2003; Kapteyn, Kalwij, and Zaidi 2004; Logeay and Schreiber 2006; Rafael Sánchez 2013; Skuterud 2007), suggesting that positive employment effects might be overestimated in existing modeling studies (e.g., D'Alessandro et al. 2020). While the relatively small employment effects of WTR policies are seen as a weakness (e.g., Rafael Sánchez 2013), we instead choose to see it as evidence that shortening the national workweek is arguably still worth pursuing in light of its other proven beneficial social effects.

In terms of the effect of WTRs on productivity, studies that were not included in our systematic review also exhibit ambiguous findings. This is hardly surprising given the diverging assumptions regarding the effects of WTRs on productivity. Devicienti, Grinza, and Vannoni (2018) assume that part-time work itself is prone to additional communication and coordination efforts, as the same amount of work is done by more employees than if it was done by full-time employees, and that part-timers may have less incentive to invest in the accumulation of human capital. By contrast, it is plausible to assume that above a certain threshold of working hours mental and physical fatigue lead to a reduction in productivity. This ambiguity may also be explained by the concrete conceptualizations of WTRs (e.g., form and accompanying measures (Devicienti, Grinza, and Vannoni 2018; von Thiele Schwarz and Hasson 2011) or size of workload (Moonesinghe et al. 2011; Passicot and Murphy 2013; Peets and Ayas 2012)). Indeed, Devicienti, Grinza, and Vannoni (2018) explain that, depending on the job sector, part-time employees who work shorter workdays may be less productive due to inefficiencies related to getting up to speed for each workday (employees are usually less productive in

the first hours of work). Further, any assertions made based on the results of the current systematic review must be made with caution, as the analyzed studies (Devicienti, Grinza, and Vannoni 2018; von Thiele Schwarz and Hasson 2011) operationalized productivity in very different ways, which restricts the comparability of the findings and possibly explains their ambiguity.

Finally, cross-sectional studies without WTR policies in their research design (and therefore excluded in our systematic review) support our finding that WTRs can harm career outcomes (Abendroth, Maas, and van der Lippe 2013; Fernandez-Lozano et al. 2020; Gallie et al. 2016; Hill et al. 2004).

While previous literature reviews on the ecological effects of WTRs (Antal et al. 2021; Shao 2020) have included more than one study, as opposed to the systematic review at hand, they also state that more evidence is necessary in this area. Indications are that WTRs have positive ecological effects, but the evidence base is too thin to support robust conclusions. Several studies that *did not* meet our inclusion criteria suggest that WTRs do indeed have positive ecological effects. These studies range from individual level studies (Devetter and Rousseau 2011; Fremstad, Paul, and Underwood 2019; Kennedy, Krahn, and Krogman 2013; Nässén, Larsson, and Holmberg 2009; Nässén and Larsson 2015) to cross-country comparisons (Fitzgerald 2022; Fitzgerald, Schor, and Jorgenson 2018; Hayden and Shandra 2009; Knight, Rosa, and Schor 2013; Schor 2008; Simionescu et al. 2021)—though cross-country WTR effects may depend on a country's particular stage of development (Shao 2015; Shao and Shen 2017; Shao and Rodríguez-Labajos 2016). Two longitudinal studies (Neubert et al. 2022; Persson, Larsson, and Nässén 2022) that would have fulfilled our inclusion criteria, but were published after our data collection, concluded that reduced working hours are associated with lower environmental impacts, mainly due to income losses, but also due to a shift in time use toward activities associated with comparatively low environmental impacts such as socializing. Nevertheless, the magnitude of this beneficial effect appears rather modest (Neubert et al. 2022; see also Fremstad, Paul, and Underwood 2019).

Our results revealed two important subgroup effects. First, in terms of the social benefits of WTRs, blue-collar employees appear to benefit more than white-collar employees. One reason for this could be that blue-collar employees are more affected by work stressors and generally have fewer resources to cope with them in comparison to white-collar employees. Another reason could be that for employees in higher positions (i.e., white-collar employees), work-life

conflict is more pronounced and the boundary between work and private life less clearly delineated. Indeed, a recent study that was not included in this systematic review found that manual laborers who reduced their working hours using Gothenburg's "right to part-time" policy were more likely to describe their work as too mentally or physically demanding—compared with white-collar workers—in general and as a motive for reducing their working hours. They were also less likely to experience a post-WTR intensification of work, offering initial support for both arguments (Persson, Larsson, and Nässén 2022).

Second, our review points to gendered effects, namely greater WTR benefits for women's health, well-being, and work-family conflict. One reason for these gendered effects may be the perceived threat of WTRs to men's "breadwinner" identity (Lepinteur 2019), such that women react more positively. Second, it is possible that women benefit more because of the higher initial "double burden" they face in terms of providing unpaid (e.g., childcare) and paid work (De Raeve, Jansen, and Kant 2007). WTRs can alleviate this double burden, enhancing women's health and well-being. These gendered patterns are reflected by the reality that women are more likely to work part-time than men, especially in the case of "short part-time" (less than or equal to 20 hours per week; Bartoll and Ramos 2020), a work schedule one can assume exacerbates the negative effects of part-time work (Doerre et al. 2006). Indeed, it seems that WTRs cause greater harm to women's career outcomes than men's (Fernandez-Kranz and Rodriguez-Planas 2021). However, it is difficult to make such assertions based on the current systematic review, as they are predicated on one study (the other studies on career outcomes only analyzed female employees). In any case, future policies should account for the different situations men and women face when it comes to working time, as well as the conditions of employees with different income levels, so as to prevent privileging one subgroup while harming others.

WTR conceptualizations and their implications

Our review showed that the specific conceptualization of WTR policies in terms of extent, implementation level, form, and wage compensation can decisively influence the degree to which the beneficial social, economic, and ecological effects can or cannot be realized.

Extent

Overall, it appears that more extensive WTRs (≥ 6 hours per week) generate greater social and

ecological benefits and do not harm productivity when implemented in the form of fewer workdays—rather than shorter workdays—though it remains unclear up to which extent of WTR these findings are generalizable. Based on our sample, from a social point of view, the WTR benefits appear to be stronger the larger the extent of the given WTR. Conversely, other research that was not included in the systematic review at hand has shown that there is no relationship between the amount of part-time work and health, as long as unemployment or excessive workloads are avoided (Kameråde et al. 2019; Virtanen et al. 2018).

From an ecological point of view, studies that were not included in the current review point toward the positive effect of WTRs on the environment stemming primarily from an income effect (e.g., Nässén and Larsson 2015). In this way, substantial losses of income—corresponding with more extensive WTRs—might be necessary to achieve a positive effect for the environment (Fremstad, Paul, and Underwood 2019; Neubert et al. 2022). From an economic point of view, it could be more the form of WTR than the extent that determines productivity gains or losses (Devicienti, Grinza, and Vannoni 2018). Moreover, the relationship between working hours and productivity is not linear, but is instead characterized by the interaction of two counteracting forces: a learning effect and a fatigue effect, resulting in multiple sector-specific thresholds in this relationship (Lee and Lim 2017 (not included in this systematic review)).

Implementation level

Overall, it appears that WTR policies on more wide-ranging implementation levels, such as the national level, are more effective in producing social, economic, and ecological benefits than those on more localized levels. However, more sweeping policies are likely to be more difficult to implement, possibly leading to a reduced extent of these WTRs. Against this background, organizational WTRs fostered and supported by national policies may be best positioned to achieve the strongest positive effects. It must be noted though that the specific level WTR that policies are implemented on has a bearing on the accessibility of such policies and should therefore be taken into consideration when conceptualizing them.

Regarding the social dividend, the studies in our sample show positive effects across all implementation levels, though organizational level trials appear to be the most effective. However, it remains unclear whether this stems from the implementation level or

is rather due to those trials having a comparably large extent of WTR in comparison to those implemented at the national level—and include wage compensation, in contrast to voluntary individual WTRs.

From an economic perspective, since (under-) employment is a macroeconomic phenomenon, employment effects have predominantly been assessed at the national level. As a result, there is very limited evidence on the relationship between working time and employment at the organizational or individual level. Yet these latter levels are where productivity effects are best measured. At present, the available evidence does not enable any robust conclusions about the merits of different implementation levels. The effect of WTRs on productivity may be less influenced by the implementation level and more by the organizational policies accompanying these reductions.

Regarding the ecological dividend, one might assume that the extent of WTR policies is more relevant than their implementation level. However, WTRs that involve large portions or even the whole of society may lead to shifts in time use toward activities with lower environmental impacts (e.g., socializing), in contrast to implementation levels that are less likely to generate simultaneous phases of discretionary time, prompting individuals with more free time to use it in more resource-intensive ways (e.g., traveling or shopping). Beyond this, further research that was not included in the current systematic review suggests that synchronous phases of discretionary time may also enable organizations to organize their workplaces in ways that save resources (e.g., by closing offices for one day per week; King and van den Bergh 2017).

Form

Policies leading to fewer workdays per week might be the most beneficial from a social, economic, and ecological perspective. Regarding social effects, evidence that was not included in the systematic review at hand shows that compressing work—i.e., working fewer but longer days, so that total work hours remain stable—worsens overall employee health, but increases job satisfaction, decreases work-family conflict, and reduces stress on days off (Bolino, Kelemen, and Matthews 2021). Accordingly, WTR policies that reduce the number of workdays, but do not increase daily work hours—as opposed to compressed workweeks—may ensure all the WTR benefits concerning work-family conflict, job satisfaction, and reduced stress on days off, while avoiding the negative effects of longer daily working hours.

Regarding economic effects and productivity in particular, while shorter workdays lead to less

productivity (presumably due to so-called startup and communication costs of daily work flows), fewer workdays do not (Devicienti, Grinza, and Vannoni 2018) and therefore constitute a form of WTR worth considering when conceptualizing WTR policies.

As for the ecological effects of WTR policies that shorten the workweek, macroeconomic calculations that were not included in this systematic review suggest that reducing the number of days employees work per week is more beneficial for the environment than reducing daily working hours or increasing holiday leave, especially if the day off is *not* adjacent to the weekend (King and van den Bergh 2017). The reasoning here is that fewer workdays makes it possible to close some offices and factories for whole days, leading to reduced energy use, as well as to less environmentally harmful commuting behavior. When the day off is adjacent to the weekend, however, it may lead to more traveling in the context of weekend trips, diminishing these positive effects. Indeed, empirical studies show that compressed workweeks lead to less emissions from commuting (Percoco 2018; Sundo and Fujii 2005). Echoing this reasoning, a recent study found that individuals who reduced their working time showed an increase in low-emission, high-pleasure activities, like hobbies and socializing, especially when they reduced their working days per week, as opposed to their working hours per day (Persson, Larsson, and Nässén 2022).

WTR policies with more vacation days, by contrast, might produce fewer benefits. Research that was not included in the systematic review at hand shows that the small to medium-sized positive effects of holidays on health and well-being fade shortly after vacation (Bloom et al. 2009), and more vacation days do not produce significant health benefits (Hofmarcher 2021). Meanwhile, vacation activities usually imply a certain amount and type of mobility that is associated with environmental harm.

Wage compensation

Overall, wage compensation may be necessary to ensure the social benefits of WTR policies for subgroups with low income. However, further research that was not included in the current systematic review suggests it must be carefully implemented so as not to override the beneficial ecological effects of WTRs. As noted above, while decreasing income might be the most important factor influencing whether WTRs have beneficial ecological effects (e.g., Bader et al. 2020), income has also been shown to be beneficial for well-being, albeit with

diminishing returns (Jebb et al. 2018). Thus, there appear to be tradeoffs between the social and ecological benefits of WTRs depending on whether they are implemented with full, partial, or no wage compensation. Indeed, a recent study found that although low-income workers who voluntarily reduced their working hours without wage compensation experienced higher well-being, they also indicated more financial hardships (Persson, Larsson, and Nässén 2022), which may diminish well-being in the long term. However, there might be a solution to this tradeoff. On one hand, research shows that income is especially important for low-income workers (Jebb et al. 2018). On the other hand, the ecologically harmful effects of income appear more pronounced for high-income households, as it increases luxury consumption (Bruderer Enzler and Diekmann 2019; Moser and Kleinhüeckelkotten 2018). Thus, WTRs featuring progressive wage compensation—i.e., full wage compensation exclusively for low-income earners and partial or no wage compensation for high earners—might prevent negative social effects due to financial hardship, while preserving most of the ecological benefits of WTRs (Bader et al. 2020; Schumacher et al. 2019).

Limitations

This study is the first to review the effects of WTRs across multiple dividends and according to multiple conceptualizations. However, as it draws on existing research and is subject to methodological choices, certain limitations regarding its results apply.

The decision to only include longitudinal and (quasi-)experimental research on WTRs led to higher quality evidence, but lower in quantity, making it difficult to draw general conclusions and possibly producing blind spots. The application of the same inclusion and exclusion criteria in general, and the exclusive focus on longitudinal and (quasi-)experimental studies in particular, led to a highly heterogeneous degree of evidence among the three dividends and subtopics. While, for example, the social dividend possesses a sample consisting of 18 studies, the sample for the entire ecological dividend comprised merely one article. Thus, for many of the outcomes, the evidence base was rather scarce, complicating the differentiation of the effects of WTRs by implementation level, form, extent, and degree of wage compensation. Further, only three studies in our sample included outcomes comprising more than one dividend simultaneously (Buhl and Acosta 2016; von Thiele Schwarz, Lindfors, and Lundberg 2008; von Thiele Schwarz and Hasson 2011).

Similarly, there is limited evidence, and the problem of confounded effects, with respect to the different conceptualizations of WTR policies, as most studies reported few, if any, specific conceptualizations of WTRs studied. Only three studies in our sample examined, for example, the differential effects of reducing daily hours of work versus reducing the weekly number of workdays (Anttila, Nätti, and Väisänen 2005; Devicienti, Grinza, and Vannoni 2018; Fagnani and Letablier 2004). Thus, it is difficult to distinguish the effects of various WTR conceptualizations and their individual elements, for example whether a particular WTR effect is based on the extent or accompanying wage compensation of the respective WTR. Conclusions regarding these questions are therefore rather speculative.

Topically, one of the blind spots that the decision to only include longitudinal and (quasi-) experimental research produced concerns the bearing of time use next to paid work (discretionary time and unpaid work) and the shift thereof over the course of WTRs on various effects of WTRs. Various studies illustrate that this is relevant for a multitude of WTR effects such as health (De Raeve, Jansen, and Kant 2007) or environmental impact (Druckman et al. 2012; Klein et al. 2021; Nässén and Larsson 2015).

Despite the decision to only include longitudinal and (quasi-)experimental research leading to less and unevenly distributed evidence, this approach helps to distinguish between what we know with some degree of certainty (e.g., the positive social effects of WTRs) and what we can only speculate on (e.g., the positive ecological effects of WTRs).

Finally, it must be noted that other relevant characteristics of our sample were represented unevenly. Most notably was the geographic locations of where the studies were conducted with most of the work conducted in Europe.

Conclusion and research agenda

To date, existing longitudinal and (quasi-)experimental studies show that WTRs lead to improvements in well-being, health, and work-family conflict. In addition, however, there are indications that WTRs may hinder career advancement, especially among women. At the same time, the overall employment effects of WTRs appear small, especially in the long run. Evidence regarding productivity effects is thin and contradictory and does not allow for generalizations. Including accompanying measures in the conceptualization of WTR policies could make a large difference in this respect. Ecological effects are almost unstudied in longitudinal and (quasi-)experimental

research designs (Buhl and Acosta 2016). However, other research that was not included in the systematic review at hand suggests that there may indeed be positive ecological effects of WTRs, especially when corresponding incomes are reduced (Nässén and Larsson 2015; Neubert et al. 2022).

The evidence base of our findings may not be solid enough to justify unambiguous policy recommendations, but it does allow us to formulate working hypotheses. Based on our systematic review and several working hypotheses (WHs), we offer the following provisional assessment.

- WH 1: WTRs are especially beneficial for social outcomes.
- WH 2: The beneficial effects of WTRs are more likely to occur if they are implemented to a meaningful extent.
- WH 3: The beneficial effects of WTRs are more likely to become manifest if the associated strategies are mandated and supported at a broad level (e.g., national) but implemented at an organizational level (rather than on an individual level).
- WH 4: The beneficial effects of WTRs are likely to become manifest if they are implemented in the form of fewer days per week as opposed to fewer hours per day or more vacation days.
- WH 5: The beneficial effects of WTRs are more likely to become manifest if lower income groups receive a disproportionate amount of wage compensation.

These assertions remain hypotheses though and therefore require more research. In this context, some of the WHs, the currently inexistent research on certain aspects of the effects of WTRs (clearly illustrated by the empty cells in Table 1), and further limitations of the systematic review at hand allow us to propose the following research agenda.

First, and in the context of WH 1, conducting studies that compare WTR effects with respect to at least two (or even better all three) dividends—social, economic, environmental—preferably from the same WTR conceptualization(s), could help to identify ideal conceptualizations of WTR policies in terms of synergies and tradeoffs between their effects. Balancing synergies and tradeoffs in the context of the conceptualization of WTR policies is, in all likelihood, of great relevance for garnering public support required for their implementation. For example, wage compensation, no matter whether full or partial, may reduce the ecological effect of WTRs, however, in terms of social justice, it would be very important in terms of protecting low-income earners from income losses.

Further, as the amount and type of people affected by WTRs, and therefore the scopes of the samples of studies based on different WTR conceptualizations differ to a great degree, being able to analyze multiple dividends from the same WTR conceptualization(s) would improve the reliability of research. Scholars should therefore consider assessing various effects on different dividends (e.g., as done by Fitzgerald 2022 on a macroeconomic level or by Neubert et al. 2022 on an individual level).

Second, and in the context of WHs 2–5, conducting studies that incorporate at least two or more WTR policies, or even just two or more manifestations of at least one conceptual element of WTR policies (implementation level, form, extent, and accompanying measures), would enable direct comparisons of their efficacy. Scholars planning (quasi-)experimental studies—for example with organizations testing WTRs—should consider varying the WTR policies over different experimental groups to address this important research gap.

Third, more research in general would help to clarify the role of intervening variables and subgroup effects, in particular skill level, work environment, and other labor-market characteristics. Such intervening variables are not negligible, as they can be pivotal in determining whether a beneficial WTR effect actually occurs or not. The gendered effects of WTRs on well-being and health are a relevant point in this regard (Lepinteur 2019; Sánchez 2017).

Fourth, and in the context of WH 1, longitudinal or (quasi-)experimental research is urgently needed on the ecological effects of WTR policies. So far, conclusions regarding the ecological benefits are very limited (Antal et al. 2021).

Fifth, wherever possible and applicable, studies should take all accompanying supportive measures of WTRs into consideration more often, for they can be decisive in guaranteeing and combining multiple beneficial effects of WTRs, such as in the case of different levels of wage compensation that accompany WTRs. From the standpoint of WH 5, the latter deserves particular attention—for example more effort should be devoted to identifying at which levels of income the degree of wage compensation would maximize the beneficial effects of WTRs and minimize any possible tradeoffs. In the case of wage compensation, this depends on two aspects: On one hand, we need to determine the levels of income above which the increases in well-being start getting smaller or even disappear altogether. On the other hand, we need to identify the level of income at which environmental impact reaches a significant size or even starts to increase disproportionately. The level of income above which wage compensation should start to

decrease should be determined in a way that minimizes the reduction of well-being, but still guarantees a sizeable reduction of environmental impact.

Sixth, current research suggests that time use next to paid work (unpaid work and discretionary time) and the shift thereof over the course of WTRs has a bearing on the effects of WTRs. In other words, researchers should pay more attention to the role unpaid work and discretionary time play in regard to the effects of WTRs.

Finally, where possible and useful, it is important for future research to differentiate the effects of WTRs according to gender. It would be beneficial to examine under which conditions the negative career outcomes of WTRs that appear to particularly affect women could be minimized, or whether WTRs can contribute to a more equitable distribution of paid and unpaid work between men and women.

It is essential to address these research gaps on the effects of WTRs to more effectively inform associated policies. A more robust knowledge base would allow for the design of policies that more closely approximate conceptualizations that maximize the beneficial effects of WTRs while minimizing possible harms. Importantly, WTR policies should also carefully consider the different effects they can have on various population subgroups. Wisely designed WTR policies could contribute to efforts to address the sustainability challenges facing post-industrial societies of the global North.

Notes

1. National or regional level WTRs are issued by law, social partnership WTRs are based on collective bargaining that applies to a selection of occupational sectors, organizational WTRs are implemented by organizations such as businesses or institutions, and individual WTRs describe individuals reducing their working hours on their own accord based on whatever means they have to do so. It must be noted, that some WTR conceptualizations exhibit an overlap between implementation levels.
2. Accessibility to, and therefore also the effects of WTRs, vary by occupational sector in general and furthermore depend on how WTR policies are conceptualized.
3. Experimental studies compare a temporal development in an intervention group, i.e., a group in which WTRs were implemented, with a control group, i.e., a group in which no WTRs were implemented. In an experimental design, participants are randomly assigned to the experimental and control groups; in a quasi-experimental design, these two groups are not randomly created (e.g., a WTR is implemented in a particular department or company and is compared to a control group from another existing department or firm). Compared to cross-sectional comparisons of only one data point

or theoretical and qualitative case studies, longitudinal and (quasi-)experimental studies are more likely to enable conclusions about causal effects.

4. It must be noted that only health indicators and not changes in health expenditure were examined, even though the latter is also relevant from an economic point of view.
5. Productivity is defined as the overall output of an entity, as opposed to a rate, maintaining productivity on a macroeconomic level over the course of a WTR would limit the WTR's ecologically beneficial effects.
6. Short-time work refers to WTRs that are usually implemented in the context of a recession on an organizational level to reduce layoffs, often of a temporary nature and sometimes supported by government schemes.

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ORCID

Hugo Hanbury  <http://orcid.org/0000-0003-3443-2285>
 Patrick Illien  <http://orcid.org/0000-0001-8185-1808>
 Eva Ming  <http://orcid.org/0000-0001-7181-3787>
 Stephanie Moser  <http://orcid.org/0000-0002-1564-447X>
 Christoph Bader  <http://orcid.org/0000-0002-8991-353X>
 Sebastian Neubert  <http://orcid.org/0000-0001-7415-6583>

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Appendix 1. Effects and WTR conceptualization of complete review sample

Article	WTR			WTR conceptualization		Effects
	WTR	Extent	Level	Form	Wage compensation	
Akerstedt et al. (2001)	Organizational WTR experiment	9 hours	Organizations	Shorter workday	Full	SOC: improved heart/respiratory symptoms, sleep quality, fatigue, satisfaction with work hours, self-rating of having adequate time for social activities, friends and family SOC: reduction in work-family conflict
Anttila, Nätti, and Väisänen (2005)	Communal WTR experiment	6–8 hours	Organizations	Shorter workday or fewer working days	Partial to full	SOC: reduction in work-family conflict
Barck-Holst et al. (2017)	Organizational WTR experiment	9 hours	Organizations	Shorter workday	Full	SOC: reduction in work intrusion on private life, stress, negative emotions, sleepiness, fatigue, exhaustion, memory difficulties, increase in restorative sleep and sleep quality on weekends
Barck-Holst et al. (2021)	Organizational WTR experiment	9 hours	Organizations	Shorter workday	Full	SOC: reduction in emotional exhaustion
Berniell and Bietenbeck (2020)	35-hour workweek in France	4 hours	National	Unclear	Full	SOC: reduction in smoking and body-mass index (BMI), increase in self-reported health
Buhl and Acosta (2016)	Individual reduction in working hours	Unclear	Individuals	Unclear	Likely none	SOC: no significant effect on life satisfaction ECOL: negative time effect on resource use, but positive and larger income effect on resource use
Chemini and Wasmer (2009)	35-hour workweek in France	4 hours	National	Unclear	Full	ECON: no significant effect on employment
Connolly and Gregory (2008)	Transition to part-time work	Unclear	Individuals	Unclear	Likely none	ECON: occupational downgrading for women transitioning to part-time
Craig and Churchill (2019)	Transition to part-time work	Unclear	Individuals	Unclear	Likely none	SOC: reduction in parental stress, especially for women
Crépon and Kramarz (2002)	Reduction from 40 to 39 hours with increase in minimum wage in France	1 hour	National	Unclear	Partial	ECON: increased probability of unemployment
De Raeye, Jansen, and Kant (2007)	Transition to part-time work	Unclear	Individuals	Unclear	Likely none	SOC: reduction in self-reported health and increase in psychological distress for women, no significant effect for men
Devicienti, Grinza, and Vannoni (2018)	Increase in part-time share of organizations	Unclear	Organizations	Shorter workday or fewer working days	Likely none	ECON: decrease in productivity for increase in part-time share for shorter workdays, but not for fewer working days per week
Dex and Bukodi (2012)	Transition to part-time work	Unclear	Individuals	Unclear	Likely none	ECON: occupational downgrading for women transitioning to part-time
Du, Yin, and Zhang (2013)	35-hour workweek in France	4 hours	National	Unclear	Full	ECON: reduced unemployment rate
Estevão and Sá (2008)	35-hour workweek in France	4 hours	National	Unclear	Full	ECON: no significant effect on employment
Fagnani and Letablier (2004)	35-hour workweek in France	4 hours	National	Shorter workday or fewer working days	Full	SOC: improved work-family balance
Fernandez-Kranz and Rodriguez-Planas (2021)	Law granting employment protection for parents reducing their working hours	Unclear	National	Unclear	Likely none	ECON: lowered career chances for women of childbearing age after implementation of law
Gash, Mertens, and Gordo (2012)	Transition to part-time work	Unclear	Individuals	unclear	Likely none	SOC: increased life satisfaction for women
Gronlund and Oun (2018)	Transition to part-time work	Unclear	Individuals	Unclear	Likely none	SOC: reduction in work-family conflict for mothers but not fathers
Herzog-Stein, Lindner, and Sturm (2018)	Temporary WTR	Unclear	Organizations	Unclear	None or partial	ECON: lowered unemployment in recessions
Lepinteur (2019)	35-hour workweek in France and 40-hour workweek in Portugal	4 hours	National	Unclear	Likely full	SOC: increased job and leisure-time satisfaction
Raposo and van Ours (2010)	40-hour workweek in Portugal	4 hours	National	Unclear	Likely full	ECON: increase in employment through less job destruction
Raposo and van Ours (2010)	40-hour workweek in Portugal	4 hours	National	Unclear	Full	ECON: decreased likelihood for directly affected workers to lose job
Sánchez (2017)	35-hour workweek in France and 40-hour workweek in Portugal	4 hours	National	Unclear	Full	SOC: no significant health effect in Portugal, positive effect in France for women <39 but negative for men

(Continued)

Appendix. (Continued)

Article	WTR	WTR conceptualization				Effects
		Extent	Level	Form	Wage compensation	
Schiller et al. (2017)	Organizational WTR experiment	9 hours	Organizations	Shorter workday	Full	SOC: increased sleep quality, sleep duration, decreased sleepiness, perceived stress, worries and stress at bedtime
Schiller et al. (2018)	Organizational WTR experiment	9 hours	Organizations	Shorter workday	Full	SOC: increased recovery activities
Tracey and Polachek (2020)	Short-term work- program participation	Unclear	Organizations	Unclear	Partial	ECON: decrease in layoff rate
von Thiele Schwarz et al. 2008)	Organizational WTR experiment	2.5 hours	Organizations	Shorter workday	Full	SOC: less general symptoms as compared to control group but increased waist-to-hip ratio
von Thiele Schwarz and Hasson (2011)	Organizational WTR experiment	2.5 hours	Organizations	Shorter workday	Full	ECON: improved self-rated work ability compared to control SOC: no significant effect on sickness absence
Wergeland et al. (2003)	Organizational WTR experiment	9 hours	Organizations	Shorter workday	Full	ECON: improved self-rated work ability compared to control SOC: decreased neck-shoulder pain and exhaustion

Note: SOC: social dividend; ECON: economic dividend; ECOL: ecological dividend.