Time reveals everything
A glimpse into the hourglass of time use research

Theun Pieter van Tienoven, Joeri Minnen & Bram Spruyt (eds.)

TIME
REVEALS
EVERYTHING

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"Hide nothing, for time, which sees all and hears all, exposes all."

– Sophocles

Content

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PART I:

CONDUCTING
TIME USE RESEARCH

Time reveals everything

Theun Pieter van Tienoven • Joeri Minnen • Bram Spruyt

It is perhaps the most common and unconscious moment of everyday life in modern societies: checking the clock to see what time it is. That is not difficult to do. We are surrounded by clocks. Not only on all our watches and smart devices, but also on our microwave, oven, dishwasher, refrigerator, extractor hood, hob, washing machine, dryer, and coffee machine. And not only at home, but also outside on the church steeple, the information boards at railway stations and bus stops, in our motor cars, on billboards, even on the scoreboards of sports clubs. Checking the time tells us "not only where we stand vis-à-vis the rest of the day, but also how to respond" (Honoré, 2005, p. 19). We made time a reality and we often attribute this to Isaac Newton, who was convinced of an absolute time in nature. A uniform time that flows independently of all that goes on in the world and could be measured by moments of absolute time that still exist in their own right.

To substantiate this claim, we equated the second with the period between two ground states of a caesium atom and we depend for our cycles of days, months, and years on the movements of the celestial bodies known to us. We even tried to explain the week using celestial bodies (Colson, 1926). However, Siffre's famous cave experiments in 1972 showed us that our inner bodily rhythms do not align with the 24-hour day (Foer, 2008). Similarly, the leap years, ~days, and ~seconds, the varying number of days per month, the out-of-synchronisation of the first day of the week with the first day of the first month of the year, the inexplicable week–weekend rhythm, and the failed attempt to replace it with a rational decimal system (Van Tienoven, Glorieux, Minnen, Daniels, & Weenas, 2013) prove that time is not reality but something quite different. But what?

True duration

Time is the only basic quantity that cannot be perceived with our physical senses, in contrast to, for example, distance that is visible or weight and temperature that can be felt. The Church Father Saint Augustin has become famous for his saying that he knows what time is as long no one asks him to explain it. In the same vein, Newton's idea of time was criticised by thinkers such as Bergson, who argued that the way mathematicians use time shows that they are concerned only with measuring things and not with their nature. Bergson considered time identical to the continuity of inner life or pure duration. To him, this unfolding time is not measurable, simply because measurement implies division and superimposition, in so doing taking away the true nature of time. Compare it to describing the rainbow. This is also only possible by means of a division of demarcated colours (Bergson, 2002). The idea that time is measured through the intermediary of motion and that time is expressed in terms of space is proven by the way the simplest words used to describe spatial relations are also used for temporal relations (e.g., *at* the door vs *at* noon, *within* a prison vs *within* a year, *around* the house vs *around* one o'clock) (Deutscher, 2006). Bergson speaks of unfolded or spatialised time.

While Bergson allows time to be measured – but not understood – with moments of absolute time, Norbert Elias (1992) criticised the so-called self-existence of the units of measurement used to indicate time. According to Elias, the human experience and conceptualisation of time changes in line with the process of civilisation. In the early stages of human societies, people communicated time at low levels of abstraction ("specifying abstractions"). They used "sleep" for what we now call "night" or "harvest" for what we call "year". Gradually, with the development (or civilisation) of societies and an increase in knowledge, time attained higher and higher levels of abstraction and generalisation (van Tienoven, 2019). Nowadays time is used in a highly abstract way. The human experience of what is called "time" changed in the past and is still changing, and therefore results from the accumulated experience and knowledge of humanity. Elias rejected the "a-priori-synthesis" that human beings are by nature equipped to form a concept of time.

Moreover, the problem with today's very abstract and generalised conceptualisation of time is that today time is perceived as a reality, whereas in fact time is invisible. How do we measure something that cannot be perceived with human senses? Clocks only represent time but are not "time" themselves. The idea that time is self-existent and available to be measured by human beings has, according to Elias, to do with the tendency to use words that make movements to tangible things (i.e., the idea of reification). In our language one

might say things such as "the wind blows" or "the river flows", but is there a wind that does not blow or a river that does not flow? According to Elias, the same happened with time: time became reified; time is made a reality rather than kept as a symbol.

Time through moments

The assumption that time can be measured is preceded by the discussion whether time is a natural given as Newton or Bergson supposes. Criticism comes from thinkers such as Bachelard and Leibniz, who argue that a single true duration does not exist, nor does it flow continuously. In fact, Bachelard considers there to be multiple durations of unequal length since every human being, every thing, every appearance, has its own duration and the only flux that exists is "the nothingness" between all these durations (Bachelard, 1950). Any duration can be experienced only through instants, through discontinuities, and time is therefore an infinite succession of these isolated instants. In a similar vein, Leibniz argues that nothing happens without there being a reason why it should be so rather than otherwise, and therefore we derive time from events and not the other way around (Withrow, 2003 [1975]).

We have already seen that, according to Elias, the transitioning of societies is central to the change in the experience or representation of time. In modern societies, our notion of time is shaped strongly by the ordering of collective, social actions. In other words, time is derived from collective rhythms of joint actions. However, that does not make the notion of time non-committal, because this notion of time also serves an impersonal set of indispensable guidelines for daily life that transcend the individual. Emile Durkheim therefore concluded that time is a social fact, a characteristic of society, and that "it is not *my* time that is thus arranged; it is time in general, such as it is objectively thought by everybody in a single civilisation" (Durkheim, 1965 [1912], p. 10).

From this idea the breeding ground for time use research follows logically. After all, it implies that the social life of the group is reflected in their time expressions and that whenever these expressions become generalised temporal structures, they serve as a mechanism for the coordination of everyday life (Schöps, 1980). This also gives the notion of time its intersubjective characteristic, which is crucial to meaningful coordination of daily acting simply because otherwise expectations are not possible (Lewis & Weigert, 1981). The latter turned out to be increasingly problematic in line with the further development of societies and the increasing need to communicate and

coordinate time between groups or societies. Finally, we fall back on a time-reckoning based on astronomical observations and chemical processes (such as the ground states of the caesium atom) and which we now regard as standard time. Yet Sorokin and Merton (1937) speak instead of *time Esperanto* which has been forced upon mankind because local time systems were not able to interact with societies that had other systems.

Temporal structures

The use of standard time naturally facilitates time use research. It combines the best of two worlds. It uses the standard units of measurement to expose temporal structures and use them to study the social organisation of societies. The work of the American sociologist Eviatar Zerubavel provides a framework from which the social organisation of daily life can be studied. Particularly in his work on hidden rhythms, Zerubavel (1982) argues that the organisation of social life is subjected to temporal structures that are normative, institutional, and (techno)logical in nature. Institutional temporal structures largely refer to timetables, such as opening hours, school hours, departure times of public transport, but also laws that determine how long we can work, until what age we must go to school, or when we are considered an adult by law. (Techno) logical temporal structures refer to natural limits on time, such as the speed at which we can travel or the duration of pregnancy, and to a logical sequence of events, such as sowing before harvesting. Normative temporal structures arise from the collective rhythms as mentioned above. These are the unwritten yet compelling structures that arise through collective action and that are at the same time maintained by this collective action. They give direction to daily life by determining what is socially acceptable and desirable behaviour. These normative structures enable us to say when a long silence becomes uncomfortable, to judge whether it is too early to go to a bar, or to arrange our daily lives in such a way that we can do things together.

What is clear from all these temporal structures is that they enable or constrain (daily) life in terms of when things happen, how long things last, how often things recur, and in what order things happen. The temporality of all our (daily) actions is therefore expressed in their timing, duration, tempo, and sequence. Measuring these time characteristics of acting is precisely one of the greatest strengths of time use research. Time use research typically consists of a chronological record of sequential activities often for 24 hours per day and for several days in time diaries. These activity records say something about when certain activities take place, how long they last, how often they recur during,

say, the day, and what preceded and followed them. This completes the circle. The absolute, standardised and supposed natural moments of time allow us to measure the time use of daily life and thus reveal the collective temporal rhythms by which societies are organised.

Let time reveal!

Time reveals everything. That this is not only a philosophical truth, but can also become reality, is evident from the foundation of Research Group TOR in 1982. Not coincidental at all is TOR the abbreviation of Tempus Omnia Revelat, which is Latin for "time reveals everything". Professor Ignace Glorieux was part of this group for more than four decades. Now, in 2023, the time has come for him to retire. With this book we reflect on his career, not to look back, but to provide an overview of the current state of affairs in conducting time use research and research into time – a process in which Ignace Glorieux played a major role.

Ignace Glorieux joined the Research Group TOR in 1983 as a graduate teaching assistant. From the outset he was involved in doing time use research and, as befits a member of the latter half of the baby boomer generation, he would experience a process by which time use research with paper-diaries and questionnaires, with hand-drawn checkboxes, conducted by interviewers, and a hand-coded database evolves into a modular data-collection platform that offers online time use research via web and mobile applications without the intervention of interviewers and coders.

The first time use study he was involved in was the TOR84 study from 1984. This study focused on the consequences of unemployment. In this study, 95 employed, 56 short-term unemployed and 55 long-term unemployed individuals kept a time diary for one day. Characteristic of the time diary in this study was the large amount of contextual information asked, including interaction partners, level of satisfaction, whether not doing the activity meant deviating from the usual way of doing things, and the motivation and assessment of the activity. The subsequent time use study, TOR88 from 1988, used the same diary but involved 1,265 respondents from the Flemish population between the ages of 20 and 40 who kept a time diary for three days. In this study, the focus was rather on the gender difference in the labour market participation. Both time use studies formed the empirical basis for his doctoral research on action and meaning, and the role that work plays in this. In 1992, Ignace Glorieux obtained the degree of Doctor in Sociology and in 1995 his work was published in book form with the title *Arbeid als zingever* (EN: *Labour as a giver of meaning*) (Glorieux, 1995).

By that time, he was also part of the international network for time use research. Initially, this network was part of the four-yearly conference of the International Sociological Association (ISA), with conferences being held in New Delhi, India in 1986, in Madrid, Spain in 1990, and in Bielefeld, Germany in 1994. In between these ISA conferences, time use researchers would meet more frequently and in 1988, in Budapest, a group of researchers, of whom Ignace Glorieux was a member at that time, decided to set up the International Association for Time Use Research (IATUR) and, under that name, organise annual time use research conferences.

The 1988 meeting in Budapest is important for another reason. During this conference, an extensive discussion was held for the first time about what the minimum requirements were for conducting time use research in order to compare different studies with one another. It would be the first impetus for the Harmonised European Time Use Surveys (HETUS) guidelines that are used to this day in the design of time use surveys in the European Member States and associate countries.

Throughout his academic career, Ignace Glorieux shared his knowledge of time use research with statistical institutions, including through working groups within Eurostat, within UNSD, or, more specifically, for example, as part of a TAIEX mission in Algeria and most recently through the World Bank in the time use study organised in Vietnam. Naturally, he also plays an advisory role closer to home, because in 1999 Statistics Belgium would make Belgium one of the first countries to carry out a large-scale time use survey based on HETUS guidelines. This study was repeated in 2005 and 2013.

Ignace Glorieux is also responsible for the analysis of the Belgian time use data. He conducted various commissioned studies, including those for the Ministries of Labour, Culture, Mobility and Equal Opportunities. In addition, as a time use expert, he is regularly asked to provide explanations in newspapers, on radio and on television about everything that is linked to time – from the time pressure people in their thirties experience to the time spent by the elderly after retirement, and from the unequal division of labour between women and men to the reorganisation of the school calendar. In addition, he regularly gives lectures to lay audiences about time and temporal structures and even holds the symbolic position of Minister of Time in the Belgian city of Tongeren.

The Belgian time use data are not the only data he has worked with. In 1999 and 2004, Ignace Glorieux was able to secure funding from the Flemish community on two occasions to carry out large-scale time use surveys among the Flemish population aged between 16 (in 1999) or 18 (in 2004) and 75 years. In comparison to the Belgian time use surveys, these time use surveys were carried out by him and his research team from the Research Group TOR. It is

unique that a university research group should conduct time use surveys under its own management. Moreover, in contrast to the Belgian time use surveys, the respondents did not fill in details of a randomised weekday and weekend day, but of seven consecutive days. This enabled a thorough study of the weekly rhythm of daily life.

A third Flemish time use survey followed in 2013 which was linked to the development of the data-collection platform for Modular Online Time Use Surveys (MOTUS). This funding came from the Hercules Fund. The 2013 time use survey was conducted entirely online – yet another unique venture in time use research.

All of these time use data gave rise to many very diverse research opportunities. Throughout his academic career, Ignace Glorieux supervised doctoral research on, among other subjects, gender division of labour (Koelet, 2005), time pressure (Moens, 2006), commensality patterns (Mestdag, 2007), career interruption (Vandeweyer, 2010), part-time work (Laurijssen, 2012), meal and cooking habits (Daniels, 2016), daily routine (van Tienoven, 2017), methodology of time use research (te Braak, 2022), a shortened working week (Mullens, 2023), and the past, present and future of time use research (Minnen, 2023). Much of this research has been presented at IATUR's annual conferences. Ignace would miss only five conferences during his academic career. In 2003 he and his research team organised the conference in Brussels and in 2013 he became President of IATUR and brought the association to Belgium. His retirement coincides with the end of his second term as President of IATUR.

But his career did not end here. The data-collection platform MOTUS appears largely to meet an international demand for measuring time in a cheaper and more twenty-first-century way (read: online through web and mobile applications) yet still in a scientifically based way. The task and time-load measurements of different groups of employees were now also part of the time use arsenal of the Research Group TOR. In 2015, he and his team organised the time-load measurement of university professors at the Vrije Universiteit Brussel (Verbeylen, Glorieux, Minnen, & van Tienoven, 2016). Several other studies followed, including the largest-to-date measurement of the time allocation of teachers in primary and secondary education in Flanders. More than 10,000 teachers would eventually sign up to participate in the study (te Braak, van Droogenbroeck, Minnen, van Tienoven, & Glorieux, 2022). In addition, MOTUS would also enter the European scene: through project funding from Eurostat, MOTUS is attracting the attention of National Statistical Institutes. The success of MOTUS led to the last type of funding that was not yet on Ignace Glorieux's résumé as a principle investigator: Innoviris funding for the

creation of a spin-off. In 2018, *hbits* was founded under the leadership of his longest-serving colleague, Joeri Minnen, with Ignace Glorieux as one of the partners. This shows not only the versatility of what time use research can do and what it can lead to, but also the versatility of Ignace Glorieux's academic career.

The book

From the above it is obvious that time use research is multifaceted in many respects: the way it is conducted, the challenges it encounters and the opportunities it presents, the purposes it serves and the topics it addresses, and the underlying theoretical grounds on which it is motivated and conducted. In line with Ignace Glorieux's multifaceted academic career, this book aims to highlight this versatility with contributions from time use experts from all over the world who have been part of his network throughout his career.

Part 1: Conducting time use research

The first part of the book touches on the versatility of conducting time use research. The first chapter to follow, by Jiri Zuzanek, focuses on the ongoing discussion of the reliability of methods collecting time use data. All methods have their advantages and limitations. In his chapter, Jiri Zuzanek focuses on the time diary method and the experience sampling method, yet not from the perspective of comparing one against the other but from the perspective of their potential complementarity.

Not only do methods vary in the field of time use research, but so do modes. Increasingly, the focus lies on moving away from paper-and-pencil modes towards digital and smart ways of collecting data on how people spend their time. In the next chapter, Joeri Minnen and Theun Pieter van Tienoven discuss the past, present and future of time use research and highlight some of the challenges of and opportunities for a paradigm shift towards new technologies.

The first written time use studies using the well-known diary method were motivated by the desire to map out how workers spend their time. After all, working hours are one of those important collective rhythms that structure our daily lives. George Bevans (in 1913) in the United States studied working men, Pember Reeves (in 1913) in the United Kingdom studied working-class families, and Stanislav Strumlin (between 1920 and 1930) studied different types of workers and the unemployed in Russia.

To this day, time use research still lends itself very well to studying economic activity. In the following chapter, Jonathan Gershuny and Michael Bittman provide two examples. First, their chapter demonstrates how the permeation of IT in daily life contributes to remote paid work and home shopping during the time of the COVID-19 pandemic. Second, their chapter focuses on the labour processes of early childhood educators and carers and demonstrates how time measurement reveals that this labour process is characterised by a large variety in short tasks that require not only rapid switching but also a great deal of multitasking.

Time use research is not limited to economic activity only. It records all daily activities throughout the day. As a result, it quickly became embraced by National Statistical Institutes (NSIs) as a measurement of living conditions, quality of life, and other social and economic indicators. In the next chapter, Juha Haaramo, Hannu Pääkkönen and Iiris Niemi take us on a journey of measuring time beyond paid work and the challenges that came with it. Even though many NSIs and other institutions, such as the OECD, the UNECE, and the Beyond GDP initiative, continue to rely on time use data, this journey is not yet at its end and challenges, such as digitalisation and the use of smart statistics, keep arising.

The last chapter of this first part takes a step back to look at time use research from a theoretically reflective perspective. Werner Schirmer argues in this chapter how Luhmann's theory of social systems can be used to understand the temporal structures of a society and to interpret the results of time use research. He explains that Luhmann sees society as functionally differentiated and that each function system creates its own time which follows from the unique rationality and operational logic related to the function it performs. In a society there is temporal incongruity and a need for temporal coordination, which leads to time scarcity and time pressure.

Part 2: Using time use data

The second part touches upon the versatility of the use of time use data to study social issues, on the one hand, and to explore their applications in various scientific disciplines, on the other. In the first chapter of this part, Laurent Lesnard and Jean-Yves Boulin show how three waves of historical time use data from 1985 until 2010 allow changes in working time estimates to be broken down into changes that arise from changes in sociodemographic characteristics and changes that can be attributed to other factors, such as policies. They reveal that in France the tax exemption for part-time work was an effective policy that reduced working time because it encouraged part-time work, especially among women.

The fact that it is mainly women who work part-time has a completely different cause, which is better understood, thanks to the insights provided by time use research. This, of course, has everything to do with the fact that women still take on the lion's share of unpaid work. In the following chapter, Lyn Craig and Liana Sayer explain how time use research has not only helped to make this previously invisible work very visible but has also helped to shed light on the mechanisms underlying the gendered division of labour.

The combination of work and family responsibilities leads to great time pressure, especially for women. Yet they are not the only ones for whom the day seems to have too few hours. Surprisingly enough, the ever-increasing reduction of working hours and the resulting increase in free time has not led to more relaxed everyday life. In fact, as Francisca Mullens and Petrus te Braak write in the next chapter, free time in modern societies has several characteristics that actually increase time pressure. Their research shows that the fragmentation, diversification, and contamination of time can actually make leisure stressful.

These characteristics of free time are largely in line with the role IT plays in our daily lives today. Using IT is much less an activity in itself and much more something we do during another activity, something which easily interrupts activities or something that facilitates an activity. In the second to last chapter, Ruben Vanderplas and Ike Pikone report on the Flemish time use survey from 2013 and show how a collaboration between media scholars and time use researchers makes it possible to study the mediatisation of everyday life and the potential opportunities that may lie ahead.

The book ends with another example of the interdisciplinary characteristic of time use research based on the possibility of time use research distinguishing between main and secondary activities. One of those main activities that is very often accompanied by a secondary activity is transport. In the final chapter, Imre Keseru, Cathy Macharis, Joeri Minnen and Theun Pieter van Tienoven investigate whether travel time is wasted or is used for other activities. This turns out to be more complex than initially assumed, as the type of auxiliary activities performed while travelling largely depend both on socio-demographic characteristics and on modes of transport.

To conclude

This book shows that time reveals a lot – much more than there is room for here. The book presents only the tip of the iceberg of what time use research allows us to study and represents only a selection of the time topics that Ignace Glorieux and his team have worked on during his illustrious career. It is obviously

impossible to give an exhaustive list, but empirically, time is of course not limited to duration alone, but the timing of activities also plays a role (Glorieux, Mestdag, Minnen, & Vandeweyer, 2009). Theoretically, activities with the same lexical meaning can have completely different subjective meanings, depending on their temporal, spatial and social context (Glorieux, 1993). Thematically, there are still several topics that are not covered in this book, including sleeping times (van Tienoven, Glorieux, & Minnen, 2014), commensality (Mestdag & Glorieux, 2009), cooking (Daniels, Glorieux, Minnen, & van Tienoven, 2012), or physical activity (van Tienoven et al., 2018). Analytically, not only the time use of women and men, or working people, is worthy of study, but also that of the unemployed (Elchardus & Glorieux, 1989), of adolescents (Glorieux, Stevens, & Vandeweyer, 2005), of the elderly (van Tienoven, Craig, Glorieux, & Minnen, 2022), or, yes, also of pensioners (van Tienoven, Minnen, & Glorieux, 2022). Methodologically, time use research still faces the challenges of a digital and smart way of data collection in an era in which respondents are less inclined to participate and concerns about privacy and security are a recurring theme (Minnen et al., 2014; Minnen, Rymenants, Glorieux, & van Tienoven, 2023).

We therefore hope that this book goes further than just a tribute to the work of Ignace Glorieux. In the context of his retirement, we offer this book in the form of free access. We hope it inspires readers to use time use research in their quest to better understand societies with all their challenges and inequalities. Let us continue to use time to reveal even more, because someday everything will be all right!

References

Bachelard, G. (1950). *La dialectique de la dureé*. Presses Universitaires de France.

Bergson, H. (2002). Concerning the nature of time. In K. Pearson & J. Mullarkey (Eds.), *Bergson: Key writings* (pp. 205-219). Continuum.

Colson, F. (1926). *The week: An essay on the origin and development of the seven-day cycle*. Cambridge University Press.

Daniels, S. (2016). *Meer dan honger stillen? Een sociaal-historisch onderzoek naar de rol van gemaksvoeding in de Belgische naoorlogse huiskeuken*. Doctoraal proefschrift. Onderzoeksgroep TOR, Vakgroep Sociologie, Vrije Universiteit Brussel.

Daniels, S., Glorieux, I., Minnen, J., & van Tienoven, T. P. (2012). More than preparing a meal? Concerning the meanings of home cooking. *Appetite*, *58*(3), 1050-1056.

Deutscher, G. (2006). *The unfolding of language. The evolution of mankind's greatest invention*. Arrow Books.

Durkheim, E. (1965 [1912]). *The elementary forms of the religious life.* The Free Press.

Elchardus, M. & Glorieux, I. (1989). De ontwrichting van het levensritme. *Mens en Maatschappij, 64*(2), 115-141.

Elias, N. (1992). *Time: An essay.* Blackwell.

Foer, J. (2008). Caveman: An interview with Michel Siffre. *Cabinet Magazine, 30*, 1-6.

Glorieux, I. (1993). Social interaction and the social meanings of action: A time budget approach. *Social Indicators Research, 30*, 149-173.

Glorieux, I. (1995). *Arbeid als zingever.* VUBPress.

Glorieux, I., Mestdag, I., Minnen, J., & Vandeweyer, J. (2009). The myth of the 24-hour society: Non-standard work hours in Belgium, 1966 and 1999. *Social Indicators Research, 93*, 177-183.

Glorieux, I., Stevens, F., & Vandeweyer, J. (2005). Time use and well-being of Belgian adolescents: Research findings and time use evidence. *Loisir et Société/Society and Leisure, 28*(2), 481-510.

Honoré, C. (2005). *In praise of slowness: Challenging the cult of speed.* HarperCollins Publishers.

Koelet, S. (2005). *Standvastige verschillen. Een analyse van theoretische benaderingen over de verdeling van het huishoudelijk werk tussen vrouwen en mannen op basis van tijdsbudgetonderzoek.* Doctoraal proefschrift. Onderzoeksgroep TOR, Vakgroep Sociologie, Vrije Universiteit Brussel.

Laurijssen, I. (2012). *Verdeeld tussen arbeid en gezin. Een panelstudie naar de context en dynamiek van de keuze voor deeltijds werk.* VUBPress.

Lewis, J. D. & Weigert, A. J. (1981). The structures and meanings of social time. *Social Forces, 60*(2), 432-462.

Mestdag, I. (2007). *Destructuration of the Belgian meal pattern? Changes in the temporal, social and spatial aspects of eating practices by means of time use data.* Doctoral thesis. Research Group TOR, Sociology Department, Vrije Universiteit Brussel.

Mestdag, I. & Glorieux, I. (2009). Change and stability in commensality patterns: A comparative analysis of Belgian time use data from 1966, 1999 and 2004. *The Sociological Review, 57*(4), 703-726.

Minnen, J. (2023). *Towards a platform for time use research. An analysis of time use research methodology to develop new ways of collecting time use data.* Doctoral thesis. Research Group TOR, Sociology Department, Vrije Universiteit Brussel.

Minnen, J., Glorieux, I., van Tienoven, T. P., Daniels, S., Weenas, D., Deyaert, J., . . . Rymenants, S. (2014). Modular Online Time Use Survey (MOTUS) – Translating an existing method in the 21st century. *Electronic International Journal of Time Use Research*, 11(1).

Minnen, J., Rymenants, S., Glorieux, I., & van Tienoven, T. P. (2023). Answering current challenges of and changes in producing official time use statistics using the data collection platform MOTUS. *Journal of Official Statistics,* Online First.

Moens, M. (2006). *Handelen onder druk. Een sociologische analyse van tijdsdruk als meervoudige ervaring.* Doctoraal proefschrift. Onderzoeksgroep TOR, Vakgroep Sociologie, Vrije Universiteit Brussel.

Mullens, F. (2023). *Time for a feminist future? A study on the impact of a 30-hour workweek on women's lives.* Doctoral thesis. Research Group TOR, Sociology

Department, Vrije Universiteit Brussel.Schöps, M. (1980). *Zeit und Gesellschaft*. Ferdinand Enke Verlag.

Sorokin, P. A. & Merton, R. K. (1937). Social time: A methodological and functional analysis. *American Journal of Sociology*, 42(5), 615-629.

te Braak, P. (2022). *Methods, modes, and measurement errors: Mapping the validity of self-administered online time diaries*. VUBPress.

te Braak, P., van Droogenbroeck, F., Minnen, J., van Tienoven, T. P., & Glorieux, I. (2022). Teachers' working time from time use data: Consequences of the invalidity of survey questions for teachers, researchers, and policy. *Teaching and Teacher Education, 109*, 103536.

van Tienoven, T. P. (2017). *Daily routines. Studying temporal structures and the organisation of everyday life*. Doctoral thesis. Research Group TOR, Sociology Department, Vrije Universiteit Brussel.

van Tienoven, T. P. (2019). A multitude of natural, social and individual time. *Time & Society*, 28(3), 971-994.

van Tienoven, T. P., Craig, L., Glorieux, I., & Minnen, J. (2022). Active participation and well-being among the elderly in Belgium and the U.S.A.: A cross-national time use perspective. *Social Indicators Research*, 160(2-3), 625-644.

van Tienoven, T. P., Deyaert, J., Harms, T., Weenas, D., Minnen, J., & Glorieux, I. (2018). Active work, passive leisure? Associations between occupational and non-occupational physical activity on weekdays. *Social Science Research*, 76, 1-11.

van Tienoven, T. P., Glorieux, I., & Minnen, J. (2014). The impact of work and family responsibilities on healthy sleep habits. *Time & Society*, 23(2), 235-257.

van Tienoven, T. P., Glorieux, I., Minnen, J., Daniels, S., & Weenas, D. (2013). If only the French Republicans had known this: The week as a social fact. *Societies*, 3(4), 399-413.

van Tienoven, T. P., Minnen, J., & Glorieux, I. (2022). Zeeën van tijd, maar wat te doen? Over de invulling van vrije tijd na het pensioen en de invloed van de beroepssector. *Gerōn: Tijdschrift over ouder worden en samenleving*, 24(4), 1-4.

Vandeweyer, J. (2010). *Werkt loopbaanonderbreking? Arbeidsoriëntaties, tijdsbesteding en drukte bij loopbaanonderbrekers in Vlaanderen*. VUBPress.

Verbeylen, J., Glorieux, I., Minnen, J., & van Tienoven, T. P. (2016). Wetenschap als roeping. Een onderzoek naar werkdruk en jobtevredenheid bij academici. *Sociologos*, 37(4), 309-327.

Withrow, G. (2003 [1975]). *What is time? The classic account of the nature of time*. Oxford University Press.

Zerubavel, E. (1982). *Hidden rhythms. Schedules and calendars in social life*. The University of Chicago Press.

Time use and experience sampling method research: how complementary?

Jiri Zuzanek

Academic and popular publications are paying growing attention to the problems of time use, time pressure, and their emotional connotations. The heightened interest in *substantive* issues, whether we are gaining or losing free time, are more or less pressed for time, and how these factors affect the quality of our lives, calls for greater attention to the *methodological* problems of studying the use of time and its well-being implications.

How reliable and valid are the data used for the analysis of time use? What causes frequent discrepancies in estimating the length of working hours? How much do we know about the experiential connotations of different types of activities?

These concerns are reflected in the ongoing debate about the comparative merits and limitations of research instruments used in the study of time use – such as time diaries, experience sampling reports, "stylised" estimates of time use, event inventories and others (Juster, Ono, & Stafford, 2003; Niemi, 1995; Robinson & Gershuny, 1994).[1]

In this chapter, these questions will be addressed, based on the findings from two surveys: the 2005 Canadian General Social Survey (GSS) and the 2001-03 Experience Sampling Method (ESM) survey, conducted under my direction at the University of Waterloo.[2]

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1   "Stylised" time use estimates usually refer to retrospective estimates of weekly hours of paid work.

2   The 2001-03 ESM survey was directed by J. Zuzanek (principal investigator) and R. Mannell, and supported by a strategic SSHRC grant. Additional insights into the relationship between recall and instantaneous measures of time use and subjective well-being were gained by the author from three ESM surveys, carried out with R. Mannell, at the University of Waterloo in 1982, 1985, and 1987. Some of the issues covered in this chapter were covered by the author in a presentation to the workshop *Time Use Measurements and Research,* organised in

The 2005 GSS survey continued the tradition of Canadian national time use surveys, begun in 1986. In it, the respondents were asked to recall activities conducted during a designated day preceding the interview. Time use was computed by summing up the duration of all activities encompassing 24 hours of the day, grouped into larger activity categories. The survey contained a number of recall questions about respondents' subjective well-being and health, including questions about the enjoyment of daily activities, life satisfaction, feelings of time pressure and stress. The sample size of the survey was 19,597.

The 2001-03 ESM survey was conducted in the Kitchener-Waterloo and metropolitan areas of Toronto, Ontario, and included 218 adults and one of their teenage children. The survey of the adults did not record the duration of activities, nor did it capture the entire 24-hour day, but covered only its waking hours. The respondents carried pre-programmed wristwatches that were activated randomly during their waking hours, usually in two-hour intervals, for one week.

At the time of a beep, the respondents were asked to fill in short self-reports (bound in a booklet) and record what they were doing, where they were, and who they were with, in addition to their subjective feelings. The filling in of each self-report took approximately 1.5 to 2 minutes. The signal response rate in the adult part of the 2001-03 ESM survey was 85 %.

The time duration of activities in the 2001-03 ESM survey was computed as the percentage of episodes of each activity, grouped into categories, similar to those used in time diary surveys.

Comparison of the time diary and ESM data was made easier by the fact that the data used in my analyses came from two surveys, which were positioned close to each other in time, used a number of similar questions, and applied reasonably close activity coding procedures.

The comparison of *time diary*, "stylised" *time estimate* and ESM *episode* findings was facilitated by the fact that the teenagers' part of the 2001-03 ESM survey contained, along with the questions about activities performed at the time of the beep, questions about the duration of the activities, performed during the day preceding the survey (time diary), and "stylised" estimates of time use on a "typical" school day.

In examining the comparative merits and limitations of time diary and ESM surveys, I focus on four issues:

2000 in Washington, D.C. by the US Committee on National Statistics and in the article *Time use research in Canada – History, critique, perspectives,* published in the *Electronic International Journal of Time Use Research* (2009). I would like to thank R. Mannell and R. Larson for their valuable suggestions and comments on my submission.

(1) How do the findings about the *duration* of daily activities, collected by time diary surveys, compare with the findings generated by the experience sampling surveys?

(2) Do the findings about the *enjoyment* of performed activities and *subjective well-being (SWB)*, collected by time diary studies, differ from the findings of the ESM surveys?

(3) What substantive and methodological problems and challenges are faced by time use and ESM surveys in the analyses of key quality-of-life concerns?

(4) Are time diaries and ESM self-reports competing or complementary research instruments?

However, before comparing the time diary and the ESM findings, a brief account of the history of time use and ESM research is appropriate.

History of time use and ESM research in a nutshell

Time use research

The beginnings of time use research are somewhat obscure. The use of "time budgets" for the study of everyday human behaviour may have been initiated at the end of the nineteenth century by the American sociologist, Franklin Giddings, who gave his students practical assignments involving observations of the respondents' behaviour over several days. These assignments provided data for the analyses of everyday behaviour as a function of the respondents' belonging to particular social groups (see Byzov, 1923/2, p. 42).

In 1913, time use data about the uses of spare time by New York workers were collected by George Bevans as part of his doctoral dissertation at Columbia University. Much of the statistical evidence about working hours, wages earned, and leisure activities collected in this survey was presented by the author in tabular form (see Bevans, 2018).

At approximately the same time, time diary techniques were, according to Gershuny (2000), used by the Fabian movement supporter, Maud Pember Reeves, to map patterns of the daily life of working families in Britain.

In the 1920s and 1930s, a number of time-budget surveys, examining changing patterns of daily life, were conducted in the Soviet Union under the direction of Stanislav Strumilin (see Strumilin, 1957).

In the United States, in 1933 and 1934, George Lundberg and his associates collected time use data in the Westchester County of New York State as part of their study of leisure behaviour.

In 1939, Pitirim Sorokin and Clarence Berger's book *Time budgets of human behaviour* was published by the Harvard University Press. Wider use of time use studies began, however, only after the Second World War. Perhaps the best known and most often quoted of these studies was conducted in the 1960s in twelve countries, including the United States and the USSR, under the auspices of UNESCO and the direction of the Hungarian economist, Alexander Szalai. The results of this study were published in 1972 in a collectively written monograph, *The use of time*.

After this, time use surveys began to be conducted – often by national statistical agencies – in a growing number of countries.

In the United States, time use surveys were carried out in the 1970s and 1980s under the direction of John Robinson and Thomas Juster. In 2003, the US National Statistical Office launched the *American Time Use Survey* – probably the biggest of its kind so far.

In the 2000s, European countries put in motion the *Harmonised European Time Use Survey* (HETUS), which included at the beginning fifteen and in 2010 eighteen countries.

The Multinational Time Use Study (MTUS) was initiated in the 1980s by Jonathan Gershuny and is supported today by the Centre for Time Use Research at the University College London. It houses the largest collection of comparative and historical time use data and brings together more than a million diary days, which allows researchers to analyse time use over the past 55 years across 30 countries.

Experience sampling method research

Experience sampling surveys originated, according to Hormuth (1986, p. 262), in the 1960s, when "behavioural observations gained a foothold in psychology and medicine". The potential for a research strategy, resembling experience sampling, was, however, envisaged long before that.

In 1934, George Lundberg wrote in *Leisure: A suburban study*:

> The ideal method of securing a detailed record of activity would presumably be to assign an investigator (preferably unseen) with a stopwatch and a motion picture camera to follow an individual during every minute of the twenty-four hours, or at least during his waking hours. Since this technique is not generally practicable in the present stage of social research, we are faced to

rely on the next most adequate method, namely, the individual's own account of his activities (1934, p. 88).

Experiments with experience sampling research may have started in the 1960s, but the *Experience Sampling Method* (ESM), as we know it today, was developed in the mid-1970s by Mihaly Csikszentmihalyi and his students at the University of Chicago.

The first systematic ESM survey was conducted in 1976. It examined the daily experiences of 107 workers in the Chicago area. Once the project had been launched, the method, according to Csikszentmihalyi, "took on a life of its own, independent of the users' intentions" (Csikszentmihalyi & Csikszentmihalyi, 1988, p. 253).

ESM fascinated researchers with its ability to provide detailed insights into respondents' changing daily behaviour and emotional states. As a result, the beginnings of ESM research were, according to Csikszentmihalyi, primarily "data- and method-" rather than "concept-"driven (Csikszentmihalyi & Csikszentmihalyi, 1988, p. 253).

Much of the original ESM research was psychologically oriented and focused on the analysis of the qualitative aspects of daily life such as experiences of freedom, alienation, loneliness, intrinsic motivation, anxiety, boredom, and emotional and cognitive well-being (Larson, Csikszentmihalyi, & Graef, 1980).

A major theme in the ESM research of the 1980s and 1990s was the study of optimal or "flow" experiences in work, leisure, and daily life (Csikszentmihalyi, 1990). Considerable attention was paid to the study of the emotional lives of adolescents, their relationships with parents, performance at school, and conditions of long-term academic achievement (Csikszentmihalyi & Larson, 1984; Kleiber, Larson, & Csikszentmihalyi, 1986; Larson & Richards, 1994). ESM studies were also used to examine behavioural and experiential correlates of psychological and mental health disorders (Myin-Germeys, Oorschot, Collip et al., 2009).

It is fair to say that while the interests driving time use surveys were primarily sociological and economic, the interests driving most ESM surveys were (and still are) primarily social–psychological.

Method

Comparisons of the 2005 GSS time diary and the 2001-03 ESM findings pose a number of research problems. To make comparisons between the GSS and ESM findings possible and to match the demographic profiles of the two

surveys, GSS samples in Tables 1, 4 and 6 were limited to 30-59-year-old full-time employed parents with at least one child, and the ESM respondents to the full-time employed parents (55 % of the sample).

To compare GSS and ESM time duration findings, reported in *minutes*, with the ESM *percentage* findings, time diary findings had to be converted to percentages – by dividing minute figures by 960 (i.e., the approximate minute duration of the waking hours).

Not all of the activities were coded similarly in the GSS and ESM surveys. Travel in the 2001-03 ESM survey – unlike in the GSS – was attributed to the means of transportation rather than to specific activities (such as work and shopping). Duration comparisons had therefore to be limited to approximately 80 % of episodes.

Another challenge was the use of different rating scales in measuring subjective well-being. Some measures, rated in the ESM survey on 1-7 scales, were rated in the GSS on five-point or ten-point scales. To ease the comparisons and visualise the findings, these scales had to be evened up.

In dealing with differences in the findings, based on *instantaneous* (ESM) and *recall* measures of time use, I distinguished between two types of recall: the *focused recall* of time diary surveys, tied to a *particular day* and a *particular time*, and *stylised* recalls or generalised estimates of *typical* time use, as reported by the respondents. While there is a considerable accord between *instantaneous* time use findings and the *focused* time diary ones, this does not apply to the *stylised* recall estimates of time use or generalised assessments of well-being. In estimating the duration of activities and their attitudinal accompaniments, the respondents seemed to report what could be "expected" rather than what was "real".

The ESM data of participation in daily activities and subjective well-being are examined in the following analyses at two different levels: the *instantaneous* episode level and the *aggregated* (person-based) level. In the first type of analyses, ESM self-reports (beeps) are treated as separate units. When examining emotional connotations of different daily activities, this allowed the full slate of observed data to be used.

The *aggregated* person-based measures capture the *frequency* of the respondents' participation in various activities and their weekly *means* of subjective well-being, which makes these measures more suitable for comparison with the person-based time diary data.

A more detailed account of the problems faced in the analyses of ESM data can be found in Csikszentmihalyi and Larson (1987) and Alliger and Williams (1993).

Time use and ESM findings compared

Duration of time

Table 1 compares the duration of daily activities, reported in the 2005 GSS and 2001-03 ESM surveys.

Table 1. Duration of daily activities: comparison of time diary and ESM findings

	GSS 2005		ESM 2001-03
	minutes	%	%
Paid work (no travel)	373.1	38.9	33.4
Domestic work (no travel)	124.0	12.9	12.6
Cooking	31.3	3.3	3.6
Housework	71.7	7.5	6.7
Shopping	21.0	2.2	2.3
Childcare	38.5	4.0	3.2
Personal care	36.6	3.8	3.8
Meals at home	49.4	5.1	5.8
Study time	3.02	0.3	0.2
Free time	210.3	21.9	22.6
TV and video	89.1	9.3	8.2
Socialising	40.6	4.2	4.0
Reading	13.2	1.4	2.8
Sports, exercise, outdoors	23.3	2.4	1.6
Attend cultural and sporting events	9.5	0.1	0.3
Hobbies, including arts and crafts	2.8	0.3	0.3
internet, computer and video games	9.1	0.9	1.1
Volunteering	1.8	0.2	0.3
Religion, praying	3.92	0.4	0.5
The sum of compared activities	840.6	87.5	82.4

When comparing the findings of the GSS and ESM surveys, we should keep in mind that, compared to the 20,000 GSS respondents, the ESM sample of 218 adults was relatively small. This was only partially compensated for by the fact that they generated a total of 10,453 instantaneous self-reports.

We need also to consider differences in the coding of activities (as in the case of travel).

On the other hand, it is worth mentioning that the Kitchener-Waterloo and larger metropolitan Toronto areas, which were used for the collection of the ESM adults' and teens' data, are often chosen by commercial organisations to assess Canadian consumers' preferences.

Keeping all of this in mind, we have to acknowledge that the findings of the 2005 GSS and 2001-03 ESM surveys about the duration of daily activities are surprisingly, perhaps even astonishingly, close.

Activities in which ESM findings, reported in Table 1, exceeded the GSS ones by more than ten per cent included only cooking, meals at home and reading, whereas activities in which ESM durations fell short of the GSS ones by the same percentage included paid work, watching TV, socialising, and attending cultural and sporting events.

One can only speculate about what, apart from sampling, could have caused these differences. Perhaps some TV watching occurred past 22:30, when the ESM signals stopped coming. Perhaps some of the time spent at work was reported and coded in the ESM survey under different headings.[3] It is conceivable that "munching on the go", while readily reported if it occurred during a beep, was omitted in the time diaries.

Table 2 compares the duration of *teens'* daily activities measured as (a) the *estimated* duration of selected activities on a "typical school day", (b) the duration of daily activities on the day preceding the survey, and (c) the percentages of activities reported by the teens, responding to the signals during the survey week (on average, they responded to 45 of the 56 beeps).

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3   The 34.1 % of the episodes, reported "at the workplace", exceeded the percentage of paid work episodes by 2.1 %.

Table 2. Duration of daily activities performed by Ontario teens on a school day: time estimates, time diary reports, and ESM episode findings

Schooldays	ESM (typical school day)		ESM (time diary)		ESM (beep)
	minutes	%	minutes	%	% episodes
Class time			385.2	40.1	17.3
Homework	114.8	12.0	83.8	8.7	7.8
Paid work			37.8	3.9	5.3
Domestic work	44.6	4.6	32.9	3.4	3.5
Shopping			5.2	0.5	0.9
Eat at home			36.5	3.8	8.2
Personal care			49.6	5.2	4.7
Free time			266.8	27.8	33.8
Socialising with friends	125.5	13.1	70.6	7.4	5.8
Watching TV and videos	100.3	10.4	75.8	7.9	10.2
Internet for fun, email, comp games	59.4	6.2	36.4	3.8	4.8
Sports, exercise, walking, bicycle			27.2	2.8	4.5
Reading			19.4	2.0	2.8
Voluntary activities			13.8	1.4	0.3
Religion, praying			7.4	0.8	0.07
Minutes or % wake-up activities		46.3	919.0	95.6	82.5
Sleep			476.8		
Total			1,395.8		

Note: Findings in this table refer to the 15-19-year-old teens.

There are pronounced differences between the findings based on teens' "stylised" time estimates and the corresponding time diary and beep figures.

Estimates of how much time was spent by the teens on a "typical school day" doing homework, domestic work, socialising with friends, watching TV or video, and using the internet were higher than the corresponding time diary and beep figures. The estimated time of socialising with friends more than doubled the time reported in time diaries or at the beep level. The estimate of time spent using the internet for fun was 1.5 times higher than the corresponding time diary and beep figures.

The discrepancies above substantiate scepticism with regard to the validity of stylised questions in assessing "real life" durations of daily activities (see Robinson & Gershuny, 1994).

The differences between *time diary* and *beep* level findings, reported in Table 2, point to measurement problems encountered in the use of ESM findings for the assessment of the duration of activities. There is a big difference between *time diary* and *beep* assessments of time spent by teens in class. This time is, clearly, *underreported* in the beep part of the survey. The 40.1 % *time diary* figure is much closer to the seven hours normally spent by kids in school (from 08:00 to 15:00) than the 17.3 % *episode* figure.

The low beep figure of attending classes is, in all likelihood, caused by the discomfort of being beeped and having to respond to it in a classroom situation (the schools permitted students to carry pagers in class).

The lower figure of class attendance inadvertently increased ratios of participation in most other daily activities. As a result, the share of the school-day free time episodes rose to 33.8 % of the wake-up time compared to 27.8 % in the *time diaries*.

Situational inconvenience is clearly a factor that needs to be taken into consideration when using ESM findings for the assessment of the duration of daily activities – an issue discussed in greater detail in the concluding part of this chapter.

Time use and subjective well-being

Tables 3, 4 and 5 compare findings about the relationship between time use and subjective well-being, based on GSS and ESM data.

The measures used in the GSS and the ESM surveys to collect information about subjective well-being differed. The respondents in the 2005 GSS survey were asked to rate their enjoyment of most daily activities on a five-point scale and to rate on the same scale their level of life satisfaction. In the 2001-03 ESM survey, subjective well-being was measured by *affect* – a composite measure of feeling happy, good and cheerful (alpha = 0.84).

How legitimate is the comparison of findings, based on these two different measures? A partial answer to this question can be found in a 1985 ESM survey, conducted by this author at the University of Waterloo, in which respondents were asked, along with *affect* questions, to rate how much they enjoyed activities, performed at the time of a beep. The correlation between these two measures was positive and fairly strong (r = 0.49), confirming the closeness of

these two measures in the assessment of the emotional appeal of performed activities.

Table 3. Correlations between recall and instantaneous measures of subjective well-being (2001-03 ESM)

Recall questions ESM beep aggregates	Happy (1-4)	Lonely (1-4)	Depressed (1-4)	Bored (1-5)	In control of life (1-5)	Stressed (1-4)	Time-pressed (1 -4.5)
Felt happy (1-7)	0.44						
Felt lonely (1-5)		0.61					
Felt depressed (1-5)			0.55				
Felt bored (1-5)				0.31			
Felt in control of the situation (1-9)					ns		
Felt stressed (1-5)						0.43	
Felt pressed for time (1-9)							0.53

Note: Findings reported in this table are controlled for employment status, gender, age, and education.

According to Table 3, correlations between participation in daily activities and subjective well-being, based on instantaneous and recall questions, were – with the exception of "being in control of the situation" – positive and reasonably strong.[4]

And yet, as shown in Table 4, the GSS recall findings about the enjoyment of daily activities and the ESM findings of the instantaneous *affect* ratings of the same activities tell us different stories about the emotional content of daily activities.

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4   People think that they have more control over their life than seems to be the case in real-life situations.

Table 4. Enjoyment of daily activities at the recall and instantaneous levels

	GSS 2005	ESM 2001-03 beep	
	enjoy the activity (1-5)	affect (1-7)	affect converted to 1-5
Supper at home	4.28	5.45	3.89
Dining in a restaurant	3.99	5.66	4.04
Paid work	3.85	5.08	3.63
Going to movies, plays, sports events	3.78	5.70	4.07
Cooking	3.33	5.33	3.81
Watching TV	3.31	5.14	3.67
Working as a volunteer	3.25	5.33	3.81
Doing repairs and maintenance of the house	3.17	4.97	3.55
Participating with clubs or social org	3.05	5.18	3.70
Non-grocery shopping	2.85	5.32	3.80
Grocery shopping	2.72	5.38	3.84
Cleaning the house	2.42	5.16	3.69

The data reported in Table 4 show that the ESM respondents were much more tolerant in their ratings of activities, pursued at the time of the beep, than they were when asked to appraise the same activities at the generalised recall level. The 4.28 rating of the *supper at home* – the activity most enjoyed in the GSS survey – exceeded the rating of the lowest-ranked activity of *house-cleaning* by 77 %. At the instantaneous ESM level, the difference between the highest-rated activity of *attending cultural and sporting events* (5.70) and the lowest-rated activity of *house repairs and maintenance* (4.97) was only 15 %. In short, the ESM ratings were much more *compressed*.

We seem to be more forbearing in our assessment of the joys and pitfalls of life at the instantaneous level than at the generalised recall level. When we "recall", we often think of an ideal world rather than the one in which we live our daily lives.

As Anton Chekhov wrote in the story *Life is wonderful* in 1885:

> Life is a most unpleasant thing, but to turn it wonderful is not that difficult. For this you need not win 200,000 roubles, be awarded the Order of the White Eagle, marry a beauty, or gain respect – all of these boons are perishable and eventually become a habit. To experience happiness without interruption, even in moments of grief and sorrow, one needs to be: (a) content with the present, and (b) rejoice that it "could have been much worse" (1946, p. 272).

The respondents in the ESM survey seemed to follow Chekhov's advice that it is better to like what we are doing than not to do so.

Table 5. Correlations between subjective well-being and participation in main daily activities (GSS and ESM)

	GSS – life satisfaction (recall, 1-5)	ESM – affect (episode level, 1-7)	ESM – affect (aggregate level, 1-7)
Paid work	−0.046	−0.052	−0.080
Domestic work	−0.014	ns	0.168
Free time	0.018	0.029	−0.118

Note: Linear regression, controlled for respondents' employment status, gender, age, and education.

According to Table 5, based on the analysis of the entire GSS and ESM samples, paid work generated a negative emotional response at both the *recall* (GSS) and the *instantaneous* (ESM) levels. The assessment of the emotional aspect of domestic work was marginal at the recall level and not significant at the episode level. Free time seemed to generate a positive emotional response at both the recall and the instantaneous levels.

But beware of the change, if we were to examine the above relationships not at the *instantaneous* but at the *aggregated* or summary level (for the difference between these two measures see section 2).

Those respondents reporting a greater number of paid work episodes per week (the workaholics?) seemed to be less happy than suggested by the correlation coefficient of paid work and affect at the episode level. This coefficient fell from −0.052 at the instantaneous level to −0.080 at the aggregate level.

More frequent involvement in domestic work, in contrast, raised rather than lowered the respondents' contentment with their lives. The correlation coefficient of affect and involvement in domestic work activities, which was insignificant at the instantaneous level, rose to 0.168 at the aggregate level. Chekhov's "you'd better like what you are doing" did not apply to paid work but seemed to apply to domestic work.

The situation with regard to free time is more perplexing. The correlation between affect and free time participation was positive at both the *recall* (GSS) and the *instantaneous* (ESM) levels but turned negative at the ESM *aggregate* level (0.018 and 0.29 respectively compared to −0.118).

In short, the respondents assessed participation in free time positively when they engaged in it, but greater (perhaps excessive) involvement in free-time activities across the survey week was associated with a lower mean weekly affect score. In layman's language, respondents felt "fine" and happy, when they engaged in free-time activities but not so happy with the rest of their lives. Frequent, and possibly disproportionate, free-time participation did not sustain its positive emotional effect in the other parts of life.

It may be symptomatic that the weekly *mean affect score* of those respondents whose behavioural profile included *more* than 35 % of free-time episodes was 5.11, whereas those respondents whose behavioural profile contained *fewer* than 20 % free-time episodes, reported a mean weekly affect score of 5.21 (not in the tables).

It is hard to tell, based on the available evidence, whether the above findings are due to the fact that people who felt less happy were looking to leisure as an escape or because a disproportionate frequency of leisure episodes led, in the end, to emotional fatigue. In any event, it is fair to say that instantaneous ESM self-reports provide a more refined vision of the relationship between time use and subjective well-being than the findings based on recall.

Time use, time pressure and stress

As already mentioned, concerns about the effects of time pressure on personal well-being and health have enjoyed the increasing researchers' attention since the 1970s (Coverman, 1989; Lehto, 1998; Linder, 1970; Zuzanek, 2004).

According to Cooper and Cartwright (1994), many health problems and almost half of all premature deaths in the United Kingdom could be attributed to lifestyle and stress-related illnesses. To many researchers working in the fields of public health, social medicine, sociology, psychology, family studies, and epidemiology, cultural and lifestyle factors of the time crunch and stress appeared to affect population health no less than genetics or environmental factors (see Denovan & Dagnall, 2019; Evans, Barer, & Marmor, 1994).

Table 6 compares levels of perceived time pressure and stress reported by respondents in the 2005 GSS and the 2001-03 ESM surveys. Do the time diary and the ESM findings tell us similar or different stories?

Table 6. Well-being effects of time pressure: GSS and ESM findings

GSS (recall)		ESM (aggregated means)	
	time pressure (1-10)		**pressed for time** (1-9)
Life satisfaction (1-10)	−0.236	affect (1-7)	−0.242
Stress (1-5)	0.462	stressed (1-5)	0.402
Health (1-5)	−0.151	health (1-5)	−0.200

Note: Linear regression coefficients, controlled for employment status, gender, age, and education.

Data reported in Table 6 support Cooper and Cartwright's observations about the negative health effects of time pressure. Regression analyses (not reported in the tables) show that a higher sense of time pressure correlated with higher education, longer hours of work, and a lack of control over one's life or time at *both* the *macro* (recall) and the *micro* (beep) levels.

The findings reported in Tables 1 to 6 provided an opportunity to assess the advantages and the challenges faced by the time diary and the ESM surveys in the study of time use and well-being.

Pros and cons of time diary and ESM research methods

Time diary studies: pros

As observed by Robinson and Converse (1972, p. 19), timediaries offer "a unique view of the intersection between the imperatives of the human condition and the range of individual behavioural choice" and provide a relatively bias-free and universal measurement of human behaviour. Some reasons are given below.

(1) Unlike money, time expenditures need not be converted into "constant" dollars or other monetary units.

(2) Time diary data measurements provide true "ratio scales" of human behaviour. The amount of time spent in one activity always affects and is affected by the amount of time spent in the others. This makes timediaries uniquely suited to the analyses of the trade-offs in human behaviour.

(3) Unlike "stylised" estimates of time use, which focus on selected daily or leisure activities, the time diary studies – by focusing on human behaviour during the entire day of the survey or the day preceding it,

covering the whole range of human activities and reporting it in short intervals – reduce the possibility of inflating participation in socially desirable or normatively approved activities.

Time-budget data are particularly well suited for the analyses of social differences in human behaviour (stratification), analyses of social change (trend analyses), and comparative analyses of life patterns in different countries and cultures (comparative or cross-cultural studies).

Time diary studies: challenges

One of the main challenges faced by time diary studies is the coding and classification of activities. How comprehensive and functional are the activity categories used in the time diary studies and what rationale, except for tradition and convenience, is there for classifying activities the way we do?

F. Stuart Chapin, in *Human activity patterns in the city: Things people do in time and in space* (1974), pointed out that every activity has a number of properties, which should be kept in mind when it is coded. Apart from the duration, activity has a place in the sequence of events. It may involve only one participant or may be shared with others. It may require the respondent's total involvement or be accompanied by other activities. Activities may have different purposes, including the purpose of serving another activity. All of these factors need to be taken into account when building classification systems of activities (Chapin, 1974, p. 37).

Classifications of activities depend, according to Chapin, largely on their purpose. A concern with shopping as a phenomenon of *culture* may be well served by the broadest definition. A concern with *public transportation* would benefit from separating shopping travel from shopping "per se".

Jonathan Gershuny, in *Changing times. Work and leisure in postindustrial society* (2000), dealt in great detail with problems associated with the coding and classification of activities into group categories, which are "necessarily constrained and standardised" (p. 255). Are you watching TV, he asked, "if the TV is switched on in a room, in which you are also cooking dinner and calming a crying child?" (p. 252).

Similar problems were faced by the ESM respondents when they were beeped in a similar situation. A lack of clarity and consistency in the coding and grouping of daily activities leads to different assessments of their duration. What seems to be overlooked in academic and public policy discussions about the length of working hours, Kubey, Larson, and Csikszentmihalyi (1996, p. 114) wrote, is the *composition* of working hours: "One simple but intriguing

ESM finding from the world of work shows that workers actually report working only about 65 % of the time they are at their jobs."

This finding was corroborated by the 1985 and 1987 ESM surveys conducted by this author at the University of Waterloo. The ESM data may help us to assess how much "slack" there is at the workplace and also how much of it is indispensable for the employees' peace of mind and overall satisfaction.

There are limitations to what time use research can do. As with any research instrument, time diaries do not always provide answers to questions that interest us. Time diary surveys are not the best instrument to measure participation in infrequent leisure activities, and attempts to use sophisticated statistical procedures (e.g., *tobit* regression analysis) to circumvent these limitations are problematic, in particular, because there are simpler methods (frequency of participation surveys) of obtaining the required information.

The ESM findings call into question the common practice in time diary studies of classifying adult and special interest education as part of free time. Experiential connotations of the employed adults' study put it closer to work than to leisure (see Zuzanek, 2000).

Housework obligations and childcare contain activities with different experiential profiles. For instance, gardening is experienced differently from cooking, laundry, home upkeep, or bookkeeping; and playing with children elicits a different emotional response from physical childcare.

The classification of "interstitial" activities poses, likewise, serious problems for ESM studies. Talking to a spouse cannot be always qualified as free time, but it does not fit the experiential profile of family obligations either. By drawing attention to the experiential ambiguity of activities, ESM surveys can provide valuable information about their more refined and functional grouping.

It has been suggested that time use surveys do not provide vital information about the meaning and motivation of human behaviour. Allegedly, they do not tell us why people engage in various activities and what meaning they attach to what they are doing. This was partly true of the early time diary studies, but today's time use surveys usually contain questions about respondents' subjective well-being, their enjoyment of different activities, feelings of time pressure, stress levels, health, etc. It is nevertheless true that time diaries do not monitor the experiential dimensions of life in their behavioural context, something that ESM surveys do.

Another important problem faced by time diary studies is the growing non-response rate or "survey fatigue". The non-response rates of time use surveys have increased lately in most countries. In the Netherlands, where time diary data were collected by personal interviews over a full week, the non-response

rate rose from about 5 % in the early 1970s to 45 % in the late 1990s (van Bochove, 1999).

In Canada, where time diary data are collected by telephone for only one day, the response rate, which originally approached 80 %, fell in the 2010 and 2015 GSS to 55 % and 38 % respectively. The reasons for falling response rates in time diary surveys are manifold and deserve separate attention (see Zuzanek, 1999).

ESM surveys: pros

Unlike traditional experimental and laboratory studies, ESM research offers us an "in situ" (contextual) rather than an "in vitro" (outside of the living body) vision of daily life. Time estimates or time diary studies reconstruct patterns of daily behaviour post factum, use attitudinal measures independently of their immediate behavioural context, and focus primarily on the *quantitative* dimensions of daily life (duration). In contrast, ESM surveys examine the process of daily behaviour as a structured sequence of *qualitative* experiences, precisely anchored in time (Csikszentmihalyi & Larson, 1987).

By providing researchers with an opportunity to assess immediate and circumstantial meanings and motivations of human behaviour, ESM studies have greatly contributed to our understanding of the dynamics of everyday life.

The ESM surveys capture daily behaviour and psychological states "at the level at which they are manifested – that is within the immediate time frame" (Alliger & Williams, 1993, p. 528). The "immediacy" of *instantaneous* ESM observations greatly reduces the potential for the failure of recall and the normative or "social desirability" bias. According to Kubey, Larson, and Csikszentmihalyi (1996, p. 105), "the very randomness of the signals reassures respondents that researchers are not trying to probe one specific behaviour or ability." This reduces possible distortions associated with the "magnifying glass effect" of over-reporting activities that are focal to the researchers' interests.

ESM surveys also reduce considerably the so-called "reflexivity" bias, that is, the attempts of the respondents to figure out what purposes their responses may eventually serve. By their very nature, ESM surveys (similarly to the time diary ones) absorb respondents' attention, leaving relatively little room for possible "editing" or manipulation of the responses.

ESM surveys contribute to a better understanding of the situational variations in human behaviour and subjective states related to the physical location of the activity, its social context, and its temporal location within weekly and daily cycles of behaviour. These variations are largely beyond the

reach of traditional recall questionnaires, which often overlook important situational and "within-person differences" (Alliger & Williams, 1993, p. 529).

ESM surveys may help researchers to refine the classification of several daily activities that seem to "fall between the cracks" and pose considerable coding difficulties.

ESM surveys are exceptionally well suited for the study of the behavioural and experiential dynamics of *interpersonal relations*. By beeping several members of the same family simultaneously, Larson and Richards (1994) were able to draw attention to the phenomenon of "unmutual togetherness", that is, of family members being physically together but emotionally apart. The fact that human behaviour and emotional states are observed repeatedly for a period of a week provides an opportunity to trace "emotional paths" of experiences, tying the present emotional experiences of the family members to the experiences of the same or other family members at the time of earlier beeps.

One is inclined to agree with Stone and Shiffman (1992, p. 127) that, when conducted well, ESM studies can provide "an unparalleled wealth of data", useful for responding to a variety of research and policy concerns.

ESM surveys: challenges

As with any method of data-gathering, ESM has its advantages but also its limitations. The shortcomings of the ESM surveys are traditionally subsumed under four headings:
 (1) self-selection bias and intrusiveness
 (2) lack of standardisation
 (3) incomplete coverage (recording waking hours only)
 (4) high financial and human resources cost that places constraints on representative sampling.

In three of these instances (i.e., except standardisation), time diaries seem to offer a better bargain than ESM.

(1) Self-reflection bias

The self-selection bias poses a serious problem for ESM research. Participation in an ESM study does not require particular intellectual skills, but it presupposes respondents' interest and commitment. Csikszentmihalyi and Larson (1987) reported that respondents in one of their surveys included adults who spoke little English and had only a few years of grammar school education, but the rate of volunteering among these workers was low. The 75-85 % "signal response rate"

reported in the ESM surveys reflects respondents' commitment to responding to the beep signals, but cannot be interpreted as a response rate in the traditional sense. The experience of this author and his colleagues in recruiting participants for ESM surveys tells us that one of the most serious challenges faced by ESM research is moving from purposive to representative sampling. In my discussion of the 2001-03 ESM survey findings (Table 2), I drew attention to the negative effects of "situational inconvenience" on the accuracy of reporting daily activities, such as students' class attendance. According to Stone and Shiffman (1992, p. 127), ESM data collection is intrusive and often "places severe response burdens on subjects". It is also important to mention that ESM surveys may carry some administrative risks. In our increasingly "litigation-prone" environment, one cannot ignore the risk of beeping a person working on a roof or attempting suicide (both real-life incidents reported by Kubey, Larson, & Csikszentmihalyi, 1996).

(2) Lack of standardisation

As indicated in my comparisons of the 2005 GSS and the 2001-03 ESM findings, problems of standardisation, consistent coding and classification pose serious challenges to both time use and ESM studies.

(3) Incomplete coverage

The problem of *incomplete coverage* is, obviously, out of ESM's reach without infringing upon respondents' privilege of uninterrupted sleep.

(4) High financial and human resources cost

Administering ESM surveys is a costly undertaking, although Kubey, Larson, and Csikszentmihalyi (1996, p. 100) have stated that "ESM is an atheoretical, general-purpose research tool, that can be used to probe an almost limitless number of theoretical and applied questions". There are, however, practical limitations to doing this. According to Stone and Shiffman (1992, p. 127), the highly intensive assessment strategies of the ESM surveys "carry severe limitations and costs; they are expensive to implement, both in human resources and hardware purchases".

The ESM surveys are best suited to studying qualitative dimensions of human behaviour, if guided by a specific substantive and conceptual perspective and using a well-defined sample, but may not be easy to implement at a representative national level. In addition to the coding and classification

problems, time use and ESM surveys face the problem of capturing respondents' simultaneous participation in several activities, which is sometimes unjustifiably referred to as the "deepening" of time (Godbey, 1976). How much of our daily time is spent doing several activities at the same time (multitasking)? What level of concentration and tension is associated with this? Unfortunately, neither time diary nor ESM surveys have responded to these questions in sufficient detail, although both methods are probably suited to doing so.

Before turning to the closing question – of how complementary time diary and ESM approaches to the study of time are – I would like to add a few personal comments about the present state of time use and ESM research. These comments are based on my experience of working with Canadian GSS data and the data collected between 1982 and 2003 in ESM surveys carried out at the University of Waterloo. I hope that some of my observations and suggestions might be of broader interest.

Researcher's hindsight

One or more diary days?

One of the problems of using Canadian GSS time use and well-being data is that these data are collected for one day only. While the level of life satisfaction reported by the respondents supposedly reflects their *general* life disposition, the time use with which it is correlated is limited to a single day, chosen by Statistics Canada. The question that comes instantly to one's mind is – How typical is this day of the overall behaviour of the respondent?

Does the fact that they reported 9.0 hours of paid work on the day of the survey validate an assumption that we are dealing with a person typically working long hours? To circumvent this problem, the 1975 US time use survey sampled four days (two weekdays, Saturday and Sunday). In the Netherlands, time use surveys collect diary information for the entire week. Such research strategies are, of course, more costly, but they provide more detailed information for the analyses of the relationship between respondents' time use and well-being, something that increasingly interests researchers and policymakers.

Sampling individuals or households?

There is another problem with the Canadian GSS time use surveys. They sample only one person from randomly selected households. It is, however, well known that individual time use is largely influenced and constrained by the

time use practices and requirements of other members of the household. The time use gender gap, which has attracted much research attention, is calculated in the GSS based on time use reported by men and women who are not couples. This complicates the understanding of the dynamics of the "within-families" division of labour.

The use of households rather than individuals as units of time use analyses has been adopted in Australia, Germany, and New Zealand. It was also used in the 1975 and 1981 US time use surveys. Interviewing several members of the same household complicates the data-gathering process, yet, in return, we derive very useful evidence for examining the problems and challenges faced by families in modern societies.

Lowering the age threshold?

Another potential "miss" in Canadian national time use surveys is, in my opinion, respondents' start-up age. In Canada, as in some other countries, time use surveys follow the model of Labour Force surveys, sampling respondents aged 15 years or older. This practice has undergone changes in other countries. In the United Kingdom, the Netherlands, Norway and Portugal the age threshold in the time use surveys was lowered to 12 or even 10 years (Finland).

Lowering the respondents' age has been recommended by Eurostat. The inclusion of twelve- to fifteen-year-old adolescents in survey samples provides information about teens' preparation for their potential entry into the labour force, in addition to their study loads, sleeping habits, well-being, and health. The *National Adolescent Time Use and Risk Behaviour Study*, commissioned by the US Department of Health and Human Services, found that the time use of 10th graders was highly predictive of what they were doing after they graduated from high school.

How large a sample?

The 25,000 target sample of the 2005 GSS doubled the sample size of the 1998 GSS. The underlying reason for this ample sampling is Canada's proverbial concern with regional differences. However, unlike labour force surveys, time use enquiries deal with social phenomena that are more universal in nature and relatively immune to local or regional differences. Therefore, if the size of the GSS time use samples were to be increased, it would be preferable, in my opinion, to do this by lowering the age threshold of respondents or by using households as units of analysis rather than by expanding the sample geographically.

Innovation versus consistency

A serious challenge faced by time use surveys is a conflict between the desire to improve old research instruments and add new measurements, and the need for across-time consistency, which enables objective analyses of social issues and trends over longer periods of time. The goals of innovation can, in most instances, be reached by *adding* rather than modifying variables and measurements. It is unfortunate when modifications of activity codes or well-being variables disallow historical and trend analyses. Simply stated, innovations should complement rather than complicate historical comparisons.

Some of the problems faced by time diary studies apply also to ESM research. Is the week a long enough survey period? Should ESM surveys sample individuals or households? Is it not the consistency in formulating subjective well-being questions which ensures the validity of ESM data for the examination of cross-country and across-time differences and similarities? Could the replacement of beepers and wristwatches with smartphones reduce the levels of "situational inconvenience"? Wouldn't an additional personal interview, after the completion of the survey, allow researchers to learn more about the reasons why the respondents' varied in their emotional assessments of the same activities?

Perhaps similarly to the situation with time diary surveys, ESM studies would benefit from finding a way to increase motivation to participate in these surveys without incurring additional costs.

Nothing is entirely new in this world. In the past, researchers were able to find a way out of difficult situations, So let us hope that we also will succeed in meeting the above challenges.

Conclusion: Time use and ESM studies - how complementary?

The question that I promised to respond to at the end of this chapter was this: How complementary are time use and ESM surveys? I do not think that I will be overly optimistic if I say "they may not be twins, but they are siblings!"

All data-gathering methods have their advantages and limitations, but the discussion of the relative merits and demerits of time diary and experience sampling research strategies need not be contentious. As noted by Kubey, Larson, and Csikszentmihalyi (1996, p. 193), "ESM does not preclude or supplant the use of other methods, it just supplements and broadens the potential of these methods." The two main methods of studying time

use – time diaries and ESM self-reports – represent complementary rather than alternative research strategies.

Summarising my thoughts about the challenges faced by ESM studies, I wrote that we are probably not yet ready to carry out a representative national ESM survey. There is, however, a compromise, which I proposed in a presentation to the Washington workshop organised in 2000 by the US Committee on National Statistics in preparation for the upcoming American Time Use Survey.

I suggested that consideration should be given to a "modular" design for the national time use surveys. Such an approach would allow "core" time diary and labour participation data to be collected from the entire GSS sample and enable it to be combined with information about specific well-being, health, education, time management and other policy-relevant issues, to be collected from sub-samples of the surveyed population.

This "modular" approach, unlike the enlargement of the topical scope of the main survey, may allow for an examination of specific issues without overburdening respondents with long interviews and treasuries with excessive costs. Sub-sampling of the national time use surveys would allow researchers to obtain more focused and detailed information about lifestyle issues facing youths, employed parents, or people living in rural areas. As part of this complementary data-collection strategy, an Experimental Sampling Method module could be used to collect in-depth information about relationships between time use, emotional well-being, and mental health.

If well-being is increasingly becoming a central policy concern, then broadening the methodological and substantive scope of time use enquiries is one of the most effective ways to enlighten future policy decisions.

References

Alliger, G. M. & Williams, K. J. (1993). Using signal-contingent experience sampling methodology to study work in the field: A discussion an illustration examining task perceptions and mood. *Personnel Psychology*, *46*(3), 525-549.

Bevans, G. B. (2018). *How workingmen spend their spare time.* Franklin Classics.

Bochove, C. A. (1999). *CBS-statistieken zijn heel geloofwaardig.* NRC 26/01.

Byzov, L. (1923). Byudzhet vremeni (Time-budgets), In: *Vremya, 1-2.*

Chapin F. (1974). *Human activity patterns in the city: Things people do in time and in space.* Wiley.

Chekhov, A. P. (1946). *Zhizn prekrasna* (Life is beautiful). Sochinenia, Tom IV, Moscow: OGIZ.

Cooper, C. L. & Cartwright, S. (1994). Healthy mind; healthy organisation – a proactive approach to occupational stress. *Human Relations*, *47*(4), 455-471.

Coverman, S. (1989). Role overload, role conflict, and stress: Addressing consequences of multiple role demands, *Social Forces, 67*(4), 965-982.

Csikszentmihalyi, M. & Larson, R. (1984). *Being adolescent.* Basic Books, Inc.

Csikszentmihalyi, M. & Larson, R. (1987). Validity and reliability of the experience sampling method. *Journal of Nervous and Mental Disease*, *175*(9), 526-537.

Csikszentmihalyi, M. & Csikszentmihalyi, I. S. (Eds.) (1988). *Optimal experience: Psychological studies of flow in consciousness.* Cambridge University Press.

Csikszentmihalyi, M. (1990). *Flow.* Harper Collins Publishers.

Denovan, A. & Dagnall, N. (2019). Development and evaluation of the chronic time pressure inventory. *Frontiers in Psychology*, *10*, 02717.

Evans, R. G., Barer, M. L., & Marmor, T. R. (Eds.) (1994). *Why are some people healthy and others not?* Aldine de Gruyter.

Gershuny, J. (2000). *Changing times. Work and leisure in postindustrial society.* Oxford University Press.

Godbey, G. (1976). Time deepening and the future of leisure. *Journal of Physical Education and Recreation*, *47*(8), 40-42.

Hormuth, S. E. (1986). Experience sampling and personality psychology: Concepts and applications. *Journal of Personality, 54*(1), 262-293.

Juster, F. T. & Stafford, F. P. (Eds.) (1985). *Time, goods, and well-being,* Ann Arbor: Institute for Social Research of The University of Michigan.

Juster, F. T., Ono, H., & Stafford, F. P. (2003). An assessment of alternative measures of time use. *Sociological Methodology*, *33*, 19-54.

Kleiber, D., Larson, R., & Csikszentmihalyi, M. (1986). The experience of leisure in adolescence. *Journal of Leisure Research*, *18*(3), 169-176.

Kubey, R., Larson, R., & Csikszentmihalyi, M. (1996). Experience sampling method applications to communication research questions. *Journal of Communication*, *46*(2), 99-120.

Larson, R., Csikszentmihalyi, M., & Graef, R. (1980). Mood variability and the psychosocial adjustment of adolescents. *Journal of Youth and Adolescence*, *9*(6), 469-489.

Larson, R. & Richards, M. H. (1994). *Divergent realities. The emotional lives of mothers, fathers and adolescents.* Basic Books.

Lehto, F-M. (1998). Time pressure as a stress factor. *Society & Leisure*, *21*(2), 491-512.

Linder, S. (1970). *The harried leisure class.* Columbia University Press.

Lundberg, G., Komarovsky, M. & M.A. McInerny (1934). *Leisure: A suburban study.* Columbia University Press.

Myin-Germeys, I., Oorschot, M., Collip, D. et al. (2009). Experience sampling research in psychopathology: Opening the black box of daily life. *Psychological Medicine, 39*, 1533-1547.

Niemi, I. (1995). *Time use of women in Europe and North America.* United Nations.

Robinson, J. (1977). *How Americans use time. A social-psychological analysis of everyday behavior.* Praeger Publishers.

Robinson J. & Converse, P. (1972). Social change as reflected in the use of time. In A. Campbell & Converse, P. (Eds.), *The human meaning of social change* (pp. 17-86). Russel Sage Foundation.

Robinson, J. & Gershuny, J. (1994). Measuring hours of paid work: Time diary vs estimate questions. *Bulletin of Labor Statistics* (pp. xi-xvii). International Labor Organisation.

Sorokin, P. & Berger, C. (1939). *Time budgets of human behaviour.* Harvard University Press.

Stone, A. A. & Shiffman, S. (1992). Reflecting on the intensive measurement of stress, coping, and mood, with an emphasis on daily measures. *Psychology and Health*, *7*(2), 115-129.

Strumilin, S. G. (1957). *Problemy ekonomiki truda*. Gospolitizdat.

Szalai, A. (1972). *The use of time.* Mouton.

ver Ploeg, M., Altonji, J., et al. (2000). *Time use measurement and research*. National Academy Press.

Williams, K. J. & Alliger, G. M. (1994). Role stressors, mood spillover, and perceptions of work–family conflict in employed parents. *Academy of Management Journal*, *37*(4), 837-868.

Zuzanek, J. (1999). Non-response in time use surveys: Do the two ends meet? *Loisir & Société*, *21*(2), 547-550.

Zuzanek, J. (2000). *The effects of time use and time pressure on child–parent relationships.* Otium Publications.

Zuzanek, J. (2004). Work, leisure, time pressure and stress. In J. T. Haworth & A. J. Veal (Eds.), *Work and Leisure* (pp. 123-144). Routledge.

Zuzanek, J. (2009). Time use research in Canada – History, critique, perspectives. *Electronic International Journal of Time Use Research*, *6*(2), 178-192.

Changes, challenges and transitions over time in collecting time use data

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Time reveals the "many interesting patterns of social life [that] are associated with the temporal distribution of human activities, with the regularities in their timing, duration, frequency, and sequential order" (Szalai, 1972, p. 1). These elements – that is, *timing*, *duration*, *tempo*, and *sequence* – are often referred to as the parameters of time (Zerubavel, 1982) and all data-collection techniques that gather information about at least one of these four parameters are referred to as "time use studies". The time diary methodology (often referred to as time use surveys) is capable of capturing all four parameters of time at once and is therefore believed to be one of the most profound and valuable ways to capture human behaviour. Time use surveys draw a picture of the ways individuals use their time by using a log or a time diary during at least twenty-four consecutive hours (Pronovost, 1989).

From the outset of time diary studies the focus laid on socio-economic issues and what started as small observational diary studies quickly grew into international comparative studies. Along with this, the number of stakeholders also increased: from individual, pioneering scholars to large research groups (e.g., the Centre for Time Use Research – CTUR, Tempus Omnia Revelat – TOR, and the Maryland Time Use Laboratory), the International Association for Time Use Research (IATUR), and from pioneering policy planners such as Stanislav Strumilin to a coordinated network of National Statistical Institutions.

While there is a great deal of consensus about the usefulness and qualities of the time diary *methodology*, there was less consensus about (the design of) the *method* by which and the way in which (i.e., *mode*) data is collected. The complexity of the diary methodology in terms of the principles of the European Statistics Code of Practice (e.g., respondent burden, cost efficiency, accuracy and reliability, and timeliness and punctuality) (Eurostat, 2018) plays a major

role in this. Concessions and choices in methods and modes to meet these principles can often be traced back to discussions about the consequences of certain choices for the reliability and validity of the collected data. With these discussions in mind, this chapter looks at the past, present and future of time use research and aims to identify five eras of time use research characterised by distinctive changes, challenges and transitions in the way time use research is conducted.

To better understand the distinctive characteristics of the different eras of time use research, we need to introduce two concepts that are relevant in all research methodologies but in particular in time use research: reliability and validity.

Reliability and validity

Time use research is a quasi-observational research method in which the respondents' own observations approximate the ways they spent their time (Juster, 1986, pp. 398-399). The discrepancy between their actual time expenditure and their estimated time expenditure is the measurement error. Regarding time use research, it is, in the words of Scheuch,

> very hard to collect answers that correspond to reality with at least some degree of accuracy. Representing the expenditure of time is one of those subject matters where the reliability and validity of data are extremely sensitive to details in the manner of data collection (1972, p. 69).

The total measurement error therefore relates to the reliability or unsystematic error and validity or systematic error of the measurement method.

Reliability

The reliability of a research method presents itself in different forms. A first form of reliability refers to the ability of a measurement instrument to produce comparable results for various samples with the same characteristics. Reliability in this sense thus refers to the stability of the measurement. The random error is then not directly linked to the method per se but relies on erroneous observations by the respondents that would not repeat itself in the same way under the same circumstances.

A second form of reliability is typical of time use research and refers to random errors that are related to the number of observed days or the observation

length of the study. Suppose time use research that consists of a single diary day. The reliability of the sleep time estimates will be high (i.e., result in fewer random errors) because sleep is highly likely to occur every day. However, the reliability of time spent on cultural participation will be low because cultural participation is much less likely to follow a daily rhythm of occurrence. The unsystematic errors are then related to zero-observations (Gershuny, 2012).

The size of the random error then depends not so much on the research method itself, but on the research design, since, in addition to the number of diary days, the reliability of the measurement is also influenced by the length of the fieldwork period (e.g., the inclusion of seasons), the distribution over different days (e.g., weekdays and weekend days), and the sample size (Harvey, 1993).

Validity

Validity subdivides into external and internal validity (te Braak, van Droogenbroeck, Minnen, van Tienoven, & Glorieux, 2022). External validity refers to the generalisability of the research results to the population from which the sample is drawn and the ability to draw conclusions about the real-world implications. Since external validity deals with ensuring that the results are not only applicable to the participating group of respondents, dealing with external validity relates to a large extent to sampling strategy (i.e., size, characteristics).

Internal validity focuses on the research method itself and the effect of the measurement tools on the collection of the research data and subsequently the results. Internal validity, thus, refers to the ability of a measurement instrument to produce accurate or valid data. A systematic error occurs when the measurement instrument does not measure what it is intended to measure.

Over the years, different research methods have been developed and employed to measure how people spend their time. Most common are

(1) the diary method in which respondents keep a time diary in close to real time and record their activities chronologically for at least 24 hours;
(2) the yesterday-recall method in which respondents are interviewed about their time expenditure on the day before over a period of 24 hours; and
(3) the beeper-method in which respondents are beeped several times throughout the course of a day to record what they have been doing, often in the past hour.

In the absence of an objective evaluation method for the internal validity of these research methods, the internal validity of the different methods is often

evaluated in relation to each other. To do this, face validity and content validity are often used. Face validity refers to the subjective acceptance and judgement of the credibility of the research method and is often a useful first indicator to assess internal validity. Content validity refers to the comprehensiveness of the research method by representing all the relevant dimensions of the construct being measured. To assess the internal validity of a diary method, several indicators have been developed (Juster, 1986). These indicators are constructed using the collected diary data, hence *content* validity. One diary method is less valid than the other diary method when respondents (1) record fewer primary activities, (2) record fewer secondary activities, (3) describe time spent using a limited number of different activities, (4) record more unspecified time, and (5) have more activities start and end at round times (Juster, 1986). These indicators are useful but should not be considered conclusive. As Scheuch points out, there is "no absolute measure to judge the results of any of the techniques used during the pre-test as 'true'. […] No one technique known to us will result in 'perfect' data" (1972, p. 74).

Reliability and validity studies between different research methods are scarce, often only apply to relatively small samples, and are seldom conclusive. Diary methods seem to have the advantage over survey methods (Bonke, 2005; Gersbuny & Sullivan, 1998; Robinson & Godbey, 1997), although occasionally survey estimates concur with time spent on activities in a diary (Frazis & Stewart, 2010). Similarly, a combination of a "yesterday survey" method for day one and a diary method for days two to seven to produce weekly time estimates led Huysmans, Lammers, and Wester (1997) to conclude that there was no difference between the two methods for their study topic (i.e., media use). However, any evaluation of reliability and validity should always be interpreted with a certain caution because "ultimately, we cannot provide conclusive proof of the validity of our results, but their technical reliability can be tested, at least in part" (Fisher, Gershuny, Gauthier, & Victorino, 2000, p. 20).

Eras of time use research

As a research discipline, time use research appears to be dynamic, which allows for both different research questions and changes in the way of doing time use research over time. Historically, it is possible to speak of five eras of time use research (Figure 1). The first era arises from the need for time use research and is characterised by the originality of the time use research methodology. The second era is characterised by standardisation of the methodology and the conceptuality of what constitutes the diary method. In the third era, the

harmonisation of time use research is central in function of an upscaling of the operationalisation of time use research. The fourth era is the era which the research community is now largely in and is characterised by a change in the way (i.e., mode) in which time use research is conducted in response to the need to modernise. The fifth era is seen as the next evolving stage where external data are captured and these different data streams are integrated into the overall data-collection strategy. In this section we discuss the first four eras. The discussion of the fifth age – the future of time use research – concludes this chapter.

Figure 1. Five eras of time use research
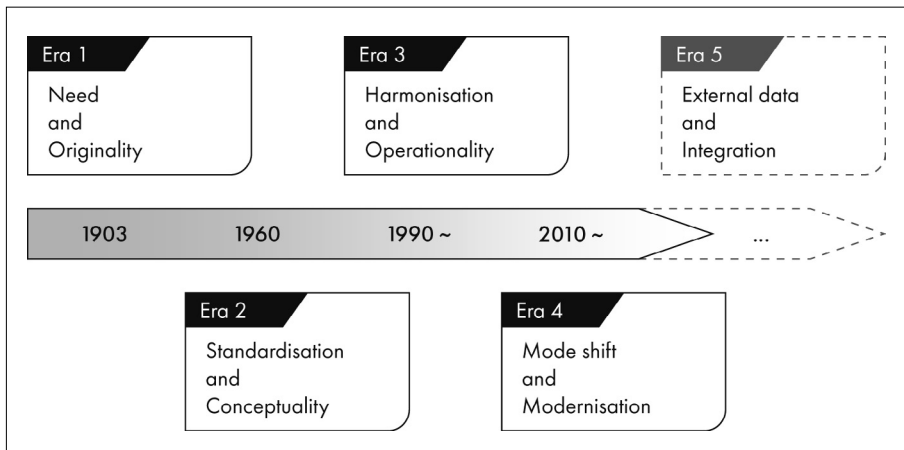
First era: need and originality

At the start of the twentieth century, the need arose to collect reliable data on the relationship between paid work, on the one hand, and unpaid work and leisure, on the other. Before that, Frédérique Le Play (1877) published *Les ouvriers européen*, which reported on 57 time reports from workers and their families from various industries across Europe and focused on paid work and how the family as a unit provided an income based on the number of hours worked. However, the origin of the time use research methodology based on diaries can be attributed to the books *How working men spend their time* by George Bevans (1913) and *Round about a pound a week* by Maud Pember-Reeves (1913). Both studies question social (in)justice. Bevans was interested in the way leisure time was spent by men from four different industrial cities and how their working conditions affected their leisure time. Feminist Pember-Reeves documented the life of working-class families in London from the perspective of the family and

the woman in that family. Her work can be said to have initiated the use of time use research to study the gender division of labour at the household level.

However, it is the USSR that validated the diary method by using it to collect data on a representative scale for planning purposes and to make comparisons between groups of industrial workers. In the communist USSR, under the leadership of Strumilin (1921-1923), time diaries were used to design and assess economic and social planning (Zuzanek, 1980). America followed later (1925-1931), with the Department of Agriculture (USDA) asking women to keep time diaries to chart work in the field and beyond (Stinson, 1999, pp. 12-14). Later, the academic world also jumped on the bandwagon of the diary method. Sorokin, who was a former student of Strumilin, published, for example, "Social time: A methodological and functional analysis" (Sorokin & Merton, 1937) and *Time-budgets of human behavior* (Sorokin & Berger, 1939), which made the link between theory of time and empirical data.

The reliability and validity of the diary method continued to be valued after the Second World War. Once again, the Russians were the first to move forward with time use research. More than a hundred studies were carried out between 1958 and 1968 (Pronovost, 1989, p. 74). At about the same time, public media companies in the United Kingdom, the United States and Japan started using the diary method to collect data on media use and thus chart emerging activities such as listening to the radio and watching TV (Robinson & Converse, 1972).

The methodology of time use research and the diary method to collect data in a reliable and valid way have secured their place in policy and scientific research.

Era 2: Standardisation and conceptuality

The real international breakthrough for time use research, though, came from the *Multinational Comparative Time-Budget Research Project*, funded by UNESCO and coordinated by Alexander Szalai. Between 1964 and 1966, respondents in twelve medium-sized cities in different European countries were surveyed using the same diary format. The underlying goal was to understand and reduce the divide between Western European and Eastern European countries. The details and results of this study are described in the so-called "bible of time use research", *The use of time* (Szalai, 1972). The then-current decisions about the format of the diary and the organisation of the fieldwork still have great resonance in contemporary time use research (Minnen & Glorieux, 2011).

For this project to succeed, the methodology of time use research had to be standardised to yield comparable results. This standardisation entailed the acceptance of the diary methodology as the most reliable and most valid methodology to capture the ways in which people spend their time. The diary methodology consists of a chronological record of daily activities and their context such that daily life can be described in terms of the timing, duration, tempo, and sequences of actions. The American Sociological Association had the same providence and founded the Task Force on Time Budget Research in 1965 with the aim of new and, above all, comparable data collections. One of the results was the American Heritage Time Use Study (AHTUS) led by John P. Robinson, which provided a detailed understanding of the way Americans use their time. It showed that Americans generally spend significantly more time on work-related activities than measured by stylised questionnaires, but also that those who work less than average underreport and those who work more than average overreport in the time diaries.

Although the diary methodology became standardised, the methods varied. Szalai used the time diary method, while AHTUS used the yesterday recall method or, similarly, the daily reconstruction method. Yet others used the beeper method. With this arsenal of methods available, the question of the most reliable and (internally) valid method must be assessed in the context of the research question. A choice between methods is then based on the choice between intra- and inter-person variation, more participants versus more diary days per participant, and the need for detail (activities and spatial and social context). It would appear that when the goal is to collect data with a focus on inter-subject variation and comparisons between groups of respondents, continuous recording seems more appropriate, while with the focus on within-person variation and a broader activity definition, daily recall records are likely to be a better strategy.

Era 3: Harmonisation and operationality

The success of the diary methodology in producing reliable and valid estimates of how people spend their time led the United Nations to popularise time use research in the 1980s. A clear added value of this research at that time was that it could provide a picture of invisible and largely undervalued unpaid work (Juster & Stafford, 1991, p. 472; Robinson & Godbey, 1997, p. 97). The diary methodology allows unpaid work to be included in the System of National Accounts. This made visible the contribution of women to the economic development of societies (Gershuny, 2003; Juster & Stafford, 1991).

For this to happen, time use research needed to be operationalised at a much larger scale and harmonised across different countries. Europe took a leading position in the *pre*-harmonisation of time use research. Under the leadership of Eurostat and after a decade of debates and decision-making, the guidelines on Harmonized European Time Use Surveys (HETUS) were formulated (Eurostat, 2020). These guidelines include instructions for the diary method (e.g., activity coding list, interval of time recording, number and assignment of diary days, length of observation period) but also on the construction of the sample selection, the training of interviewers, and data entering and cleaning. Eurostat promoted time use research in its member states and associated countries, which resulted in comparable datasets of 20 countries, several of which are available in different waves.

The success of time use research also triggered the interest of academics. More and more academics started taking up the diary method to analyse a wide variety of social and economic issues. This led to a plea for more internationally comparable time use data – including those beyond Europe (Harvey, 1993) – which also fuelled a *post*-harmonisation project. This project has largely been realised by the Centre for Time Use Research (CTUR) and resulted in an open-access database of Multinational Time Use Study (MTUS), containing harmonised time use data across 30 countries in over 70 different waves all over the world (Fisher, Gershuny, & Gauthier, 2012).

Through guidelines and international collaboration, time use research became a reliable and standardised method for making valid comparisons between countries and regions and studying trends over time.

Era 4: Mode shift and modernisation

It is safe to say that this is the current era of time use research. It signifies a change in the mode of collecting time use data under the wings of the process of modernisation. This process is not only fuelled by technological developments and the rise in use of ICT in an increasingly connected world but is also seen as an answer to the waning willingness to participate and the high costs of time use research (Minnen, Rymenants, Glorieux, & van Tienoven, 2023). Essentially, this era begins by progressing through the previous three eras, but at a much faster pace – not only at the level of time use methodology, but also at the level of a mode shift in the way time use data are collected. First, there is a need for modern, connected tools and platforms that are again subject to the question of whether they lead to reliable and valid data. Second, the standardisation and harmonisation of the diary method is questioned. Are these tools and platforms a literal translation of the paper-and-pen mode of data collection or not? And

if not, how do data collections remain comparable? The answers lie in concepts such as flexibility, modularity, reusability, and shareability. Third – and this is relatively unique to this era – how are privacy and security handled?

Need for new tools and platforms

At this point, the standardised and harmonised diary method consists of an interviewer conducting household and individual surveys and leaving behind two paper time diaries per eligible household member with the dates on which both time diaries must be completed. One diary concerns a weekday and another diary concerns a weekend day. All eligible household members need to complete the same days. The interviewer also leaves behind a drop-off questionnaire, which is to be completed by all eligible household members after the time diaries. At a prearranged date, the interviewer returns to check and collect the time diaries and the drop-off questionnaire. The paper-and-pencil mode of data collection has at least three downsides: (1) it is very expensive due to interview visits, printing costs, and data entering and coding costs; (2) it is very burdensome for respondents to participate in, and (3) processing the data is time-consuming and no longer answers to the quest of understanding the rapidly changing context of modern societies (Cai & Zhu, 2015).

As time use research yields highly valid and reliable data, rich in information and contexts, and allows regions, countries and cultures to be compared, the momentum of the "Big Data" challenged researchers to modernise and digitise time use research to collect data in increasing volumes with greater speed and more variation. Eurostat is again an accelerator in promoting this modernisation, showing their ambition in the DGINS Wiesbaden Memorandum 2011. This Memorandum is grounded in Eurostat's responsibility to provide reliable, valid, and comparable statistical information to the institutions of the European Union (E.U.). An important tool to achieve this is to promote – as far as possible – harmonised statistical methods in all Member States. The Memorandum emphasises the need for better data, in terms of coverage and comparability. The process of modernising the production of official statistics should contribute to this by a mode shift from paper-and-pencil to online data collection with the aim of (1) improving the responsiveness of respondents, (2) better integrating new ways of data collection and new sources of information, and (3) collecting data more efficiently.

Bonke and Fallesen (2010) were among the first to develop a prototype for data collection via a web interface, with funding from the Rockwool Foundation in Denmark. In addition to being online, the diary featured a search tag selectable pre-coded list and reported for a weekday and a weekend day divided

into ten-minute time slots. The first (native) mobile application on a smartphone was created in 2011 by the Netherlands Institute for Social Research with the HETUS guidelines in mind. The app was tested in a feasibility study with a representative sample of the adult Dutch population via the LISS panel in 2012 (Sonck & Fernee, 2013). The backbone of the application was reporting on pre-stated HETUS-based activities in ten-minute intervals over two fixed days (a weekday and a weekend day) along with context on location and mode of transport and social context of the activity. The app also got into reality mining by using prompts to ask questions about mood at different times of the day.

In 2012 and after receiving a Hercules grant, the Research Group TOR of the Vrije Universiteit Brussel also translated the pencil-and-paper method into a web-based environment. In 2013, the MOTUS web application was tested in a yearlong large-scale data collection parallel to the then ongoing Belgian Time Use Survey (BTUS). This concurrency made it possible to differentiate between two designs and modes: a pencil-and-paper two-day diary, ten-minute intervals, post-coding, and household mapping (BTUS), on the one hand, and an online seven-day diary, continuous time recording, pre-coding and individual sampling, on the other hand. Compared to the Danish and Dutch development, MOTUS also takes into account the full ecosystem of a time use survey where respondents are invited to complete their questionnaires and diaries in the same application without the help or support of an interviewer because all communication is managed by the platform (Minnen et al., 2014). These strengths were further embodied in updates and new releases of MOTUS. MOTUS currently combines a web application with a mobile application. The big difference to the Danish and Dutch application is that MOTUS is a platform instead of a native application. The platform currently consists of a back office where studies are designed and a front office where studies are conducted.

More recently, the Centre for Time Use Research of the London School of Economics (at the time located at Oxford University) and the Time Use Laboratory at the University of Maryland developed and released their online implementation. CTUR's web-based CaDDI tool takes its name from its Click-and-Drag principle of reporting an activity by "dragging a pointer across a horizontal timeline bar to create a record of the duration" (Sullivan, Gershuny, Sevilla, Walthery, & Vega-Rapun, 2020, p. 8). The activity list to choose from is a light version with broader categories than known from the HETUS activity list, but the context questions are similar. These context details populate only after all the primary activities throughout a day have been registered instead of per primary activity, as in the previous applications. In line with the HETUS

guidelines, recording is done in ten-minute intervals on a weekday and a weekend day.

The Time Use Laboratory starts from the daily reconstruction method where, as the name suggests, respondents are asked to reconstruct their previous day. They use mytimeuse.com for this, which is a responsive web application developed with a grant from the National Science Foundation (Rinderknecht, Doan, & Sayer, 2022). Activities are recorded continuously (i.e., not in intervals but with exact start and end times) and include a primary activity and the associated context of a secondary activity (as a percentage of the primary activity) as well as where the time was spent and with whom. The context is further expanded by also scaling emotions when doing the activity. The selectable activities are presented to the respondent as they type the activity into a search field. Respondents may keep their own wording as a custom activity, which will be saved to the list for later use; but they must relate it to an already existing activity from the list.

At the University of New England in Australia, Michael Bittman continued to work with the beeper method. The "Intensive Hour" app or Random Time Sampling (RTS) method "beeps" respondents at random times, asking them to reconstruct the past hour into ten six-minute entries (Wong et al., 2022). The advantage of this method is that it is less invasive and allows, in particular, to survey time spent on paid work in more detail. The HETUS guidelines examine paid work only in broad, generic categories to prevent participation in time use research from leading to conflicts in the workplace. In addition, recording randomised, beeped hours of work time prevents sensitive company information from being obtained or individuals from being monitored.

Another application worth mentioning is the i-log application from the University of Trento, available for smartphones with Android and recently also with iOS as an operating system (Zeni, Bison, Reis, Gauckler, & Giunchiglia, 2020). This application aims to collect sensor streams in a passive way (i.e., mainly to determine the position of the device but also to capture para-data) in addition to asking respondents to fill in a small questionnaire and then a time diary for a weekday and a weekend day. Activities are selected from a pre-coded activity list and context recording is similar to the HETUS guidelines. No additional activities can be registered. As with the Danish, Dutch, Belgian and American applications, each episode repeats the same logic of questions over and over. The application started as part of an EU Horizon project and was used, among other contexts, as part of the Big Data Hackathon 2019 in Brussels.

There are many more applications that entered a development path, but many did not reach the pilot or test phase. An overview can be found via the

Eurostat inventory.[1] More importantly, all these different applications mean that the internal validity and comparability of the diary method have once again been called into question. While the method itself has remained relatively standardised and harmonised (i.e., activity lists, recording intervals, context query, diary days), the mode is anything but. To harmonise this, the focus must be on the modularity and shareability of the modes.

Modularity and shareability

Harmonising the outcome of the modernisation of time use research (and other surveys) is part of the European Statistical System (ESS). While the Member States are responsible for collecting the data and compiling the statistics for national and EU knowledge building, Eurostat's role is to support the ESS to create networks that strive towards harmonised procedures. One way to guide this process in a standardised manner is to use a generic production architecture such as GSBPM. The GSBPM or Generic Statistical Business Process Model was developed by UNECE, Eurostat and OECD to provide a standardised overview of the way official statistics are produced (Kuonen & Loison, 2019). The GSBPM considers a total of eight phases, of which the design phase (phase 3), the construction phase (phase 4) and the process phase (phase 5) relate to the set-up and implementation of the data collection itself, including the handling of the data files. This also applies to time use research (Minnen et al., 2023).

As mentioned above, the need to modernise not only arises from the need to produce data more cheaply and faster, but also to visualise the ever faster-changing society. Consider, for example, mapping the effects of the COVID-19 pandemic on daily life (Gershuny et al., 2021; van Tienoven et al., 2023). The statistical process should therefore be sufficiently modular in design to meet country-specific requirements but at the same time be sufficiently harmonised to ensure comparability (Glorieux & Minnen, 2009; Salgado, Esteban, Novás, Saldaña, & Sanguiao, 2018; Stodden, 2014).

This underlines the importance of using platforms. Platforms are more supportive to tailor the research design to the needs of the research question, while native or one-off applications are quite rigid about making adjustments in favour of the setting. It is the task of the GSBPM to then communicate the opportunities for designing, building, and implementing the data collection and the means of processing the collected data in a standardised way.

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1   Accessible through https://webgate.ec.europa.eu/fpfis/wikis/display/ISTLCS/TUS+ TOOLS+MENU.

However, this is only half the story, because in order to support standardisation it is also important that these platforms can be shared. Shareability here refers to the ability of a platform to be integrated into a data-collection architecture and/or process of another institution (e.g., NSI, academic institution, …). The simpler the implementation, the more easily the environment can be shared. A platform that is modular and has a high degree of (re)use, sharing and collaboration also has minimal development and maintenance costs.

Shared platforms mapped to a business architecture such as the GSBPM combine the power of modularity (internal validity) and the power of standardisation (reliability). The result is an upgrade of the time use research toolbox to configure the right approach to collect the best fit data for a given research problem within the same IT environment. Evolved modernisation and digitisation provide the opportunity to embed differences into a stronger and interoperable validation of time use practices.

Privacy and security

Privacy and data security are not new concerns, but the modernisation of data collection based on technological progress and digitisation has brought them explicitly to the fore. Particularly in the light of the decreasing willingness of the population to participate, data collectors can no longer act overnight. When collecting data, personal data are essential, visible and stored in databases. In addition, the output of the participation is a detailed collection of activities timestamped and contextualised with additional personal information.

This is even more true when modernisation also means that external databases can be linked or when passive data registration, for example via sensors, becomes part of a collection process. As well-intentioned as it is to reduce the registration burden on the respondent and to increase the ease of use of the applications, concerns about privacy and security must first be dispelled. Although hard work can be done in the background on all kinds of documentation about privacy statements, data-protection impact assessments, data management plans, and data protection policies, the main challenge remains to gain and maintain the trust of the respondents (Keusch, Struminskaya, Antoun, Couper, & Kreuter, 2019; Revilla, Couper, & Ochoa, 2019; Ricciato, Wirthmann, & Hahn, 2020).

One way to do this is to shift from "privacy by legal" to "privacy by design". For data-collection platforms, this means that privacy and data security are taken into account from the very beginning of the platform's design. This involves matters such as pseudonymisation, encryption, two-step authentication,

and limiting default positions (e.g., omitting unnecessary profile information), on the one hand, and, using ISO-certified servers, penetration tests, and load and performance tests on the other hand.

Privacy and security are an essential part of the development of the platforms, not only in the back office but also in the front office applications (web, mobile) to bolster participants' confidence to start and continue their respondent journey in collecting highly detailed data. Tools with a higher resolution of privacy and security will benefit from better response rates and data accuracy compared to tools that only declare privacy and security from legal documentation.

MOTUS

Our added value to the field of time use research lies most profoundly in development of the MOTUS data-collection platform. MOTUS stands for Modular Online Time Use Survey and the development builds on a long-standing history in time use research at the Research Group TOR of the Vrije Universiteit Brussel. After having conducted multiple pencil-and-paper time use surveys (in 1984, 1988, 1999 and 2004) and having played an advisory role in the pencil-and-paper time use surveys of 1999, 2005 and 2013 of Statistics Belgium, TOR won a HERCULES grant to develop "An Infrastructure for a Continuous Modular Online Time Use Survey". It marked the start of the MOTUS project in 2012.

Unique to the MOTUS project was not only the digitisation of the pencil-and-paper method. The main aim was to translate all the accumulated knowledge about the design, implementation, and execution of time use studies and the known consequences of design and implementation choices for the reliability and validity of time use data into a platform that makes it possible to make different choices regarding different parameters. MOTUS did this (and still does) by using the concept of "modularity". It means that the front office application (i.e., the application that is used by respondents) is (largely) defined by the content and the different settings in the back office application (i.e., the application that is used by researchers). In other words, the front office application is not a rigid time diary tool but remains an "empty box" until linked to an active (time use) study that has been designed in the back office application. A major additional advantage is that the front office can host multiple studies, even in one and the same respondent.

To achieve such a platform, we identified (at least) four development challenges:

(1) the user interface (UI) and user experience (UX) design of a tool to collect data (i.e., the front office);
(2) the back office software or platform design to manage and organise data collections;
(3) the creation of a shareable architecture to run the tool and the platform with respect to privacy and security requirements; and
(4) the ability to connect the architecture to other environments.

MOTUS front office

The front office is the application for the respondent to participate in surveys, register data, consult data, and provide additional data. Through a well-balanced UI and UX of MOTUS, visual elements and functionalities, it supports a less burdensome task on the part of the respondent, for both the mobile and web application. The mobile application is available in the Appstore (iOS) and the Play Store (Android). The web application can be accessed via https://www.motusresearch.io using any conventional internet browser. Information is interchangeable between the two applications, while multiple devices can also be used to participate in the surveys.

Figure 2 shows some of the trademarks of MOTUS for the mobile application. Diaries start from a calendar that highlights the days that need to be recorded (Figure 2A). On a registration day, the application shows the timeline overview with, if selected, the activity that is currently tracked at the bottom (Figure 2B). The activity recording is sequential (Figure 2C) and allows for more detailed context questions (Figure 2D). Tapping on an activity unfolds additional options to edit the timeline, such as deleting, copying, splitting the activity, or inserting another activity (Figure 2E). Finally, the sequence of registering an activity is supported by the on-screen Assistant that can be toggled on or off in the bottom left corner (Figure 2F). The web application has the same look and feel as the mobile application to make it easier and more recognisable for respondents to switch between applications and devices. More visuals of the mobile and web application are available on https://www.motusresearch.io.

Figure 2. Visuals of some of the trademarks of the MOTUS application
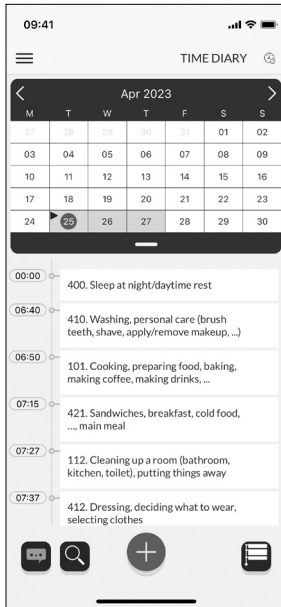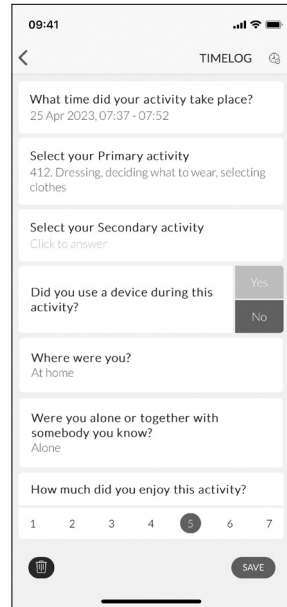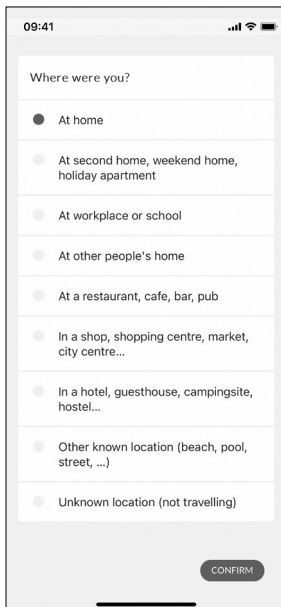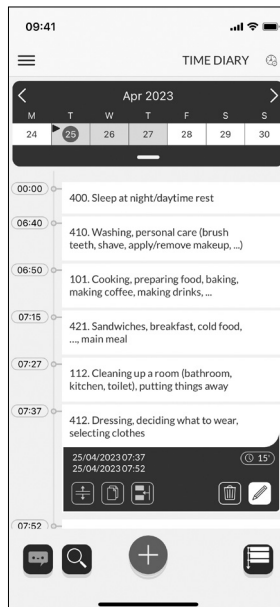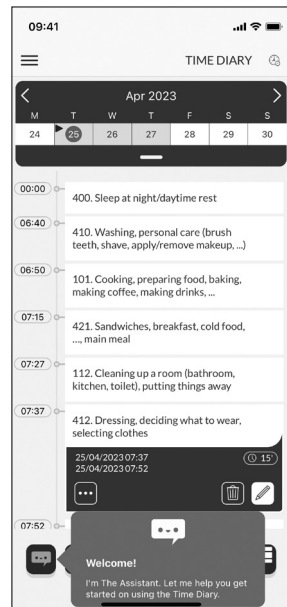

A
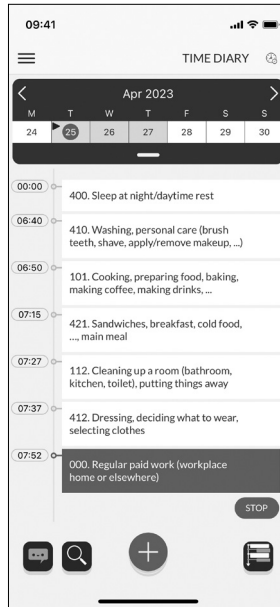
B

C

D

E

F

MOTUS back office

The modular character of MOTUS is related to the flexibility with which investigations can be designed in the back office. For this MOTUS uses the concept of "builders". Each builder allows to shape certain elements of a study. The "survey builder" provides for the preparation of questionnaires, the "diary builder" for the preparation of surveys based on the diary method, such as time use research, but also household budget research. Surveys conducted at the household level and involving multiple members of the household (simultaneously) can use the "grid builder" that synchronises the research tasks of groups of respondents. The "communication builder" provides for setting up communication with the respondent (e.g., via email, via static information pages, or via notifications). The so-called "survey flow builder" brings everything together – for example, when a study consists of several sequential tasks (e.g., questionnaire and time diary).

Other builders support related processes. For example, there is a "translation builder" that allows to offer a survey in multiple languages and an "invitation builder" that manages respondents (i.e., import, invite). Data processes, such as real-time quality checks, are supported by the "R builder" using the `motusR` package. Finally, the "event builder" is under construction: it enables certain (passive) data streams to initiate tasks (cf., the beeper method).

A comprehensive overview of both the builders and the way they support the design, construction, and collection phase of the GSBPM is given in Minnen et al. (2023). Within the theme of reliability and (internal) validity of this chapter, we only go a little deeper into the "diary builder". After all, within this builder two important elements of time diary research are designed: the activity list and the parameters of the diary.

The activity list can be designed up to three levels deep. A first relevant element of the activity list is the selection of the activities. MOTUS offers respondents four options to select an activity: they can

(1) search for their activity in a tree structure of categories that expand to the lowest (selectable) detail;
(2) search for their activities using search terms they type in the search field. For this, search tags must be assigned to each activity in the back office;
(3) "star" activities so that they are available in a personal list of favourites and can be selected from there; or
(4) use a list of suggestions made by MOTUS based on previous entries and depending on time and place.

Which of the options is available to the respondent is indicated in the back office.

A second relevant element of the activity list is registering the context. MOTUS allows (in theory) a separate context questionnaire to be added to each activity. These questionnaires are created in the "survey builder". This shows an important advantage of digital time use research over pencil-and-paper. After all, in printed diaries, all context questions must be visible and it is not possible to vary them per activity (group). MOTUS allows, for example, the questions about transport modes to be displayed only when a displacement is registered, or no questions to be displayed when sleeping time is registered (cf., HETUS guidelines), or additional questions to be asked about the content when media-related activities are recorded.

Modularity also plays out at the level of the diary's parameters. We previously described that the choices about the number of days surveyed, the fieldwork period, the size of the registration intervals, and so on, (can) influence the reliability and (internal) validity of the collected data. MOTUS allows respondents to set several parameters in advance according to their own wishes and insights (see Table 1). These parameters are divided into the diary settings and closing criteria. Diary settings are the granularity of the recording, the length and the way it is calculated when the recording starts and how the 24-hour cycle is offered. There is also the option to allow a learning period. The diary starts, for example, at midnight, but it is available from 19:00 to enable the respondent to explore and practice. Closing criteria enable respondents to close the diary themselves or not. If this is conditional, then a number of quantitative criteria can be indicated, such as the extent to which indefinite time is allowed and whether there is a minimum number of registered activities. Quality criteria can also be indicated, such as a minimum of different activities, the mandatory registration of sleeping time, and the mandatory registration of some eating and/or drinking activities.

All in all, MOTUS therefore offers the opportunity to design time use research in a well-considered manner as a function of the concessions or requirements for the reliability and validity of the data. Moreover, by means of the back office and the underlying builders, MOTUS facilitates automated data collection without the intervention of an interviewer.

Table 1. Overview of adjustable time diary parameters in MOTUS

Diary settings		
Item	*Options*	*Details*
Granularity	Continuous	
	Fixed	5/10/15/20/30 minutes
		1/2/3/4 hours
Length	Week	
	Day	
	Custom	Specified as number of hours
Length calculation	Sum of logged time	
	Start of diary to end of last activity	
	Start of first activity to end of last activity	
Diary start	Immediately	
	Fixed	
	Retrospective	Define number of retrospective days
Diary cycle	Midnight to midnight	
	16:00 to 16:00	
	Custom	Specify start time
Learning cycle	None	
	Custom	Specified as number of hours
Closing criteria		
Item	*Options*	*Details*
Manual closing	Allowed	
	Not allowed	
	Allowed under conditions	
Quantity criteria	Undefined hours per day	Unlimited or specified as number of hours
	Number of activities per day	None or specified as number of activities
	Undefined hours per week	Unlimited or specified as number of hours
	Number of activities per week	None or specified as number of activities
Quality criteria	Number of different activities	None or specified as number of activities
	Duration of sleep	None or specified as number of hours
	Occasional eating and/or drinking	Required/not required

MOTUS architecture

With privacy by design in mind, the MOTUS architecture is separated into three levels (see Figure 3). The first level presents the web and mobile interfaces to the respondents (i.e., front office) and the web interface to the researchers and administrators (i.e., back office). Both the front office and the back office are connected to the MOTUS core via Application Programming Interfaces (APIs). The core holds the database with all information required to build a study and collect data. A separate analysis server holds a replica of the database from the

core and facilitates the processing of information in the back office. The back-up server is a replica of the core and analysis server.

Figure 3. Overview of the MOTUS platform architecture
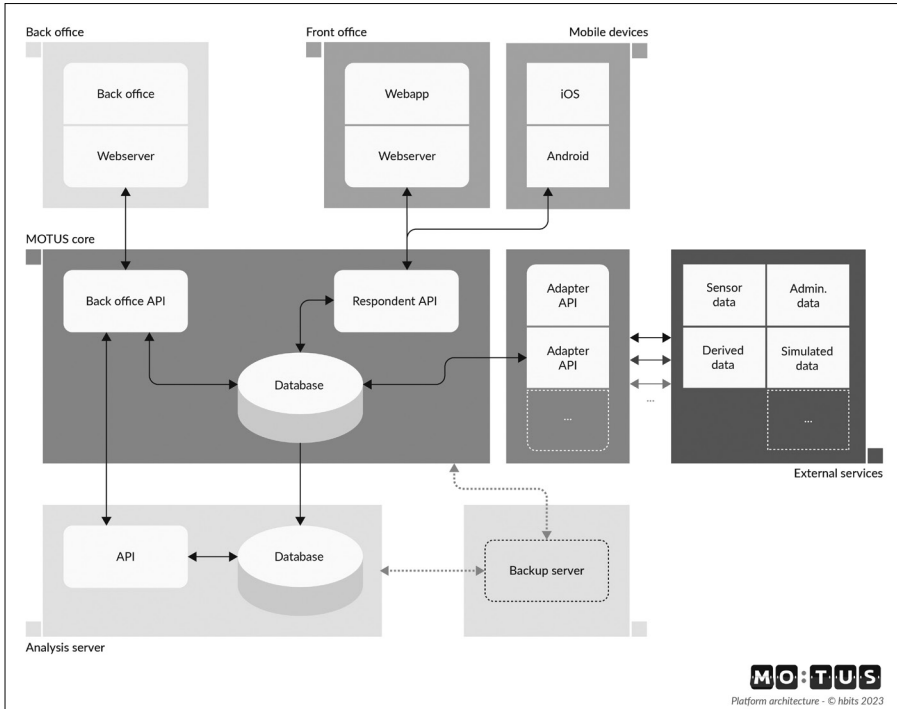
Adapter APIs serve to adapt external information so that it can be processed in the core, enabling the inclusion of, for example, passive data collected from integrated sensors or connected devices, administrative or secondary data available from external data sources, or other processed data. For optimisation, data security, and privacy reasons, these data are handled and organised into standalone microservices.

The MOTUS architecture is set up using Docker containers. This enables installation within a data-collection environment of another institution in a simple, rapidly scalable, manner with certified and tested privacy and security. These four pillars characterise a good architecture and increase the divisibility of MOTUS so that it can grow into a modern and stable platform.

Era 5: external data and integration

We conclude with a look into the near future, because the fifth era that is coming is a result of the previous era where we arrive at the integration of different data streams. The fifth era will be centred on the apparent contradiction that, on the one hand, national and scientific institutions are finding it increasingly difficult to obtain permission and cooperation from respondents to collect data while, on the other hand, more and more behavioural data are being tracked via internet-connected devices and are even being combined by algorithms and artificial intelligence to gain a better understanding of (individual) human behaviour. The questions that are therefore central to this fifth era are: Who owns such external data? How can this data be integrated for the production of official statistics and/or scientific research? And, how can the introduction of external data reduce the registration burden of respondents be reduced?

Much of these types of data will be owned by market-oriented parties. They collect data through connected devices as a continuous stream of embedded personal data (Groves, 2011). These data are collected passively without the continuous and active participation of respondents. Today, however, most time use data are still collected through active participation, even when this is done through web and mobile applications developed for the domain of time use research. Looking back at what sets time use data apart from other data-gathering information about people's daily lives, it is the validity of the data. If we want to understand why people engage in an activity, we must focus on the "beneficial, immediate approach" (Hamermesh, 1999), which understands what people do in their temporal, spatial, social, and motivational contexts. A large measure of such observations can be supported by passive data streams such as perceptual (body), environmental, and even administrative data.

Sensor data

It is therefore expected that sensor data will play an important role in this fifth era. Through sensors, the state of respondents or their environment can be observed and measured, continuously or intermittently, or even at a defined level (e.g., entering geographic location, exceeding noise level, from a certain point in time). The variety of sensors is extensive and almost every physical element can be captured by temperature sensors, pressure sensors, proximity sensors, accelerometer and gyroscope sensors, humidity sensors, CO_2 sensors, and many more. If these sensors are connected to the internet, the output is available in real time and can be used as input for another system or used to

control a process of actions. It is this "If This Then That" (ITTT) application that is the true added value of the "Internet of Things" (IoT).

However, the current downside of sensor data is they are too fragmented, of too high velocity and too scarce on subtlety (Marr, 2015). At this point, a link between sensor data and behavioural data (e.g., time use) seems ideal. After all, sensory data are timestamped and sequential. They can therefore easily be linked to the activities that are registered in the time diary. As a result, these data can provide additional context not only for research itself (e.g., data enrichment through sensor data), but also for the way in which respondents can participate in research (e.g., sensor data can make activity suggestions). The question remains how data enrichment and respondent support can be realised.

Microservices and tentative and committed data

Sensors are often embedded in other devices, the smartphone being the most prominent. The data that are captured are processed into meaningful output using developed algorithms supported by Machine Learning and/or models based on Artificial Intelligence. Smartphones are often recognised as a proxy for the individual using it (place, sound, temperature …). The most common way to send data to another environment is via a microservice. Such a microservice is often specialised in one specific function, such as geotracking or energy consumption. A characteristic of a microservice is that it is independent from a platform and can communicate with other platforms by means of an API. A data-collection platform on which time use research runs can therefore retrieve and link the data via this API.

The use of APIs facilitates the exchange of data between environments, including communication with front office applications used by respondents to participate in surveys. This also makes it possible to go beyond the rather rigid duality between active and passive data (collection), by making use of so-called tentative versus committed data in practice. Tentative data are passively collected from an individual but have not yet been validated by the individual. The data are considered a proxy of (the behaviour of) the individual and need interaction with the individual before they are turned into committed data. The big difference with the active registration of data is therefore that tentative data are first presented to the respondent for confirmation, addition, or a specific question, whereas otherwise the respondent must provide the input entirely himself. This business process, where an API exchanges tentative data between the microservices and the platform which in turn allows the individual to confirm the data through the front office application(s), is designed to keep the respondent central to the data-collection strategy. As such, it supports the

trustworthiness of the collection strategy since the respondent retains control over the data collection because the data becomes part of the research database only when the respondent records (i.e., commits) the data. At the same time, the front office application provides the option to the respondent to delete the tentative data stored in the microservice.

Sensor data provide extra information which is often difficult for an individual to grasp in such detail and with such precision. When this data stream is committed by human beings in the data-collection loop, both systematic error and privacy concerns are reduced.

This is the trajectory MOTUS currently follows and will continue to follow in the future. Microservices are seen as external environments which can be developed by external partners (e.g., using wearables like a Fitbit) but which can also be developed internally in connection with the MOTUS platform (e.g., the inclusion of sensors in the MOTUS applications). The development of microservices gives priority to the flexibility, on the one hand, and to privacy, on the other hand, as sensor data can contain sensitive information. The MOTUS core can communicate with different satellite microservices via adapter APIs to collect the tentative data that are defined in the study design in the back office of MOTUS, and which are presented to the respondent in the front office application for inclusion, adaptation, or deletion.

References

Bevans, G. E. (1913). *How working men spend their spare time*. Columbia University Press.

Bonke, J. (2005). Paid work and unpaid work: Diary information versus questionnaire information. *Social Indicators Research*, *70*, 349-368.

Bonke, J. & Fallesen, P. (2010). *The impact of incentives and interview methods on response quantity and quality in diary-and booklet-based surveys.* Paper presented at the Survey Research Methods.

Cai, L. & Zhu, Y. (2015). The challenges of data quality and data quality assessment in the big data era. *Data Science Journal*, *14*.

Eurostat. (2018). *European statistics code of practice: For the national statistical authorities and Eurostat (EU statistical authority)*. Luxembourg: Publications Office of the European Union.

Eurostat. (2020). *Harmonised European Time Use Surveys (HETUS) – 2018 guidelines – Re-edition*. Luxembourg: Publications Office of the European Union.

Fisher, K., Gershuny, J., & Gauthier, A. (2012). *Multinational time use study: User's guide and documentation.* Oxford: Centre for Time Use Research, University of Oxford.

Fisher, K., Gershuny, J., Gauthier, A. H., & Victorino, C. (2000). *Exploring new ground for using the Multinational Time Use Study*. Study No. 2000-28. ISER Working Paper Series.

Frazis, H. & Stewart, J. (2010). Why do BLS hours series tell different stories about trends in hours worked? In K.G. Abraham, J.R. Spletzer, & M. Harper (Eds.), *Labor in the New Economy* (pp. 343-372). University of Chicago Press.

Gersbuny, J. & Sullivan, O. (1998). The sociological uses of time-use diary analysis. *European sociological review*, *14*(1), 69-85.

Gershuny, J. (2003). *Changing times: Work and leisure in postindustrial society*. Oxford University Press.

Gershuny, J. (2012). Too many zeros: A method for estimating long-term time-use from short diaries. *Annals of Economics and Statistics/Annales d'Economie et de Statistique*, 247-270.

Gershuny, J., Sullivan, O., Sevilla, A., Vega-Rapun, M., Foliano, F., Lamote de Grignon, J., . . . Walthery, P. (2021). A new perspective from time use research on the effects of social restrictions on COVID-19 behavioral infection risk. *Plos One*, *16*(2), e0245551.

Glorieux, I., & Minnen, J. (2009). How many days? A comparison of the quality of time-use data from 2-day and 7-day diaries. *Electronic International Journal of Time Use Research*, *6*(2), 314-327.

Groves, R. M. (2011). Three eras of survey research. *Public opinion quarterly*, *75*(5), 861-871.

Hamermesh, D. S. (1999). The timing of work over time. *The Economic Journal*, *109*(452), 37-66.

Harvey, A. S. (1993). Guidelines for time use data collection. *Social Indicators Research*, *30*, 197-228.

Huysmans, F., Lammers, J., & Wester, F. (1997). Radioluistertijd: Dagboekmeting, yesterday-meting en directe schattingen vergeleken. *Tijdschrift voor Communicatiewetenschap*, *25*(3), 253-276.

Juster, F. T. (1986). Response errors in the measurement of time use. *Journal of the American Statistical Association*, *81*(394), 390-402.

Juster, F. T. & Stafford, F. P. (1991). The allocation of time: Empirical findings, behavioral models, and problems of measurement. *Journal of Economic Literature*, *29*(2), 471-522.

Keusch, F., Struminskaya, B., Antoun, C., Couper, M. P., & Kreuter, F. (2019). Willingness to participate in passive mobile data collection. *Public opinion quarterly*, *83*(S1), 210-235.

Kuonen, D. & Loison, B. (2019). Production processes of official statistics and analytics processes augmented by trusted smart statistics: Friends or foes? *Statistical Journal of the IAOS*, *35*(4), 615-622.

Le Play, F. (1877). *Les ouvriers européen*. Alfred Mame et fils.

Marr, B. (2015). *Big Data: Using SMART big data, analytics and metrics to make better decisions and improve performance*. John Wiley & Sons.

Minnen, J. & Glorieux, I. (2011). Two days a week? A comparison of the quality of time-use data from 2-day, 7-day diaries and a weekly work grid. In J. Carrasco,

S. Jara-Díaz, & M. Munizaga (Eds.), *Time use observatory* (pp. 105-118). Grafica LOM.

Minnen, J., Glorieux, I., van Tienoven, T. P., Daniels, S., Weenas, D., Deyaert, J., . . . Rymenants, S. (2014). Modular Online Time Use Survey (MOTUS) – translating an existing method in the 21st century. *Electronic International Journal of Time Use Research*, *11*, 73-93.

Minnen, J., Rymenants, S., Glorieux, I., & van Tienoven, T. P. (2023). Answering current challenges of and changes in producing official time-use statistics using the data collection platform MOTUS. *Journal of Official Statistics*, Online First.

Pronovost, G. (1989). The sociology of time. *Sociologie Contemporaine (La)*, *37*(3), 1-124.

Reeves, M. S. R. & Reeves, M. P. (1913). *Round about a pound a week*. G. Bell and Sons, Limited.

Revilla, M., Couper, M. P., & Ochoa, C. (2019). Willingness of online panelists to perform additional tasks. *Methods, Data, Analyses: A Journal for Quantitative Methods and Survey Methodology (MDA)*, *13*(2), 223-252.

Ricciato, F., Wirthmann, A., & Hahn, M. (2020). Trusted smart statistics: How new data will change official statistics. *Data & Policy*, *2*.

Rinderknecht, R. G., Doan, L., & Sayer, L. C. (2022). MyTimeUse: An online implementation of the day-reconstruction method. *Journal of Time Use Research*, *1*.

Robinson, J. P. & Converse, P. (1972). Social change as reflected in the use of time. In A. Campbell & P. Converse (Eds.), *The human meaning of social change* (pp. 17-86). Russell Sage Foundation.

Robinson, J. P. & Godbey, G. (1997). *Time for life: The surprising ways Americans use their time*. Penn State Press.

Salgado, D., Esteban, M. E., Novás, M., Saldaña, S., & Sanguiao, L. (2018). Data organisation and process design based on functional modularity for a standard production process. *Journal of Official Statistics*, *34*(4), 811-833.

Scheuch, E. (1972). The time budget interview. In A. Szalai (Ed.), *The use of time* (pp. 69-87). Mouton.

Sonck, N. & Fernee, H. (2013). *Using smartphones in survey research: A multifunctional tool*. The Hague: The Netherlands Institute for Social Research.

Sorokin, P. A. & Berger, C. Q. (1939). *Time-budgets of human behavior* (*Vol. 2*). Harvard University Press.

Sorokin, P. A. & Merton, R. K. (1937). Social time: A methodological and functional analysis. *American Journal of Sociology*, *42*(5), 615-629.

Stinson, L. L. (1999). Measuring how people spend their time: A time-use survey design. *Monthly Lab. Rev.*, *122*, 12.

Stodden, V. (2014). The reproducible research movement in statistics. *Statistical Journal of the IAOS*, *30*(2), 91-93.

Sullivan, O., Gershuny, J., Sevilla, A., Walthery, P., & Vega-Rapun, M. (2020). Time use diary design for our times-an overview, presenting a Click-and-Drag Diary Instrument (CaDDI) for online application. *Journal of Time Use Research*, *15*(1), 1-17.

Szalai, A. (1972). *The use of time: Daily activities of urban and suburban populations in twelve countries.* Mouton.

te Braak, P., van Droogenbroeck, F., Minnen, J., van Tienoven, T. P., & Glorieux, I. (2022). Teachers' working time from time-use data: Consequences of the invalidity of survey questions for teachers, researchers, and policy. *Teaching and Teacher Education*, *109*, 103536.

van Tienoven, T. P., Minnen, J., Glorieux, A., Laurijssen, I., te Braak, P., & Glorieux, I. (2023). Locking down gender roles? A time-use perspective on gender division of household labour during the COVID-19 pandemic lockdown in Belgium. *Journal of Family Issues*, *44*(3), 654-680.

Wong, S., Harrison, L. J., Gibson, M. L., Press, F., Bittman, M., Crisp, K., & Ryan, S. (2022). Measuring early childhood educators' time at work using an electronic random time-sampling approach. *International Journal of Research & Method in Education*, 1-16.

Zeni, M., Bison, I., Reis, F., Gauckler, B., & Giunchiglia, F. (2020). Improving time use measurement with personal big data collection – the experience of the European Big Data Hackathon 2019. *Journal of Official Statistics*, *37*(2), 341-365.

Zerubavel, E. (1982). *Hidden rhythms: Schedules and calendars in social life.* University of Chicago Press.

Zuzanek, J. (1980). The work-leisure relationship in Soviet sociological discussion. *Canadian Slavonic Papers*, *22*(1), 122-128.

Time use during the pandemic and beyond: augmented diary methods to capture daily life in twenty-first century

Jonathan Gershuny • Michael Bittman

The COVID-19 pandemic required some drastic policy responses, in the absence of a vaccine – social isolation, economic compensation for small businesses, employees affected and a strengthening of the care economy (De Henau & Himmelweit, 2021). In comparison to its medieval origin of Quarantine (Sehdev, 2002), quarantine in the twenty-first century has the advantage of virtual social presence enabled by information technologies (IT), potentially minimising the disruptive effects of social isolation, relocating paid work, education, shopping and medical consultations to the home. The COVID-19 pandemic also exposed the significance of the commodified (in the sense of staffed by paid employees) "care economy" as parents replaced teachers, grandparents were at risk and hospitals could be overwhelmed (McDowell, 2014). The only way to know if these policies achieve their objectives is a survey showing how the population adjusted, when and where and they undertook the key activities, i.e., a time use survey.

These social changes not only underscore the importance of collecting time use data for framing public health, economic and social policy but also new, faster methods of data collection, processing, and data analysis. In what follows we discuss two specific new approaches to collecting time use data, each of which overcomes specific methodological challenges constraining data collection. The Click and Drop Diary Instrument (CaDDI) was developed by the Centre for Time Use Research at University College London (Sullivan et al., 2020). A further electronic instrument – the "Intensive Hour" or Random Time Sampling (RTS) smartphone app (Bittman, 2016) – permits a detailed investigation of the nature of paid labour. The example used here is work in a commodified care occupation, whose unique characteristics are evident when

compared to academics, the only other occupation that has been studied using RTS.

Method

CaDDI

CaDDI collects data online with nested drop-down menus that appear as the cursor hovers over particular points (ten-minute intervals) in each diary field (see Figure 1).[1]

Figure 1. User interface of CaDDI
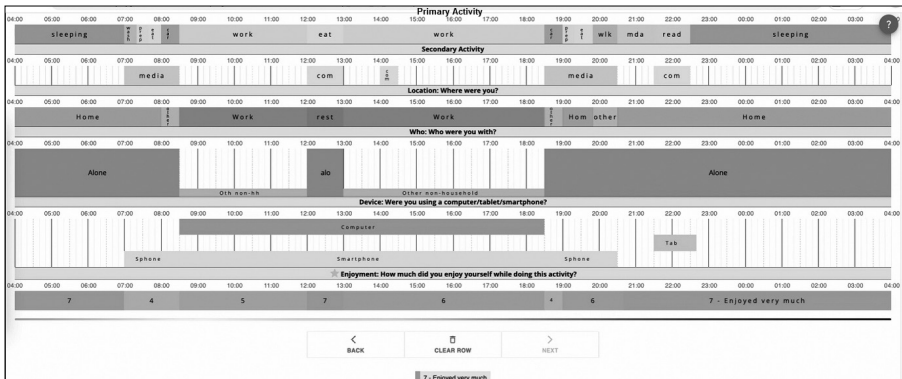
The version whose results are described here relied on access to a computer screen or tablet scrolling through the day from left to right; the latest version automatically switches between "landscape" screens and smartphones, the latter scrolling the day from top to bottom. There are six diary fields: (1) primary activity, (2) secondary activity, (3) location, (4) device use (smartphone/screen/laptop/tablet), (5) co-presence, and (6) level of enjoyment of the current activity. The respondents work through the day, entering primary activities by "clicking" on the appropriate activity and then "dragging" a cursor from the beginning to the end of a field representing the 144 successive ten-minute intervals of the day.

Once the primary field is completed (with no blank spaces), respondents move to complete the secondary activity row, now displayed immediately below the primary (which allows blank or "null" entries). Successively, they also complete location (no "null" entries permitted), device use, and co-presence (again no "null" entries but providing respectively "none" and "alone" as responses), and finally enjoyment (positive scale of 1-7, registered continually through the day). By the end of the entry process (median duration twelve minutes) all six fields are displayed in their entirety from 04:00 to 15:50 the following day (the smartphone version shows only part of the day on a single screen).

A particularly important feature, carried forward from the previous paper diary technology, is the independent timing of each field which enables both the registration of interruptions to primary activities (so that, for example, the changing pattern of co-presence during a single registered primary activity reveals the full extent of social interaction) and also perhaps the carry-over of a given range of co-presence between successive activities (e.g., childcare continuing through successive periods of work and leisure). Unlike some alternative developments (e.g., the American Time Use Study, ATUS) there are no "dependent timings" ("While you were doing … did you also …?") and the start and finish time of each of the six fields is recorded separately – maintaining an important flexibility of potential analytic activity whose importance is described in what follows. The data are represented as a continuous set of successive "episode" units, covering the maximum duration of each period during which none of the fields vary (Stone, 1984). This, as demonstrated in what follows, provides analysts the opportunity to design variables and tailor data structures to their specific analytical requirements.

The CaDDI evidence discussed here comes from a sequence of quota samples (selected to represent age and regional distributions across the United Kingdom) collected before and during the COVID-19 emergency using a 36-activity classification system. A UK random sample collecting the 140 Harmonised European Time Use Study (HETUS) activity codes is currently (late 2022) in the field.

Intensive hour

Typically, 24-hour time diaries have not encouraged the detailed reporting of activities undertaken in the course of paid employment, probably due to concerns about overburdening respondents and because this information is industrially sensitive (Eurostat, 2020; United Nations, 2005). The "intensive hour" technique overcomes both these obstacles: (1) it reduces the respondent

burden; and (2) it collects insufficient data from any individual to make any judgments about performance.

The Intensive Hour software randomly selects s few moments during the workday, sending for each a notification ("beep") requesting a recall of the activity episodes undertaken in the last hour. The RTS app takes the employee through a nested activity classification starting with ten broad categories of activity (domains), followed by a more detailed choice of subtasks, up to a maximum of 99 separate activities. The amount of time spent in the selected activity is recorded and any other activities (multi-tasked activities) is completed at the same time. For each activity, the employee then answers pre-coded questions about where the activity took place, and who they were with at the time. Data entry is repeated until ten blocks of six minutes each are completed. At the completion of the hour of time, the participants are asked to select a rating from 1 (low) to 10 (high) that describes their experience of the sampled hour of work on four dimensions: (1) the intensity of the pace of the hour (feeling rushed); (2) the extent of multiple demands; (3) the level of stress; and (4) job satisfaction. Gathering job experience in one-hour samples improves the global (whole) job ratings familiar to occupational health psychologists.[2]

Pilot work indicated that each response takes less than two minutes to complete, and one hour is easier to recall than an entire workday, thus greatly reducing the respondent burden. Typically, a respondent provides a random twenty hours of work. This is insufficient data to be useful to employers as a measure of employee "performance".

The technique relies on sampling theory. Given a sufficiently large pool of randomly sampled data, the technique joins up random pieces of information and creates a composite picture of what typically happens in a specific occupation (Bittman, 2016; Wong et al., 2022).

The intensive hour technique not only collects data on the allocation of time to specific components of the labour process. It also provides information about each episode: its duration and timing; the sequencing of activities; and the density of multi-tasking. The intensity of work can vary by the time of day, the day of the week and by season of year. RTS recognises that there are variations – peaks and troughs – in job demands, instead of assuming they are constant. This opens the way for investigating the conditions that heighten or lessen the intensity of a particular job.

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2   See, for example, Demerouti et al. (2001), Siegrist et al. (2004), Theorell and Karasek (1996).

Capturing the effect of the pandemic through CaDDI

The waves of CaDDI data presented here correspond roughly to the successive stages of public health restrictions aimed at managing the COVID-19 pandemic in the United Kingdom:

(1) the *first lockdown order* 23 March 2020: heavy restriction on paid work away from home; on meeting non-household members at home; closing non-essential shops and places of recreation, and requiring two-metre physical separation from non-household members;

(2) a *gradual relaxation,* from mid-May in England (slower in Wales and Scotland), but followed by a gradual increase in regional restrictions (Manchester, Midlands of England) from August 2020: additional rules were imposed in mid-September, and mid-October a three-tier system of restrictions;

(3) a *second lockdown starting* 5 November, for four weeks, followed initially by lighter restrictions, but with newfour-tier restrictions on 20 December;

(4) a third lockdown starting 5 January 2021, similar to that of 23 March 2020; and most recently;

(5) a substantial *second relaxation* from the end of July 2021.

Constructing complex diary variables

Szalai (1973) dealt with simultaneous activities by reporting findings larger than the 24-hours in a day, offending against this most fundamental time availability constraint and making interpretation difficult. The issue of multi-tasking was initially resolved by the Harvey et al. (1984) proposal of "hypercoding": constructing 24 hours by a mixture of single and double activities (e.g., watching television as a single activity, eating as a sole activity and watching television while eating as a combined activity). However, hypercoding all possible combinations yields very large, and frankly unwieldy, activity classification.

This unwieldiness is further compounded if one considers the context of an activity to be important. Most time use diaries have a column where respondents record their *mode* of transport. Was the respondent travelling by car, walking, cycling, or using the bus or some other means? However, under the HETUS protocol, respondents do not record the *reason* for undertaking the trip. In fact, assigning trip purpose is non-trivial (since the analyst must infer the diarist's motivations and planning assumptions). There are several

alternative methods for this, some more complex than others (e.g., the "trip circle" approach in Eurostat, 2019, pp. 64-68). The approach adopted here, however, is the one used by the UK National Travel Survey. Trip purposes are assigned by the application of two rules: (1) The trip purpose is taken to be the non-travel activity that immediately *follows* the trip in the diary narrative; (2) *unless* that activity is located at the diarist's home base, in which case the purpose is taken to be the non-travel activity immediately *preceding* the trip.

Devising complex variables to capture IT uses

We focus here on how to best analyse the diary information collected on IT use. Initially, IT was treated by diary studies, like television in the middle of the twentieth century, as a new primary activity and simply added to the activity classification. It soon became clear that employers expected their workers to use IT for paid work, nevertheless, the same devices were used for streaming entertainment, playing games, social contact and even online purchases of goods and services. So, should "IT use" complement "paid work", "leisure", "familial care", and so on, or should it be seen as a *means* of doing many distinctly different activities? CaDDI adopts both approaches with IT as an activity and IT use as a diary field.

Multiple IT use results

IT use is one of the most difficult activities to measure because it is a means of doing other activities and often remains hidden and often drastically underestimated. The analysis that follows is driven by substantive interests in an economic activity (specifically focused on paid work and shopping). The starting point is estimating the scale of the impact of COVID-19-related regulation on the location of these activities by splitting primary episodes of paid work and shopping into "at-home" and "away/workplace" episodes using the location field. Associated with a change in location of activities is, necessarily, a change in travel patterns, so we must also split travel by purpose, using the rules set out earlier, for our current focus, separating work- and shopping-related travel. For this analysis, "primary and secondary IT use" groups together all media (TV, radio, recorded media, and telephones with tablets, laptops, etc.).

As we see from the final column of Table 1, a total of 291 minutes of the day is declared as primarily involving leisure time at home (including watching TV, listening to radio, and using laptops, screens and smartphones). Of this, 150 minutes is in episodes mentioning primary home leisure activity alone, without listing the use of any equipment in the device field. A further sixteen

minutes primarily devoted to leisure activities also mention other simultaneous ("secondary") activity or activities involving IT devices (as for instance where a conversation with a family member is interrupted by a brief telephone call). And 125 minutes more is allocated to primary leisure activities with IT use mentioned only in the device field (as for example primarily "watching a film" while also checking "tablet"). The two cells in Table 1 representing respectively secondary IT use concurrent with another primary IT activity use (as in answering telephone while playing a computer game) or IT device use declared simultaneously with a primary IT activity (e.g., "writing emails" on a screen or a laptop) are provided with a grey background in the table, to remind us to avoid double-counting.

Table 1. A multiple activity IT use accounting hierarchy (CaDDI UK May-June 2020)

Minutes per day all adults	Primary activity, with no secondary or ICT device use	Concurrent secondary IT use with primary activity	IT device in use during primary activity	All time associated with the primary activity
ICT, computer use	13	6	37	57
Sleep, self-care	517	2	85	605
Eating, drinking	56	1	22	79
Work at the workplace	18	1	29	48
Work at home	24	1	64	90
Unpaid, caring and education	107	2	49	158
Shopping at the shops	7	0	2	9
Shopping at home	4	0	8	12
Out-home leisure	31	0	14	45
Home leisure	150	16	125	291
Travel home	12	0	9	21
Travel away	3	0	2	5
Work-related travel	3	0	2	5
Shopping-related travel	3	0	0	4
Unassigned	4	0	8	13
Total	954	30	456	1,440

So in addition to the 57 minutes of primary activity time devoted to IT by our sample, we can see another 441 minutes (456 − 37 + 30 − 6) of IT use associated with *other* primary activities, including, amongst others, 85 minutes of IT use while in self-care or resting activity (e.g., watching television in bed) a further 49 minutes associated with IT childcare, 30 minutes paid work at the workplace (one minute secondary plus 29 minutes device use), and 64 minutes associated with paid work done at home. This means that, rather than the

Figure 2. Primary activity only (a) vs. primary-minus-simultaneous IT (b) (UK adults, minutes/day)
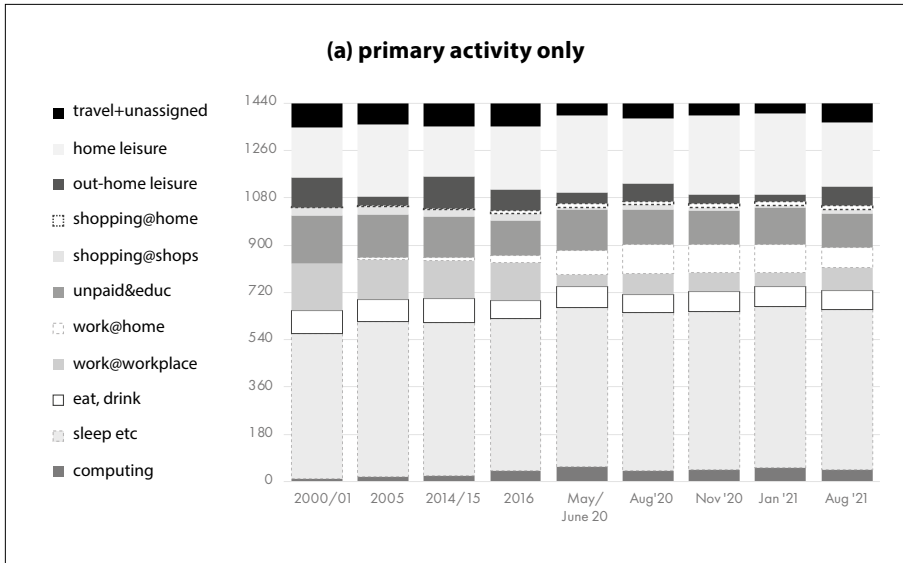
approximately one hour per day declared as using computers in the response to the straight-forward "What were you doing?", we find a total of more than eight hours per day in activities that somehow involve IT devices.

This major result – demonstrating that the impact of IT is so widely spread across all the activities of the day – is essentially invisible except using diary evidence with independent (i.e., separately timed) diary fields identifying multiple activities, locations and device use. The penetration of IT into daily life appears dramatically in Figure 2, by comparison of the simple "primary activity" (Figure 2a) histogram with that for more complex "primary activity minus simultaneous IT use". The left-hand panel of Figure 2 shows the 1,440 minutes of the UK adult population's day, in terms of fifteen primary activities aggregated from the final column of Table 1, for each of the UK-HETUS studies and the five successive tranches of CaDDI data.

The increase in the dark bars at the bottom of Figure 2b represent additions to the IT category, corresponding to the secondary and IT and IT device information missing from the columns of Figure 2a. Without exception, all primary activity totals (in Figure 2a) are diminished, and some substantially diminished, when simultaneous IT use is subtracted from them.

Figure 2. Continued

(b) primary activity minus simultaneous IT use

Legend:
- travel+unassigned
- home leisure
- out-home leisure
- shopping@home
- shopping@shops
- unpaid&educ
- work@home
- work@workplace
- eat, drink
- sleep etc
- computing

X-axis: 2000/01, 2005, 2014/15, 2016, May/June 20, Aug '20, Nov '20, Jan '21, Aug '21

Y-axis: 0, 180, 360, 540, 720, 900, 1080, 1260, 1440
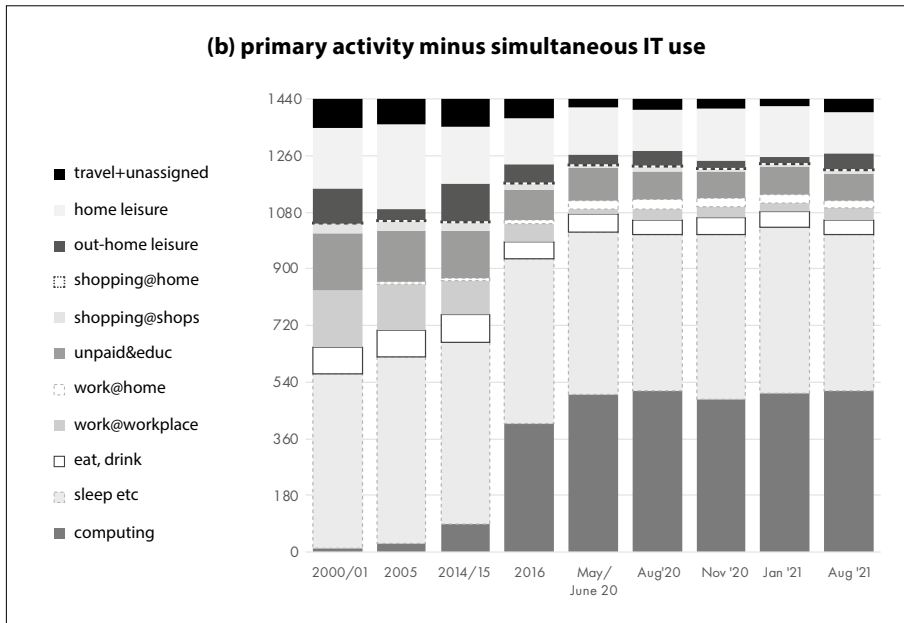
The all-IT "computing" (primary IT + secondary IT + IT device) bars in Figure 2b are the key observations. Note the substantial change between the 2014-2015 UK-HETUS and the 2016 CaDDI evidence. This is undoubtedly to some degree an artefact of three design issues:

(1) respondents to the paper and pencil-based UK-HETUS instrument were allowed to leave a blank response in the device field (25 % left the field incomplete) while the internet-based CaDDI required an explicit response;

(2) UK-HETUS 2014-15 IT device field had a binary "use/not-use" range, where the CaDDI instrument had a detailed five-element "not-use/ smartphone/laptop/tablet/other screen" value range, encouraging more careful responses; and

(3) the sample selection required the CaDDI respondents to be internet users. But even if the 2014-2016 gap is greatly exaggerated by these factors, we still see substantial and significant contrasts between the all IT "computing" totals in the 2016 and 2020-2021 CaDDI surveys, which use an exactly identical instrument. The higher 95 % confidence limit for the 2016 CaDDI "computing" mean of 409 minutes is 433 minutes, while the lower 95 % limits for the four COVID-19 period observations are, in order, 473, 484, 463 and 482 minutes, implying that the 2016-2020 differences in "computing" means are unambiguously significant.

We suspect that the 2014-2015 UK-HETUS "all IT/computing" total might have been two or three times higher had the CaDDI instrument been used at that time. The CaDDI "computing" total might have been 10 % or 20 % lower if the sample had been randomly selected. But even if an unbiased sample produced only half the current estimated "all IT" use, we would still have essentially the same story. In 2000-2001 there had been virtually no diffusion of smartphones or tablets, and the 2000 HETUS instrument – and previous UK studies – had no separate device field whatsoever.

Why does this growth in IT use happen? We can make sense of it by considering changes in two primary activities (paid work and shopping) with which it is associated. But first, Figure 3 estimates all IT use, irrespective of the specific purposes to which the equipment is put (as indicated by the non-IT-related primary and secondary activities with which it is associated). Adding together the primary, secondary and device-use evidence (and remembering to avoid double counting of secondary IT and IT device use associated with primary IT use), we first see an initial jump of just over an hour (from just over 400 minutes to just short of 500 minutes) from the pre-COVID-19 period to the first COVID-19 lock-down in May-June 2020, and then modest fluctuations over the next eight months and arriving at just over 500 minutes in January 2021.

Figure 3. UK primary and non-primary IT time use (minutes per day)
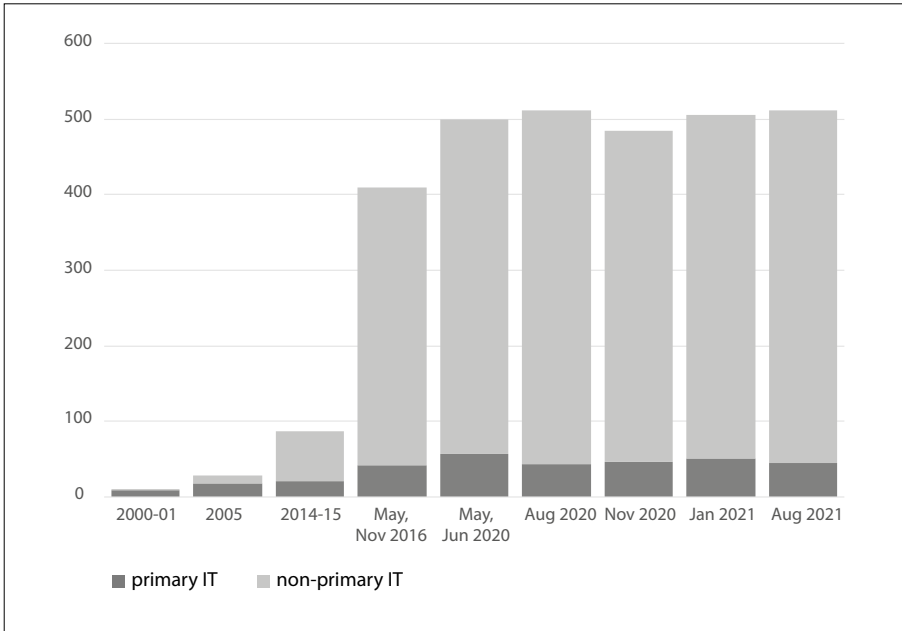
Changes in time use during the COVID-19 pandemic

Paid work time before and during the COVID-19 period

Now consider paid work specifically (Figure 4). In Figure 4a we see, stage by stage, a reasonably regular pattern of change in location. In the first lockdown paid work at the workplace falls from 147 minutes/day for the population, to 53 minutes with paid work at home increasing substantially, though initially giving a much lower overall level of total (home plus workplace) paid working time. Then, as the first lockdown ends (August 2020), we see a partial recovery of paid work time at the workplace. Subsequent declines (November 2020) in paid work at the workplace as the population moved towards the second lockdown, are mostly compensated for by increases in paid work at home. In January 2021, now subject to the second lockdown restrictions, paid work at the workplace is reduced to little more than its first-lockdown level – but paid work time at home was at the same time growing, sufficiently to bring the total of paid work close to the pre-COVID-19 level. Finally, August 2021, with substantial release from lockdown restrictions, sees a substantial increase in paid work at the workplace, but still little more than half of the pre-COVID-19 level, while the remaining paid work at home brings the total yet closer to equality with the 2016.

Note the decline in time spent travelling to work, clearly a consequence of home-based paid work. This might be interpreted as a major increase in economic efficiency – in effect an increase in labour productivity entirely uncounted in official economic statistics, and invisible except from this source.

In sum, on this evidence, a near-recovery of the total of paid working time (169 minutes per day in 2016 to 163 minutes per day in January 2021) – but, remarkably, with a tripling of paid work time at home (27 minutes before, 76 minutes in 2021, and halving the time spent commuting to the workplace, from twenty to eleven minutes per day). Note again, however, that the particular characteristics of the CaDDI market research sample – probably biased towards paid work despite the population-weighted quota – implies some degree of exaggeration in this result.

Figure 4. Time (in minutes per day) spend on paid work by location and travel (a) and share (in %) of IT use in paid work and related travel (b)
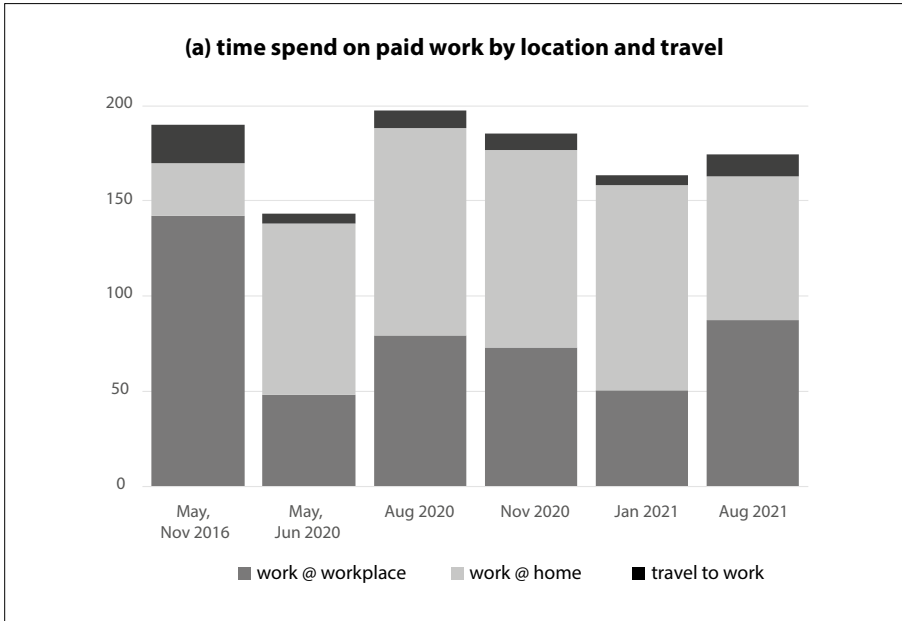
Turning to the IT trends in paid work on the Figure 4b, we see an initial overall rise in the IT proportion of all time in paid work as the United Kingdom moves into the first lockdown, subsequently the proportion then declines somewhat. This is the summation of two contrary trends: a sustained high proportional use of IT during paid work *at home* during the COVID-19 period, with a COVID-19-era decline in the proportion of IT time in the *workplace,* perhaps a result of a larger part of the now scarcer workplace time spent in face-to-face meetings. This will certainly reflect a *selection effect*: people with appropriate personal IT skills, or work roles more amenable to IT applications, or at least those in jobs with established higher levels of investment in equipment, databases and other facilities and procedures, being more likely to adopt home rather than workplace locations, with a corresponding decline in workplace IT use. We observe a decline – up to the third lockdown, in the proportion using of IT during work travel: we may speculate that this involves a similar selection-type explanation, with a smaller proportion of the IT users traveling to the workplace, reversed with the subsequent partial return to the workplace.

Systematic sample biases – from an internet-based panel – again imply the likelihood of a degree of exaggeration in these estimates. Nevertheless, we may expect, on the basis of the evidence from the CaDDI sample on its

Figure 4. Continued

(b) share of IT use in paid work and related travel

Legend:
- ······ % of paid work time at home
- ——— % of paid work time at workplace
- ——— % of all paid work time
- – – – % of time travelling to workplace

own deployed in Figures 4a and 4b – evidence which has no design variation whatsoever, and hence no *internal* response biases – that a properly constituted random sample of respondents would produce similar results, albeit perhaps at an overall lower level of IT penetration.

Shopping time before and during COVID-19

Shopping time exhibits a similar pattern. Figure 5a shows that initially with the emergence of the virus and the first lockdown, shopping at shops declined by nearly two-thirds, from 24 minutes per day to nine, with a smaller, less-than-compensating increase in shopping at home twelve minutes per day in 2016 to thirteen minutes in May and June 2020. During the August relaxation, shopping time at the shops rebounds substantially to a mean of seventeen minutes per day, but with the continuing pandemic and stronger regulations, this falls again, to twelve minutes per day in November and then nine minutes in January.
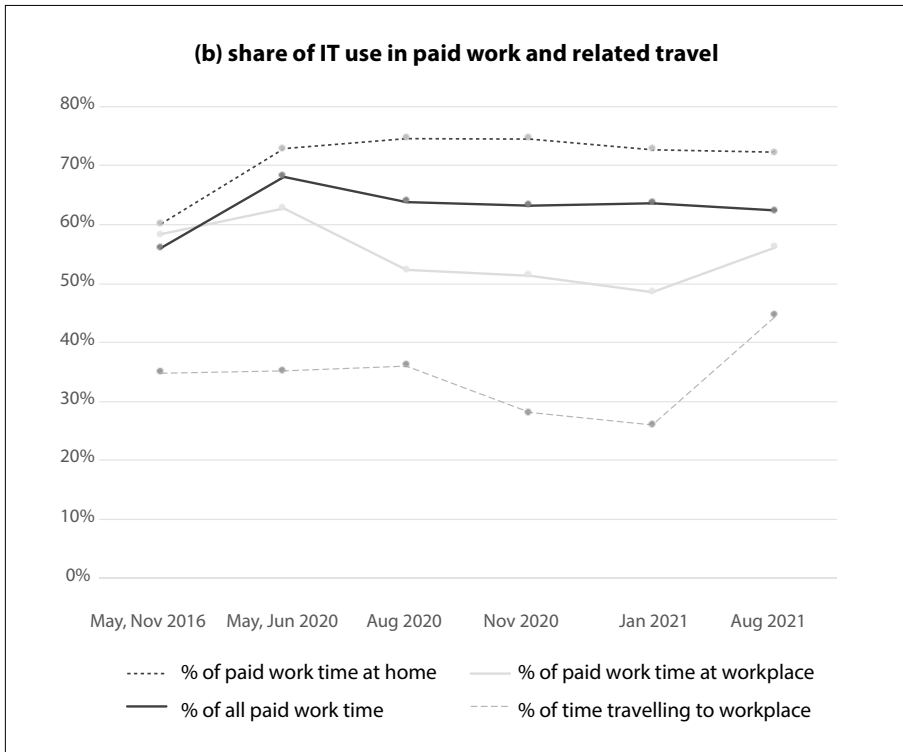
Figure 5. Time (in minutes per day) spend on shopping by location and travel (a) and share (in %) of IT use in shopping and related travel (b)

Shopping time at home only partially compensates, increasing to thirteen and then seventeen minutes through the successive stages of the pandemic. We may note that time spent travelling to shops adjusts approximately proportionally to time spent in the shops. Overall, this comprises a quite substantial reduction in overall time devoted to shopping (from 44 minutes/day in 2016 to 28 minutes/ day in January 2021) – nearly one-third of pre-COVID-19 shopping-related time freed for other activities. The release from the third lockdown brought a doubling of shopping at shops – but still reaching only two-thirds of the pre-pandemic level, and an overall level, including shopping travel of 37 minutes/ day as compared to 45 minutes/day before COVID-19.

Figure 5b shows the IT component of these trends in shopping time. Overall, up to the third lockdown we see a continuous increase in the proportional contribution of IT to shopping time (with, in 2016, 33 %, rising to 55 % of all shopping time involving IT use). Most of this increase is explained by the decline in IT-light shop time, combined with the 70 % difficult to rapidly increase home-shopping capacity. As these initial problems were resolved, so the IT-related shopping proportion rose from around 65 % in the first lockdown to 75 % in January 2021. We have as yet come up with no plausible explanation for the proportion growth in IT time during travel to the shops.

Figure 5. Continued

(b) share of IT use in shopping and related travel

Legend:
- ······ % of time shopping at home
- —— % of shopping at shops
- —— % of all shopping time
- ---- % of travelling to shops

X-axis categories: May, Nov 2016 | May, Jun 2020 | Aug 2020 | Nov 2020 | Jan 2021 | Aug 2021
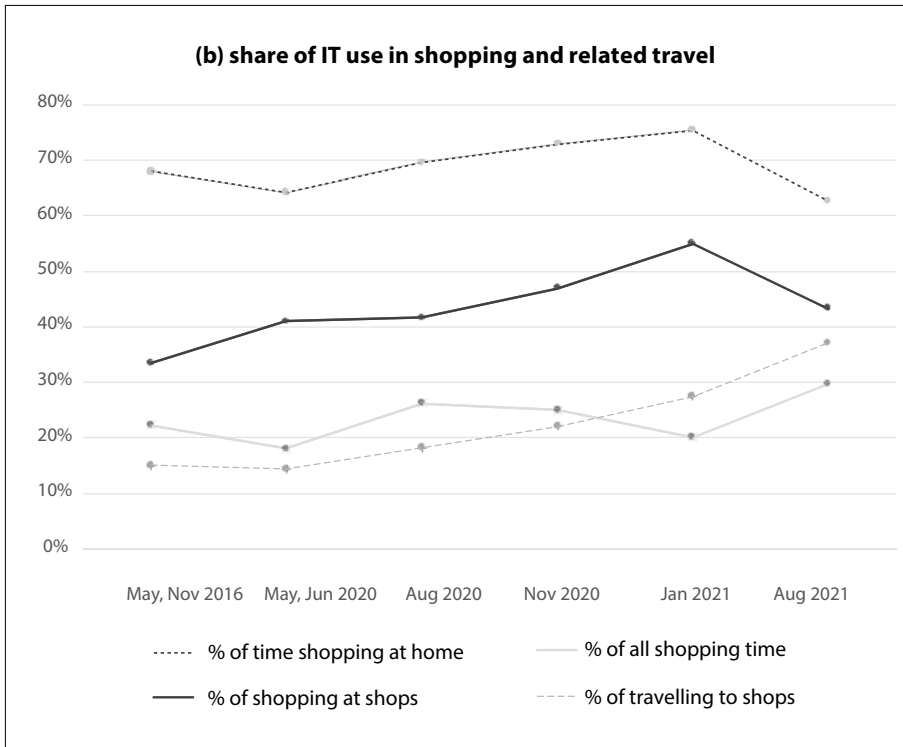
Pandemic and "care economy"

Feminists have argued for almost half a century that the market economy production rests on the bundle of goods and services they call the "care economy" – creating and nurturing the necessary capacities and associated functioning (Sen, 1985). The care economy embraces various forms of care – self-care, aged care, childcare, education and health care – each of which are different and are serviced in a distinct way. Official economic indicators – GDP, employment, and consumption surveys – ignore the care economy because much of it is outside the market economy, is unpaid, and produced by households, most often in the form of women's domestic labour.[3] However, commodified care is a fast-growing, if largely unrecognised, industry whose importance has been made obvious by the pandemic (De Henau & Himmelweit, 2021).

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3   The time Australian parents devote to childcare is much greater than time in any branch of paid labour (Ironmonger, 2004, p. 104).

The intensive hour technique enables, for the first time, detailed research into the actual labour process of this understudied profession. Since a key issue in the discussion of commodified childcare is how to maintain the quality of service at a cost that makes access affordable, this research was conducted, in "exemplary" Australian early childhood education and care (ECEC) services for children under the age of five years. A unique feature of Australia's ECEC is its national regulation, and its assessment and rating system that assigns an overall quality grade. In this study, exemplary preschools and childcare centres were identified based on having a current overall rating of "exceeding" all elements of regulator's standards. High-quality centres are especially interesting because Himmelweit (2007), following Baumol (1967, 1996), argues that a key issue in this sector of "stagnant" productivity is the trade-off between costs and quality. The danger is that key subgroups of women will be priced out of access to quality care.

Eligible centres were approached by letter or email using a staggered rollout, to provide greater flexibility in managing recruitment. Centre managers and directors were not included, unless their work week included a regular allocation of time providing care and education for children. A nested activity classification collected information in ten broad domains and a total of 55 employment-related subtasks.[4] The use of the intensive hour strategy gathered information from 321 respondents and yielded 3,610 hours and 10,155 episodes of employment-related activities. Mean times allocated to the ten activity domains were calculated, along with the mean times of 55 specific subclasses of activities. In addition to the average duration of activities, the distribution of episode lengths and the proportion of multi-tasking were also investigated. This enabled the analysis of the typical duration of activities and the timing of activity in the ten domains were analysed by season, day, and hour. The data were collected mostly before the outbreak of the pandemic, which resembles more closely the conditions that might prevail post-pandemic.

Objective characteristics of the job

Figure 6 shows the broad allocation of time among the ten activity domains. The domains are divided into two broad categories: (1) client-centred activities and (2) managerial or administrative activities.

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4   The activity classification was developed through pilot studies (e.g., Wong et al., 2022). It has images of the smartphone screen sequence, the equivalent of a pre-coded, one-hour time diary.

The largest allocation of client-centred category of activity domains is "Being with Children". This domain accounts on average for a third of the working time. About half of the time allocated to this domain is actively playing with children and the remainder is either devoted to "passive care" (watching and supervising children) or listening to children. Since G.H. Mead, sociologists have known that children's play is formative of self, other and society, so this domain is vital to learning. Furthermore, so-called "passive care" supervision of young children at all times is mandated under child neglect laws. The next largest activity domain is "Routine Care and Transitions", occupying about an eighth of the working time, covering the activities of maintaining hygiene, nutrition, health, sleep or rest, organising transitions and dealing with injuries or illness. "Direct, Intentional Teaching" activities occupy 10 % of working time, including instruction in literacy; speech and language; art and crafts; science and the study of nature; music and dance; social, cultural and socio-dramatic activities; problem-solving; physical assistance and self-help; health and well-being education; numeracy and media or digital technology. "Emotional Support" – supporting positive behaviour; mediating conflict; comforting children; stopping unsafe behaviour; encouraging inclusion; other child relationships; supporting colleagues – is experienced as an intense activity, which often requires extra help from more senior colleagues, but fortunately the need for it arises infrequently, occupying only 2 % of the working day. As expected, "Staff Personal Time" accounts for about an eighth of time spent at work, although scheduled breaks are shorter than one hour, and the remaining time is devoted to self-care and other forms of break. Four per cent of working time, on average, is devoted to "Family Communication", either face-to face, by email or phone, or group circular or individual letter.

Turning to the category of administrative/managerial of activity domains, 7 % of total working time, on average is devoted to the activity domain of "Plan/Assess/Evaluate". This domain includes curriculum planning, observing or assessing a child, documenting learning and evaluating policies. A further 7 % of working time is allocated to the activity domain of "Organise Room; OH&S Maintenance", including setting up the room; packing up the room; preparing and serving food; cleaning and tidying; tending to plants or animals; laundry; general maintenance and occupational health and safety compliance. A similar proportion of working time (7 %) is taken up by the activity domain of "Administration", embracing the activities of record-keeping rolls; answering the phone or the door; staff handover/communications; staff meetings; organising staffing; other administrative activities. "Staff Professional Development" accounts for 3 % of working time; this activity consists of self-education activities; professional development in service; supporting or

mentoring others; pedagogical leadership and reflection. Taken together, these four outright administrative and managerial activity domains occupy, on average, more than a quarter of all staff time.

The variation in the timing of activities whether analysed by time of day, day of the week or season of the year are minor and not of any theoretical significance.

Figure 6. Average time devoted to main (primary) activities in the ten domains
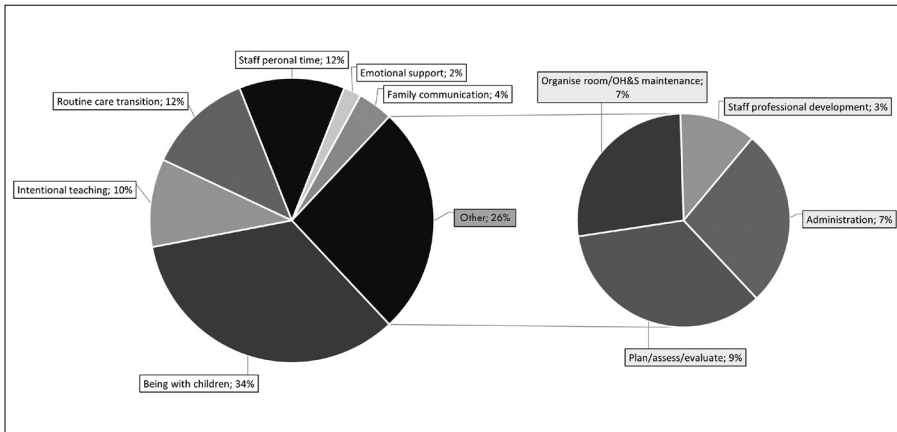
It is striking how little specialisation by rank there is among early childhood carers and educators. Whereas senior staff in this study spent a little more time away from children, did a little more of the paperwork, and stepped in when children were distressed (see Table 2), everyone participated in all ten domains. All ranks performed a wide range of activities, similar to a craft form of organisation (but with low pay). This contrasts with Adam Smith's famous description of how industrialised pin-making is divided into eleven or twelve specialist activities in order to maximise productivity and cheapen the cost of pins (Smith, 2010) and aligns with Baumol's and Himmelweit's ideas about the limits to productivity inherent in personal services.

The distinctive characteristics of the ECEC labour process are not so much found in the allocation of time, but in the sheer variety of tasks and the short duration of tasks that demand rapid switching. The incessant switching of tasks is combined with the high proportion of time that requires the performance of more than one task at the same time, while responsible for high numbers

of children. These characteristics make it clear that this job requires intense cognitive agility, a highly developed skill.

Since the RTS smartphone app is a recent development, the only possible comparison is with the pilot study of academics in a single Australian department in the faculty of Humanities and Social Sciences (HASS) (see Bittman 2016). These two service occupations differ in the granularity of tasks. The two distributions are mirror opposites of each other. The ECEC pattern displays the rapid, regular changing of activities. In contrast, the modal activity-duration for academic adult educators is at the other extreme, with over 40 % of sample hours devoted to a single activity. The switching of activities may appear to be the result of a young child's short span of attention, or the alternative explanation is that at this age childhood development is very rapid, as they move from activity to activity at speed, requiring educators and carers to constantly adjust their activities. Moreover, the pattern of ECEC work challenges the instrument design. While breaking the hour into ten blocks with a minimum of six minutes fits comfortably on a smartphone screen, but since the modal episode duration is six minutes, one is forced to wonder if the granularity of the ECEC tasks could well be shorter than is captured by this time-length limitation.

Table 2. Time spent (min/h) in activity domains by position in the organisation

	Assistant	Educator	Teacher	Room Leader
	Mean (95 % CI)	Mean (95 % CI)	Mean (95 % CI)	Mean (95 % CI)
Staff personal time	9.3(5.2-13.5)	8.1(3.6-12.6)	6.0(1.5-10.5)	6.2(−1.5-11.0)
Intentional teaching	5.4 (3.8-7.1)	5.1(3.1-7.1)	6.7(4.7-8.8)	5.4(2.7-8.1)
Being with children	23.8(18.2-29.3)	23.1(16.9-29.2)	16.9(10.9-23.0)*	18.9(12.5-25.4)
Routine care/Transition	9.0(6.3-11.7)	8.9(5.6-12.1)	5.1(2.2-8.1)*	8.7(5.2-11.8)
Emotional support	1.7(0.9-2.5)	0.9(0.0-1.8)	1.3(0.4-2.2)	3.1(1.8-4.5)*
Family communication	1.1(0.6-1.6)	1.2(0.5-1.8)	3.0(2.1-3.9)***	3.8(2.4-5.3)***
Organise room/OH&S	5.9(3.5-8.3)	4.8(1.9-7.7)	3.9(−0.7-4.6)	3.6(−1.0-6.5)
Planning	2.5(0.6-4.5)	3.1(0.9-5.4)	8.3(5.9-10.6)***	5.7(3.4-8.0)**
Administration	1.2(0.2-2.1)	2.4(0.9-4.0)	6.5(4.5-8.5)***	4.0(1.2-6.7)*
Staff development	0.1(−0.0-0.2)	2.4(1.0-3.8)**	2.3(1.5-3.1)**	0.5(0.2-0.8)***

Notes: Linear regression based on 304 persons and 3,526 hours. Assistant/floater is the reference group.
*** p-value<0.001, ** <0.01, * <0.05.

A further indication of the intensity of ECEC work is the extent to which two or more tasks were performed at the same time, namely, multi-tasking. Among academics, the proportion of activities involving multi-tasking is vanishingly small. Cross-domain multi-tasking was present in every domain in this study. Every activity had a high probability of being accompanied by a second, unrelated activity. The proportion was lowest in personal staff time and in professional learning, although there was some multi-tasking even there.

Experiments by psychologists suggest that both rapid switching of tasks or doing more than one task at a time, especially if tasks are complex, impedes productivity. The experiments compare how long it takes for people to repeat a single task with how long it takes to get everything done when there are two tasks involved. Rogers and Munsell's (1995) experiment showed when people had to switch between two tasks every two or four trials, even when this was predictably regular, they were still slower on task-switch than on task-repeat trials. Furthermore, increasing the time interval between trials for preparation reduced, but did not eliminate, the cost of switching.

Strangely, even switching to the more habitual of two tasks can be harder. Meuter and Allport (1999) conducted an experiment that required subjects to name digits in their first or second language, depending on the colour of the background on which the digit was displayed. Subjects, as one might expect, named digits in their second language more slowly than in their first when the language repeated. However, they were also slower in their first language when the language changed.

Rubinstein et al. (2001) conducted four experiments in which subjects switched between different tasks – for example, solving maths problems or classifying geometric objects. Participants lost time in all tasks when they had to switch from one task to another and they lost more time as tasks got more complex or were less familiar. The reverse also applied; the participants were faster when they switched to tasks they knew better.

Yeung and Monsell (2003) quantitatively modelled interactions between relative task dominance and task switching. Their results uncovered some more issues that need to be dealt with to improve our understanding of the cognitive load imposed by real-life multi-tasking. In addition to reconfiguring control settings for a new task, one is also obliged to recall where you got to in the task to which you are returning, and to decide which task to change to, and when.

The most accepted interpretation of these findings is that the time costs of switching tasks or trying to do two tasks at the same time derive from the cognitive processes of (1) goal shifting ("I need to do this activity now instead of the activity I am currently doing") and (2) rule activation ("I am turning off

the rules of my previous activity and turning on the rules for newly demanded activity") (Meyer, Evans, & Rubinstein, 2001).

Regarding scaling-up productivity and its effects on the quality of the service, it should be noted that this is a sample of exceptionally high-quality early childhood service providers. Nevertheless, a worker in these centres spends a great deal of time caring for more children than the "ideal" family size of two (Heard & Arunachalam, 2014). ECEC work is like raising a large family. In this study, an employee was responsible for more than two children 36 % of the time, and for six or more children 25 % of the time. One-on-one relationships with the children took up only a small proportion of the working day (4 %). This level of responsibility adds to the job demands and may well contribute to the constant switching of activities and the proportion of working hours that require attention to more than a single task.

Subjective characteristics

As mentioned earlier, the RTS software asked respondents to rate (out of ten) their experience of the sampled hour of work in terms of (1) how rushed they felt, (2) whether they thought they were subject to demands for many separate things, (3) their level of stress and (4) the satisfaction with the job in that hour. A factor analysis revealed that self-rated items on the employee's experience of the pace of work (the "rushed" scale), the frequency of multiple demands, and the level of stress, all loaded into a factor we called "Job Demands".

A linear regression tested the hypothesis that (1) the number of episodes per hour, (2) the proportion of an hour involving multi-tasking, and (3) the proportion of an hour with responsibility for six or more children is significantly related to the factor of "Job Demands". The jobs demand factor combines the respondents' rating of the pace of work, the proportion of multiple demands, and the level of stress. Table 3 shows that each of these features did significantly influence the Job Demands factor. This analysis predicted that an ECEC worker with six activity episodes per hour (one above the median), a high proportion of multi-tasking, and responsibility for six or more children, would feel that their Job Demands were 150 % the level it would have been with fewer than five activity episodes in an hour, fewer multi-tasked episodes, and responsibility for fewer children. Not only does ECEC have a hectic, fast-changing rhythm, it also has peaks of intensity.

Table 3. Regression determinants of Jobs Demands factor in fourteen-minute intervals (n = 14,440)

	Coefficient (SE)
Number of episodes (range 1 to 10)	0.12(0.05)*
Proportion of time multi-tasking	0.99(0.21)***
Proportion of time with 6+ children	0.50(0.19)**
Constant	2.77(0.17)***

Note: SE = standard error.
*** p-value<0.001, ** <0.01, * <0.05.

Conclusion

Multiple activity IT use based on CaDDI

The CaDDI evidence, focusing here on IT, virtual employment and remote shopping, demonstrates the remarkable extent of penetration of IT into the daily life of the population: nearly nine hours per day is in some way involved with information technology – implying that the great majority of IT use is simply invisible from the primary activity data recorded in time diary studies. Particularly striking is the overall high level of penetration of IT-use in the workplace. Since the use of IT certainly implies portability and a degree of location-independence of work tasks, and in parallel with the high level of availability of IT devices to private households, IT is an important enabler of the transfer of the location of paid work from the workplace to the home. Similarly, IT is the major enabler of the transfer of shopping activity from shops to homes. The shopping results show patterns of change generally very similar to those from paid work.

Also, two particular methodological implications emerge. First, it highlights the importance of correctly structured time use diary design and analysis, avoiding interdependencies of timing between diary fields. Second, it underlines the imperative for care in the construction of secondary analytic datasets, making full use of the evidence of both the simultaneous and the sequential activity patterns that are available in correctly structured diary instruments.

ECEC labour processes based on the intensive hour

The intensive hour app, applied to investigating the ECEC labour process, skills and prospects for increased productivity demonstrates that one can investigate

how people in a particular occupation spend their time, revealing information that was previously unavailable. As with other electronic methods of data collection, some effort is required to conduct pilot research in order to develop what are forced-choice nested activity classifications specific to each occupation. Of course, paper-and-pencil diaries, where the respondents described their activities in their own words, were more flexible but required significant labour to post-code these entries into numerical form.

The intensive hour app provides information that shines some light on the trajectory of post-Fordist occupations. Do they require higher skills or fewer skills? Are service occupations labour-intensive with limited opportunity for progressive increases in productivity? Would investing in the feminised care economy not only improve well-being but also generate faster growth than building more infrastructure? This pioneering study of early childhood educators and carers casts doubt on 1980s US skill rating of "childcare" as lower than the skill level of a "horse-handler", since the objective characteristics of the ECEC labour process require advanced cognitive skills to cope with rapid switching and multitasking. Indeed, it calls into question the conventional operationalisation of human capital as years of schooling and experience, while simultaneously increasing our understanding of the developmental importance of the early years and the significance of parents' unpaid work.

Adam Smith's famous example of the division of labour in pin-making among twelve specialists, which yielded substantial productivity gains that lowered the cost of pins, depends on the concept of zero cognitive switching costs. Each specialist labourer repeats the same simple task and there is no multi-tasking. Henry Ford built on this principle in devising his assembly line that became the characteristic of industrial mass production. As Braverman (1998) observed, when complex tasks are divided and reduced to a single, simple, repetitive task, this allows the supplication of the "Babbage principle", that is, of replacing craftsmen with unskilled labourers with lower pay. Similarly, high cognitive skills required in the ECEC labour process might explain why it is difficult to upscale commodified childcare to the point where Baumol would classify it as a "progressive" industry and Himmelweit could abandon concerns that the cost of this service will price key subgroups of women out of the labour force.

The policy responses to the COVID-19 pandemic have relied on the *Digital Revolution* (also known as the Third Industrial Revolution) to successfully practice social isolation without fatally disrupting paid employment and the market provision of vital goods are services. However, fluctuations in location and activities have been subtle and require methods of data collection that make data rapidly available for intense forms of analysis. Ironically the very digital

techniques that we are studying enable promising solutions to these challenges. To paraphrase Pietro Sraffa's famous book title, this might be called The Study of the Digital Revolution by Means of the Digital Revolution. The same techniques reveal the complicated labour processes that constrain productivity in the care economy, replacing armchair speculation in these industries the pandemic has shown to be indispensably important.

References

Baumol, W. J. (1967). Macroeconomics of unbalanced growth: The anatomy of urban crisis. *The American Economic Review*, *57*(3), 415-426.

Baumol, W. J. (1996). Children of performing arts, the economic dilemma: The climbing costs of health care and education. *Journal of Cultural Economics*, *20*(3), 183-206.

Bittman, M. (2016) Looking into the black box of employment: The "intensive hour" approach to time spent in employment-related activities https://www.timeuse.org/sites/default/files/M.Bittman %20- %20Looking %20into %20the %20Black %20Box %20- %20Working %20paper.pdf

Braverman, H. (1998). *Labor and monopoly capital: The degradation of work in the twentieth century*. NYU Press.

De Henau, J. & Himmelweit, S. (2021). A care-led recovery from COVID-19: Investing in high-quality care to stimulate and rebalance the economy. *Feminist Economics*, *27*(1-2), 453-469.

Demerouti, E., Bakker, A. B., De Jonge, J., Janssen, P. P., & Schaufeli, W. B. (2001). Burnout and engagement at work as a function of demands and control. *Scandinavian Journal of Work, Environment & Health*, *27*(4) 279-286.

Eurostat (2020) Harmonised European Time Use Surveys (HETUS) 2018 Guidelines RE-EDITION 2020 edition. https://ec.europa.eu/eurostat/documents/3859598/11597606/KS-GQ-20-011-EN-N.pdf/2567be02-f395-f1d0-d64d-d375192d6f10?t=1607360062000

Harvey, A. S. (1984) Special time budget measures. In A. Harvey, A. Szalai, D. Elliott, P. Stone, & S. Clark (Eds.), *Time budget research: An ISSC workbook in comparative analysis*. Frankfurt Campus Verlag.

Heard, G. & Arunachalam, D. (Eds.). (2014). *Family formation in 21st century Australia*. Springer.

Himmelweit, S. (2007). The prospects for caring: Economic theory and policy analysis. *Cambridge Journal of Economics*, *31*(4), 581-599.

Ironmonger, D. (2004). Bringing up Bobby and Betty. In N. Folbre & M. Bittman (Eds.), *Family time: The social organisation of care* (pp. 93-109). Routledge.

McDowell, L. (2014). Gender, work, employment and society: Feminist reflections on continuity and change. *Work, Employment and Society*, *28*(5), 825-837.

Meuter, R. F. & Allport, A. (1999). Bilingual language switching in naming: Asymmetrical costs of language selection. *Journal of Memory and Language*, *40*(1), 25-40.

Rogers, R. D. & Monsell, S. (1995). Costs of a predictable switch between simple cognitive tasks. *Journal of Experimental Psychology: General*, *124*(2), 207.

Rubinstein, J. S., Meyer, D. E., & Evans, J. E. (2001). Executive control of cognitive processes in task switching. *Journal of Experimental Psychology: Human Perception and Performance*, *27*(4), 763.

Sehdev, P. S. (2002). The origin of quarantine. *Clinical Infectious Diseases*, *35*(9), 1071-1072.

Sen, A. (1985). *Capabilities and commodities*. North-Holland Publishing.

Siegrist, J., Starke, D., Chandola, T., Godin, I., Marmot, M., Niedhammer, I., & Peter, R. (2004). The measurement of effort–reward imbalance at work: European comparisons. *Social Science & Medicine*, *58*(8), 1483-1499.

Smith, A. (1937). *The wealth of nations [1776]* (Vol. 11937). na.

Stone, P. J. (1984). Event analysis. In A. Harvey, A. Szalai, D. Elliott, P. Stone, & S. Clark (Eds.), *Time budget research: An ISSC workbook in comparative analysis*. Frankfurt Campus Verlag.

Sullivan, O., Gershuny, J., Sevilla, A., Walthery, P., & Vega-Rapun, M. (2020). Time use diary design for our times-an overview, presenting a 'click-and-drag' diary instrument for online application. *Journal of Time Use Research*, *15*(1), 1-17.

Szalai, A. (1971). *The use of time*. Mouton.

Theorell, T. & Karasek, R. A. (1996). Current issues relating to psychosocial job strain and cardiovascular disease research. *Journal of Occupational Health Psychology*, *1*(1), 9-26.

United Nations. Statistical Division. (2005). *Guide to producing statistics on time use: Measuring paid and unpaid work (Vol. 93)*. United Nations Publications.

Wong, S., Harrison, L. J., Gibson, M. L., Press, F., Bittman, M., Crisp, K., & Ryan, S. (2022). The development and useability testing of a random time sampling time use diary for the early childhood field. *International Journal of Research and Method in Education*. [Online First].

Yeung, N. & Monsell, S. (2003). Switching between tasks of unequal familiarity: The role of stimulus-attribute and response-set selection. *Journal of Experimental Psychology: Human Perception and Performance*, *29*(2), 455-469.

A road full of challenges: how time use surveys became an essential part of statistical production

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A time use survey is a unique research method that describes the living conditions, everyday life, and quality of life of the population, and it provides information that cannot be obtained in other ways. A wide variety of information and official statistics is produced from time use data, which can be used to examine a wide range of social and cultural phenomena.

The most traditional statistical time use data method is to report people's different activities in an average 24-hour period as averages, percentages or graphical tempograms. In this so-called time-budget perspective, the rhythms of time use can be examined according to the day, day of the week, season, and year. Time use data can be used to compare the time use of different ages, the division of labour between the sexes, the time spent on gainful work and the reconciliation of work and family life. As a time use survey, it provides information about hobbies and cultural participation, social relationships and loneliness, in addition to modes of transport and commuting, for example.

Time use surveys are recognised today as an important source of indicators of living conditions and quality of life (e.g., Stiglitz et al., 2009). Worldwide, time use surveys are becoming an increasingly important source of information for economic and social statistics (Jeskanen-Sundström, 2009).

Time use information is essential when monitoring the implementation of the Sustainable Development Goals (SDGs) of the United Nations Agenda 2030. Time use data help us to understand the population's living conditions and well-being, analyse the differences in the time use of women and men, measure the time spent on unpaid household and care work, and determine their value (Sustainable Development Goal 5.4.1). They also serve to make this visible and appreciated. The statistics on the value of household production

complement national accounts (see, e.g., Suh & Folbre, 2017; UNECE, 2017). In addition to Goal 5.4.1, time use data also provide background information for and evidence about other sustainable development indicators (UNSD EG, 2020).

Carrying out surveys today is challenging in many ways. Regarding response rates and participation, household-based surveys and especially time use surveys, which the respondents can often perceive to be a burden, are particularly challenging. It is challenging to carry out year-long, expensive data collection, both in terms of resources and of the data-collection process and infrastructure. The processing and analysis of the data also have their own challenges, as microdata are broader and clearly more complex compared to conventional survey data, and therefore require solid expertise from the users of microdata. The modernisation of time use data collection has been aimed at least some of these challenges in recent years.

In this chapter we describe how time use surveys have become an essential part of statistical production and the challenges the national statistical institutes are facing in conducting these surveys. We start from the history of the time use surveys: how time use studies transformed from small local studies to large-scale nationwide surveys (Challenge 1). Crucial in this process was the entrance of national statistical institutes to conduct the surveys. Then, international harmonisation was needed to enable comparisons between individual surveys (Challenge 2). First, post-harmonisation was used to compare already existing surveys. The comparisons grew on a more solid foundation when international organisations (e.g., Eurostat and the United Nations) started to coordinate harmonisation work. Crucial to harmonisation is the classification of activities (Challenge 3). One of the biggest challenges in statistical production is the need to modernise the data collection (Challenge 4). And, finally, we examine how certain aspects in the modernisation of daily life (e.g., the use of new communication technologies) lead to new challenges to data collection and the classification of time use.

Challenge 1: measuring time beyond paid work

Pioneers of time use research

Individual time use surveys have been conducted for more than a century in different parts of the world. According to Suh and Folbre (2017), small-scale surveys were conducted as early as in the early twentieth century. The time-budget method had its origins in the study of family budgets, the accounting

method which was used for studying the living conditions of English and French factory workers at the end of the nineteenth century. The need for more comprehensive information on the lifestyles of families led to the study of the use of time, in addition to the study of the use of money. This gave rise to time-budget research as the research tradition where the behaviour of people is measured according to their use of time, in hours and minutes (Szalai, 1966).

The first time use studies were published in 1913 in the United States (Bevans, 1913) and in Britain (Harvey & Pentland, 1999, p. 5; Pember Reeves, 1913). Bevans' doctoral thesis was titled "How working men spend their spare time". Pember Reeves studied money and the time use of working families in London. After these studies, individual surveys were conducted in separate countries in the following decades. They studied, for instance, the time use of the urban and rural population, leisure time and commuting times (see, e.g., Bauman et al., 2019; Chenu & Lesnard, 2006; Gershuny, 1995; Michelson, 2005; Szalai, 1966). Problems of leisure time came up early as study objects along with the spread of movies and radio (Szalai, 1966, p. 5).

The USSR was a leading country in time use surveys in the 1920s and 1930s. Many research techniques were developed at that time. A study led by Professor Stanislav Strumilin in 1923-1924 is regarded as "the first large-scale study of time budgets" (Szalai, 1984, p. 39, as cited in Michelson, 2005, p. 9). The studies by Strumilin focused on the time use of factory workers, state employees, agricultural workers, the unemployed and their families. The aim of the studies was to serve state and local planning. Later in the 1920s and 1930s several time use surveys of different population groups were conducted in the Soviet Union until they were interrupted for two decades (see Artemov & Novokhatskaya, 2004; Chenu & Lesnard, 2006; Zuzanek, 1980).

Time use surveys were conducted also in the United States in the 1920s and 1930s. In addition to the studies on leisure activities the use of time by farm women was studied under the direction the Bureau of Home Economics of the US Department of Agriculture (Szalai, 1966, p. 5).

Time use studies were carried out only sporadically until the late 1960s, when a comparative time-budget study of twelve countries, the Multinational Comparative Time Budget Research Project, was carried out under the direction of Professor Alexander Szalai (1972).[1] The project included individual cities from both market and centrally planned economies. This research project has had a significant impact on time use research. The main solutions for the methods and classifications applied in later surveys were developed in this study.

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1   Belgium, Bulgaria, Czechoslovakia, France, East and West Germany, Hungary, Peru, Poland, the Soviet Union, the United States, and Yugoslavia.

Time use surveys as part of official statistical production

The pioneers in the field of time use research were academic researchers, and the materials they used were usually small, consisting of data from a single location and population group. In studies carried out in the 1980s and later, information gathering has mainly been collected by national statistics authorities. Research materials have grown from samples of a few hundred to samples of thousands, which are designed to be representative of the major parts of the population. The role of academic researchers has changed from producers to users of the time use data (Niemi, 1995).

Central statistical offices have conducted time use surveys since the 1960s. The first surveys were conducted by statistical offices in Hungary and the Soviet Union (Szalai, 1966, 1972). According to Bauman et al., "By the early 1960s, large diary-based time use studies were underway in Czechoslovakia, France, Hungary, Poland, Japan and many other countries" (2019, p. 3).

A remarkable new step in collecting time use data was taken in the form of the American Time Use Survey (ATUS) in 2003. The ATUS was sponsored by the Bureau of Labor Statistics and conducted by the US Census Bureau. The ATUS data are collected continuously for most days of the year using Computer Assisted Telephone Interviewing. Nearly 228,000 interviews were conducted between 2003 and 2021 (US Bureau of Labor Statistics, 2022).

According to an overview by Data2X, in recent decades, 257 major Time Use Surveys have been conducted in 88 countries. Most of these surveys have been conducted by government statistical agencies, but some have been carried out by international agencies, national universities, or private sector firms (Buvinic & King, 2018, p. 8).

Measuring modern life

Time use surveys, which are recommended to be carried out every ten years (see, e.g., UNECE, 2013, p. 39), form a unified cross-sectional time series of official statistics, which enables the description of changes in the time used for different activities. Along with the steady continuity of the time series, the research's strengths are its historical knowledge of the current phenomena and trends. In the past ten years, significant changes have occurred in communication technology: the mobile internet and social media have become commonplace. With time use research, we gain information about how this is reflected in time use and its changes.

The time use survey is currently the only method from which we obtain information about how much time people spend in their free time in front of

various screens. While other media studies usually measure one medium, the time use survey examines all the activities of people; this means that, depending on the structure of the diary, the total time that people spend in their free time in front of various screens can also be measured. This is accessed by looking at time spent watching TV, the internet, social media and digital gaming and whether a smartphone, computer or tablet was used to perform the various activities (see Statistics Finland, 2023a; cf., Mullan 2019a, 2019b).

The internet and the use of smartphones have practically exploded screen time into completely different spheres than was the case previously. As a result, time use has become fragmented, and there have been a huge number of short periods, which poses challenges for measuring time use. Watching TV and video content has been increasing for a long time, as has the use of computers and communication technology. The COVID-19 pandemic has further accelerated the use of different screens.

One of the many things the pandemic has affected is the experience of everyday life and subjective well-being. Today, adding subjective emotional variables to measuring time use is even more common. The most common subjective emotions measured as context in time use surveys are how stressed people are when performing an activity or how much people enjoy what they are doing (Gershuny, 2019; UNSD EG, 2022c, p. 26).

Measuring subjective well-being (SWB) or mood is not a mandatory element in the European time use survey, but Finland, France, the United Kingdom and the United States, for example, have included this in their national surveys. International organisations such as the Organisation for Economic Cooperation and Development (OECD) and the United Nations Economic Commission for Europe (UNECE) have stressed the importance of measuring subjective well-being, and they have compiled guidelines for this purpose (OECD, 2013; UNECE, 2013).

Subjective well-being can be measured in a general way with additional questions in the time use diary or in more detail connected with time episodes. For example, Finland decided on the latter solution, because user tests showed that a separate "column" in the diary did not increase the burden of answering but made answering more attractive. The results of the 2020-2021 data collection from this pandemic period regarding subjective well-being are certainly interesting and historically valuable.

Challenge 2: harmonisation

Some of the countries that took part in the Multinational Comparative Time-Budget Research Project replicated their studies in the 1980s. For example, the United States–Soviet bilateral comparative study (Robinson et al., 1988). Also, other comparisons between two or more countries were made, for example, between Hungary and Finland, and between Finland, Russia, Latvia and Lithuania (Andorka et al., 1983; Niemi et al., 1991).

The University of Bath gathered time use studies from several countries in the Multinational Time Use Study (MTUS) dataset. Professor Jonathan Gershuny developed the MTUS in the mid-1980s, supported by the European Foundation on Living and Working Conditions in Dublin (Gershuny, 1995, p. 547; Gershuny et al., 2007). The MTUS is now hosted at the Centre for Time Use Research at the University College London, and it includes over 70 national-scale surveys from 30 countries (Centre for Time Use Research, 2022).

These projects used national data sets that were post-harmonised. This created many problems for comparisons. Data were collected in different ways in different countries. Comparisons were most difficult, almost impossible. In addition, despite activity classifications, the composition of the samples differed notably.

International organisations became interested in the harmonisation of time use surveys in the 1990s. In Europe, the coordinating role was taken on by Eurostat, the statistical office of the European Union (Eurostat, 2004, p. 3). Most of the previously conducted surveys were based on the methods and classifications used by the Szalai project from the 1960s, which made harmonisation easier. In addition, national survey traditions were also considered.

Over the years, Eurostat task forces (TF) have been established to lead the harmonisation of time use surveys and work related to its sub-areas, which have worked under the authority of working groups (WG TUS) dealing with time use surveys and supported by national statistical offices.

The first Harmonised European Time Use Surveys (HETUS) were collected between 1998 and 2005, and about twenty European countries participated in them (Table 1). Based on these surveys, Statistics Finland and Statistics Sweden prepared a harmonised database and a tabulation application with financing from Eurostat. The database contains comparable data from fifteen countries: Belgium, Bulgaria, Estonia, Finland, France, Germany, Italy, Latvia, Lithuania, Norway, Poland, Slovenia, Spain, Sweden, and the United Kingdom.

Table 1. Countries' participation in HETUS data-collection rounds

Country	Collection round (x = yes)		
	2000	**2010**	**2020**
Albania		x	x
Austria		x	
Belgium	x	x	x
Bulgaria	x	x	x
Croatia			x
Denmark	x[1]	x[1]	
Estonia	x	x	x
Finland	x	x	x
France	x	x	x
Germany	x	x	x
Greece		x	x
Hungary	x	x	x
Italy	x	x	x
Latvia	x		
Lithuania	x		
Luxembourg		x	x
Netherlands	x[1]	x	x
North Macedonia		x	x
Norway	x	x	x
Poland	x	x	x
Portugal	x[1]		
Romania	x[1]	x	x
Serbia		x	x
Slovenia	x		x
Spain	x	x	
Sweden	x	x	
Turkey		x	x
United Kingdom	x	x	

[1] Not fully comparable.
Sources: Charmes, 2021; European Commission, 2004; Eurostat, 2020b; UNSD, 2023.

The second round was conducted between 2008 and 2015. Statistics Finland combined and again harmonised the database of eighteen countries: Austria, Belgium, Finland, Germany, Estonia, Greece, Spain, France, Hungary, Italy, Luxembourg, the Netherlands, Norway, Poland, Romania, Serbia, Turkey, and the United Kingdom (Pääkkönen, 2015).

The third HETUS round will be carried out between 2019 and 2025, and more than 20 European countries will participate (Table 1). The COVID-19 pandemic in the early 2020s delayed the start of the data collection in several countries and especially affected the data collection and the research results of 2020-2021 (Eurostat, 2020b). The time use surveys carried out in those years can with good reason be called the time use surveys of the pandemic period.

Thanks to harmonisation, time use materials are largely comparable between different European countries. Over the years, the most central areas of survey research instruments have been largely kept the same, which also enables comparability over time. The principles of harmonisation are summarised in the HETUS Guidelines manual published by Eurostat, which is periodically updated to reflect the current situation (Eurostat, 2020a).

For example, harmonisation applies to the content and layout of the time use diary (e.g., one main activity, one secondary activity, contextual information, granularity of registration), time use variables (e.g., Activity Coding List), and microdata and their variables to be submitted to Eurostat. The harmonisation also applies to the design and content of household and personal interviews – for example, essential background questions and variables related to households, working, studying and health, whose broader standardisation is regulated by the IESS (Integrated European Social Statistics) framework regulation.

Thus far, HETUS data collection has been based on an informal "gentlemen's agreement" between participating countries and Eurostat without legal regulation. As a whole, the time use survey will be included optionally in the IESS framework regulation from 2025, but even before then, uniform standardised social variables have been introduced in the European time use survey, which also enables comparability with other European social surveys and statistical data (see Eurostat, 2020a, p. 3).

Challenge 3: classification of activities

One of the most important results of harmonisation in European time use surveys is the unified Activity Coding List (ACL). The HETUS ACL is based on the experience with the Multinational Comparative Time-Budget Research Project and country modifications in Europe, Canada, and Australia. Comments from international organisations and time use researchers around the world were also considered (Eurostat, 2020a). Thus far, there have been three versions of the HETUS activity coding list: ACL 2000; ACL 2008 and ACL 2018. The latest list contains 116 activity categories. In addition, many

European countries have their own national classifications, from which, however, uniform and comparable classifications can be derived.

Another internationally uniform activity classification is the ICATUS classification (International Classification of Activities for Time use Statistics) launched by the United Nations (UN), from which the HETUS activity classification differs in certain respects. The UN has taken the responsibility to create the measurement techniques and the activity classification especially for developing countries. In the ICATUS 2016 ACL, activities are classified based on their productive nature as productive and personal activities. The classification is consistent with the System of National Accounts (SNA) and other key standards, concepts and classifications. The classification has 165 three-digit codes (UN, 2021).

Roughly, it can be said that HETUS is perhaps more sociology than production and economics and ICATUS perhaps more of economics. The HETUS classification emphasises leisure and other non-productive activities more than the ICATUS classification. The ICATUS classification covers more different kinds of household production and unpaid domestic and care work than the European classification. Time spent on these activities is used as information in the UN Sustainable Development Goals indicator 5.4.1. In addition, information on unpaid domestic work obtained from time use surveys is also used when calculating the value of household production in the national satellite accounts (UN, 2021; UNECE, 2017).

Time use surveys can also be used epidemiologically. Activities can be classified according to how much energy a person usually uses for them. This is represented by the so-called MET (Metabolic Equivalent of Task) scores or values. In the study of Liangruenrom et al. (2019) a classification system was developed that enables ICATUS-based time use data to be classified into sleep, sedentary behaviour, light physical activity, and moderate-to-vigorous physical activity (see also Gershuny & Harms, 2019).

In Latin America, the Classification of Activities for Time use for Latin America and the Caribbean (CAUTAL) is used. CAUTAL is a five-level hierarchical classification. The classification was revised and adopted by the Statistical Conference of the Americas of the Economic Commission for Latin America and the Caribbean (ECLAC) in 2015 (Buvinic & King, 2018).

In addition to these major classifications, many countries have developed their own classifications for time use statistics. These countries include Australia, New Zealand, and the United States (Charmes, 2019, p. 15).

In the 2010s, work began on identifying similarities between the HETUS and ICATUS classifications, and the first correspondence table was completed

in 2016 (UN, 2021).[2] Eurostat completed the latest correspondence table in 2022, with the input of the WG TUS and the UN's EG-TUS. The work done enables activities to be comparable, depending on the activity, at least at the upper level of the classifications.

Until now, the harmonisation of European time use surveys has primarily concerned the implementation of a full-scale paper-diary survey. A time use survey can also be carried out with light diaries, which include a limited number of pre-classified main activities (e.g. 25-40) (see, e.g., UN, 2005, pp. 52-54; UNECE, 2013, pp. 38-39). Light diaries have not yet been harmonised in the European time use survey, but the need for harmonisation has nevertheless been recognised, because the use of light diaries enables more countries to conduct time use surveys with a lower threshold.

An even lighter way to collect time use data than light diaries is the use of stylised questions, which are used in the interview to enquire about the time spent on predefined activities, for example over a period of one day or one week. Stylised questions have been used in time use surveys especially in Latin America (Charmes, 2021).

Harmonisation work has also been done within the framework of the expert group established by the UN (Expert Group on Innovative and Effective ways to collect Time Use Statistics). The work especially concerns lighter ways to conduct time use surveys. More broadly, this work is related to the renewal of the UN's "Guide to Producing Statistics on Time Use" and modernisation of the production of time use statistics (UN, 2005; UNSD EG, 2022b).

As a result of the harmonisation work, a background document (Minimum Harmonised Instrument for the Production of Time use Statistics) was published in the spring of 2022. The document presents the minimum conditions for conducting a time use survey, under which the production of harmonised time use statistics would be possible (see UNSD EG, 2022a). For example, the document lists the minimum number of key background questions and daily activities (25 pcs) and the minimum data requirements. National statistical offices can use the document in question as a minimum model for a time use survey or as a working tool in planning a more detailed and extensive time use data collection, especially one based on a digital menu-style light diary.

The subject of harmonisation by the expert group of the United Nations is to agree upon certain minimum criteria or core, not an all-encompassing broader harmonisation of data collection, although it also covers the minimum content

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2   Before that, the correspondence table between the trial version of ICATUS and the Eurostat classification was developed and published (UN, 2005).

of digital data collection and an example of the menu structure of a light diary. The harmonisation of European time use surveys, on the other hand, has primarily concerned traditional full-scale diaries and not, for example, light diaries or children's diaries, the possible harmonisation of which is still to come.

The spread of digital data collection poses new challenges for the harmonisation of official statistics, regarding mixed data-collection modes, as well as new data-collection tools and the solutions implemented in them, for example. At the moment, there is no standard for an online tool. In addition, the research modernisation process poses very different challenges to different countries, depending on how developed the society is in terms of, for example, digitalisation and the population's digital skills and general literacy.

Challenge 4: modernisation

Sub-challenge 1: what does it mean?

In recent years, the modernisation of time use research has been aimed at meeting the challenges that survey studies and especially time use research face today. Online time use surveys aim to reduce the costs of data collection and data processing and at the same time aim for higher response rates than would be possible to achieve with a paper-and-pencil diary alone. The modernisation also aims to reduce the response burden by utilising new innovative tools and other sources to obtain information (e.g., mobile diary, GPS, para data).

The work related to the modernisation of time use survey data collection is conducted both nationally by statistical agencies of different countries and internationally by a task force appointed by Eurostat and an expert group appointed by the United Nations. In 2017, Eurostat appointed a task force whose purpose is to modernise and enhance the time use survey data collection in EU member states. The aim of the task force is to develop and find new data-collection methods and sources for time use research. A task force with similar content also works in the household budget survey area. Eurostat has granted funding to development projects with the aim of producing tools that can be used more widely by member countries (Eurostat, 2020a, p. 3).

Meanwhile, in 2018, "the Expert Group on Innovative and Effective Ways to Collect Time use Statistics" (EG-TUS) established by the United Nations began its work. One of the group's tasks is to develop methodological guidelines for operationalising the ICATUS 2016 classification and the production of time use statistics using the latest technologies (UNSD EG, 2022b).

Web-based data collection is already used to produce several statistics, but collecting time use data digitally has been rare until now. Of the countries participating in the HETUS 2020 data-collection round, only five (Belgium, Germany, Hungary, Norway, and Poland) intend to conduct the interviews using an online form, and only two (Belgium and Norway) intend to conduct the diary data collection only digitally (Eurostat, 2020b). Clearly, the more common intention is to use mixed modes: to collect part of the data digitally online and part of them traditionally. Mixed modes are supported above all by the demographic representativeness of the sample and the data obtained. Even in developed countries, not everyone can respond online; and, on the other hand, the web option can gain more participants for the survey. Of course, the costs of mixed-mode data collection are higher than those for online data collection alone. By far the most common but also the most expensive method in the European time use survey remains the collection of time use data with paper diaries and conducting the interviews in person (Eurostat, 2020b).

Globally, modernisation means different things to different countries. For some, modernisation may mean moving from paper-and-pencil interviewing (PAPI) to a computer-assisted personal interviewing (CAPI). For others, modernisation can be a transition from a paper diary to an online or a mobile diary, or a transition to the use of different types of mobile and passive data, or supplementing the material with open data. Information about what the modernisation of the production of time use statistics can mean can be found in the UNSD EG (2022b) background document: "Modernization of the Production of Time use Statistics".

For example, Finland collected time use data for the HETUS 2020 round in 2020-2021 mainly with online diaries with a responsive format, which adapted to the screen size of the device used and were optimised above all for mobile devices. A paper diary was an alternative for those who could not respond online (Statistics Finland, 2023b). Data collection in Finland was also exceptional in that the online diary was in free text format and was not based on predefined categories and menus, as previous online diary solutions or their plans have been.

Sub-challenge 2: pros and cons

Finland decided to collect HETUS 2020 data by using a full-form online diary that could be freely completed in one's own words. The reasons for this decision were that the comparability with previous studies and the paper diary of the same collection round would be as valid as possible, and that the diaries would conform to the model of the HETUS guidelines (Eurostat 2020a) as much as

possible. However, no grid structure that resembles a paper diary works on a mobile device, so such an option was basically ruled out. The data in the online diary were coded manually afterwards, just as the data in the paper diary, which is very resource intensive. Before starting the data collection, the possibility of automatic coding was also investigated, but no satisfactory solution was found.

In a diary based on free text, respondents can use their own language and their own understanding, and they do not have to think about finding the right category from a list or menu to interpret their activity. Ready-made classifications can also lead to too much answering, and navigating the menus, especially on the screen of a small device, can sometimes produce errors. Material based on free text is also richer than material based merely on predefined codes. Of course, the scope and level of written text varies from person to person, but in a time use survey, the main interest does not lie with the individual answers per se. In general, the activities reported in free text are more versatile and the results can be used to create new activity classifications and also in qualitative research in general and text analysis in particular (see, e.g., UNSD EG, 2022c).

The main downside of a free text diary is that the time use data must be coded afterwards, and that coding takes a great deal of time and resources (see, e.g., UN, 2005, pp. 53-54; UNECE, 2013, p. 39). In addition, coding that takes place afterwards is slowed down and made difficult by the fact that several activities are often recorded in one main activity in the free text online diary. A solution based on predefined categories and menus, on the other hand, produces pre-coded data, which bring significant time and cost savings, so it is no surprise that it will become the most obvious new standard in producing time use statistics (see, e.g., Minnen et al., 2014). There is therefore a need for guidance and harmonisation regarding combined and new data-collection formats, so that different countries' time use data will be and will remain as comparable as possible in the future.

The most typical tool for filling in the diary in Finland's 2020-2021 time use survey was a smartphone. This is understandable, because almost everyone has a smartphone, and they almost always carry it with them. In this sense, filling in a diary is at least potentially more practical and up to date than filling in a paper diary.

Sub-challenge 3: modernisation of daily life

Although the internet and social media make certain things possible, their constant use also poses challenges for completing the diary. Everyday life is

fragmented, concentration is disturbed, several things are done at the same time, it is difficult to distinguish between main and secondary activities, several activities can be recorded in one main activity, there are many episodes of different lengths and less than ten minutes, and the smartphone as a data-collection tool is the same, the use of which should also itself be measured.

The use of different communication technologies is so common and all-encompassing that reporting it in the diary can be forgotten, and if it is reported, the content of the activity is often left unreported, at least in the free text diary. In Finland's 2020-2021 time use survey, those filling in the diary often simply stated: "I was on Facebook, on the phone, on the computer, on the internet, on Facebook" or "I was browsing the phone", "I was looking at messages" or "I was looking at the phone". This already poses challenges with instructions, which are often unnoticed, as well as with data collection now and in the future. It would be desirable that the mobile device's use and geolocation information be obtained directly from the device and/or operators, and that the respondent will not have to report this information separately in the time use diary.

In addition to the phenomenon of the ubiquitous society – a society in which information and communication technology independent of time and place is present in almost everything and everywhere – as a result of the COVID-19 pandemic, the huge proliferation of various "tele-activities" and virtual events has caused and is causing new challenges for defining and coding activities and defining with whom time was spent. With fewer in-person meetings, regular phone calls or virtual meetings may be perceived as more meaningful, in which case the respondent may record in the diary that they were in the company of an acquaintance, for example. When playing online multiplayer games, it may seem counterintuitive to record that you have done these actions alone when you have acted and interacted with others. The pandemic also defined new frames for whether a day was perceived as exceptional or not.

Coding telework as paid work is easy in itself but telework often also involves doing other things as a side activity, for example looking after children, which current coding guidelines do not recognise. In "tele-school", the line between lessons, homework and the rest of life is blurred. Participating in a virtual wedding can be coded as a party in the traditional way, but how do you act in cases of a virtual concert or a virtual theatre performance? Is it the theatre or a concert, or should it be coded as watching TV? The latter option was decided on when coding Finnish time use data, but the activities were coded for the most part according to their content, whether the place of activity was home or some other place. This is also the view of the United Nations, but there is no generally agreed current guidance or harmonisation for such a new situation in European time use research, for example.

Discussion

Time use surveys have been conducted for more than a hundred years. Academic researchers were long responsible for the studies until national statistical offices took over the data collection. This meant increased sample sizes, from small amounts to thousands. Increased comparability between national surveys was noticed in the 1990s, when international organisations took care of harmonisation. This was started by Eurostat and expanded globally by other international organisations. Today, Eurostat is actively continuing its activities to modernise the survey-based data-collection process, especially in the time use survey and household budget survey areas.

The web and/or smartphone applications and electronic diaries are becoming more common all the time, but few if any countries are currently technologically so digitalised, let alone socio-culturally so digitalised, that demographically representative samples can merely be collected online, especially if there is no upper age limit for the sample. In the 2020s, mixed-mode data collection will still hold its ground in the collection of time use data, because by offering suitable methods for providing data for different population groups, it is possible to obtain data that are more comprehensive in terms of population than using only one data-collection method. An electronic diary based on predefined categories and menus, on the other hand, brings considerable time and cost savings, because the answers no longer have to be coded afterwards.

The modernisation of data collection aims to respond to changed lifestyles and living conditions and to reduce the response burden. At the same time, we are fighting against rising data-collection costs and falling response rates. In the goal of reducing the response burden, various integrated systems and mobile device usage and geolocation data, as well as data sources outside statistical agencies, will play an increasing role in the future.

ESSnet – a network of European Statistical System (ESS) organisations – started its first big data project in 2016 to prepare the ESS for integration of big data sources into the production of official statistics. The selected big data sources were, for example, web-scraping, electricity consumption (smart meters) and mobile phone data. The objective of the second project (Big Data II) was the integration of selected big data sources in the regular production of official statistics (see European Commission, 2023).

Integrating new data sources to time use research enriches the data and can expand the possibilities of using the time use data and increase its users. The possibilities of combining various external data sources (e.g., health data, financial transactions data) with time use data vary from one data source to another and country to country, depending on legislation, data-protection

regulation, the existence of registers, trade secrets, etc. The roles of data sources in time use research also vary. Health data or electricity consumption data enrich time use data and may be relevant only to some of the users of the data. On the other hand, mobile phone data, at least geolocation data, should already be an integral part of modern time use data collection.

At the same time, all these new data-collection methods and data sources pose new challenges for guidelines and harmonisation to ensure the time use data and time series of different countries remain as comparable as possible. In addition to the COVID-19 pandemic of the early 2020s, the proliferation of "tele-activities" and virtual events presents new challenges for the definition of activities and the coding of the data.

Time use research was connected to the social indicator movement of the early 1970s, within the framework of which it was desired to develop quality of life measures that would describe the population's well-being more comprehensively than traditional economic measures. Well-being and quality of life aspects remain a key element of time use research and perhaps even more visible than before. Examples of this are the United Nations' sustainable development goals, the Beyond GDP initiative, and the OECD's well-being indicators, time use epidemiology, as well as the various measures of subjective well-being that have become common in time use surveys today.

References

Andorka, R., Harcsa, I., & Niemi, I. (1983). *Use of time in Hungary and in Finland: Comparison of results of time budget surveys.* Central Statistical Office of Finland.

Artemov, V. & Novokhatskaya, O. (2004, 27-29 October). *Time budget studies in the Soviet Union (the 1920s-1930s)* [Paper presentation]. International Association for Time Use Research. Annual Conference 2004, Rome, Italy.

Bauman, A., Bittman, M., & Gershuny, J. (2019). A short history of time use research: Implications for public health. *BMC Public Health*, *19*(607). https://doi.org/10.1186/s12889-019-6760-y

Bevans, G. E. (1913). *How working men spend their spare time.* Columbia University Press.

Buvinic, M. & King, E. M. (2018). *Invisible no more? A methodology and policy review of how time use surveys measure unpaid work.* Data 2X. https://data2x.org/wp-content/uploads/2019/05/Data2X-Invisible-No-More-Volume-1.pdf

Centre for Time Use Research (2022). *Multinational time use study.* https://www.timeuse.org/mtus

Charmes, J. (2019). *The unpaid care work and the labour market: An analysis of time use data based on the latest world compilation of time use surveys.* International Labour

Organisation.   https://www.ilo.org/wcmsp5/groups/public/---dgreports/---gender/documents/publication/wcms_732791.pdf

Charmes, J. (2021). *Measuring time use: An assessment of issues and challenges in conducting time use surveys with special emphasis on developing countries. Methodological inconsistencies, harmonization strategies, and revised designs.* United Nations Entity for Gender Equality and the Empowerment of Women, UN Women. https://data.unwomen.org/sites/default/files/documents/Publications/Measuring%20time%20use.pdf

Chenu, A. & Lesnard, L. (2006). Time use surveys: a review of their aims, methods, and results. *European Journal of Sociology, 47*(3), 335-359.

European Commission (2004). *How Europeans spend their time: Everyday life of women and men.* Office for Official Publication of the European Communities. https://ec.europa.eu/eurostat/documents/3930297/5953614/KS-58-04-998-EN.PDF

European Commission (2023). *ESSnet big data.* https://ec.europa.eu/eurostat/cros/content/essnet-big-data-1_en

Eurostat (2004). *Guidelines on harmonised European time use surveys.* Office for Official Publications of the European Communities. https://ec.europa.eu/eurostat/documents/3859598/5884753/KS-CC-04-007-EN.PDF.pdf/03057369-0bfe-47d5-b584-be0868d65f29?t=1414781110000

Eurostat (2020a). *Harmonised European Time Use Surveys (HETUS) 2018 guidelines.* Re-edition, 2020 edition. https://ec.europa.eu/eurostat/documents/3859598/11597606/KS-GQ-20-011-EN-N.pdf/2567be02-f395-f1d0-d64d-d375192d6f10?t=1607360062000

Eurostat (2020b). *HETUS 2020 participation: Short survey on countries' intentions to participate in the HETUS 2020 data collection round.* Eurostat.

Gershuny, J. (1995). Time budget research in Europe. *Statistics in Transition, 2*(4), 529-551.

Gershuny, J. (2019). Time and enjoyment: Measuring national happiness. In J. Gershuny, O. Sullivan, K. Fisher, P. Walthery, E. Altintas, J. Suh, C. Payne, G. Vagni, E. Jarosz, T. Harms, K. Mullan, & J. Jun (Eds.), *What we really do all day: Insights from the Centre for Time Use Research* (pp. 307-328). Pelican Books.

Gershuny, J., Fisher, K., Gauthier, A., Jones, S., & Baert, P. (2007). A longitudinal, multinational collection of time use data – the MTUS. In J. Gershuny, *Changing times: Work and leisure in postindustrial society* (pp. 270-288). Oxford University Press.

Gershuny, J. & Harms, T. (2019). Time and physical activity. In J. Gershuny, O. Sullivan, K. Fisher, P. Walthery, E. Altintas, J. Suh, C. Payne, G. Vagni, E. Jarosz, T. Harms, K. Mullan, & J. Jun (Eds.), *What we really do all day: Insights from the Centre for Time Use Research* (pp. 189-206). Pelican Books.

Harvey, A. & Pentland, W. (1999). Time use research. In W. E. Pentland, A. S. Harvey, M. P. Lawton, & M. A. McColl (Eds.), *Time use research in the social sciences* (pp. 3-18). Kluwer Academic/Plenum Publishers.

Jeskanen-Sundström, H. (2009, 27-30 October). *About benefits and challenges of time use surveys* [Paper presentation]. The 3rd OECD World Forum on Statistics,

Knowledge and Policy: Charting Progress, Building Visions, Improving Life, Busan, Korea. https://www.oecd.org/site/progresskorea/44098534.pdf

Liangruenrom, N., Craike, M., Dumuid, D., Biddle, S. J. H., Tudor-Locke, C., Ainsworth, B., Jalayondeja, C., van Tienoven, T. P., Lachapelle, U., Weenas, D., Berrigan, D., Olds, T., & Pedisic, Z. (2019). Standardised criteria for classifying the International Classification of Activities for Time use Statistics (ICATUS) activity groups into sleep, sedentary behaviour, and physical activity. *International Journal of Behavioral Nutrition and Physical Activity*, *16*(106). https://ijbnpa.biomedcentral.com/articles/10.1186/s12966-019-0875-5

Michelson, W. (2005). *Time use: Expanding the explanatory power of the social sciences*. Paradigm Publishers.

Minnen, J., Glorieux, I., van Tienoven, T. P., Daniels, S., Weenas, D., Deyaert, J., van den Bogaert, S., & Rymenants, S. (2014). Modular Online Time Use Survey (MOTUS) – translating an existing method in the 21st century. *Electronic International Journal of Time Use Research*, *11*(1), 73-93.

Mullan, K. (2019a). Technology in the daily lives of adults. In J. Gershuny, O. Sullivan, K. Fisher, P. Walthery, E. Altintas, J. Suh, C. Payne, G. Vagni, E. Jarosz, T. Harms, K. Mullan, & J. Jun (Eds.), *What we really do all day: Insights from the Centre for Time Use Research* (pp. 237-264). Pelican Books.

Mullan, K. (2019b). Technology in the daily lives of children and teenagers. In J. Gershuny, O. Sullivan, K. Fisher, P. Walthery, E. Altintas, J. Suh, C. Payne, G. Vagni, E. Jarosz, T. Harms, K. Mullan, & J. Jun (Eds.),*What we really do all day: Insights from the Centre for Time Use Research* (pp. 209-236). Pelican Books.

Niemi, I. (1995). A general view of time use by gender. In I. Niemi (Ed.), *Time use of women in Europe and North America* (pp. 1-22). United Nations.

Niemi, I., Eglite, P., Mitrikas, A., Patrushev, V. D., & Pääkkönen, H. (1991). *Time use in Finland, Latvia, Lithuania and Russia*. Central Statistical Office of Finland.

OECD (2013). *OECD Guidelines on measuring subjective well-being*. https://www.oecd-ilibrary.org/docserver/9789264191655-en.pdf?expires=1652794582&id=id&accname=guest&checksum=E4BB0E048A3E6F145AEA11FA31F7C7A1

Pember Reeves, M. (1913/1979). *Round about a pound a week*. Virago.

Pääkkönen, H. (2015). Harmonising time use microdata for the 2010 wave of the European time use surveys. *Electronic International Journal of Time Use Research*, *12*(1), 153-190.

Robinson, J. P., Andreyenkov, V. G., & Patrushev, V. D. (1988). *The rhythm of everyday life: How Soviet and American citizens use time*. Boulder.

Statistics Finland (2023a). *Review: More time spent in front of screens in 2021 than ever before.* https://stat.fi/en/publication/cl8ipicxx123r0bw2oxe42g8i

Statistics Finland (2023b). Time use: Documentation of statistics. https://stat.fi/en/statistics/documentation/akay

Stiglitz, J. E., Sen, A., & Fitoussi, J.-P. (2009). *Report by the commission on the measurement of economic performance and social progress.* https://ec.europa.eu/eurostat/documents/8131721/8131772/Stiglitz-Sen-Fitoussi-Commission-report.pdf

Suh, J. & Folbre, N. (2017). Time, money, and inequality. *Oeconomia*, *7*(1), 3-24.

Szalai, A. (1966). Trends in comparative time-budget research. *The American Behavioral Scientist*, *9*(9), 3-8.

Szalai, A. (Ed.) (1972). *The use of time: Daily activities in urban and suburban populations in twelve countries.* Mouton.

Szalai, A. (1984). Cross-national comparative time budget research and the multi-national time budget project. In A. S. Harvey et al. (Eds.), *Time budget research: An ISSC workbook in comparative analysis* (pp. 36-61). Campus Verlag.

UN (2005). *Guide to producing statistics on time use: Measuring paid and unpaid work.* United Nations, Department of Economic and Social Affairs, Statistics Division. https://unstats.un.org/unsd/publication/seriesf/seriesf_93e.pdf

UN (2021). *International classification of activities for time use statistics 2016.* United Nations, Department of Economic and Social Affairs. Statistics Division. https://unstats.un.org/unsd/gender/timeuse/23012019%20ICATUS.pdf

UNECE (2013). *Guidelines for harmonizing time use surveys.* United Nations Economic Commission for Europe. https://unece.org/fileadmin/DAM/stats/publications/2013/TimeUseSurvey_Guidelines.pdf

UNECE (2017). *Guide on valuing unpaid household service work.* United Nations Economic Commission for Europe. https://unece.org/DAM/stats/publications/2018/ECECESSTAT20173.pdf

UNSD (2023). *Demographic and social statistics: Time use statistics.* https://unstats.un.org/unsd/demographic-social/time use/#dmdata

UNSD EG (2020). *Policy relevance: Making the case for time use data collections in support of SDGs monitoring.* https://www.google.be/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiswbGgjKL9AhWBDuwKHUB5Al0QFnoEC BMQAQ&url=https%3A%2F%2Funstats.un.org%2Funsd%2Fstatcom%2F51st-session%2Fdocuments%2FBG-Item3m-PolicyRelevance-E.pdf&usg=AOvVaw2q2fMcWeMkX-UlV0EfZnkL

UNSD EG (2022a). *Minimum harmonized instrument for the production of time use Statistics.* https://unstats.un.org/unsd/statcom/53rd-session/documents/BG-3h-TimeUseStats-rev2-E.pdf

UNSD EG (2022b). *Modernization of the production of time use statistics.* https://unstats.un.org/unsd/statcom/53rd-session/documents/BG-3h-Modernization_UN_EG_TUS2021_FINAL_SENT_rev-E.pdf

UNSD EG (2022c). *Quality considerations for time use surveys.* https://unstats.un.org/unsd/statcom/53rd-session/documents/BG-3h-Quality_UN_EG_TUS2021_FINAL_SENT_rev-E.pdf

US Bureau of Labor Statistics (2022). *American time use survey.* https://www.bls.gov/tus/home.htm

Zuzanek, J. (1980). *Work and leisure in the Soviet Union: A time-budget analysis.* Praeger Publishers.

A view on time through the eyes of Luhmann's theory of social systems

Werner Schirmer

In this chapter, we will look at time from the viewpoint of sociologist Niklas Luhmann (1927-1998). Luhmann's theory was not invented with time use research in mind, but, as I aim to demonstrate, it offers a complex framework for understanding social relations in modern society. The chapter can be read as an introduction to Luhmann's versatile social theory with a special focus on time and temporal structures. In addition, it is also an invitation for time use researchers to engage with a complex theoretical analysis of modern society that offers unconventional insights to interpret empirical patterns. The aim is to add some theoretical underpinnings of empirical observations in the wider frame of how modern society and its subsystems operate, and what this means for the time management of individuals within and outside of organisations.

In the analysis of time that follows, I draw largely on Luhmann's theories of social systems and society, and some generalisations about organisational behaviour based on Luhmann's own observations while working in public administration. What I want to show is that social systems are temporal: they exist only in and through time and, therefore, social order is primarily a temporal order. Modern society is characterised by a multitude of temporal orders that give rise to problems of synchronisation and coordination that produce time scarcity in the first place. In a nutshell, time scarcity is a result of the structural features of modern society.

Although this chapter is about systems theory and time, I need to dedicate considerable space to introducing several concepts and theoretical claims that may on the surface have less to do with time. In the first section, I give a brief introduction of some of the core elements of Luhmann's general theory of social systems that are relevant to his understanding of time: the shift from action to communication, autopoiesis, and meaning. The second section applies Luhmann's general social theory to the analysis of modern society as a functionally differentiated society. Function systems such as the economy,

science, polity, and law, each operate with their own logic and in their own time frames. This structure leads to problems of coordination and synchronisation. The third and fourth sections look at how organisations and our everyday lives are affected by the need for coordination. Coordination makes time scarce and this has repercussions for decision-making and problem-solving. For individual decision-makers, time scarcity is a problem and a resource at the same time.

Temporalisation of social reality

Social systems before time

Luhmann is one of the most important continental European social theorists of the late twentieth century, being particularly influential in the German-speaking, Latin American and Scandinavian communities; but he has increasingly gained a standing in the Anglo-Saxon world. In order to appreciate the central role the notion of time has in Luhmann's vast oeuvre, let us start with a brief historical and theoretical detour. In the early 1960s, Luhmann spent a study year at Harvard University that turned out to be pivotal to his future contributions to sociological theory. At Harvard, Luhmann met Talcott Parsons and devoted substantial time studying Parsons' work. The latter had developed a general social theory based on a systems theory of action. In the tradition of classical action theorists such as Max Weber, Parsons considered the basic unit of social reality the "social action" performed by an individual. At the same time, he regarded actions integrated in a cultural and normative social context, in this way famously criticising utilitarian and contractual explanations of social order. While Parsons in his "voluntaristic theory of action" of 1937 spoke of the "unit act" as the basic element of social reality, he later reformulated his early ideas and incorporated them into a general interdisciplinary framework of systems theory. The outcome was a series of books (Parsons, 1951, 1963; Parsons & Shils, 1951; Parsons & Smelser, 1956) in which he conceptualised social action as being embedded in a complex web of analytic systems (the cultural, societal, personality, and biological systems). This overarching web of systems received the name "action system". Within this general systems-theoretical frame, any social system could be analysed with the same conceptual tools.

Luhmann was intrigued by Parsons' elaborate conceptual framework. In his own writings, Luhmann made use of many terms that had their origin in Parsons' work, such as functional differentiation, function system, symbolically generalised media of interchange, interpenetration, or double contingency.

However, it would be quite wrong to consider Luhmann's own theory as a Parsons 2.0 or a variant of neo-functionalism (Alexander & Colomy, 1985). Actually, Luhmann considered Parsons' grand theory a failure and said he wanted to understand how and why Parsons' grand theory was failing (Luhmann, 2013a).

While Luhmann did integrate concepts of Parsonian origin into his own theories, he did so in a critical and counteractive way. Quite often the words are the same but the meaning or function within the framework has shifted. Most importantly, this is the case with the concept of the "system" itself. Like Parsons, Luhmann considers social reality organised through systems, but – diverging from Parsons – Luhmann's systems are empirical entities, not analytic constructs. In his earlier texts Luhmann still spoke of action systems, but from the 1970s onwards he replaced action with communication as the primary element of social systems. As Luhmann explained later (Luhmann, 1992), the reason for this move is that actions could, in principle, be executed in solitude, without any reference or relation to other people. Communication, in contrast, can take place only between at least two agents, so it is *social by definition*, whereas action is not. Luhmann argues that communication, and not social action, is the truly sociological concept. In this regard, Luhmann's theory is compatible with conceptualisations of the "social" that stress its interactive reality – for example, Simmel's *Wechselwirkung* (Simmel, 2009) and Mead's and Blumer's *symbolic interaction* (Blumer, 1986).

Influenced by developments in the interdisciplinary literature on systems theory, information theory, and cybernetics of the period between the 1950s and the 1980s (Bateson, 1972; Von Bertalanffy, 1968; Von Foerster, 1984), Luhmann became convinced that concepts such as self-organisation, self-reference, and operational closure are useful for analysing social systems, not least because of their high compatibility with communication as the basic social unit. However, it was not until Luhmann became acquainted with the works of the Chilean biologists Humberto Maturana and Francisco Varela that all the puzzle pieces started fitting together. Maturana and Varela (1980) were interested in the processes that are necessary to make biological cells live. Maturana coined the term *autopoiesis*, which would become central to Luhmann's theory. Autopoiesis refers to the idea that the living cell produces all the components it requires for its operation of "living" through a network of these components: it literally makes itself.

Operational closure: what autopoiesis means to social systems

Despite Maturana's concerns about the applicability of *autopoiesis* to non-biological processes, such as societies, Luhmann imported it into his mature version of social systems theory as outlined in his magnum opus, *"Soziale Systeme"*, of 1984 (published in English in 1995). Luhmann claims that society – like cells – also produces itself through its own elements. According to Luhmann, Maturana's mistake that many mainstream sociologists also make is taking for granted that human beings are the elements of society. If that were the case, applying autopoiesis to social systems would indeed not make sense (Mingers, 2002). However, if one regards communication as the central element of social systems, Luhmann suggested that the equation would work out. One of Luhmann's bold theoretical moves was to place human beings in the environment of social systems. It sounds radical but it is only logical and consistent with the idea that the primary element of social systems is communication.

This defining decision has caused many misunderstandings and unjustified criticism (Kihlström, 2012). Centring on communication and, thus, placing the human into the environment of social systems does not render human beings irrelevant, as critics have claimed. From a Luhmannian systems theory perspective, this criticism seems non-sensical (for an explanation, see Schirmer & Michailakis, 2015) because human beings and their consciousness – Luhmann speaks of "psychic systems" – are as necessary to society as their bio-physiological organisms are for their consciousness. Society is not possible without human beings, but, as Luhmann (2002, p. 157) put it: "It is also impossible without carbon, without moderate temperatures, without the earth's magnetic field, without the atomic bonding of matter".

Human beings with their psychic systems participate in social systems, but they are not the elements. Like social systems, psychic systems are autopoietic, operationally closed systems. This means that our consciousness can perceive, feel, and think but it cannot escape the limits of its own operations. Thinking as such does not do anything in its environment – it may help trigger an action or communication, but it does not *do* it. At the same time, our consciousness does what it does: thoughts permanently induce new thoughts, and it is hard not to think of anything when we are awake, while it is equally hard to control our thoughts as in only thinking about the things we want. Like a "stream of consciousness", one thought connects to the other without necessarily knowing where any of them came from.

The operational closure of psychic systems is the reason why communication is necessary in the first place. Thoughts cannot directly connect to communi-

cation and vice versa. We can think of thoughts such as "What a warm and sunny day". However, if we do not say it out loud (or write it down) for others to hear (or read) what we think, our thought stays in our consciousness but never becomes a part of a social system. Once we utter the thought through a spoken sentence, it enters communication. Then, however, it follows the dynamics and logics of social systems that defy the dynamics and logics of the consciousness. If I say "What a warm and sunny day" to another person, this may lead to a plethora of different replies, varying on what they were thinking right before I say it, on what was said by (an)other participant(s), or if it was I who started the conversation. More importantly, it will also depend on other characteristics of the social system in question. It makes a difference if I say this sentence to a stranger in a coffee bar or at an academic congress on climate change in times of prolonged drought. Furthermore, my own intention with making my thought public (small talk, an opening line to initiate romantic interaction, a sales pitch, dramatic effect in a scientific debate) may be irrelevant to what happens next. Most likely, the other's psychic system will be triggered, and they may say something in return – for instance "yes, it is" – which may or may not represent what they were actually thinking. Possibly they are polite and adjust to the rules of the current social system.

Operational closure of social and psychic systems means that each follows its own operational dynamics depending on its systems' history (what happened before) and their expectation structure (what is supposed to be said next and what is not). As Luhmann put it, a social system cannot think, and a psychic system cannot communicate. They are opaque to each other. Our thoughts remain our own and are inaccessible to others. While I am typing these words, I may be thinking about things completely unrelated to the topic and you will never know them. Likewise, I will never know what you think while you read these words, and even if you happen to tell me, there is no way to assess whether you really had that thought or meant it that way, because you would have to use communication, which, again, follows its own dynamics and rules. So, while I cannot reconstruct or predict your exact thoughts, it is likely that, by now, you will have wondered if any of this has to do with the sociology of time at all. The possibly unexpected answer is that time was present all along throughout the previous paragraphs – albeit only implicitly.

Time and the dimensions of meaning

Let us make the link to time more explicit. For starters, the concept *autopoiesis* makes sense only if there is time. Autopoietic systems reproduce through their operations that exist only as emergent entities *through time*. While a

technical system (such as a washing machine) still persists when it is turned off, autopoietic systems end their existence when their operations fail to continue. To persist, living systems (such as cells or organisms) live, psychic systems think, and social systems communicate. Psychic and social systems do not even take up space in the physical world. Their basic elements are events of very short duration. Thoughts and communicative acts decay the moment they are made, and the respective system constantly needs to reproduce itself by creating and connecting new elements. Understanding elements of social reality as events implies a "radical temporalisation", as Luhmann (1995) put it.

Psychic and social systems also differ from living systems insofar as they observe or experience their environment through the medium of *meaning* (not through electric impulses like neuronal systems; not through electromagnetic or mechanical waves like machines, not through binary codes like computers). Social systems reproduce through communicative events (utterances) that are recursively interconnected to one another through meaning. As will become clearer in the following paragraphs, meaning is what keeps these events together while also making them possible in the first place. Therefore, Luhmann regards meaning as a basic concept of sociology (Luhmann, 1971).

Luhmann conceives meaning as the difference between *actuality* and *potentiality*. Whatever I think (psychic system) or say (social system) carries with it a depiction of what is currently meant (actualisation) and what is possible based on this actualisation (potentiality). For instance, let us assume I am thinking that I am hungry (actualisation of meaning): this could make me think of what I will eat, when I will eat, with whom I will eat, how I will get food, whether I will be thirsty, too, whether I just ate something, whether I eat too much in general (all are potentialities of meaning), and many other things. If they are actualised in the first place, each of these potentialities will have their own future potentialities.

What becomes apparent is a "surplus of reference" (*Verweisungsüberschuss*): when a consciousness processes meaning, there are also many more potentialities to the one current actualisation. The same is (in principle) true for social systems. There is always more possible than actualised. Processing meaning requires *selection*. If you ask me what time it is (present actuality), I might answer and tell you it is half past three, or three thirty, I might not answer at all, I might question your right to pose your question (or otherwise change the topic). Which of these potential responses I choose (which response gets actualised) determines what is now possible; it selectively makes some connections more likely and others more unlikely. Let us consider two examples.

(1)
A: What's the time?
B: It's half past three.
A: Damn, I need to hurry to get the kids.
B: Hope you get there in time; see you tomorrow.
A: Thanks, bye.

(2)
A: What's the time?
B: Why are you asking? You haven't done much yet.
A: I need to know how long I've worked already.
B: Not long enough to ask. There's a long day ahead, no matter.
A: Oh, c'mon.

In these two examples, we can see how meaning in social systems unfolds along three different dimensions that each deal with the different actuality or potentiality in a different manner. Luhmann distinguishes between the *fact dimension*, the *social dimension*, and the *temporal dimension*. For the topic of this chapter, the last of these is most important, and it is dealt with more extensively. Before that, we briefly discuss the other two.

The *fact* dimension (*Sachdimension*) refers to what the communication is about, for instance, a topic, a certain purpose, or the social setting. The circumstance that the communication partners disagree in example (2) makes the *social* dimension of meaning visible. We can assume that both speakers interpret the situation very differently. Communication partners permanently need to reckon with the incongruence of perspectives. Meaning is selected along the social dimension with concern about whether consensus and mutual agreement are necessary or can be ignored.

In social systems, every new actualisation changes the horizon of new potentialities in the fact dimension (did the topic change?) and in the social dimension (can people agree?; is agreement still necessary?). The relationship between actualisation and potentialisation is most apparent in the *temporal* dimension because it deals directly with the relationship between past and future. What is actualised in the present moment has an impact on potential future actualisations. What is actualised at the moment is also the (contingent) result of past selections. The temporal dimension of meaning reflects this difference between past and future. Events are selected through recursive anticipation of currently in-actual but potential time horizons, both into the future and in the past. What is in the past is no longer actual and what is in

the future is not yet actual. Past and future are in-actual but they narrow down what can be actualised in the present.

If we revisit examples (1) and (2) from above, we can see in both cases that from the second turn onwards the question "What's the time?" is already past but limits the frame of what can be said afterwards (which is still a lot but not just anything). The second turn in both examples refers to the same first turn, but each anticipates and enables a different future (turn 3), seen from which turn 2 appears as past and turns 4 and 5 as anticipated future. In example (1) it is a time frame of conflicting futures depending on whether person A makes it in time or not. In example (2) the future time frame is about work that must be finished, but also about who has the final word (social dimension).

Sequentiality of meaning through time

Time plays another important role in processing meaning. The actualised events themselves are of minuscule duration and disappear the moment they came into being. Meaning is what connects these events while, at the same time, meaning is produced through a chain of single events. In other words, meaning, too, only unfolds in time, just as individual tones receive their meaning only in the melody of a piece of music. The individual tones are meaningless without a relationship to one another. This relationship unfolds only in time, in what happened before, what happens now, and what will happen next. The present of the concrete tone (or conglomerate of frequencies) persists only at the moment itself and is replaced by the future present of the subsequent tones. It disappears the moment it comes, but it receives its meaning in the unity of before and after.

Similarly, the future and past constrain the present in psychic and social systems. As an example of the former, we mentally simulate different scenarios, intend to achieve certain outcomes, and observe ourselves through the viewpoint of the others (see also Mead, 1934) in order to anticipate possible reactions that we can try to avoid or invite. Likewise, the past can co-determine the present. If you play a well-known sequence on a piano and leave out the last tone, or play a wrong note, the whole experience is rendered into something that our brains experience as dissonant or unpleasant.

The same applies to social systems. What I say at the moment will influence what you say next and what you just said will affect what I can say next. If normative expectations are disappointed – for example, when my question fails to prompt your answer or my "thank you" is not met by your "you're welcome" – there may be psychological reactions akin to the experience of dissonance and

displeasure and social reactions manifesting this discontent, and possibly even claiming Goffmannian correction rituals (Goffman, 1967).

The sequential operations of social systems can be seen ideal-typically in face-to-face interactions – for example, in the two examples above. Interaction systems must unfold their complexity through time in a sequential order because they can actualise only one element or event at a time. Only one person can speak at a time. If two or more speak at the same time, as regularly happens in the case of heated discussions, communicative disorder or chaos occurs.

The usual solution to avoid this in the social dimension is turn-taking: each interlocutor waits for their turn to speak and remains silent during the other moments. However, this is an idealised image because waiting takes mental effort, particularly in emotionally intense interactions. As a result, the time horizon of psychic and social systems is often out of sync: communication can happen either too fast or too slow in relation to the involved psychic systems. We may find it hard to follow because the other person speaks too quickly or makes incomprehensible logical leaps. Mostly, however, the tempo of communication is too slow and we catch our thoughts running ahead or drifting elsewhere, because the autopoiesis of psychic systems is usually much faster than the autopoiesis of social systems. We can think many more things than we can put into words; and we will think many things, related or unrelated, while having to wait for our turn. It is difficult to keep the thought in mind for a while and then utter it in the intended way. Once a thought is transformed into a communicative utterance, it obeys the selectivity of communication systems, which means the past actualisations and future potentialisations of the communicative reality. Whether other people react to it, whether they react in the intended way, what they reply to it, may render the intended meaning into something else. Something that often happens in meetings with turn-taking order is that we form a thought that could contribute to the discussion but it is rendered irrelevant because the communication has already moved on, in both the fact and the temporal dimension.

So far, we have covered large, abstract terrain. We had to introduce the basic tenet of Luhmannian systems theory that psychic and social systems are operationally closed autopoietic systems. The link to time is indirect, but, as demonstrated, time plays a central role in the background as one of the three dimensions of meaning. This is archetypically the case in face-to-face interaction systems with their sequential order. In the next sections, we consider how this plays out in society.

Theory of society: functional differentiation and time

What is functional differentiation?

Face-to-face interaction has been the dominant form of social systems throughout most of human history. In the oral cultures of the past, social reality and the reality of face-to-face interaction were the same thing. The invention of written language has changed this fundamentally – slowly at first, but ever more radically in the past few hundred years. Today's society is largely based on mediated communication, through printed and digital documents, letters, telegraphs, radio, television, emails, blog posts and many others.

With its emancipation from face-to-face interaction, society is no longer bound to the co-presence of speaker and audience in the here and now. Social reality is no longer reproduced through oral traditions that need to be repeated or forgotten for good, and the procession of meaning is stretched ever further into its three dimensions. We can read books written by people who died 2,500 years ago and interpret their analyses of social life in ancient Greece to the benefit of today's social problems. The same communicative element (such as a text, a tweet, or a payment) could have a completely different meaning and consequence, depending on which social system processes it in which historical context.

According to Luhmann, this co-occurrence of multiple, simultaneous social realities is a key feature of modern society. A prime element of Luhmann's theory of society (as a special application case of his general social systems theory) is that society is characterised by *functional differentiation*. Luhmann incorporated the concepts "functional differentiation" and "function systems" into his own theory of society (Luhmann, 2012, 2013b), but he conceived of the systems as empirical entities (not analytical constructs) and suggests many more than Parsons did. Like Parsons, Luhmann speaks of a political system and an economic system, but he also posits the function systems of science, religion, media, art, law, health and illness, love, family or kinship, education, and social help.

Each of the function systems follows a unique rationality and operational logic that is related to the function they fulfil for the whole. For instance, the function of the economy is to deal with the allocation of goods and services under conditions of scarcity. From the viewpoint of the economic system, the world appears as a big market within which everything is a potential commodity that can be bought and sold if the price is right. From the viewpoint of the political system, the world appears as a matter of power distribution, domination, coalitions and alliances, majorities, and followership. The system

of science regards everything as a potential research object to be examined, analysed, and explained. For law, everything is a matter of legality and illegality, for the media a matter of newsworthiness, and for religion a matter of sin, sacredness, and supernatural forces.

In contrast to Durkheim and Parsons, Luhmann refused to see functional differentiation as well integrated, unity and the foundation of cross-societal solidarity built from mutual dependence on the parts. Instead, he took both the differentiation concept and the assumptions of operational closure and autopoiesis seriously by focusing on how each of these function systems creates its own version of social reality as separate "frameworks of meaning" (King, 2009). This understanding of functional differentiation is comparable to Max Weber's ideas about the "polytheism of value spheres" such as art, love, religion, science, and politics. All these spheres adhere to their own values, grounded only in themselves and not in some overarching, transcendent order. As an outcome, they follow an *Eigengesetzlichkeit* (Weber, 1968) and are indifferent and (possibly) incompatible with one another. To give an example, the aesthetic value of a work of art depicting human beings having sexual intercourse does not translate into its economic price and does not predict the level of moral outrage.

A functionally differentiated society, thus, is more of a paradoxical unity: its unity is the multiplicity of incongruent function systems. The important insight from differentiation theory is that each of these systems processes and constructs different social realities, whereas an overarching shared logic value system, or rationality that applies all at once, is absent. As Luhmann put it, society lacks an "Archimedian" standpoint from which the world could be grasped in its entirety. Instead, we have something that could best be called "multiperspectivity" (Nassehi, 2003; Schirmer & Michailakis, 2019). We touched on this idea briefly in the previous section when discussing the social dimension of meaning, namely, that different participants may not share the same view on things. At the level of society, this problem is exacerbated because it goes beyond the question of whether consensus can be reached between communication partners. Multiperspectivity at the societal level means that there are incommensurable, potentially incompatible perspectives on the world that perceive, process, and construct the world in fundamentally different ways, and there is no single one of them that is more adequate or important than the others.

Time in a functionally differentiated society

The differentiation of functions is an expression of incongruence in the fact dimension of meaning; the differentiation of perspectives marks an incongruence in the social dimension. However, there is also an incongruence in the temporal dimension that has important implications for a sociological understanding of time. Sociologists of time speak of a "social time" as opposed to a natural time and argue that social time is collectively shared (van Tienoven, 2019). We share the same calendar and time division. When two people agree to meet at 15:30 tomorrow afternoon, they can assume mutually that either understands what it means and that both will be there at that time. In the Western world, we divide our weeks into seven days and the year into twelve months. Although these divisions have some correlation in geographical and astronomical material substrates, they are socially constructed (Zerubavel, 1982).

From a Luhmannian perspective, the term "social time" can be sharpened to account for a society that is structured by an order of co-equal operationally closed function systems and the absence of a unifying centre. Function systems maintain a boundary to their environment by constituting their own function-specific meaning, for instance, based on money (economy), power (political system), truth (science), and legality (law). What falls outside their scope is irrelevant to them, akin to the Weberian value spheres. In Luhmann's terms, the systems cannot gain resonance for things their codes and programmes are blind to. This means that function systems do not automatically react to everything going on in the world: a scientific publication on human evolution may or may not trigger a reaction in the religious system and a crash in the stock market may or may not affect the political system. But even if these events in the environment are considered relevant by the system, the system does not simply react immediately and automatically as if it were a stimulus-response mechanism. Any reaction of a functioning system to an event in its environment has to be translated into its own operations following its own rationalities: Does a scientific publication require a new interpretation of sacred texts or the way worshippers need to approach their spirits? Does a stock market crash require decisions by the government, or will non-decision be attributed as a failure to act that will be exploited by the opposition?

While all of this happens in real time (a month takes a month), it also happens in the system-immanent time the systems themselves create through their operations, through selections of (communicative) events that connect to each other recursively. Only the system itself defines which events in the past are elements of its own. To illustrate this, let us imagine an armaments

manufacturer that sells several artillery rocket systems to the government of a foreign country. The payment and delivery of the goods are economic operations that entail the circulation of money from one actor to another, and the goods in a reverse direction. For the economic system, this brings about a shift in spending power and goods that possibly affect future supply, demand, and prices on markets, determined by past supply, prices, and demands. The arms sale is most likely preceded by several legal processes in the recipient country and the home country of the manufacturer (among others matters, regarding constitutional laws, international agreements of weapons proliferation, contracts about the modalities of production) that have repercussions on future legal procedures. More obviously, an arms sale requires decisions by the political system that need to consider national security interests, the dynamics between government and opposition in the respective countries, party politics and ideological debates about supporting or jeopardising peace by weapon deliveries.

If we analyse time through the lens of functional differentiation, the same event (armaments sale) takes place at the same absolute, socially shared moment in time. However, it receives a different selective interpretation by each involved system because each of them operates within its own time frame in line with its own history of past operations, semantics, decisions, and routines. This means that the same event is processed differently by each system because different past events are differently relevant and different futures are projected.

The system-specific time frames differ from system to system in a way that is not covered by generic distinctions such as "social time" versus "natural time". Moreover, there is not just one single time frame within a functioning system. In the economic system, there is the business perspective which concerns the availability of components in markets, production time, delivery, and workforce that define time frames of operational planning and future investments, also considering past and future prices. There are also processes that run along very long cycles of growth and recession, such as Kondratieff cycles (Wallerstein, 1984), but in the business world the period of quarter years is more important when the CEO has to be evaluated based on key performance indicators.

In a similar vein, the political system of parliamentary democracies is largely determined by election cycles (such as presidential elections and midterms) and terms of office (often four or five years, depending on the country). Political decisions are made or postponed with an eye on how the electorate may react. If the ruling parties believe they can benefit from pushing through the arms delivery (presenting themselves as peace brokers or supporters of the local industry), they may go for it before the elections. If they fear their decision is too unpopular in current public opinion and could shift power balances to

their detriment, they may wait until after the elections. The opposition will adjust their actions with the same target in mind, but with inverse goals.

By creating their own "social times", function systems gain autonomy from their environment also in the fact dimension (Luhmann, 2013b). If a system automatically reacted immediately after events in the environment, it could not *select* its reactions. Delaying reactions and reacting selectively at its own pace opens space for system-specific strategies. Consequently, the time frames of different function systems will most likely differ from those in their environment.

As our armaments example indicates, however, events and time frames in one system may affect the events and time frames of other systems. If the election cycle in one country determines when (and if) an arms manufacturer may sell his merchandise to the government of a foreign country, this may delay or hamper the beneficial timing of operations on the battlefield. If international regulations that affect manufacturers in some countries need to be adjusted first (which requires time-consuming legal procedures and political efforts), companies under the jurisdiction of these regulations may be disadvantaged with regard to future market situations compared to companies that are not.

If function systems operate, in principle, autonomously with regard to time, functionally differentiated society as a whole is characterised by a temporal incongruence – the problem of *synchrony* and *diachrony* arises (Brose & Kirschsieper, 2014). On the one hand, the shared social time – "time Esperanto", in the words of Sorokin and Merton (Sorokin & Merton, 1937) – applies to all social systems simultaneously. January is January and 14:30 CET is 14:30 CET. In this regard, the systems operate in synchrony. News media or social media spaces can create a form of simultaneity around a certain topic: for instance, a terrorist attack of global significance, such as 9/11, the outbreak of a global pandemic, or a stock market crash – and in this way create "joint topics" that every system reacts to simultaneously so that we can speak of a "joint present" as a moment of synchrony.

On the other hand, even if the same event happening at one moment in time sets the trigger for operations in the surrounding function systems, each of these deals with it diachronically in its own time and time frame, as argued above. The diachrony creates synchronisation problems because the relative rigidity of different time frames of the involved function systems requires each of them to wait for something to happen in the other – such as federal elections, verdicts by the European Court of Justice, quarterly reports companies of too big to fail, announced visits by the Pope, or football world championships.

At a more general level, diachrony entails that in a complex society many different things happen simultaneously. When things happen simultaneously

in the environment, they cannot be causally controlled by the system (and vice versa). Instead, the system needs to prepare for "eventualities" as unforeseen risks in a way that takes time into account: the system needs to be able to delay or accelerate reactive operations at a moment when something else is already happening. A business may prepare for sudden changes in the future by deploying product diversification and operational units with flat hierarchies that can react flexibly when a technological innovation threatens to disrupt entire markets. In contrast, the legal system cannot act as quickly because it needs to apply currently valid laws in order to evaluate the legal corollaries of the technology, while laws that could adequately capture the situation need to be projected into a more distant future because political opinions among elected legislators have not been formed due to a lack of cognitive comprehension, and because the scientific analyses necessary to determine legally relevant social or health implications of the new technology take their due time (e.g., writing and evaluation of grant applications, ethical reviews, research, publication).

How time becomes scarce

Time in past societies

Functionally differentiated society differs from past societies because of its complexity in the factual, social, and temporal dimensions. Owing to the simultaneousness of social processes and the diachronic time-processing within function systems, coordination between social processes across systems is necessary. Coordination requires waiting, adjusting, accelerating, delaying operations, and this is what ultimately makes time scarce and creates time pressure.

To appreciate how time scarcity and time pressure became inherent characteristics of modern societies (Rosa, 2013), it is useful to contrast modern with archaic societies of low complexity. In the latter, time is experienced as a repeated rhythm of recurring profane events such as hunting ventures and raids in addition to recurring sacred events such as religious rituals (Durkheim, 2001 [1912]). Social life is based on ephemeral, oral communication and it circles around the present with a limited focus on the past and the future. Furthermore, there is no extreme discrepancy between the events and things that are objectively happening and their subjective experience. Durkheim argued that there is a large overlap between collective and individual conscience. Expressed in Luhmannian terms, there is no considerable differentiation between the factual and the social dimensions. Whatever is objectively happening in society

can easily be integrated into the subjective time horizon of its members. The coordination of different time horizons (for instance, between those involved in hunting and defence, on the one hand, and those involved in gathering and childcare, on the other) can be resolved relatively easily. As a result of both features of archaic societies (circularity, the overlap between objective and subjective experience), time is not perceived as scarce.

Larger societies such as chiefdoms and kingdoms must temporise their complexity and expand their time horizons further into the past and the future. Because such societies are mainly built around horticulture or agriculture, the overall understanding of time in daily life is still circular, in line with cycles of meteorological seasons and a rhythm of sowing and harvesting, which require at least some coarse timing and moderate coordination (allocation, administration, storage). Despite the general circularity of temporal experience, highly stratified societies extend their focus on the past and the future to justify the political domination they are founded upon. This can be achieved, for instance, by reference to a century-old history of dynastic rulership and future expectations in the name of an eternal godly order. The invention of written language is helpful because it allows us to build up more persistent and reliable memory of the past than mere oral tradition ever could. Writing allows the past to be transformed into "written history" which is documented in holy books that describe the origins of cosmological orders and provide legitimacy.

In modern society, time is scarce

The functional differentiation in modern society breaks radically with the factual, social, and temporal orders of past societies. At the societal level, past and future are no longer perceived as cyclical repetitions but are determined by non-teleological evolution, disruption, and uncertainty. Factual, social, and temporal orders are experienced as contingent, malleable, and unstable: the knowledge that was true yesterday may no longer be true tomorrow. At the same time, there is now a multiplicity of cyclical repetitions imposed by the temporal orders of function systems. As a consequence, the subjective experience of time becomes overburdened by diverse expectations because there are too many relevant pasts and possible futures to be considered for decisions under the condition of uncertainty. Each function system follows its own rationalities and logic, while there is no overarching, integrating social pulse generator. Synchrony between the function systems can be realised punctually and with great coordination efforts, for instance, only by organisations that operate in the context of the function systems. Examples of the latter are businesses and banks in the context of the economy, governments and administrations in

the context of politics, or universities in the context of science (Schirmer & Michailakis, 2019).

Many different, incongruent things happen at the same time, which implies that objectively expectable events cannot be integrated into the subjective, diachronic time horizons of specific social systems. Simultaneousness – the fact that different things happen at the same time – makes time scarce in the first place. This problem is particularly pertinent in organisations, which, owing to internal differentiation into sub-units, can process meaning in parallel (unlike interactions that can process meaning only sequentially). While parallel procession allows for dealing with much greater complexity, it requires an integration of multiple, simultaneously happening decision procedures into a joint temporal order. Joint temporal orders are difficult to achieve among function systems, but they are possible among and in organisations (Nassehi, 2005). Joint temporal orders are dependent on coordination through appointments and deadlines, which in turn exacerbate the time pressure. Something in the other subsystem that should be considered is already happening – or the inverse: the other event cannot happen yet because it has to wait for something to happen in the system first. The longer the wait, the less time is available for the own operation.

Time pressure can be a decisive factor in everyday life in organisations even when it is not intended in the procedural decision structure. It is an "undecided decision-premise" (Luhmann, 2018), which means it does not appear on any flow chart or organogram. Nevertheless, time pressure has a tight grip on the daily reality of decision-making (Luhmann, 2007) because it renders some issues more urgent than others and urgency (mistakenly) becomes a placeholder for importance.

Urgency arises as a corollary of coordination through appointments and deadlines. The advantage of appointments and deadlines is that they refer to an objective, socially shared time which ensures that nobody can legitimately claim not to understand what it means that the deadline is Wednesday next week at 10 o'clock. Appointments and deadlines determine the rhythm of work and the choice of its content: until when does what need to be done? Tasks will be prioritised according to what must be ready by tomorrow, next week, or next month. Time pressure and urgency vary and thematic preferences and priorities shift accordingly. Appointments create new appointments for preparation, coordination, follow-ups, each of which reproduces the time pressure. By setting appointments and deadlines, even organisational behaviour that is undetermined by time can come under time pressure, for instance as preparation for appointments or because time needs to be made between appointments; everything that is not covered by appointments can

be postponed, has no urgency, and in this way is rendered less important (for now). What hasn't been accomplished now may be forgotten until it suddenly becomes urgent at some later point.

The prioritisation of deadlines also has a disciplining effect because it shifts the focus to the controllable aspects of behaviour. If someone misses a deadline, they may be scapegoated for the overall failure of a project – which deflects attention from the complexity or quality problems in other realms. The purported argument would be: we didn't succeed because you missed the deadline. Under such circumstances, it becomes rational for individuals to make their deadlines the highest priority at the cost of finding better solutions or delivering more thorough work. As a result, time pressure drives a wedge between personal and organisational preference hierarchies.

Another reason for urgency to arise within organisations is the interdependence of the three meaning dimensions. Complexity in each meaning dimension creates scarcity in the interrelation with the other dimensions. The complexity of fact structures would be not a problem if there were enough time to gather and process all the information or if consensus among incongruent perspectives (social dimension) were guaranteed (Luhmann, 2007). A socially complex world makes consensus more difficult, but finding consensus would be less of a problem if there were enough time. Problems in the fact dimension – making the right decision – are, therefore, regularly rendered into a problem in the temporal dimension and the social dimension: if only there were more time, more information could have been taken into account and a more rational decision could have been made. Decisions about complex matters may require information from several specialist contributors (or systems) whose knowledge is incomplete and scattered. Because an incongruence of perspectives (social dimension) makes an agreement in the fact dimensions unlikely, the typical solution is to negotiate towards a consensus based on the premise that we cannot know everything. Negotiations of consensus cannot go on eternally either. Not everybody can be heard at length, not everybody can answer to everybody, and not everybody has enough knowledge to evaluate the state of the matter. The mere time lapse does not automatically lead to consensus: just because we discussed the matter all day on Monday, and it is now Tuesday, does not make everyone agree.

However, the mutual dependence of the meaning dimensions on each other can, inversely, also lead to a mutual unburdening that organisations can make use of. For instance, meaning can switch to the temporal dimension (Luhmann, 2012) by reference to time pressure and urgency. We need to reach a decision now; we cannot discuss it any longer. Time pressure is therefore a means to reduce complexity. Reference to the temporal dimension can be a

communicative tool to dismiss claims, and the outcome is what March and Simon (1993) famously called a satisfying, not optimal, solution.

Because everyone in the organisation orients to deadlines, an informal "ideology of pace" (Luhmann, 2007) emerges that forces members to avoid the impression of having too much time. Too much time implies poor performance or low effort. In contrast, the ideology of pace in a temporal order of time scarcity and urgency offers the clever employee several communicative tools for tactical manoeuvres. For starters, it allows them to dismiss claims and requests by using the institutionalised excuse "I'm on a deadline". Moreover, those in a higher status position usually have more freedom to dispose of their own time and push appointments onto others. Time scarcity can be exploited by filling one's own agenda with appointments at certain dates to avoid participation in others and in doing so evade the time pressures set by others. A full agenda at the right moment offers socially acceptable excuses for absence and withdrawal when others expect cooperation. In the same vein, those in a position of power can set appointments (their own and those of others) to accelerate or delay certain processes depending on their own micro-political agenda – for instance, by setting tighter deadlines for personally important projects or by granting appointments late for unpleasant issues in the hope they may disappear if only enough time has passed.

Decision-makers with less formal power can also play tactically with time scarcity and urgency. For example, they can prepare materials for a decision-making meeting that are too complicated or unusable so that it would take too much time for everybody to understand them; or they may request the cooperation of parties without expertise on the matter who do not know how to contribute. That way they can increase the time pressure because the deadline is drawing closer and a decision needs to be made. Then they can present their own ideas as an acceptable solution that goes uncriticised because there is no time left for substantial changes.

Luhmann made some of these observations during his service in public administration before he started to work as a theoretical sociologist, but they fit neatly with the main claim in his works on social systems, functionally differentiated societies and organisations: that time pressure is a modern phenomenon that arises through the differentiation of the factual, social, and temporal dimensions of meaning, with simultaneousness and complexity. It also arises from the need for coordination in a society that lacks an integrated Archimedean perspective and is characterised by diachrony more than synchrony.

Time pressure in everyday life

Simultaneousness and the need for temporal coordination create time pressure in social systems. In the previous section, we illustrated this with a focus on decision-making in organisations. Now, we briefly address how functional differentiation creates time pressure in the everyday life of individuals. The way functionally differentiated society resorts to human beings, again, marks a break with pre-modern ways of social inclusion. In archaic segmentary societies, people were included as a "whole person" into one societal segment (their tribe, village, or clan). In ancient and medieval stratified societies, they belonged as a "whole person" in their estate (noble, clergy, peasant, serf), where membership almost completely predefined their societal place and life. In both cases, people are included in one societal subsystem at a time.

Modern society, in contrast, is characterised by functional differentiation, where the primary subsystems arrange themselves around functions, not segments of people. Now individuals can be included in all subsystems at the same time, albeit not as "whole persons". Only those psychological and social properties relevant to the specific function are included and the "rest" of the person is excluded. In an economy, individuals are relevant for their spending power or credit status; in the political system as voters; in the legal system as defendants with legal track records; in the educational system as students with academic track records; in the media as audience or target of attention; in medicine as patients with medical track records. On top of that, some people also inhabit a specific "performance role" (Stichweh, 1988) in one or more function systems that help to execute the respective function, such as trader or business person; politician or officebearer, lawyer or judge; teacher; reporter; researcher; doctor, etc.

Whatever their "whole person" may be, it exists outside of, not within, function systems. It is up to the individuals themselves to integrate their different roles, social expectations, and psychological experiences through participating in several function systems at the same time. Figuratively speaking, functional differentiation *cuts right through* individuals, leaving them to their own devices. This unique structural position of the individual vis-à-vis social systems has profound implications on the experience of time. As argued earlier, function systems create their own, system-specific time frames and constructions of past and future. Functional differentiation means that there is a multitude of such function systems and their organisations that operate simultaneously, each imposing their own time frames onto their environment, leading to synchrony problems at the societal level.

Individuals need to navigate the emporal imperatives of the social systems they are included in, via performance roles, lay roles, or client roles. This requires them to constantly coordinate and integrate conflicting demands. This problem has often been described as a work–life balance (Guest, 2002) or work–family conflict (Byron, 2005). Through the link to performance roles, paid work is as central a mechanism to economic reproduction as is family or kinship to socio-emotional reproduction. Moreover, both domains are key mechanisms for social inclusion (Schirmer & Michailakis, 2018), which possibly explains the strong focus on conflicts between these two domains. Both clash not only in the temporal but also in the factual dimension; where they impose on the individual contradictory rationalities, one of which follows a Weberian *vergesellschaftungs*-logic (economy) and one a Weberian *vergemeinschaftungs*-logic (family) – a contradiction typical of modern societies that also affects the quality of romantic relationships (Glorieux, Minnen, & van Tienoven, 2011).

Concepts such as work–family conflict raise a justified point, but seen from a Luhmannian perspective they fall short because they refer to only one (albeit important) aspect among potentially many such conflicts or "balances". Individuals need to take into account the temporal structures of several function systems and organisations that, each for themselves as well as in conjunction with one another, impose a mixture of what Zerubavel (1982) called institutional, cultural, and normative temporal structures. These deeply affect what can be done when, has to be done until when, and what cannot be done when. For instance, educational organisations have their opening and closing hours to which parents of school-age children need to adhere. This temporal structure is both institutional (set by the organisation and the education system) and normative. Parents and carers cannot bring the children to school either too early or too late or they will face sanctions of some kind – both within and outside of the institution. Similarly, public office hours and business opening hours are set based on institutional and cultural premises with normative implications. The prolonged opening times of supermarkets are a (politically and legally) induced adjustment of the economic system to cater to the needs of the working parents, who pick up their children from school after work and have time to do their shopping for groceries only in the evening.

At a macro-level, these temporal structures follow their respective (function-)system specific logics but are also coordinated with one another – in part by self-organisation and in part by regulation. At the micro-level of everyday life, individuals juggle all these temporal structures. They experience their time as scarce to the extent that they need to fulfil conflicting demands in the factual dimension of different systems (work, family, education, leisure activities, legal appointments, cultural, religious or sports events) that cannot

be dissolved in the temporal dimension because they happen simultaneously. Time scarcity for individuals emerges when different demands in the factual or social dimensions need to be coordinated via the temporal dimension. Time scarcity may cause time pressure and psychological stress to keep up, leading individuals to be constantly on the verge of being late. As time use researchers have shown (van Tienoven, Glorieux, & Minnen, 2017), individuals revert to routinisation strategies, trying to integrate all conflicting demands in a brittle sequential order where every element needs to fit into the other akin to just-in-time production in the industry and where any disturbance – such as the illness of a family member – threatens to collapse the whole scheme.

Next to first-hand experience of time pressure, there is also a second-order time pressure that occurs when individuals need to adjust to the time pressures of others. For instance, birthday parties for children often have to be scheduled at the weekend to accommodate the schedules of invited guests' parents. Some long-term romantic couples need to arrange "date nights" to make time for institutionalised quality time. Such adjustment to the scarce time of others is important because the meaning people attach to activities is highly contingent on whom they spend them with (Glorieux, 1993). Even here in everyday life we can observe the "ideology of pace" that Luhmann noted within organisations (see previous): individuals who have too much time, are too flexible for appointments, or can afford to engage in non-duty-related activities raise suspicion or envy. However, this perceived "ideology of pace" can be subverted and turned into a resource towards increased freedom and autonomy. Unpleasant obligations or requests in one domain can be fenced off with reference to time-sensitive obligations in other domains ("I need to hurry to get the kids") or generic time pressure ("I'd like to have a beer with you tonight, but my boss wants me to finish this report by tomorrow …").

The specific way functionally differentiated society includes people as role-specific parts into its subsystems while leaving the "whole person" outside allows savvy individuals to play different temporal structures against each other: demands in one system can be used as legitimate excuses for demands in others with explicit reference to a lack of time. Given the lack of any overarching Archimedean position in society, nobody really knows (or has the right to know) what is going on in one's life beyond the functionally relevant parts. We could conclude that the functionally differentiated structure of modern society is both a cause of and a solution to the experience of time scarcity and time pressure.

References

Alexander, J. & Colomy, P. (1985). Toward neo-functionalism. *Sociological Theory*, *3*(1), 11-23.

Bateson, G. (1972). *Steps to an ecology of mind*. University of Chicago Press.

Blumer, H. (1986). *Symbolic interactionism: Perspective and method*. University of California Press.

Brose, H.-G. & Kirschsieper, D. (2014). Un-/gleichzeitigkeit und Synchronisation. *Zeitschrift für Theoretische Soziologie*, *2*, 1-48.

Byron, K. (2005). A meta-analytic review of work–family conflict and its antecedents. *Journal of Vocational Behavior*, *67*(2), 169-198.

Durkheim, É. (2001 [1912]). *The elementary forms of religious life*. Oxford University Press.

Glorieux, I. (1993). Social interaction and the social meanings of action: A time budget approach. *Social Indicators Research*, *30*(2), 149-173.

Glorieux, I., Minnen, J., & van Tienoven, T. P. (2011). Spouse "together time": Quality time within the household. *Social Indicators Research*, *101*(2), 281-287.

Goffman, E. (1967). *Interaction ritual: Essays on face-to-face behavior*. Doubleday.

Guest, D. (2002). Perspectives on the study of work–life balance. *Social Science Information*, *41*(2), 255-279.

Kihlström, A. (2012). Luhmann's system theory in social work: Criticism and reflections. *Journal of Social Work*, *12*(3), 287-299.

King, M. (2009). *Systems, not people, make society happen*. Holcombe.

Luhmann, N. (1971). *Systemtheoretische Argumentationen. Eine Entgegnung auf Jürgen Habermas*. Suhrkamp.

Luhmann, N. (1992). What is communication? *Communication Theory*, *2*(3), 251-259.

Luhmann, N. (1995). *Social systems*. Stanford University Press.

Luhmann, N. (2002). *Theories of distinction*. Stanford University Press.

Luhmann, N. (2007). Die Knappheit der Zeit und die Vordringlichkeit des Befristeten. In N. Luhmann (Ed.) *Politische Planung* (pp. 143-164). VS Verlag.

Luhmann, N. (2012). *Theory of society. Volume 1*. Stanford University Press.

Luhmann, N. (2013a). *Introduction to systems theory*. Polity Cambridge.

Luhmann, N. (2013b). *Theory of society. Volume 2*. Stanford University Press.

Luhmann, N. (2018). *Organisation and decision*. Cambridge University Press

March, J. G. & Simon, H. A. (1993). *Organisations*. John Wiley & sons.

Maturana, H. & Varela, F. (1980). *Autopoeisis and cognition. The realization of the living*. D Reidel.

Mead, G. H. (1934). *Mind, self, and society: From the standpoint of a social behaviorist*. University of Chicago Press.

Mingers, J. (2002). Can social systems be autopoietic? Assessing Luhmann's social theory. *The Sociological Review*, *50*(2), 278-299.

Nassehi, A. (2003). *Geschlossenheit und Offenheit. Studien zur Theorie der modernen Gesellschaft*. Suhrkamp.

Nassehi, A. (2005). Organisations as decision machines: Niklas Luhmann's theory of organized social systems. *The Sociological Review*, *53*(1), 178-191.

Parsons, T. (1951). *The social system*. The Free Press.

Parsons, T. (1963). *Sociological theory and modern society*. The Free Press.

Parsons, T. & Shils, E. (Eds.). (1951). *Toward a general theory of action*. Harvard University Press.

Parsons, T. & Smelser, N. (1956). *Economy and society*. Routledge.

Rosa, H. (2013). *Social acceleration*. Columbia University Press.

Schirmer, W. & Michailakis, D. (2015). The Luhmannian approach to exclusion/inclusion and its relevance to social work. *Journal of Social Work*, *15*(1), 45-64.

Schirmer, W. & Michailakis, D. (2018). Inclusion/exclusion as the missing link. A Luhmannian analysis of loneliness among older people. *Systems Research and Behavioral Science*, *35*(1), 76-89.

Schirmer, W. & Michailakis, D. (2019). *Systems theory for social work and the helping professions*. Routledge.

Simmel, G. (2009). *Sociology: Inquiries into the construction of social forms*. Brill.

Sorokin, P. A. & Merton, R. K. (1937). Social time: A methodological and functional analysis. *American Journal of Sociology*, *42*(5), 615-629.

Stichweh, R. (1988). Inklusion in Funktionssysteme der modernen Gesellschaft. In R. Mayntz, B. Rosewitz, U. Schimank, & R. Stichweh (Eds.), *Differenzierung und Verselbständigung* (pp. 261-294). Campus.

van Tienoven, T. P. (2019). A multitude of natural, social and individual time. *Time & Society*, *28*(3), 971-994.

van Tienoven, T. P., Glorieux, I., & Minnen, J. (2017). Exploring the stable practices of everyday life: A multi-day time diary approach. *The Sociological Review*, *65*(4), 745-762.

Von Bertalanffy, L. (1968). *General system theory: Foundations, development, applications*. Braziller.

Von Foerster, H. (1984). *Observing systems*. Intersystems Publications.

Wallerstein, I. (1984). Long waves as capitalist process. *Review (Fernand Braudel Center)*, *7*(4), 559-575.

Weber, M. (1968). *Economy and society: An outline of interpretive sociology*. Bedminster.

Zerubavel, E. (1982). The standardization of time: A sociohistorical perspective. *American Journal of Sociology*, *88*(1), 1-23.

PART II:
USING TIME USE DATA

Trends in working time in France, 1985-2010: a decomposition approach

Laurent Lesnard • Jean-Yves Boulin

Since the beginning of the Industrial Revolution and the emergence of wage labour, the daily and weekly number of work hours has been the subject of tension between employers and workers (Thompson, 1967). In France, as in most European countries, working time has been regulated in connection with a succession of linked issues: the improvement of working conditions; demographic and public health objectives (in particular for military purposes); the quest for free time and for family, social and educational life; sharing work; productive flexibility in extending the duration of equipment use and the opening times of services (Fridenson & Reynaud, 2004).

During the 2000s, faced with the increasing intensification of working time, its densification and its acceleration that also affected all the other spheres of social life, the question of the balance between work life and personal life became a key element of reflections and actions on the organisation and duration of working time.

However, this issue has become more significant in Nordic and Anglo-Saxon countries (Eurofound, 2006, 2012) and at the European level (see, for example, the European Pillar of Social Rights adopted in 2017 in Gothenburg and renewed at the Porto summit in 2021) than in France, where this issue has become key only since the COVID-19 pandemic and the correlative development of telework.

More recently, the issue of working time, in particular its reduction but also its organisation, has also been called upon to deal with the climate crisis (De Spiegelaere & Piasna, 2021; Devetter & Rousseau, 2011; Knight, Rosa & Schor, 2013, but also the 28-hour working week that was debated in France by the Citizens' Climate Convention in 2020-2021 and also the renewed interest in the four-day week in several countries, see Autonomy, 2019, 2021). Telework,

the development of which has been greatly stimulated by the pandemic, is also cited as one of the ways of fighting global warming.

Compared to most other European countries, and irrespective of the issues at stake, one of the peculiarities of France with regard to regulating the duration and organisation of working time is the decisive role played by legislation. This means that the role of politics is central to the way working time is regulated. It follows that what has been done by one government can be undone by another whose political colour is different.

The hypothesis that will structure our discussion throughout this chapter is the argument that the reduction in working time in a country such as France, where this issue is very marked ideologically and regulated by law, struggles to materialise in the actual working hours of employees. Thus, the law implementing the 40-hour working week in 1936 did not come into being in real working time until the end of the 1970s, more than 40 years later. Of course, the reconstruction and the shortage of labour after the Second World War explain the massive recourse to overtime, but from 1938, just after the fall of the Popular Front, decrees came to call into question this social progress.

Using data from time use surveys conducted in 1985, 1998, and 2009 – a period during which the legal working time was reduced twice, in 1981 from 40 to 39 hours a week, then in 1997 and 2000 from 39 to 35 hours a week – we will show that these reductions in the legal duration of working time did not really materialise in the actual duration practised by employees. This result is due to structural changes in the working population. But it is also due to legislative acts that emptied the various laws aimed at reducing working time of their substance.

The regulation of working time

From the 1814 law banning Sunday work to the 2022 law allowing workers to monetise their compensatory days off work, the number of legal texts dealing with working time in France is substantial[1]. If we confine ourselves to the contemporary period from the 1980s until the 2020s, there are no fewer than 20 pieces of legislation relating to working time.

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1   Established by the Aubry laws (1997 and 2000) – In France, laws often take the name of their author and Martine Aubry was in charge of implementing the 35-hour workweek and the laws she passed are often referred to as the "Aubry laws" – these are rest days that are granted to employees whose agreed duration of working time exceeds the legal duration (35 h a week). Therefore, an employee whose actual weekly working time, defined by collective company agreement, is 39 h a week benefits from 20 days of rest in addition to their annual leave.

Reduction in working time according to homogeneous standards

From 1841, the year of the first social law that regulated the duration of children's work hours, until 1968, working time was regulated by collective and homogeneous standards, although there were a few exceptions regarding certain specific activities (process industries, safety and health sectors)[2].

Defined by law during the first half of the twentieth century, these collective standards generalised a daily duration of eight hours, a 40-hour working week and paid holidays gradually increased to four weeks annually. To this was added a minimum age for entry into the labour market and a maximum age for exit. This resulted in the sedimentation of a standard model based on fairly widely shared collective working hours (08:00-09:00 to 17:00-18:00) and a ternary cycle in terms of life course (education-work-retirement). This model, resulting from a Fordist organisation of work, was based on a separation between spaces and temporalities of work, on the one hand, and spaces and temporalities of family and social life outside work, on the other, in addition to a gendered division of tasks.

Although over the entire period from the middle of the nineteenth century to the present days working hours have experienced a reduction trend due to the legislation, this has not always been linear. Thus, the 40-hour working week instituted in 1936 did not really come into being until the end of the 1970s. Indeed, the approach of the Second World War and then the reconstruction of the country afterwards generated a large volume of overtime, which resulted in effective weekly work durations well above 40 hours. After 1968, the effective weekly duration of work gradually came closer to the legal threshold of 40 hours due to the reduction in overtime (Marchand & Thélot, 1997).

Tensions between work-sharing and productive flexibility

The period that began with the 1980s was marked by a double movement of a reduction in working hours and the development of working time flexibility. Indeed, in less than two decades, two laws have triggered a reduction in legal working hours, both of which contained provisions aimed at making working time more flexible. Moreover, these laws were followed by legal provisions

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2 The law of 22 March 1841 "relating to the work of children employed in factories or workshops" prohibited work for children under the age of eight, limited working hours to eight hours for those aged between eight and twelve, to twelve hours for those aged between twelve and sixteen, and prohibited night work for children under the age of thirteen. Work on Sundays and public holidays was prohibited for those under the age of sixteen.

which aimed to make schedules more flexible and, in the case of the "Aubry laws", to empty them of their very substance, that is to say, to actually reduce working time.

Indeed, the 1982 decrees reducing the weekly legal working time from 40 to 39 hours also initiated a movement towards deregulating collective standards, a movement that is still going on today. Between 1982 and 2022, no fewer than 20 laws dealt, more or less, with issues relating to working time, most of them aiming at making working time more flexible for employers.

These past four decades working time policies have in fact been marked by tensions between employer-led flexibility and the need to reduce unemployment. Sometimes the emphasis was on reducing working time in order to reduce unemployment (e.g., a shift in the legal weekly working time from 40 hours to 39 hours; the so called "Aubry laws" in 1997 and 2000 that implemented the 35-hour working week).

At other times, it was the search for greater flexibility in working time (increased opportunities for weekend work in the manufacturing sector – the so-called Friday, Saturday, Sunday teams – in 1982; the "Séguin law" in 1987 that allowed for more flexible working-time arrangements for economic reasons; the "Quinquennium law" in 1993 that extended the opportunities for counting work hours annually instead of weekly, increased tax incentives to develop part-time work, and implemented additional exemptions from Sunday rest).[3]

In some cases, the laws aimed at both goals simultaneously. This was the case with the 30 % reduction on employers' social insurance contributions for hiring part-time employees in 1992, which was increased to 50 % in 1993. The aim was both to provide more flexible forms of employment to employers in the services industry and to offer more job opportunities for women, whose share of the working population had grown considerably since the 1970s but whose unemployment rate had also risen sharply (Afsa Essafi, 2006).

The same observation can be made for the "Aubry laws" (1997 and 2000). Through a strong collective reduction in working time (from 39 to 35 hours per week) the legislation clearly aimed at creating jobs; but it also introduced more opportunities for making working hours more flexible by generalising its annualisation and also by introducing a flat-rate pay agreement covering days worked (*forfait jours* in French) for some qualified managers. This last measure makes it difficult to control the working time of managers who, in fact, in 2019 worked on average more than 43 hours per week (Insee, 2021, p. 132). The increase in the number of women in the workforce and the growth in the number of managers (whose share of total employment has more than

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3   Philippe Séguin passed this law.

doubled in 40 years) are due to a movement towards the growth of the services sector.

Growth of the services sector

Even though the services sector has grown continuously since the end of the nineteenth century, it has experienced a strong increase since 1945. As a result, the number of jobs in the services sector has more than doubled in 50 years (Marchand & Thélot, 1997): services activities represented about 76 % of total employment in France in 2018 (Insee, 2022). This growth involved public services, where employment has increased steadily since the end of the Second World War, with peaks in job creation in the 1980s (with TUC – *Travaux d'utilité collective* – a kind of community work contract) and the 1990s (with the *Contrats de Solidarité* – Solidarity Contracts) together with the devolution movement, which has stimulated job creation at the local level (Marchand & Thélot, 1997). From the 1960s onwards, the strong development of jobs in market services, provided the bulk of job creation until today.

This development of services was also associated with an increase in educational attainment and in highly qualified jobs. Indeed, the share of professionals and managers increased by about seventeen points since the 1960s: executives now represent a fifth (21.5 %) of the employed population.

This period was also marked by a strong increase in female employment: whereas 50 % of women aged 25 to 59 were in employment at the beginning of the 1970s, this was the case for 75 % of them in 2006 (Afsa Essafi, 2006). This double movement of growth in qualifications and the feminisation of employment is linked to the development of services – which has accompanied the rise of information and communication technologies.

The feminisation of employment has also been favoured by incentives for part-time work (cuts in employers' social contributions in 1992 and 1993), the share of which has increased by more than ten points since 1982, to reach 18 % at the end of the 1990s.

This increase in part-time employment is clearly linked to the increase in personal services, the development of which was stimulated by the introduction of a tax credit for households employing someone at home, by the ageing of the population, and by the commodification of public services. Part-time employment, which is in fact an individual decrease of work hours collectively provided for by law, is linked to inequalities in the labour market since, in 2021, (1) it involved 28 % of employed women (8.3 % of men) and (2) this form of employment was made up of 43 % low-skilled employees.

Another consequence of the growth of services is the diversification of working hours, which has led to an increase in atypical working hours in recent decades. Indeed, all front office services (personal care, retail, delivery people, etc.) presuppose the performance of the service *uno actu*, that is to say, they presuppose the co-presence of service producers and consumers, which could shake up the daily time organization of employees.

Measures to thwart the reduction in working time since 2002

The main argument used to circumvent the working-time reduction initiated by the "Aubry laws" was to increase wages through overtime. Indeed, the overtime quota jumped from 130 hours a year in 2002 to 220 in 2004. This gave employees the opportunity to carry on working 39 hours per week. The social contribution and tax exemption of overtime (TEPA law in 2007), or even the monetisation of RTT days (working-time reduction days) or of time savings accounts (2003, 2005, 2008) went in the same direction (Boulin & Cette, 2008). All these policies have been carried out without any real coherence, often referring to an ideological underpinning ("work more to earn more") and without continuity.[4]

The following government first reversed the tax exemption for overtime in 2012 then introduced an opportunity to modulate the remuneration of these overtime hours, which, since the 2016 "Labour" law (*Loi Travail*), may be subject to a lower rate of remuneration (up to a minimum of 10 % instead of 25 %). On the one hand, the first measure aimed at promoting employment by discouraging the use of overtime. On the other hand, the second measure aimed, on the contrary, to facilitate the use of overtime in order to increase purchasing power to the detriment of job creation.

The successive deregulations of working time norms have led to an increase in atypical working hours, that is, to working hours outside the standard 08:00-09:00 to 17:00-18:00 over five days or exceeding it. The result was an increase in night work (1 million more were involved in 2012 compared to 1991) and also in Sunday work (Boulin & Lesnard, 2016).

In both cases, women have been most affected by the increase: they represented 30 % of night workers in 2012 compared to 20 % twenty years earlier, while their share of the population affected by Sunday work increased from 34 % to 44 % between 1986 and 2010. The destabilisation of the working-time norm has been confirmed by Sautory and Zilloniz (2015), who, using the

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4   Slogan used by Nicolas Sarkozy during the 2007 French presidential campaign (see https:// fr.wikipedia.org/wiki/Travailler_plus_pour_gagner_plus).

2010 French time use survey, identified eight types of workday and nine types of working week.

Another striking habit of successive French governments is to not really care about the effectiveness of the laws they pass. Most of the time, these laws come into effect without a preparatory phase (experiments, for instance) and without *ex post* evaluation. Again, this underlines the ideological nature of laws on working time, which goes as far as disregarding their real practical consequences for employees.

This leads us to our main research question: How effective are the two main laws that are likely to change working time in France (i.e., the incentive for part-time jobs and the implementation of the 35-hour working week)? To answer to this question, we apply decomposition methods on three time use surveys to separate structural from policy or behavioural changes.

Data, measurements, and methods

Data

We used the last three time use surveys fielded in France (the previous surveys focused only on urban areas or, on the contrary, on rural areas):

- 1985-1986 (n = 29,723);
- 1998-1999 (n = 20,370);
- 2009-2010 (n = 18,521).

These three surveys were organised by the French National Statistical Institute (*Institut national de la statistique et des études économiques* – Insee). The data collection was the same for the three surveys (Insee, 1988, 2017 Martin & Morin 1999): paper diaries were left for randomly selected dwellings and respondents and were retrieved later by interviewers. Paper diaries were not precoded and the respondents were asked to describe their activities during the day randomly selected by interviewers in their own words. The diaries were then coded, manually for the 1985 survey and semi-automatically for the other two (an algorithm was used to code diaries and when it failed to do so they were manually coded). Regarding the timing, the first two surveys should enable revealing what happened before and after the tax incentives were introduced for part-time jobs. However, the 2010 survey is a bit distant from the two 35-hour working week laws, so we will only be able to see what remained of these laws after ten years.

Measurement

Unfortunately, the activity lexicons used to code daily activities were not exactly the same for the three surveys. However, as we are interested in activities related to paid work, the three surveys were in the end quite comparable. Paid work was defined as: "normal paid work outside of home", "normal professional (i.e., paid) work at home", "travelling during work (excluding commuting time)", "related work of farmers", and "non-work in the workplace, related to work: getting ready, changing clothes, waiting for work to start (including breakdowns)".

We therefore excluded commuting time and lunch time in our definition of work. In fact, commuting time is not directly related to job requirements but it depends on many external parameters that are irrelevant here. In some instances, lunch time could be considered as real paid working time (for instance, a business lunch). However, it is impossible to distinguish such events from the more classical lunch with colleagues, which may be related to paid work to varying degrees.

We took into account the different paid work activities described above only when they were described as primary activities. Indeed, in the last three French time use surveys, the respondents could also describe secondary activities, activities that were carried out simultaneously with the primary one.[5] There is no consensus in the time use community about how to take into account, or not, secondary activities. In the American Time Use Surveys (2003-2021), secondary activities are not collected. This choice is not discussed but it is possibly because, according to Michael Bittman (cited by Budig and Folbre, 2004, p. 59),

> official statistical offices are haunted by the idea that the number of secondaries recorded has more to do with how much effort a respondent is willing to commit to completing the time diary than the real number of simultaneous activities.

In addition, if we were to add primary and secondary activities, days would no longer be limited to 24 hours and would have differing lengths. Here, we also excluded secondary paid work activities on the ground that we were not interested in residual working time spells but only in those fully focused on paid work.

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5   For instance, watching TV - primary activity - while eating - secondary activity - or the other way around: it was left to respondents to decide which activity was more important to them.

Explanatory variables

We used common variables to describe the French workers' characteristics:
- Gender (all the analyses are conducted separately by gender)
- Age (under 25, 25-34, 35-44, 45-54, 55-64, 65+)
- Partnership status (No partner, Partner labour force, Partner not labour force)
- Number of children aged sixteen or younger (No children, one child, two children, three+ children)
- Educational attainment (No diploma, Primary education, Lower secondary education general, Lower secondary education vocational, Upper secondary education vocational, Upper secondary education general, Post-secondary education, Bachelor and above)
- Social class (Managers, Scientific & cult. occupations, Teachers, Intermediate occupations, Clerks, Police, Lower-grade service sales employees, Skilled manual workers, Unskilled manual workers)
- Industry (Agriculture, Agricultural industry, Energy, Other industries, Construction, Trade, Transport, Finance, Real estate, Education and health, Business services, Services, Admin NGO)
- Class of worker (Government, Private)
- Full or part-time (Part-time, Full-time)

In the 2009 survey, the part-time variable had to be manually imputed using information from other variables (Values for 7,577 individuals had to be imputed).[6] The different rules used seem reasonable and, on an aggregate level, the proportion of part-time workers for both women and men in the 2009 French time use survey was very close to those found using the French labour force survey. However, the results regarding this variable in 2009 will have to be interpreted with care.

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6   The computer implementation of the questionnaire had some flaws. To be more specific, the filter of the question on part-time work (variable TPP) was not respected: the question was asked only to people with permanent contracts or to civil servants who had already declared themselves to be part-time in the main part of the questionnaire. For people with another status, it was not possible to know whether they work part-time or full-time. There is also a consistency problem between this variable and the TYPEMPLOI variable of the main questionnaire: a person who declared that they work part-time was able to declare that they work full-time in the TPP variable. Several imputation possibilities were considered: imputation by a logistical model estimated on the Labour Force Survey gave unsatisfactory results, whether at the level of external consistency or that of internal consistency. The option finally chosen was a deterministic imputation according to the responses to the other variables.

Methods

Given the social changes discussed above, we expect workers to have different characteristics in 1985, 1998, and 2009. In order to take into account these changes, we use decomposition techniques, also known as Kitagawa-Oaxaca-Blinder decompositions (Blinder, 1973; Kitagawa, 1955; Oaxaca, 1973). Decompositions explain the difference between the mean in two groups by (see Box 1):

- a part explained by observed structural changes in the models' explanatory variables;
- a part unexplained by these structural changes and that can be attributed to other factors such as policy or behavioural changes. However, in a few instances, policy changes can directly alter, at least partially, the structure. This is the case with the tax incentives for part-time work in 1992 and 1993 that led to an increase in part-time workers.

The explained part of the decomposition is a thought experiment because it amounts to comparing a real situation to a hypothetical one. If we take the example of the difference between paid working time in 2009 and 1985, then the explained part will be the difference between the predicted paid working time in 2009 and the paid working time in 1985 predicted using the 2009 estimated coefficients. As a result, the only differences between these two terms are the structural changes between the two dates.

The non-structural part of a decomposition based on dummy variables depends on the choice of reference groups (Oaxaca & Ransom, 1999). As a result, Jones and Kelley (1984) argue that all decompositions are necessarily arbitrary. However, others suggested normalising coefficients (Gardeazabal & Ugidos, 2004; Yun, 2005). According to these authors, this normalisation procedure would amount, in fact, to switch from the dummy coding scheme to the effect coding one where the constant term represents the grand mean of working time and coefficients indicate the difference from this average working time.[7] However, doing so raises some important questions because most of the time, observed categorical variables are unbalanced. As a result, we used dummy variables. A detailed example of a simple decomposition is presented below. The reference category of the decomposition analyses is a woman or a man (analyses are conducted separately by gender) aged 25-34, single, without children, with an upper secondary general education level, working full-time in the private sector for a company offering services to other companies in an intermediate occupation, in 1985.

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7   The mean of working time without taking into account the fact that observed categorical variables are unbalanced.

Box 1. Decomposition method

Let us take a very simple decomposition to clarify how they work: we want to model the changes in women's working time between 1998 and 1985 using only one variable describing whether they worked full- or part-time. This variable is, however, a bit tricky as tax incentives introduced at the beginning of the 1990s in France to favour part-time work are likely to directly alter the structure (proportion) of part-time workers. This variable is going to be introduced in the models as a dummy variable, the omitted value being full-time so that the constant term will represent the average mean of working time for full-time workers. This simple model, as applied to the two years, can be written as:

$$Y_{1985} = \alpha_{1985} + \beta_{1985}X_{1985} + \epsilon_{1985}$$
$$Y_{1998} = \alpha_{1998} + \beta_{1998}X_{1998} + \epsilon_{1998}$$

where Y is working time, α is the constant term, β is the coefficient associated with part-time, X is a dummy variable for part-time, and ε is the error term. In 1985, the average working time of full-time workers is $\hat{\alpha}$ = 438 minutes; see Table 1). That year, working part-time is associated with –119 minutes of work. In 1998, full-time workers worked on average more than in 1985 and if part-time workers worked less than them, the difference is smaller than in 1985: part-time workers' average working time also increased from 1985.

Table 1. Simple ordinary least square of working time for women in 1985 and 1998

	1985		1998	
Characteristic	**B**	**P**	**B**	**P**
(Intercept)	438	<0.001	457	<0.001
Part-time				
Part-time	–119	<0.001	–91	<0.001
Full-time	—		—	

As we seek to explain the difference between average working time, that is to say $\bar{Y}_{1998} - \bar{Y}_{1985}$, it is possible to re-express this difference using a counterfactual term $\bar{Y}^*_{1985}$:

$$\bar{Y}_{1998} - \bar{Y}_{1985} = (\bar{Y}_{1998} - \bar{Y}^*_{1985}) + (\bar{Y}^*_{1985} - \bar{Y}_{1985})$$

Where $\bar{Y}^*_{1985} = \hat{\alpha}_{1998} + \hat{\beta}_{1998}\bar{X}_{1985}$ is a counterfactual term for which the structure (here only part-time work) is based on 1985 but the relationship between the structure and working time is that estimated for 1998. This fictitious situation can be interpreted in two ways. When compared to the 1998 regression, this counterfactual estimate can be viewed as creating a society in 1998 (in terms of the relationship between part-time work and working time) but with workers' characteristics of 1985. When compared to the 1985 regression, it will be interpreted as a fictitious society with the structure of 1985 but with relationships between part-time and working time that are those of 1998. In the first component, only the structure changes, whereas in the second, the structure is fixed and only the relationship between the explanatory variable and working time changes.

Here $\bar{Y}_{1985}$ = 416 minutes and $\bar{Y}_{1998}$ = 432 minutes. And the counterfactual $\bar{Y}^*_{1985}$ = 440 minutes. If we were in 1998 but with the number of part-time workers of 1985, the average working time would be higher than the one observed in 1998 precisely because part-time work increased for women between 1985 and 1998; see Table 1).

The first term is the structural effect and can be rewritten as the difference between means of the explanatory variable:

$$\bar{Y}_{1998} - \bar{Y}^*_{1985} = \hat{\alpha}_{1998} + \hat{\beta}_{1998}\bar{X}_{1985} - \hat{\alpha}_{1998} - \hat{\beta}_{1998}\bar{X}_{1985}$$
$$= \hat{\beta}_{1998}(\bar{X}_{1998} - \bar{X}_{1985})$$

The source of variation of the structural part comes from the difference of structure (the s) between the two dates. Here the structural part is equal to –8 minutes and, in this very basic example, it is explained by the increase in part-time work between 1985 and 1998.

The second term is the non-structural term and can be rewritten as follows:

$$\bar{Y}^*_{1985} - \bar{Y}_{1985} = \hat{\alpha}_{1998} + \hat{\beta}_{1998}\bar{X}_{1985} - \hat{\alpha}_{1985} - \hat{\beta}_{1985}\bar{X}_{1985}$$
$$= \hat{\alpha}_{1998} - \hat{\alpha}_{1985} + \bar{X}_{1985}(\hat{\beta}_{1998} - \hat{\beta}_{1985})$$

It is important to remember that $\hat{\alpha}_{1998} - \hat{\alpha}_{1985}$ refers to the difference between the average working time of full-time workers in 1998 and in 1985. In this example, $\alpha_{1998} - \hat{\alpha}_{1985}$ = 457 – 438 = 19 minutes: the average working time of full-time workers increased by 19 minutes between 1985 and 1998. Moreover, $\bar{X}_{1985}\hat{\beta}_{1998}$ = –17 minutes and $\bar{X}_{1985}\hat{\beta}_{1995}$ = –22 minutes: for a given structure (here, a certain proportion of part-time workers), the contribution of part-time to the national average working time is smaller in 1998 than in 1985, smaller

by $\bar{X}_{1985}(\hat{\beta}_{1998} - \hat{\beta}_{1985})$ = 5 minutes.[8] So, between 1998 and 1985, independently of any structural changes, the average working time of both full- and part-workers increased.

In the end, tax incentives indeed led to an increase in the number of women in part-time work and this has led to a decrease of –8 minutes of working time (structural part). However, independently of this structural change, working time increased for both part- and full-time workers, leading to a 24-minute increase (non-structural part). So, the observed difference between the average working time in 1998 and 1985, $\bar{Y}_{1998} - \bar{Y}_{1985}$ = 16 minutes, can be decomposed as a sum of a structural part, -8 minutes, and of a non-structural one, 24 minutes.

Results: trends in work hours in France 1985-2010

Descriptive statistics

Women's total working time in France increased between 1985 and 1998 but remained quite stable afterwards (see Table 2). This increase between 1985 and 1998 is somewhat surprising, considering the fact that part-time work was made more attractive for firms. French male workers' average working time also increased between 1985 and 1998. However, contrary to women, men's working time decreased marginally between 1998 and 2009.

Table 2. Total working time in France 1985-2010 (in minutes)

Gender	Year	Q1	Mean	Median	Q3
Female	1985	357.5	411.70	445	480
Female	1998	360.0	430.48	450	500
Female	2009	350.0	432.41	450	500
Male	1985	425.0	463.08	475	510
Male	1998	440.0	484.02	480	540
Male	2009	420.0	479.76	480	530

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8   The average of a dummy variable is the percentage of what it represents. In this example, $\bar{X}_{1985}$ = proportion of part-time workers in 1985 = 0.18 (see Table 3).

Descriptively, on average, the trends in women's and men's working time do not seem to align with what we could have expected based on the policy changes described above. However, workers' characteristics also evolved in between. Therefore, it is not possible to state that the 35-hour laws successfully led to a reduction in working hours in France for men and not for women.

As expected, (see Table 3), workers in 1985 and 2009 differ quite significantly. In 2009, compared to 1985, workers are more likely to be older, more educated and less likely to work in the primary and secondary economic sectors. Part-time work is also increasingly pervasive among female employees. In terms of social class, both the highest (managers) and the lowest (lower-grade service or sales employees, especially) positions gained ground, but this process is largely gendered as men are more commonly found among the former and women in the latter. Finally, the private sector also gained much ground compared to the public sector, especially for men.

Table 3. Structural changes in French employees' characteristics 1985-2010 (in %)

Variables	Women 1985	Women 1998	Women 2009	Men 1985	Men 1998	Men 2009
Age						
Under 25	13.88	8.20	7.30	12.90	8.47	8.37
25-34	31.02	27.38	21.98	31.20	29.50	24.18
35-44	28.14	31.86	28.18	28.62	29.18	29.24
45-54	17.64	25.31	29.77	19.30	26.24	27.19
55-64	8.66	6.96	12.45	7.31	6.18	10.62
65+	0.66	0.28	0.31	0.67	0.43	0.39
Partnership status						
No partner	42.47	33.27	32.48	28.24	28.49	25.75
Partner labour force	54.37	59.02	56.74	57.20	49.79	56.88
Partner not labour force	3.17	7.72	10.78	14.56	21.71	17.37
Number of children aged 16 or younger						
No children	53.91	59.33	53.95	49.36	55.13	53.11
1 child	24.54	22.63	22.91	21.68	20.94	19.47
2 children	17.52	14.28	18.11	19.91	17.50	18.60
3+ children	4.03	3.76	5.03	9.05	6.44	8.81
Educational attainment						
No diploma	15.44	10.13	12.85	18.50	12.78	13.64
Primary education	18.56	9.38	4.95	14.01	7.30	2.22
Variables	**Women 1985**	**Women 1998**	**Women 2009**	**Men 1985**	**Men 1998**	**Men 2009**
Lower secondary ed. general	9.10	8.98	7.13	5.35	7.32	4.33

Table 3. Continued

Variables	Women 1985	Women 1998	Women 2009	Men 1985	Men 1998	Men 2009
Lower secondary ed. vocational	26.85	23.90	22.98	38.48	33.44	31.65
Upper secondary ed. vocational	3.10	6.31	9.68	2.46	6.59	11.04
Upper secondary ed. general	11.49	10.25	9.19	7.41	5.92	6.19
Post-secondary education	8.91	16.34	15.92	5.72	12.73	14.46
Bachelor and above	6.55	14.71	17.31	8.08	13.92	16.47
Social class						
Managers	2.69	7.01	7.70	9.34	15.20	18.34
Scientific & cult. occupations	3.75	6.19	3.81	3.04	4.84	3.04
Teachers	5.77	5.01	4.09	2.16	1.53	1.52
Intermediate occupations	16.55	19.13	20.25	22.62	23.93	26.47
Clerks	38.99	34.60	28.60	8.27	7.27	6.53
Police	0.29	0.36	0.67	2.95	2.60	3.55
Lower grade service sales employees	16.37	17.43	23.48	3.07	3.02	4.35
Skilled manual workers	6.91	4.14	4.23	36.28	29.16	27.08
Unskilled manual workers	8.69	6.13	7.17	12.26	12.45	9.13
Industry						
Agriculture	4.28	1.79	0.79	3.07	3.10	0.72
Agriculture industry	3.34	2.60	2.69	3.71	3.50	2.41
Energy	1.13	0.87	0.59	2.26	2.49	4.52
Other industry	16.17	10.42	6.66	28.46	25.47	21.41
Construction	1.59	1.79	1.45	10.79	9.91	9.30
Trade	15.69	14.25	12.45	11.59	11.21	12.28
Transport	1.77	1.37	3.44	6.58	5.91	10.12
Finance	3.65	4.32	5.04	2.38	3.80	3.75
Real estate	1.04	1.05	0.97	0.62	0.75	1.16
Education, health	13.10	28.93	35.08	3.41	9.45	7.49
Business services	6.65	6.01	5.35	6.81	8.41	5.99
Services	7.04	13.77	7.11	2.99	6.36	6.75
Admin NGO	24.55	12.83	18.39	17.35	9.64	14.10
Class of worker						
Government	37.18	35.27	30.41	30.76	24.11	18.55
Private	62.82	64.73	69.59	69.24	75.89	81.45
Full-time or part-time						
Part-time	18.30	27.44	26.76	2.75	4.09	8.14
Full-time	81.70	72.56	73.24	97.25	95.91	91.86

Decomposition analyses of changes in working time, 1985-2009

The decomposition of changes in working time (see Table 4) reveals that, overall, these changes were mostly due to non-structural factors and not to changes in French employees' characteristics.[9]

Table 4. Decomposition of *working time* changes by gender (in minutes)

	Women 1998-1985	Women 2009-1998	Women 2009-1985	Men 1998-1985	Men 2009-1998	Men 2009-1985
Observed change	15.71	1.63	17.34	23.30	–3.48	19.82
Structural part	–6.99	2.07	0.10	5.63	4.31	5.41
Non-structural part	22.70	-0.45	17.24	17.67	–7.78	14.40

Between 1998 and 1985, women's average working time increased by about sixteen minutes despite the fact that structural factors would have led to a decrease of about seven minutes. Indeed, the rise in part-time employment between the two dates is clearly the largest driving structural factor (see Figure 1). However, this structural effect is very likely to be partially linked to the tax incentives for part-time work introduced in 1992 and 1993.

The working time of the reference situation increased by more than one hour (see Figure 2). The contribution of part-time female workers to the national average working time also increased, in other words, compared to 1985, there were more women working part-time (structural effect) and their working time was also greater (non-structural effect).[10] Working time also increased for women under the age of 25.

All the other characteristics are associated either with no change or a decrease in working time. The most negative changes in the contribution to the national average working time are found for clerks, lower grade service and sales employees and for workers with a low level of education.

Women's working time did not change much between 1998 and 2009. Indeed, the slight decrease in working time associated with the non-structural part – that could be interpreted as a potential effect of the 35-hour working week – is overridden by the slight increase in working time explained by structural factors. The different laws and decrees passed since the "Aubry laws"

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9 See Table A1 in appendix for the underlying linear models

10 This result was already found in the examples we used in the decomposition methods box.

have therefore been successful in neutralising the 35-hour working week for French women.

Figure 1. Structural part of the decomposition of *working time* changes for women between 1998 and 1985 (in minutes)
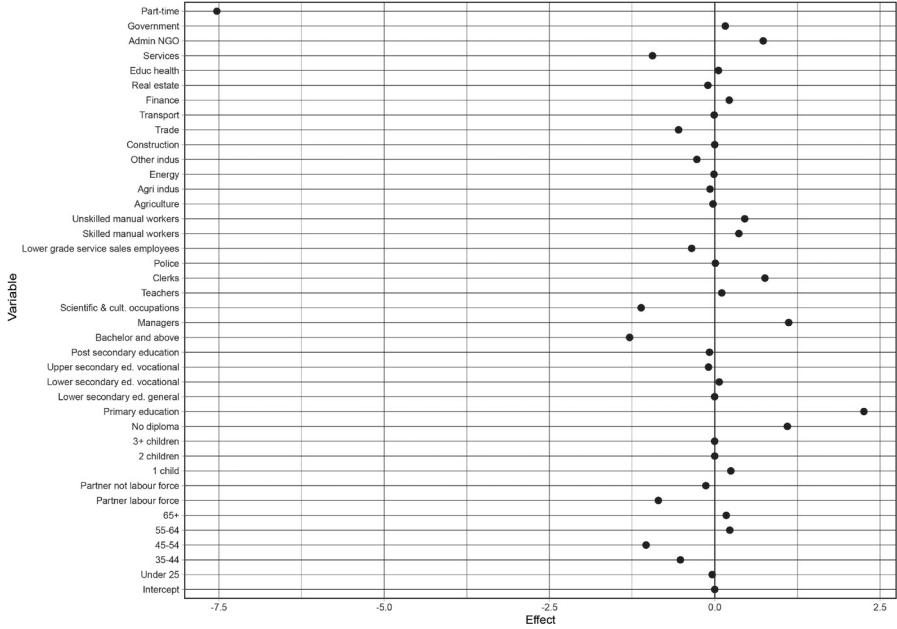
Figure 2. Non-structural part of the decomposition of *working time* changes for women between 1998 and 1985 (in minutes)
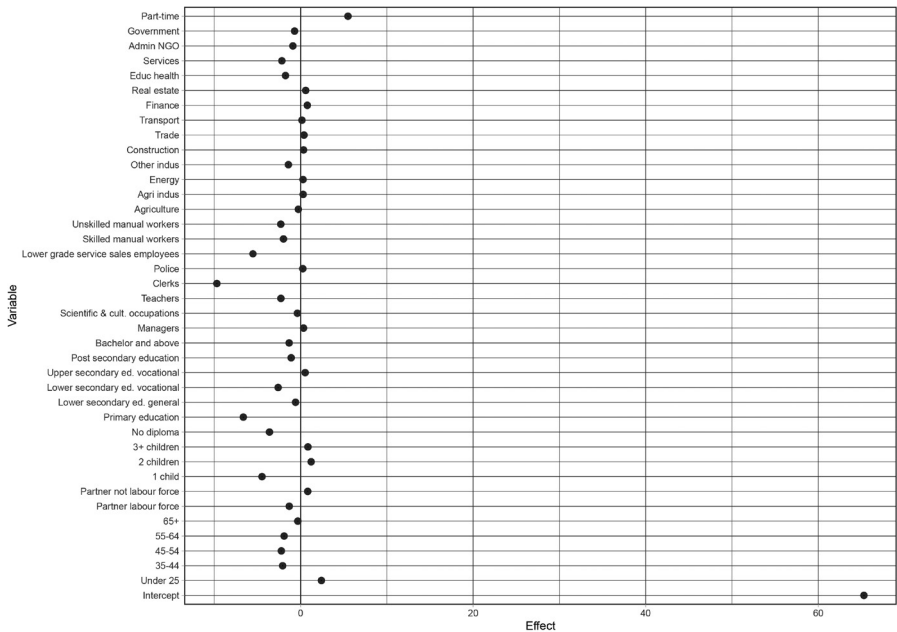
As for men, between 1998 and 1985 the increase in working time explained by structural factors can be attributed to a certain extent to the increase in the number of managers, to educational attainment, and to the decrease of the number of civil servants (see Figure 3). Part-time work also had a negative structural effect on men's working time; however, it is not as high as for women and is overridden by the aforementioned effects. It is quite logical because, if part-time also increased for men, the proportion of men in part-time jobs is clearly lower than that of women (see Table 3).

Contrary to women, the non-structural part of the increase in men's working time can be more clearly identified (see Figure 4): compared to workers with an upper secondary general education, the contribution to the national average working time of those with lower secondary vocational education or no diploma increased in 1998. The contribution to the national working time average also increased, to a lesser extent, for workers aged 35-44 and also for those with no diploma.

Figure 3. Structural part of the decomposition of *working time* changes for men between 1998 and 1985 (in minutes)
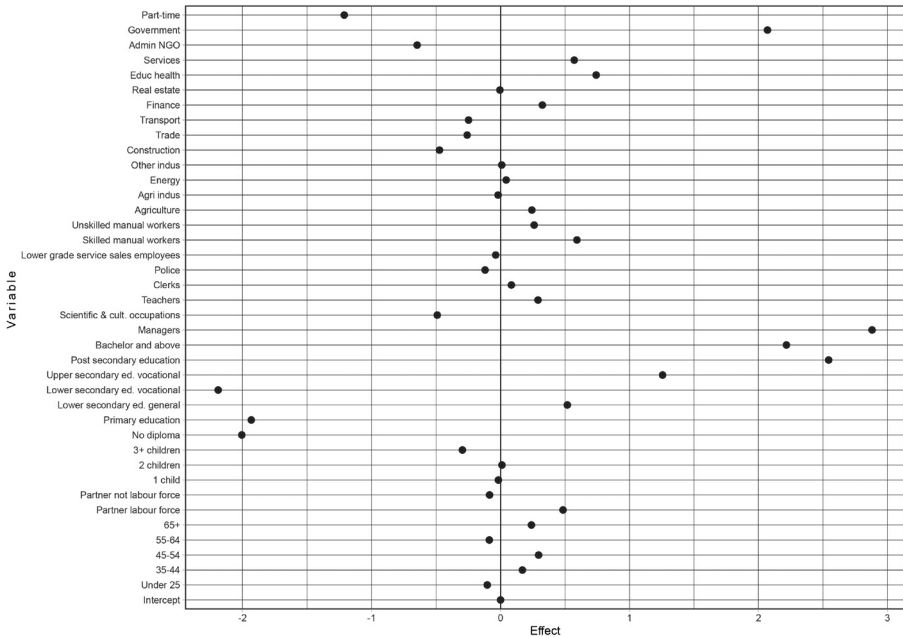
Figure 4. Non-structural part of the decomposition of *working time* changes for men between 1998 and 1985 (in minutes)
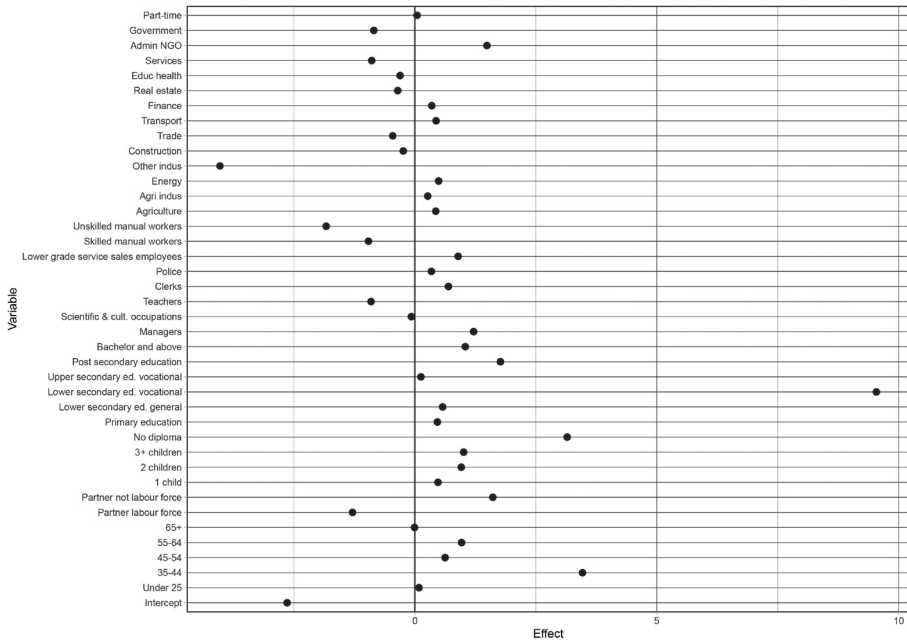
Men's working time decomposition between 2009 and 1998 seems interesting at first sight. Indeed, overall working time did not change appreciably but the decomposition tells a different story as structural factors would have led to a small increase in working time; but this increase has been more than compensated for by a decrease in working time due to non-structural factors, possibly because of the 35-hour working week laws.

Among the structural factors that would have led to an increase in working time we find, again, the increase in the number of managers, of scientific or cultural occupations and the decrease in low-educated workers (see Figure 5).

The details of the non-structural part seem to tell the story of what happened to the 35-hour working week reform (see Figure 6). Indeed, the constant term is positive, so for intermediate occupations with an average level of education, working full-time in the private sector, etc., working time increased by almost one hour between 1998 and 2009. However, compared to this reference category, most other characteristics are associated with a negative contribution to the national average working time. For instance, if teachers' contribution did not change, managers or scientific and cultural occupations' contributions to the national average working time decreased marginally between 1998 and

2009. However, this is not the case for skilled and unskilled manual workers, whose contribution increased.

It seems that the 35-hour working week was also more effective for workers with a low educational attainment (especially those who had a lower secondary vocational diploma). Age is also interesting as there is a clear age gradient between 35 and 65 and above: the younger the worker, the more negative the contribution to the national working time average. However, for the youngest workers it is the opposite: their contribution is higher.

Figure 5. Structural part of the decomposition of *working time* changes for men between 2009 and 1998 (in minutes)
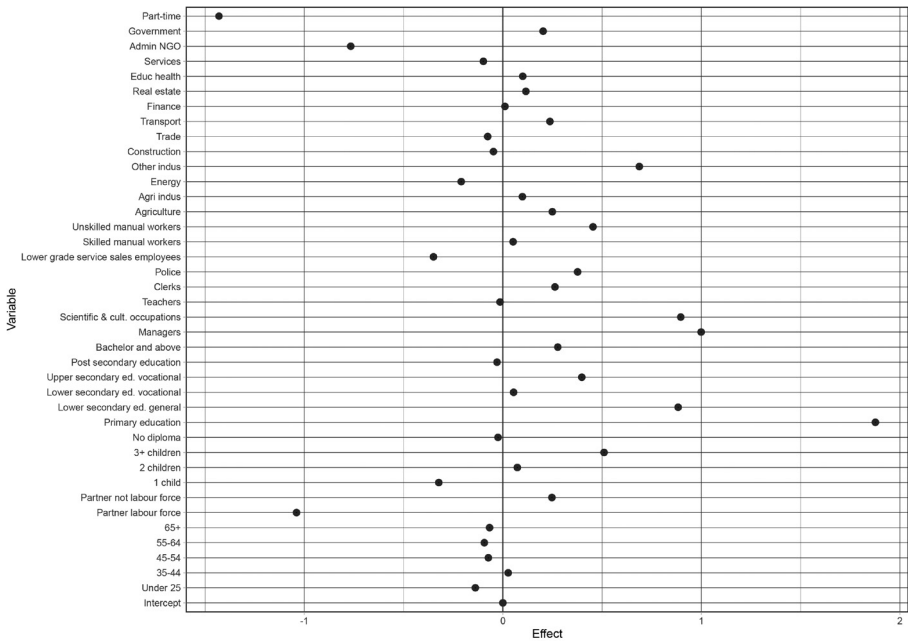
Figure 6. Non-structural part of the decomposition of *working time* changes for men between 2009 and 1998 (in minutes)
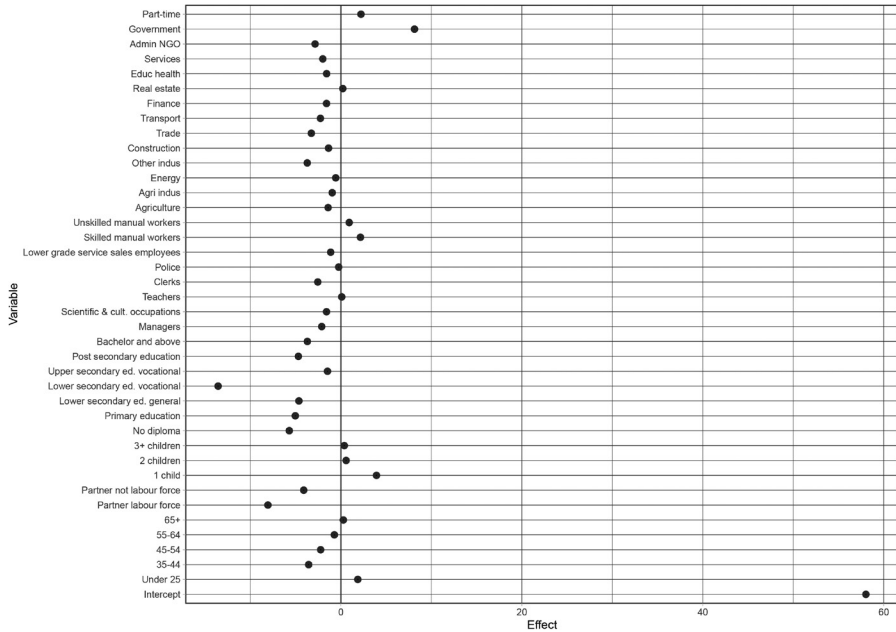
Conclusion

Using the data from French time use surveys, we have highlighted the fact that the average daily working time of both working men and working women has changed very little between 1985 and 2009. This despite two laws that reduced the weekly working time by about 10 % during the period. The decomposition analysis of changes shows that the most effective policy regarding working time is the tax exemptions for part-time work introduced in 1992 and 1993. They certainly played a key part in increasing the number of part-time jobs, especially for women. The decomposition analyses also shows that the 35-hour working week laws had no impact on women's working time and a very small impact on men's.

This approach also highlights the combination of structural changes such as the increase in the share of executives, on the one hand, and the impact of legislative changes such as the introduction of the day package to autonomous executives, on the other hand. Gradually, this day package was extended to other categories of executive and even to other categories of employee. Owing to the fact that it makes it difficult to control working time, this daily package

has contributed to the increase in working time of these categories. As a result, executives nowadays work an average of more than 43 hours a week, eight hours more than the legal working time duration.

One to the main lessons that can be drawn from these observations is that legislative action on working time is very fragile, particularly in a country where the political positions relating to working time are very ideologically marked. In the case of working-time legislation in France, the working-time reduction voted by Parliament in 1997 and 2000 was circumvented by a series of decrees and laws.

It was not the purpose of this chapter to compare the strength of a reduction in working time obtained by law, on the one hand, and by collective bargaining, on the other. But we can hypothesise that a reduction in working time obtained by agreement between the social partners is more effective than when it is imposed on them by law. This is an analysis that remains to be done as a future extension of this chapter.

References

Afsa Essafi, C. & Buffeteau, S. (2006). L'activité féminine en France: Quelles évolutions récentes, quelles tendances pour l'avenir? *Economie Et Statistique, n°398-399*, 85-97.

Autonomy. (2019). *The shorter working week: A radical and pragmatic proposal.* Autonomy.

Autonomy. (2021). *Going public: Iceland's journey to a shorter working week.* Autonomy.

Blinder, A. S. (1973). Wage discrimination: Reduced form and structural estimates. *The Journal of Human Resources*, 8(4), 436-455.

Boulin, J.-Y. & Cette, G. (2008). Temps de travail et pouvoir d'achat: Le temps est-il de l'argent? *Regards Sur l'actualité*, *341*, 43-58.

Boulin, J.-Y. & Lesnard, L. (2016). Travail dominical, usages du temps et vie sociale et familiale. Une analyse à partir de l'enquête emploi du temps. *Économie Et Statistique, n°486-487*, 149-182.

Budig, M. J. & Folbre, N. (2004). Activity, proximity, or responsibility? Measuring parental childcare time. In N. Folbre, & M. Bittman (Eds.), *Family time: The Social Organization of Care* (pp. 51-68). Routledge.

De Spiegelaere, S. & Piasna, A. (2021). *The why and how of working time reduction.* ETUI, The European Trade Union Institute.

Devetter, F.-X. & Rousseau, S. (2011). Working hours and sustainable development. *Review of Social Economy*, 69(3), 333-355.

Eurofound (2006). *Working time and work–life balance in European companies.* Eurofound.

Eurofound (2012). *Working time and work–life balance in a life course perspective. A report based on the fifth European working conditions survey.* Eurofound.

Fridenson, P. & Reynaud, B. (2004). *La France et le temps de travail (1814-2004).* Odile Jacob.

Gardeazabal, J. & Ugidos, A. (2004). More on identification in detailed wage decompositions. *The Review of Economics and Statistics*, *86*(4), 1034-1036.

Insee. (1988). *Enquête sur les emplois du temps (1985-1986). Tomes 1 & 2.* Insee.

Insee. (2017). *Enquête emploi du temps et décisions dans les coupes 2009-2010. Dictionnaire des codes.* Insee.

Insee. (2021). *Emploi, chômage, revenus du travail.* Insee.

Insee. (2022). *Tableaux de l'économie Française.* Insee.

Jones, F. L. & Kelley, J. (1984). Decomposing differences between groups: A cautionary note on measuring discrimination. *Sociological Methods & Research*, *12*(3), 323-343.

Kitagawa, E. M. (1955). Components of a difference between two rates. *Journal of the American Statistical Association*, *50*(272), 1168-1194.

Knight, K., Rosa, E.A., & Schor, J. B. (2013). Reducing growth to achieve environmental sustainability: The role of work hours. In Wick-Lim, J. & Pollin, R. (Eds.), *Capitalism on Trial* (pp. 187-204). Edward Elgar Publishing. https://EconPapers.repec.org/RePEc:elg:eechap:14843_12

Marchand, O. & Thélot, C. (1997). *Le travail en France, 1800-2000.* Nathan.

Martin, P. & Morin, V. (1999). *Enquête emploi du temps 1998-1999.* Insee.

Oaxaca, R. (1973). Male-female wage differentials in urban labor markets. *International Economic Review*, *14*(3): 693-709.

Oaxaca, R. L. & Ransom, M. R. (1999). Identification in detailed wage decompositions. *The Review of Economics and Statistics*, *81*(1), 154-157.

Sautory, O. & Zilloniz, S. (2015). De l'organisation des journées à l'organisation de la semaine: Des rythmes de travail socialement différenciés. *Économie Et Statistique*, *n° 478-479-480*, 155-188.

Thompson, E. P. (1967). Time, work-discipline, and industrial capitalism. *Past and Present*, *38*, 56-97.

Yun, M.-S. (2005). A simple solution to the identification problem in detailed wage decompositions. *Economic Inquiry*, *43*(4), 766-772.

Appendix

Table A1. Linear models used for the decompositions

Characteristic	Female 1985		Female 1998		Female 2009		Male 1985		Male 1998		Male 2009	
	B	**p**	**B**	**p**	**B**	**p**	**B**	**p**	**B**	**p**	**B**	**p**
(Intercept)	432	<0.001	497	<0.001	472	<0.001	440	<0.001	438	<0.001	496	<0.001
Age group												
Under 25	−14	0.081	0.48	>0.9	−27	0.004	0.72	>0.9	1.2	0.9	23	0.011
35-44	−5.9	0.4	−13	0.058	−5.9	0.4	−6.8	0.3	6.0	0.3	−5.9	0.3
25-34	—		—		—		—		—		—	
45-54	1.5	0.9	−12	0.12	−7.7	0.2	−0.28	>0.9	3.4	0.6	−5.2	0.4
55-64	5.8	0.6	−18	0.14	1.7	0.8	−4.1	0.7	11	0.3	−1.8	0.8
65+	−44	0.4	−171	0.010	132	0.001	−155	<0.001	−157	<0.001	−62	0.067
Partner												
No partner	—		—		—		—		—		—	
Partner labour force	−0.10	>0.9	−3.8	0.5	−0.76	0.9	7.0	0.3	3.2	0.6	−13	0.027
Partner not labour force	−24	0.066	−3.8	0.7	−7.4	0.3	5.9	0.4	13	0.077	−5.6	0.4
Number of children under 16												
No children	—		—		—		—		—		—	
1 child	6.5	0.3	−12	0.086	−6.1	0.3	−3.2	0.7	−0.57	>0.9	18	0.003
2 children	−7.5	0.4	0.91	>0.9	−11	0.11	−1.4	0.9	4.1	0.6	7.4	0.3
3+ children	−19	0.2	4.1	0.8	−18	0.089	5.2	0.6	17	0.087	23	0.006
Educational attainment												
No diploma	0.96	>0.9	−23	0.052	−35	<0.001	19	0.10	36	0.003	−8.1	0.4
Primary education	12	0.2	−26	0.045	−8.7	0.5	29	0.015	33	0.014	−37	0.030
Lower secondary ed. general	3.9	0.7	−2.6	0.8	−2.1	0.8	25	0.065	35	0.005	−27	0.042
Lower secondary ed. vocational	7.6	0.4	−2.0	0.8	−12	0.14	13	0.2	37	<0.001	−2.5	0.8
Upper secondary ed. vocational	−19	0.2	−4.0	0.8	−11	0.3	27	0.15	32	0.014	8.5	0.4
Upper secondary ed. general	—		—		—		—		—		—	
Post-secondary education	11	0.4	−1.1	>0.9	−3.6	0.7	3.8	0.8	36	0.001	−1.4	0.9
Bachelor and above	1.7	>0.9	−16	0.2	−0.28	>0.9	23	0.10	36	0.003	9.3	0.4
Class												
Managers	12	0.5	25	0.043	25	0.009	29	0.007	43	<0.001	29	<0.001
Scientific & cult. occupations	−46	0.004	−56	<0.001	−30	0.017	−20	0.3	−23	0.11	−57	<0.001
Teachers	−28	0.039	−71	<0.001	−35	0.003	−6.8	0.7	−50	0.013	−43	0.019
Intermediate occupations	—		—		—		—		—		—	
Clerks	8.5	0.3	−16	0.045	−5.0	0.5	−13	0.2	−4.9	0.6	−40	<0.001
Police	−62	0.2	19	0.7	51	0.063	41	0.010	53	<0.001	44	<0.001
Lower grade service sales employees	−7.7	0.5	−42	<0.001	1.1	0.9	−14	0.4	14	0.3	−24	0.036
Skilled manual workers	15	0.2	−14	0.4	−18	0.2	−6.4	0.4	−9.1	0.2	−1.7	0.8
Unskilled manual workers	9.2	0.5	−17	0.2	−29	0.011	−6.7	0.5	−20	0.029	−13	0.2

Table A1. Continued

Characteristic	Female 1985		Female 1998		Female 2009		Male 1985		Male 1998		Male 2009	
	B	p	B	p	B	p	B	p	B	p	B	p
Industry												
Agriculture	16	0.6	−16	0.6	35	0.2	18	0.4	39	0.017	−12	0.6
Agriculture industry	14	0.4	25	0.2	35	0.029	11	0.5	18	0.2	−8.1	0.6
Energy	−20	0.4	6.7	0.8	−12	0.7	−11	0.6	12	0.5	−10	0.4
Other industry	13	0.3	4.4	0.8	15	0.2	14	0.2	−0.66	>0.9	−15	0.13
Construction	−21	0.3	0.93	>0.9	−2.4	>0.9	37	0.005	35	0.002	20	0.069
Trade	14	0.2	17	0.2	−1.1	>0.9	29	0.019	25	0.020	−5.2	0.6
Transport	−5.7	0.8	5.2	0.8	13	0.4	36	0.006	43	<0.001	5.8	0.6
Finance	−1.3	>0.9	22	0.2	22	0.091	14	0.4	27	0.051	−14	0.3
Real estate	−17	0.5	27	0.3	−8.1	0.7	64	0.063	−2.5	>0.9	26	0.2
Education, health	13	0.3	0.35	>0.9	8.2	0.4	21	0.2	12	0.3	−5.0	0.7
Business services	—		—		—		—		—		—	
Services	18	0.2	−13	0.3	3.5	0.8	48	0.004	22	0.086	−12	0.3
Admin NGO	−2.5	0.8	−6.0	0.6	12	0.3	0.02	>0.9	8.4	0.5	−20	0.074
Class of workers												
Government	−7.1	0.4	−8.9	0.2	−9.8	0.10	−33	<0.001	−35	<0.001	−3.1	0.7
Private	—		—		—		—		—		—	
Part-time												
Part-time	−113	<0.001	−83	<0.001	−75	<0.001	−94	<0.001	−92	<0.001	−37	<0.001
Full-time	—		—		—		—		—		—	

The role of time use studies in the recognition of unpaid work

Lyn Craig • Liana C. Sayer

When we think about work and labour, paid employment usually takes centre stage. But also essential is non-market, or unpaid, work: housework, home maintenance, caring for children, and kin-care for elders or family members who are sick, living with a disability, or frail. Both paid and unpaid work require time and effort, and both are productive in that they generate economically valuable outcomes. Following industrialisation, paid and unpaid labour became gendered and spatially differentiated. A consequence of this shift was that "work" came to be seen as only those activities which resulted in the production of goods and services that have monetary value. As non-market work was not exchanged for money, it became "invisible", no longer widely recognised as being "real" work (Daniels, 1987; Folbre, 2001; Fraser, 2016). Concomitant with this shift was the conflation of paid work with the realisation of masculine identities and social roles and unpaid work with the realisation of feminine identities and social roles. Historically and today, official statistics on work have overwhelmingly focused on its paid dimensions, with substantial investment in gathering detailed and highly complex information on those working in the labour market or looking for paid work, and the characteristics of the workplace (Warren, 2011).

Despite its sidelined status, unpaid work is of high value. It has benefits that extend to the whole of society because in order to function successfully societies depend not only on the market economy but also on an adequate supply of domestic labour and family care (Fineman, 2004). This argument was forcefully made by generations of feminists, who have long noted the essential nature of unpaid work and argued that the route to gender equality requires women to achieve equality not only in paid work, but also in unpaid work (Elson, 2017; England, 2010). Evidence that women's wages, lifetime earnings, and economic security suffer from their bearing the costs of caregiving and household work is abundant (for a recent review see Perry-Jenkins & Gerstel, 2020). Yet the dominant policy approach in Western nations offers formal equal

opportunities in education and paid work while framing the labour of social reproduction as a private matter for individuals and families to manage (Folbre, 2014). This perpetuates its invisibility and has not led to equality for most women. For many it is the worst of both worlds: "Ignoring social reproduction whilst recruiting women into paid work externalises care work onto families and communities while simultaneously diminishing their capacity to perform it" (Fraser & Jaeggi, 2018, p. 133). Policies that are based on the idea that women's economic inequality can be solved by expanding women's labour-force opportunities fail because the proposed solution of more paid work intensifies the problem of insufficient time for unpaid social reproduction.

Gender gaps in wages and wealth cannot be closed by measures that aim to make women's working lives more like men's. What is required is "recognizing, redistributing and reducing" unpaid work (Elson, 2017). Time Use Surveys were advocated by the United Nations Development Program (UNDP) expert group on unpaid work, time and gender as the best means to provide the necessary information to feed into policies to serve this aim (Warren, 2011). Accordingly, many countries now mandate the collection of time use data through their national statistical agencies, and some append calculations of unpaid work as satellite accounts to GDP.

In this chapter, we ask: What have time use studies revealed about the distribution of unpaid work and its consequences for gender equality and well-being across different social groups and over time and space? Then, foregrounding the examples of the United States and Australia, we ask: How did COVID-19 affect the recognition of unpaid work and the likelihood of its gender redistribution?

Influences on the amount and division of unpaid work

A large body of knowledge on unpaid work has now been produced using time use data and its recognition in social research has risen substantially (see, e.g., Bittman, England, Sayer, Folbre, & Matheson, 2003; Craig & Mullan, 2010; Craig & Powell, 2013; Gershuny & Sullivan, 2003; Hook, 2010; Kan, Zhou, Kolpashnikova, Hertog, Yoda, & Jun, 2022; Sayer, 2016; Sayer, England, Bittman, & Bianchi 2009). Although broad patterns confirm the persistence of unequal gender division of care and other unpaid work, some mitigating factors have been identified. Much of the early literature focused on three possible explanatory levers: time availability, bargaining on the basis of relative resources, and gender ideology (Bianchi & Milkie, 2010; Perry-Jenkins & Gerstel, 2020). These factors generate predictions about the gender division of

labour in couples. For example, it is expected that the spouse or partner with the higher earning capacity (captured through education or earnings) will do the most paid work and the spouse or partner who does the most paid work will do the least unpaid work. Those who work longer market hours will have less time for unpaid work than those who work short market hours. Couples with a more conservative gender ideology are expected to adopt more traditional divisions of paid and unpaid work than those with a more progressive ideology (Lachance-Grzela & Bouchard, 2010).

Internationally, time use studies testing these explanations have yielded a much better understanding of the division of unpaid labour, its variability, its gendered nature, and its social and economic consequences. Time use analyses of data from multiple countries have found the amount of time devoted to unpaid work to vary by individual and demographic characteristics, including family structure, race, education, workforce participation status, and over the life course, notwithstanding that at each life stage more of men's labour is paid than women's (Craig & Mullan, 2010; Craig & van Tienoven, 2021; Hook, 2010; Kendig & Bianchi, 2008; Pepin, Sayer, & Casper, 2018). Gender gaps in unpaid domestic labour time persist even as men's and women's education levels, earnings and paid work time become more similar (Bittman, England, Sayer, Folbre, & Matheson, 2003; Negraia, Augustine, & Prickett, 2018; Sayer, 2016). Gaps are widest for parents of young children, when household time pressures are most intense (de Castro Galvao, 2022; Yavorsky, Kamp Dush, & Schoppe-Sullivan, 2015). They narrow, but persist, into older age, when kinship care remains prevalent (Doan et al., 2022) and demands for grandparent care arise (Craig, Brown, & Jun, 2020). Higher education predicts greater care involvement for both fathers and mothers (England & Srivastava, 2013; Sayer, Gauthier, & Furstenberg, 2004), and fulltime workforce participation in dual-earner parent couples generates rather more equal, albeit often higher, paid and unpaid workloads (Chesley & Flood, 2017; Craig & Brown, 2017).

High and unequal family time demand can have a negative impact on well-being, including time stress (Craig & van Tienoven, 2021), leisure quality (Passias, Sayer, & Pepin, 2017) and health (Doan et al., 2022). Such findings point to the need to investigate aspects of unpaid work time in much more detail than looking at the total or average amount of time spent. Central to this endeavour is capturing simultaneous activity – doing more than one thing at a time – especially since care work often requires being present with those one is caring for, and being ready to provide active care should the need arise. Notwithstanding the importance of this supervisory and "secondary" time, national time use surveys still do not measure it in the same way or, as in the American Time Use Survey, do not measure it at all, making cross-national

comparison difficult. Therefore, most analyses of multitasking are within-country studies (Kalenkoski & Foster, 2016), some of which have enquired whether multitasking unpaid work with other activities increases stress or reduces enjoyment. The results are mixed. Craig and Brown (2017) and Offer (2014) find negative effects; Sullivan and Gershuny (2018) no associations, and Dunatchik and Speight (2020) find that associations vary according to the specific activities that are paired.

Although Dunatchik and Speight (2020) find that childcare paired with leisure is more enjoyable than childcare paired with housework, other research suggests that the converse is not so: *leisure* quality is reduced if unpaid work is performed at the same time. Mothers' leisure quality is lower than fathers' because it is less often child-free (Mattingly & Bianchi, 2003; Sayer, England, Bittman, & Bianchi, 2009) and probably as a result free time does not reduce subjective time stress as much for mothers as it does for fathers (Craig & Brown, 2017; Mattingly & Sayer, 2006).

Other aspects of leisure quality, including whether it is socially isolated or largely inactive, are associated with physical and mental health (Doan et al., 2022); and there is US evidence suggesting that these types of leisure are higher for black and single mothers compared to married mothers (Passias et al., 2017). Although parents' happiness and meaning during daily activities are higher than those of non-parents (Negraia & Augustine, 2020), mothers' higher load of care activities means they spend more time characterised by negative emotions such as stress and fatigue, even when positive emotions such as meaningfulness are also experienced (Musick, Meier, & Flood, 2016; Negraia et al., 2018).

An important aspect of unpaid work that remains poorly captured in standard time use data is cognitive unpaid labour, conceptualised as the tasks of household planning and management (Daminger, 2019; Dean, Churchill, & Ruppanner, 2022; Haupt & Gelbgiser, 2022). The cognitive burden of unpaid work can add to an already heavy mental load, especially since contemporary paid employment increasingly includes "knowledge work" that requires thinking time. For many, working conditions are increasingly precarious and include unpredictable schedules which exacerbate the logistical challenges of (for example) arranging substitute carers (Harknett, Schneider, & Luhr, 2020). As with leisure quality, there are likely to be intersectional differences by race, class and family structure in the amount and effect of cognitive unpaid work on stress and well-being.

Time use studies that compare different countries have found that in addition to individual and demographic factors, the demands of work and family, and the options for meeting them, are also influenced by macro-level and

national factors that include cultural gender norms, working-time systems, and social policies (Gershuny & Sullivan, 2003; Gornick, Meyers, & Wright, 2009; Hook, 2010; Sayer & Gornick, 2012). The gendered division of labour is likely to be more equal in countries where gender attitudes are progressive and there is a suite of policies to assist work–family reconciliation (e.g., paid parental leave, available and affordable childcare, and state-subsidised elder care). This is the case in the Nordic social democracies: Finland, Denmark, Sweden and Norway (Lewis, 2009). These measures reduce the quantum of unpaid work and make it easier to divide more equally by gender than in countries such as southern Europe and Asia, and in neoliberal Anglo countries (Australia, Canada, the United Kingdom and the United States) in which there are strong traditional gender norms, long employment hours, and more meagre public institutional support for women and men to take part in both employment and household or care work. For example, in the United States and Australia, any solutions to the inequitable gender division of labour must be implemented in the face of higher overall paid and unpaid workloads than in northern Europe (Craig & Mullan, 2010). Cross-national comparisons have found some gender convergence in unpaid work over time (Altintas & Sullivan, 2016), but more so for childcare than for housework (Pailhé, Solaz, & Stanfors, 2021). However, the pace is slow or even stalled, notably in Asia (e.g., in Hong Kong, South Korea and Japan), where paid work hours are very long (Craig, Brown, Strazdins, & Jun, 2021; Kan et al., 2022). Extreme employment time regimes can reinforce inequitable gender relations and limit opportunities to redistribute unpaid work (Goldin, 2014).

The role that social and workplace policies can play in entrenching or disrupting gendered work–care patterns is apparent not only in cross-national comparisons, but also over time within countries (Begall & Grunow, 2015; Bünning & Pollmann-Schult, 2016; Craig, Mullan, & Blaxland, 2010). In Australia, a series of time use analyses considered the effects of various employment conditions and household work–care arrangements on the division of labour and subjective time pressure in two-parent family households. The predictors examined included part-time work (Craig & Powell, 2011), non-standard work schedules (Craig & Brown, 2011, 2017), working at home and flexible hours (Powell & Craig, 2015), self-employment (Craig, Powell, & Cortis, 2012), non-parental childcare (Craig & Jenkins, 2016; Craig & Powell, 2013), and domestic outsourcing (Craig, Perales, Vidal, & Baxter, 2016). The results suggest that non-standard work schedules and non-parental care slightly narrow gender gaps in unpaid labour, whereas part-time work, working at home and self-employment widen the gaps and reinforce women's secondary earner status. There were negligible effects on overall workloads or subjective time

stress. Cross-national comparisons show that Australia scores very high on these measures, with both total time demand and stress particularly high for working mothers of young children (Craig & Brown, 2017). Australia has very expensive childcare and early education and limited statutory paid parental leave, so these time use outcomes may be related to the absence of broader policy support.

In the United States, a small number of studies have also examined the role that social and workplaces factors play in childcare, with fewer also examining housework. Mothers who are employed part-time or have flexible work schedules spend more time engaged in housework and childcare, whereas those who work regular weekend shifts spend less time in childcare (Qian & Sayer, 2022); but for fathers the results are more mixed. Some studies using recent data, some from time diary studies, show that flexible work schedules increase paid work hours but not household or care work (Kim, 2020), while others find that fathers spend more time in childcare but not housework (Carlson, Petts, & Pepin, 2021; Lyttelton, Zang, & Musick, 2022; Qian & Sayer, 2022). Other studies using older data typically report no association (Hill, Tranby, Kelly, & Moen, 2013; Noonan, Estes, & Glass, 2007).

COVID-19 and unpaid work

Crises often crystallise longstanding issues and make them more obvious (Mooi-Reci & Risman, 2021), and the COVID-19 pandemic threw a glaring spotlight on unpaid work and care. Researchers worldwide focused their attention on the issue (see, e.g., Peng & Jun, 2022 in Korea; Sevilla & Smith, 2020 in the United Kingdom; van Tienoven, Minnen, Glorieux, A., Laurijssen, te Braak, & Glorieux, I., 2021 in Belgium; Yaish, Mandel, & Kristal, 2021 in Israel). Here we again foreground Australia and the United States, because we conducted real-time research on the impact of COVID-19 lockdowns in those countries. They are examples of market-based care regimes that share some features of social organisation and attitudes. In both, the prevalent policy view is that care is primarily a private matter rather than a shared social responsibility to be dealt with collectively through gender-inclusive policies such as affordable childcare and generous statutory family leave entitlements.

Australia and COVID-19

Its conservative gendered policy profile made Australia an interesting country in which to examine the effects of the COVID-19 pandemic. There was initial optimism that the external shock of the pandemic might clear the way for a new

and more gender-equal division of unpaid work (Blundell, Costa Dias, Joyce, & Xu, 2020). The coronavirus stress-tested the prevailing neoliberal policy approach to care. In response, the government was briefly willing to make childcare free to parents and give allowances to families who took elders out of facilities to be cared for at home (Craig, 2020). This was implicit recognition that the work of unpaid social reproduction is indispensable, productive and a collective social concern. School, daycare, and respite care closures increased the need for family care, and workplace lockdowns caused an unprecedented spike in working from home. Lockdown mandates significantly blurred the temporal and spatial boundaries between paid work and unpaid work and temporarily removed a gendered fault line in external constraint by requiring men and women alike to stay home, even if they were still employed. There appeared to be significant potential for the pandemic to test and disrupt longstanding patterns in the gender division of unpaid work (van Barneveld et al., 2020).

Empirical studies on the effects of lockdown did not justify the initial optimism, however. In households with care-giving responsibilities paid work time was slightly lower and time spent on housework and care was very much higher (Craig, 2020; Craig & Churchill, 2021b). These time increases were the highest for women, in line with pre-existing patterns. From a subjective point of view, combining work and family demands during the pandemic was stressful and at times overwhelming for women, many of whom reported a lack of support from their male partners (Craig, 2020). Divisions of labour were more equal in same-sex families; and although single mothers reported very high time stress before COVID-19, they expressed more satisfaction with the flexibility in the way they spent their time during lockdown (Craig & Churchill, 2021b). However, in heterosexual couples there were pervasive implicit or explicit assumptions about women being the default care providers and men's work and careers being more valued and more important (Craig & Churchill, 2021a, 2021b). In these couples, in lockdown, men's work commitments took precedence in both access to dedicated private workspace and time (Craig & Churchill, 2021c; Mallett, Marks, & Skountridaki, 2020).

This inequity was further compounded by expectations from employers and the workplace, as most employers seemed to expect that home-based workers would deliver the same output as before the pandemic. The special difficulties of working and caring for children simultaneously in the same physical location were considered by employers as family matters not requiring workplace support (Craig & Churchill, 2021c). There were negative psychological and emotional consequences of these employer expectations of unaffected productivity, together with gendered domestic inequality (Nieuwenhuis & Yerkes, 2021). Insecurity was heightened, with many feeling their jobs were under threat if

they could not perform to the level expected (Craig & Churchill, 2021a). For many, pre-existing work–family arrangements were already stressful to the point of unsustainability, and the pandemic only made them more so (Craig, 2020).

This is not to say that men were not under pressure too. This showed up in their reports of satisfaction with how unpaid domestic work was shared in households. One study found that before the pandemic fewer than 10 % of men in heterosexual couples had been dissatisfied with their partners' share of domestic labour and care. During the pandemic, this proportion more than doubled (Craig & Churchill, 2021a). However, these men were still doing significantly less unpaid work as a primary activity (5.39 hours per day) than women (7.41 hours per day) (and no more than women had been doing pre-pandemic (6.23 hours per day)). This suggests a relatively low threshold before heterosexual men feel it is too much and therefore unfair on them. It could be because employer expectations weighed heavily upon them. Consistent with pre-existing notions of "ideal workers" as those being unencumbered by care responsibilities (Livnat & Villa Braslavsky, 2020; Williams, Blair-Loy, & Berdahl, 2013), most employers seemed to expect that home-based workers would deliver the same output as before the pandemic. The implication is that both employers' and men's own attitudes would need to change substantially if women's careers are not to continue being the first to be sacrificed next time a family encounters the pointy end of everyday stressors (Craig & Churchill, 2021c).

On a more positive note, reduced time pressure was noted quite widely during lockdown, with many people feeling less rushed and pressed for time than hitherto, due to relief from daily commutes and external deadlines, including school and daycare drop-offs (Craig & Churchill, 2021a, 2021b). This was particularly the case for single mothers. Such findings highlight the need for flexibility to support families in organising their daily lives as suits them best; that workplaces should continue letting employees to work from home when possible, and that cutting commuting times through improved transport services would improve daily lives significantly. Also, if women are expected to take on the domestic load by their partners and given no relief from productivity expectations by their employers, they need to rely on non-parental childcare, which again underscores how necessary external care services and infrastructure are to families (Collins et al. 2021).

United States and COVID-19

In the United States, the potential equalising influences of the pandemic on gender relations were an unexpected bright spot in the early days of the pandemic. Studies using both a non-representative and a representative time diary collected in 2020 showed increases in mothers' and fathers' childcare time, with the relatively larger increase in fathers' time narrowing the gender gaps in care (Augustine & Prickett, 2022; Carlson et al., 2022). For example, Augustine and Prickett (2022) report that mothers' childcare time increased by 40 minutes in 2020 relative to 2019, whereas fathers' childcare time increased by 51 minutes during the same period. Carlson et al. 2022 found that the proportion of fathers who indicated that they shared housework equally with the mother increased from 36 % in March 2020 to 64 % in April 2020, but then decreased to 51 % by November 2020. shifts in the proportion of fathers who indicated sharing childcare equally with the mother were 54 % to 71 % to 63 % respectively. Furthermore, as the pandemic continued into 2022, mothers more than fathers rearranged daily time use to provide more supervision for the children's school-related activities and physical care for children at home because of the closures of childcare facilities (Heggeness & Fields, 2020). Housework also increased among women generally but not among men (Carlson & Petts, 2022; Sayer, Yan, Doan, & Rinderknecht, 2021). Most studies on daily activities during COVID-19 have focused on samples of married or cohabiting heterosexual parents and surprisingly document a redistribution across activities (such as driving children places) but no substantial increases in the total amount of parental childcare time (Lyttelton et al., 2022; Sayer, Flood, & Hofferth, 2022). Nonetheless, combining supervisory childcare with paid work, as well as time engaged in housework, increased among mothers and fathers who worked remotely (Augustine & Prickett, 2022; Lyttelton et al., 2022). Furthermore, among parents able to work at home, supervisory care combined with paid work increased substantially among mothers and fathers, although the increases were larger for mothers (Sayer, Yan, Doan, & Rinderknecht, 2021).

The pandemic also widened gender gaps in paid work hours (Collins, Landivar, Ruppanner, & Scarborough, 2021; Collins, Ruppanner, Landivar, & Scarborough, 2021). Job losses and reduced work hours were concentrated among mothers, particularly those raising children two years of age and younger (Heggeness, Fields, Garcia Trejo, & Schulzetenberg, 2021; Villareal & Yu, 2022). This pattern also widened within-gender employment gaps because of the disproportionate unemployment and reduced hours among less-educated women and among black and Latina mothers who worked primarily in retail, service, and education and health services – all sectors where jobs fell off the

cliff due to pandemic restrictions (Kashen, Glynn, & Novello, 2021; Zamarro, Perez-Arce, & Prados, 2021). Also central was the shuttering of childcare and school facilities (Collins et al., 2021). Despite the critical need for Federal policies subsidising childcare facilities and securing a robust care infrastructure, the United States did not roll out an expanded family safety net. Instead, Federal support was limited to expanded eligibility for food stamps, short-term direct payments to families with children, and expanded eligibility criteria for the Earned Income Tax Credit (EITC). But none of these policies were intended to reduce the insufficient supply of affordable childcare. On average, single mothers can spend as much as 35 % of their income on childcare and married parents 10 %, with even that amount being twice as high as Federal agency estimates of childcare that is affordable (Malik, 2019).

Heightened time demands for care combined with job loss and greater economic precariousness also amplified pre-existing intersectional inequalities in time pressure, chronic and life stressors, and depression, in addition to feelings of stress and anxiety experienced during daily activities (Mooi-Reci & Risman, 2021; Ruppanner, Tan, Scarborough, Landivar, & Collons, 2021; Yan et al., 2022). Before the pandemic, unemployment increased depression and anxiety (Burgard & Kalousova, 2015) and reduced life satisfaction, with the impacts stronger for men, given the gendered expectations about work (Damaske, 2021; Knabe, Schöb, & Weimann, 2016). The pandemic also increased stress and economic insecurity among employed and non-employed mothers (Bauer, 2021).

Discussion and Conclusion

In the longer run, the pandemic may yet prove to have been a catalyst for change. Both the Australian and the United States' examples suggest that the pandemic enhanced the recognition of unpaid work and care. The tenacity of the pattern by which unpaid work defaults to women (Craig & Churchill, 2021c), in addition to the gendered economic vulnerability (Foley & Cooper, 2021) and high stress and exhaustion (Craig, 2020) this pattern creates, was made more obvious. In Australia, in early 2022, as the country entered the "living with COVID" stage of freer movement and a return to "normal", there was a general election. The progressive Labour party became the government; the conservative party was ousted. Women voted in high numbers for this change. Not coincidentally, policy issues that had long been sidelined moved onto the agenda. Promised new policy platforms include affordable universal childcare, extending statutory paid parental leave and actively targeting the gender pay

gap, including by changing industrial relations laws to allow care workers' wages to be revalued through collective industrial bargaining agreements. Although Australia remains without recent nationally representative time use data, the UNDP goal of "recognition" now seems more attainable.

In the United States, the pandemic has led many workers to question the culture of intensive devotion to paid work. Anecdotal evidence about the great resignation and "quiet quitting" (Olen, 2022) is not yet evident in government surveys. College-educated workers are demanding continuing options to work at home, despite employer resistance, and some workplaces have capitulated to these demands (Maas, 2022). The lack of Federally mandated support for childcare persists and it is unlikely that subsidised childcare will be passed any time soon because of the Republican Party control of the Congress. However, in recognition of the care crisis, US states have passed legislation requiring paid family leave, parental leave, and sick days.

The COVID-19 time impacts we found in Australia and the United States were broadly echoed elsewhere. As time went on, it became clear that women were shouldering by far the greater burden of extra housework, homeschooling and childcare across Europe, Asia and the Middle East, as well as in the Anglophone countries (Andrew et al., 2020; Collins, Ruppanner, Landivar, & Scarborough, 2021; Petts, Carlson, & Pepin, 2021; Power, 2020; Schieman, Badawy, Milkie, & Bierman, 2021; Sevilla & Smith, 2020; van Tienoven, Minnen, Glorieux, Laurijssen, te Braak, & Glorieux, 2021; Yaish, Mandel, & Kristal, 2021). Negative psychological effects were also widespread. In the United Kingdom, Xue & Mc Munn (2021) found that working parents who adapted their work patterns during COVID-19 – who were disproportionately women – experienced more psychological distress than those who did not. Mothers spent substantially longer in childcare and housework than their (heterosexual) partners and also spent a larger proportion of their paid work hours having to juggle work and childcare (Andrew, Cattan, Costa Dias, Farquharson, Kraftman, Krutikova, & Sevilla, 2022). A large study across the United States, Canada, Denmark, Brazil and Spain found that, to the extent that women spent more time on unpaid work under lockdown, they reported lower levels of happiness (Giurge, Whillans, & Yemiscigil, 2021). By increasing women's housework and childcare beyond a manageable threshold, the pandemic created a wide gender gap in self-rated work productivity and job satisfaction (Feng & Savani, 2020).

In summary, a common finding was that, in the lockdowns, unpaid work increased and gender gaps in care somewhat narrowed but, overall, most of the international research underlined the persistence of unequal gendered divisions of labour. However, as before the pandemic, time use studies were central in

fostering recognition of the amount, distribution, and consequences of unpaid work. The COVID-19 crisis brought to light, in an unprecedented way, the critical role of care and unpaid work performed predominantly by women in their families (Wenham, Smith, & Morgan, 2020). Activists were hopeful that this unprecedented exposure would be an opportunity to place care and social reproduction at the heart of the development agenda (Dugarova, 2020), but early hopes that the pandemic might produce significant social change in the distribution of unpaid work were disappointed (Blundell, Costa Dias, Joyce, & Xu, 2020). Recognition is an important step, and time use data are essential to it; but meeting the challenges of translating recognition into transformative policy and behaviour change that engenders the redistribution of unpaid work remains a work in (gradual) progress.

References

Altintas, E. & Sullivan, O. (2016). Fifty years of change updated: Cross-national gender convergence in housework. *Demographic Research*, *35*(16), 455-470.

Andrew, A., Cattan, S., Costa Dias, M., Farquharson, C., Kraftman, L., Krutikova, S., . . . Sevilla, A. (2020). Inequalities in children's experiences of home learning during the COVID-19 lockdown in England. *Fiscal Studies*, *41*(3), 653-683.

Augustine, J. M. & Prickett, K. (2022). Gender disparities in increased parenting time during the COVID-19 pandemic: A research note. *Demography*, *59*(4), 1233-1247.

Bauer, L. (2021). *Mothers are being left behind in the economic recovery from COVID-19*. https://www.brookings.edu/blog/up-front/2021/05/06/mothers-are-being-left-behind-in-the-economic-recovery-from-COVID-19/

Begall, K. & Grunow, D. (2015). Labour force transitions around first childbirth in the Netherlands. *European Sociological Review*, *31*(6), 697-712.

Bianchi, S. M. & Milkie, M. A. (2010). Work and family research in the first decade of the 21st century. *Journal of Marriage & Family*, *72*(3), 705-725.

Bittman, M., England, P., Sayer, L. C., Folbre, N., & Matheson, G. (2003). When gender trumps money: Bargaining and time in household work. *American Journal of Sociology*, *109*(1), 186-214.

Blundell, R., Costa Dias, M., Joyce, R., & Xu, X. (2020). COVID-19 and inequalities. *Fiscal Studies*, *41*(2), 291-319.

Bünning, M. & Pollmann-Schult, M. (2016). Family policies and fathers' working hours: Cross-national differences in the paternal labour supply. *Work, Employment and Society*, *30*(2), 256-274.

Burgard, S. A. & Kalousova, L. (2015). Effects of the great recession: Health and well-being. *Annual Review of Sociology*, *41*(1), 181-201.

Carlson, D. L. & Petts, R. J. (2022). U.S. parents' domestic labor during the first year of the COVID-19 pandemic. *Population Research and Policy Review*, *41*(6), 2393-2418.

Carlson, D. L., Petts, R. J., & Pepin, J. R. (2021). Flexplace work and partnered fathers' time in housework and childcare. *Men and Masculinities*, *24*(4), 547-570.

Carlson, D. L., Petts, R. J., & Pepin, J. R. (2022). Changes in U.S. parents' domestic labor during the early days of the COVID-19 pandemic. *Sociological Inquiry*, *92*(3), 1217-1244.

Chesley, N. & Flood, S. (2017). Signs of change? At-home and breadwinner parents' housework and child-care time. *Journal of Marriage and Family*, *79*(2), 511-534.

Collins, C., Landivar, L. C., Ruppanner, L., & Scarborough, W. J. (2021). COVID-19 and the gender gap in work hours. *Gender, Work & Organization*, *28*(S1), 549-560.

Collins, C., Ruppanner, L., Landivar, L. C., & Scarborough, W. J. (2021). The Gendered consequences of a weak infrastructure of care: School reopening plans and parents' employment during the COVID-19 pandemic. *Gender & Society*, *35*(2), 180-193.

Craig, L. (2020). Coronavirus, domestic labour and care: Gendered roles locked down. *Journal of Sociology*, *56*(4), 684-692.

Craig, L. & Brown, J. E. (2017). Feeling rushed: Gendered time quality, work hours, nonstandard work schedules, and spousal crossover. *Journal of Marriage and Family*, *79*(1), 225-242.

Craig, L., Brown, J. E., & Jun, J. (2020). Fatherhood, motherhood and time pressure in Australia, Korea, and Finland. *Social Politics: International Studies in Gender, State & Society*, 27(2), 312-336.

Craig, L., Brown, J. E., Strazdins, L., & Jun, J. (2021). Is it just too hard? Gendered time symmetry and subjective time pressure in Australia, Finland and Korea. In R. Connelly & E. Konga (Eds.), *Gender and time use in a global context* (pp. 465-494). Palgrave MacMillan.

Craig, L. & Churchill, B. (2021a). Dual-earner parent couples' work and care during COVID-19. *Gender, Work & Organization*, *28*(S1), 66-79.

Craig, L. & Churchill, B. (2021b). Unpaid work and care during COVID-19: Subjective experiences of same-sex couples and single mothers in Australia. *Gender & Society*, *35*(2), 233-243.

Craig, L. & Churchill, B. (2021c). Working and caring at home: Gender differences in the effects of COVID-19 on paid and unpaid labor in Australia. *Feminist Economics*, *27*(1-2), 310-326.

Craig, L. & Jenkins, B. (2016). Grandparental childcare in Australia: Gender differences in the correlates of providing regular grandparental care while parents work. *Community, Work & Family*, *19*(3), 281-301.

Craig, L. & Mullan, K. (2010). Parenthood, gender and work–family time in the United States, Australia, Italy, France, and Denmark. *Journal of Marriage and Family*, *72*(5), 1344-1361.

Craig, L., Mullan, K., & Blaxland, M. (2010). Parenthood, policy and work–family time in Australia 1992-2006. *Work, Employment and Society*, *24*(1), 27-45.

Craig, L., Perales, F., Vidal, S., & Baxter, J. (2016). Domestic outsourcing, housework time, and subjective time pressure: New insights from longitudinal data. *Journal of Marriage and Family*, *78*(5), 1224-1236.

Craig, L. & Powell, A. (2011). Non-standard work schedules, work–family balance and the gendered division of childcare. *Work, Employment and Society*, *25*(2), 274-291.

Craig, L. & Powell, A. (2013). Non-parental childcare, time pressure and the gendered division of paid work, domestic work and parental childcare. *Community, Work & Family*, *16*(1), 100-119.

Craig, L., Powell, A., & Cortis, N. (2012). Self-employment, work-family time and the gender division of labour. *Work, Employment and Society*, *26*(5), 716-734.

Craig, L. & van Tienoven, T. P. (2021). Gendered shares of the family rush hour in fulltime dual earner families. A cross national comparison. *Social Indicators Research*, *153*(1), 385-405.

Damaske, S. (2021). *The tolls of uncertainty: How privilege and the guilt gap shape unemployment in America.* Princeton University Press.

Daminger, A. (2019). The cognitive dimension of household labor. *American Sociological Review*, *84*(4), 609-633.

Daniels, A. K. (1987). Invisible work. *Social Problems*, *34*(5), 403-415.

de Castro Galvao, J. (2022). Gender inequality in lifetime earnings. *Social Forces*. [Online first: doi:10.1093/sf/soac060]

Dean, L., Churchill, B., & Ruppanner, L. (2022). The mental load: Building a deeper theoretical understanding of how cognitive and emotional labor overload women and mothers. *Community, Work & Family*, *25*(1), 13-29.

Doan, T., LaBond, C., Banwell, C., Timmins, P., Butterworth, P., & Strazdins, L. (2022). Unencumbered and still unequal? Work hour-health tipping points and gender inequality among older, employed Australian couples. *SSM Population Health*, *18*, 101-121.

Dugarova, E. (2020). Unpaid care work in times of the COVID-19 crisis: Gendered impacts, emerging evidence and promising policy responses. In *UN Expert Group Meeting 'Families in development: Assessing progress, challenges and emerging issues, Focus on modalities for IYF (Vol. 30).*

Dunatchik, A. & Speight, S. (2020). Re-examining how partner co-presence and multitasking affect parents' enjoyment of childcare and housework. *Sociological Science*, *7*(11), 268-290.

Elson, D. (2017). Recognize, reduce, and redistribute unpaid care work: How to close the gender gap. *New Labor Forum*, *26*(2), 52-61.

England, P. (2010). The gender revolution: Uneven and stalled. *Gender & Society*, *24*(4), 149-166.

England, P. & Srivastava, A. (2013). Educational differences in U.S. parents' time spent in childcare: The role of culture and cross-spouse influence. *Social Science Research*, *42*(4), 971-988.

Feng, Z. & Savani, K. (2020). COVID-19 created a gender gap in perceived work productivity and job satisfaction: Implications for dual-career parents working from home. *Gender in Management*, *35*(7/8), 719-736.

Fineman, M. A. (2004). *The autonomy myth: A theory of dependency.* The New Press.

Folbre, N. (2001). *The invisible heart: Economics and family values.* The New Press.

Folbre, N. (2014). *Who cares? A feminist critique of the care economy.* Rosa-Luxemburg Stiftung.

Foley, M., & Cooper, R. (2021). Workplace gender equality in the post-pandemic era: Where to next? *Journal of Industrial Relations*, *63*(4), 463-476.

Fraser, N. (2016). Contradictions of capital and care. *New Left Review*, *100*(July/August), 99-117.

Fraser, N. & Jaeggi, R. (2018). *Capitalism: A conversation in critical theory*. Polity.

Gershuny, J. & Sullivan, O. (2003). Time use, gender, and public policy regimes. *Social Politics*, *10*(2), 205-228.

Giurge, L. M., Whillans, A. V., & Yemiscigil, A. (2021). A multicountry perspective on gender differences in time use during COVID-19. *PNAS*, *118*(12), e2018494118

Goldin, C. (2014). A grand gender convergence: Its last chapter. *American Economic Review*, *104*(4), 1091-1119.

Gornick, J. C., Meyers, M. K., & Wright, E. O. (2009). *Gender equality: Transforming family divisions of labor*. Verso.

Harknett, K., Schneider, D., & Luhr, S. (2020). Who cares if parents have unpredictable work schedules? Just-in-time work schedules and childcare arrangements. *Social Problems*, *69*(1), 164-183.

Ham, S. (2021). Explaining gender gaps in the South Korean labor market during the COVID-19 pandemic. *Feminist Economics*, *27*(1-2), 133-151.

Haupt, A. & Gelbgiser, D. (2022). The gendered division of cognitive household labor, mental load, and exhaustion. *SocArXiv Papers*. https://osf.io/preprints/socarxiv/tsfu6

Heggeness, M. L. & Fields, J. M. (2020). *Working moms bear brunt of home schooling while working during COVID-19*. America Counts, U.S. Census Bureau. https://www.census.gov/library/stories/2020/08/parents-juggle-work-and-child-care-during-pandemic.html

Heggeness, M. L., Fields, J., García Trejo, Y. A., & Schulzetenberg, A. (2021). *Moms, work and the pandemic*. [Retrieved from https://www.census.gov/library/stories/2021/03/moms-work-and-the-pandemic.html].

Hill, R., Tranby, E., Kelly, E., & Moen, P. (2013). Relieving the time squeeze? Effects of a white-collar workplace change on parents. *Journal of Marriage and Family*, *75*(4), 1014-1029.

Hook, J. (2010). Gender inequality in the welfare state: Sex segregation in housework, 1965-2003. *American Journal of Sociology*, *115*(5), 1480-1523.

Kalenkoski, C. & Foster, G. (2016). *The economics of multitasking*. Palgrave Macmillan.

Kan, M.-Y., Zhou, M., Kolpashnikova, K., Hertog, E., Yoda, S., & Jun, J. (2022). Revisiting the gender revolution: Time on paid work, domestic work, and total work in East Asian and Western societies 1985-2016. *Gender & Society*, *36*(3), 368-396.

Kashen, J., Glynn, S. J., & Novello, A. (2021). *How COVID-19 sent women's workforce progress backward*. https://www.americanprogress.org/issues/women/reports/2020/10/30/492582/COVID-19-sent-womens-workforce-progress-backward/

Kendig, S. & Bianchi, S. M. (2008). Single, cohabiting, and married mothers' time with children. *Journal of Marriage and Family*, *70*(5), 1228-1240.

Kim, J. (2020). Workplace flexibility and parent–child interactions among working parents in the U.S. *Social Indicators Research*, *151*(2), 427-469.

Knabe, A., Schöb, R., & Weimann, J. (2016). Partnership, gender, and the well-being cost of unemployment. *Social Indicators Research*, *129*(3), 1255-1275.

Kristal, T. & Yaish, M. (2020). Does the coronavirus pandemic level the gender inequality curve? (It doesn't). *Research in Social Stratification and Mobility, 68*(August), 100520.

Lachance-Grzela, M. & Bouchard, G. (2010). Why do women do the lion's share of housework? A decade of research. *Sex Roles, 63*, 767-780.

Lewis, J. (2009). *Work–family balance, gender and policy*. Edward Elgar.

Livnat, I. & Villa Braslavsky, P.-I. (2020). Who takes care of "care"? *Gender, Work & Organization*, *27*(2), 270-277.

Lyttelton, T., Zang, E., & Musick, K. (2022). Telecommuting and gender inequalities in parents' paid and unpaid work before and during the COVID-19 pandemic. *Journal of Marriage and Family*, *84*(1), 230-249.

Maas, S. (2022). Work from home likely to remain elevated post-pandemic. *The Digest*, *6*(June). https://www.nber.org/digest/202106/work-home-likely-remain-elevated-post-pandemic

Malik, R. (2019). *Working families are spending big money on childcare*. https://www.americanprogress.org/article/working-families-spending-big-money-child-care/

Mallett, O., Marks, A., & Skountridaki, L. (2020). Where does work belong anymore? The implications of intensive homebased working gender in management. *Gender in Management: An International Journal*, *35*(7/8), 657-665.

Mattingly, M. J. & Bianchi, S. M. (2003). Gender differences in the quantity and quality of free time: The U.S. experience. *Social Forces*, *81*(March), 999-1029.

Mattingly, M. & Sayer, L. C. (2006). Under pressure: Gender differences in the relationship between free time and feeling rushed. *Journal of Marriage and Family*, *68*(1), 205-221.

Mooi-Reci, I. & Risman, B. J. (2021). The gendered impacts of COVID-19: Lessons and reflections. *Gender & Society*, *35*(2), 161-167.

Musick, K., Meier, A., & Flood, S. (2016). How parents fare. *American Sociological Review*, *81*(5), 1069-1095.

Negraia, D. V. & Augustine, J. M. (2020). Unpacking the parenting well-being gap: The role of dynamic features of daily life across broader social contexts. *Social Psychology Quarterly*, *83*(3), 207-228.

Negraia, D. V., Augustine, J. M., & Prickett, K. C. (2018). Gender disparities in parenting time across activities, child ages, and educational groups. *Journal of Family Issues*, *39*(11), 3006-3028.

Nieuwenhuis, R. & Yerkes, M. A. (2021). Workers' well-being in the context of the first year of the COVID-19 pandemic. *Community, Work & Family*, *24*(2), 226-235.

Noonan, M. C., Estes, S. B., & Glass, J. L. (2007). Do workplace flexibility policies influence time spent in domestic labor? *Journal of Family Issues*, *28*(2), 263-288.

Offer, S. (2014). The costs of thinking about work and family: mental labor, work–family spillover, and gender inequality among parents in dual-earner families. *Sociological Forum*, *29*(4), 916-936.

Olen, H. (2022). How the pandemic ended America's bad romance with work. *Washington Post*. 14 November 2022. https://www.washingtonpost.com/opinions/2022/11/14/COVID-pandemic-work-resignation-quitting-unionization/

Pailhé, A., Solaz, A., & Stanfors, M. (2021). The great convergence: Gender and unpaid work in Europe and the United States. *Population and Development Review*, *47*(1), 181-217.

Passias, E. J., Sayer, L., & Pepin, J. R. (2017). Who experiences leisure deficits? Mothers' marital status and leisure time. *Journal of Marriage and Family*, *79*(4), 1001-1022.

Peng, I. & Jun, J. (2022). Impacts of COVID-19 on parents with small children in South Korea: Survey findings and policy implications. *International Journal of Care and Caring*, *6*(1-2), 13-32.

Pepin, J. R., Sayer, L. C., & Casper, L. M. (2018). Marital status and mothers' time use: Childcare, housework, leisure, and sleep. *Demography*, *55*(1), 107-133.

Perry-Jenkins, M. & Gerstel, N. (2020). Work and family in the second decade of the 21st century. *Journal of Marriage and Family*, *82*(1), 420-453.

Petts, R. J., Carlson, D. L., & Pepin, J. R. (2021). A gendered pandemic: Childcare, homeschooling, and parents' employment during COVID-19. *Gender, Work & Organization*, *28*(S2), 515-534.

Powell, A. & Craig, L. (2015). Gender differences in working at home and time use patterns: Evidence from Australia. *Work, Employment and Society*, *29*(4), 571-589.

Power, K. (2020). The COVID-19 pandemic has increased the care burden of women and families. *Sustainability: Science, Practice and Policy*, *16*(1), 67-73.

Qian, Y. & Sayer, L. C. (2022). Gender and educational variation in how temporal dimensions of paid work affect parental childcare time. *Socius*, *8*, 23780231221132383.

Ruppanner, L., Tan, X., Scarborough, W., Landivar, L. C., & Collins, C. (2021). Shifting inequalities? Parents' sleep, anxiety, and calm during the COVID-19 pandemic in Australia and the United States. *Men and Masculinities*, *24*(1), 181-188.

Sakuragi, T., Tanaka, R., Tsuji, M., Tateishi, S., Hino, A., Ogami, A., ... & Fujino, Y. (2022). Gender differences in housework and childcare among Japanese workers during the COVID-19 pandemic. *Journal of Occupational Health*, *64*(1), e12339.

Sayer, L. C. (2016). Trends in women's and men's time use, 1965-2012: Back to the future? In S. M. McHale, V. King, J. van Hook, & A. Booth (Eds.), *Gender and couple relationships* (pp. 43-78). Springer.

Sayer, L. C., England, P., Bittman, M., & Bianchi, S. M. (2009). How long is the second (plus first) shift? Gender differences in paid, unpaid, and total work time in Australia and the United States. *Journal of Comparative Family Studies*, *40*(4), 523-545.

Sayer, L. C., Flood, S., & Hofferth, S. (2022). *Gender and social class disparities in COVID-19 impacts on parental care of children.* [Paper presented at the Social, Behavioral and Economic (SBE) Health Impacts of COVID-19 Spring Webinar].

Sayer, L. C., Gauthier, A. H., & Furstenberg, F. F. (2004). Educational differences in parents' time with children: Cross-national variations. *Journal of Marriage and Family*, *66*(4), 1149-1166.

Sayer, L. C. & Gornick, J. C. (2012). Cross-national variation in the influence of employment hours on childcare time. *European Sociological Review*, *28*(4), 421-442.

Sayer, L., Yan, X., Doan, L., & Rinderknecht, R. G. (2021). *Gendering the pandemic: Women's and men's time use during COVID-19.* [Paper presented at the 2021 American Sociological Association Annual Conference, virtual].

Schieman, S., Badawy, P. J., Milkie, M., & Bierman, A. (2021). Work–life conflict during the COVID-19 pandemic. *Socius*, *7*, 2378023120982856

Sevilla, A. & Smith, S. (2020). Baby steps: The gender division of childcare during the COVID-19 pandemic. *Oxford Review of Economic Policy*, *36*(Supplement_1), S169-S186.

Sullivan, O. & Gershuny, J. (2018). Speed-up society? Evidence from the U.K. 2000 and 2015 time use diary surveys. *Sociology*, *52*(1), 20-38.

van Barneveld, K., Quinlan, M., Kriesler, P., Junor, A., Baum, F., Chowdhury, A., . . . Rainnie, A. (2020). The COVID-19 pandemic: lessons on building more equal and sustainable societies. *The Economic and Labour Relations Review*, *31*(2), 133-157.

van Tienoven, T. P., Minnen, J., Glorieux, A., Laurijssen, I., te Braak, P., & Glorieux, I. (2021). Locking down gender roles? A time-use perspective on gender division of household labour during the COVID-19 pandemic lockdown in Belgium. *Journal of Family Issues, 44*(3), 654-680.

Villarreal, A. & Yu, W.-h. (2022). Gender differences in employment during the COVID-19 epidemic. *Demography*, *59*(1), 13-26.

Warren, T. (2011). Researching the gender division of unpaid domestic work: Practices, relationships, negotiations, and meanings. *The Sociological Review*, *59*(1), 129-148.

Wenham, C., Smith, J., & Morgan, R. (2020). COVID-19: The gendered impacts of the outbreak. *The Lancet*, *395*(10227), 846-848.

Williams, J. C., Blair-Loy, M., & Berdahl, J. L. (2013). Cultural schemas, social class, and the flexibility stigma. *Journal of Social Issues*, *69*(2), 209-234.

Xue, B. & McMunn, A. (2021). Gender differences in unpaid care work and psychological distress in the U.K. COVID-19 lockdown. *PLOS ONE*, *16*(3), e0247959

Yaish, M., Mandel, H., & Kristal, T. (2021). Has the economic lockdown following the COVID-19 pandemic changed the gender division of labor in Israel? *Gender & Society*, *35*(2), 256-270.

Yan, H. X., Sayer, L. C., Negraia, D. V., Rinderknecht, R. G., Doan, L., Drotning, K. J., . . . Buck, C. (2022). Mothering and stress during COVID-19: Exploring the moderating effects of employment. *Socius*, *8*, 23780231221103056

Yavorsky, J. E., Kamp Dush, C. M., & Schoppe-Sullivan, S. J. (2015). The production of inequality: The gender division of labor across the transition to parenthood. *Journal of Marriage and Family*, *77*(3), 662-679.

Zamarro, G., Perez-Arce, F., & Prados, M. J. (2021). Gender differences in the impact of COVID-19. *Review of Economics of the Household*, *19*(1), 11-40.

Feelings of time pressure despite leisure time?

Exploring the effect of different time use and leisure time characteristics on subjective time pressure

Francisca Mullens • *Petrus te Braak*

> Time has become a sensitive issue. People increasingly complain about a lack of time and increasing busyness. There is increasing awareness that, while we may be better off materially today than ever before, we hardly find the time or peace to enjoy it (Glorieux et al., 2006, p. 13).

This quotation still hits the nail on the head when it comes to time in our contemporary society. Many scholars describe our society as being characterised by busyness and feelings of time pressure (Robinson & Godbey, 1997; Zuzanek, 2017), stimulated by technological progress and the faster rhythms of daily life (Rosa & Scheuerman, 2009). These feelings of busyness and rush are captured by the concept of subjective time pressure. Whereas *objective* time pressure refers to the number of hours spent on paid work and household tasks (Knulst & van den Broek, 1998; Pääkkönen, 1998) or having too little free time (Vickery, 1977), *subjective* time pressure refers to the feeling that there is too little time to do all the things one needs and/or wants to do (e.g., Kleiner, 2014; Roxburgh, 2002). This is sometimes also referred to as time crunch, time shortage or time stress. Some scholars (Robinson & Godbey, 1997; Wajcman, 2015) argue that the increase in time pressure in Western societies is, at least partly, the result of perception that cannot be measured using objective approaches of time pressure because they do not consider the experience of time. From that perspective, in this chapter, we focus on subjective time pressure, which thus refers to people's perception or feeling of having insufficient time to perform the activities they want to do and must do.

Research has shown that time pressure can be reduced by having more leisure time (Zuzanek, 2004). Yet, coinciding with the increase in time pressure in society, other research indicates that the time spent on leisure activities has increased since the 1960s (e.g., Aguiar & Hurst, 2007; Gershuny, 2000). This seems contradictory, as we would expect an increase in leisure time to go hand in hand with a decrease in time pressure. An explanation for this seeming paradox might be that duration is not the only aspect of (leisure) time that is related to time pressure. Possibly, part of the explanation may lie in how we choose to spend our leisure time. Schwartz (2004) argues that freedom of choice in leisure time is under pressure due to the many choices available to allocate leisure time, which would lead to more time pressure as the amount of leisure time remains similar. Therefore, we must allocate the same duration of leisure time among more activities, making our choices more volatile and less meaningful (Scitovsky, 1976). This raises the question to what extent our use of leisure time, more than solely the duration of it, affects our experience of time pressure. In this book chapter, and in line with recommendations of Glorieux (2022) during his recent lecture at the 44th IATUR conference in Montréal, we attempt to go beyond duration and consider the degree of fragmentation, the timing, diversity, and contamination of leisure time and consider how these dimensions of leisure affect the feelings of time pressure. For this purpose, we use time use data gathered in Flanders by the TOR research group in 2013 and 2014. Considering that (time) norms and time use are gendered (Coser, 1991; Epstein, 2004), we analyse men and women separately and focus on the working population only.

Background

In this chapter, we focus on leisure time and its impact on time pressure. Leisure time is described by Glorieux et al. (2010, p. 165) as a freer kind of time or "the time with the fewest commitments and the greatest freedom of choice to do whatever we want". In the literature, this type of time is often associated with time affluence (Vickery, 1977). Lacking leisure time is associated with stress and lower well-being (Sharif et al., 2021). Although previous studies demonstrate that other time use categories affect subjective well-being, such as time spent on paid and unpaid work (e.g., Craig & Brown, 2017; Laurijssen & Glorieux, 2013; van der Lippe, 2007), we focus solely on leisure time precisely because of this quality of freedom that is ascribed to it and the seeming paradox between the general increase in leisure time and the simultaneous increase in subjective time pressure in Western countries.

Subjective time pressure

The concept of subjective time pressure plays a crucial role in the work of Ignace Glorieux and colleagues, and by extension the Research Group TOR, who consider time pressure in relation to objective time pressure (Moens, 2006), career interruptions (Vandeweyer, 2010), part-time work (Laurijssen, 2012), leisure participation (Mullens & Glorieux, 2023), survey non-response (te Braak et al., 2023), and time diary data quality (te Braak et al., 2022). This chapter elaborates on this tradition.

Subjective time pressure, or the perception of having too little time, has risen sharply since 1965, reaching its peak during the 1990s and 2000s and decreasing again after 2010 (Robinson & Godbey, 2005; Rudd, 2019). As mentioned above, research has indicated that subjective time pressure is affected by the duration of leisure time (Zuzanek, 2004). After paid and unpaid work, the time people spend on leisure is the most correlated with subjective time pressure (Zuzanek & Beckers, 1999). Kleiner (2014, p. 109) states that subjective time pressure lies at the intersection of time experience and social roles: "it involves both the perception of time, and of role obligations perceived as necessary to accomplish within a given time period". To study the impact of role obligations, people's life stages and situations are often considered. Workers, women, parents with young children and the higher-educated have greater role demands and experience more time pressure (e.g., Gimenez-Nadal & Sevilla-Sanz, 2011; Mattingly & Sayer, 2006; Roxburgh, 2002). The ages of 24 to 50, when responsibilities, ambitions and obligations are concentrated, is associated with high levels of time pressure. During this "rush hour of life", people are busy building a career, building a home, raising children, and chasing their leisure pursuits (Moens, 2004). In particular, young working parents are pressed for time as they combine the demands of parenting, with its high expectations of parental involvement (Hays, 1996), with the demands of employment (Hill et al., 2013). This strand of research shows how personal characteristics (which are used as a proxy for their current roles in life) affect the experience of time pressure.

Another strand of research, although smaller, has investigated the way gender moderates the relationship between the duration of leisure time and subjective time pressure. Mattingly and Sayer (2006), using US time diary data, found that subjective time pressure among men was reduced by an increase in their duration of free time, whereas the duration of free time did not have an impact on the subjective time pressure of women in 1998. Similarly, Jang, Lee and Choe (2012), using time use data in South Korea, show that leisure time reduces the level of subjective time pressure for men solely, while

the time women spent on leisure did not affect the feelings of time pressure. In sum, previous studies demonstrate that the duration of leisure time affects the subjective time pressure for men, but not for women.

Leisure time and its dimensions

The studies above describe a relationship (at least for men) between subjective time pressure, on the one hand, and the duration of leisure time, on the other. Remarkably few studies have investigated other dimensions of time and its impact on subjective time pressure. One of the notable exceptions is a time diary study on the existence of a harried leisure class in Flanders by Glorieux et al. (2010). Based on the time spent on different activities (paid work, unpaid work, personal care, different types of leisure, etc.), twelve time use patterns were identified. One of these patterns is described as the pattern of the harried leisure class, a term introduced by Linder (1970) to describe those who assert their material and cultural resources to extend their consumption of pleasure and leisure. The harried leisure class differs from the equanimous leisure class based on several different dimensions of leisure. According to Glorieux et al. (2010), the harried leisure class spends a great deal of time in paid work. The higher-educated, with higher salaries and dual earners, belong disproportionally more often to the harried leisure class. This class experiences more time pressure and a work–leisure tension and spends less time on leisure activities during the working week. Despite spending less time on leisure, they spend much more of this time on *active* leisure, outside of the house and with others, both during the working week and over weekends. In addition, the rate of voraciousness (i.e., the number of leisure activities per hour) and volatile consumption is higher than among the equanimous leisure class. Glorieux et al. (2010, p. 177) conclude that the harried leisure class are "the archetypal members of contemporary society who are pressured by time". Feeling pressed for time is not a one-dimensional experience but represents multiple experiences of time (Southerton & Tomlinson, 2005). Time pressure is related to life stage and cultural, social, and economic capital that makes for abundant choices, which causes them stress to keep up with their needs and wants (Glorieux et al., 2010; Schwartz, 2004).

In a study that investigates gender differences in leisure, Bittman and Wajcman (2000) differentiate between leisure quantity and leisure quality. Their results show that women experience a higher time pressure than men and associate this experience with the quality of leisure rather than the quantity; women experience a more fragmented and contaminated leisure time and this time is therefore of lesser quality than that of men. However, based on

this distinction between quality and quantity, Mattingly and Bianchi (2003) found that duration, fragmentation and contamination of free time affected the subjective feeling of time pressure for men only. The high levels of time pressure that women, in particular mothers, experience (Robinson & Godbey, 1997) are often attributed to the combined paid and unpaid workload (Glorieux et al., 2006; Zuzanek & Beckers, 1999). Puzzled by the findings of Mattingly and Sayer (2006) discussed above, where men's subjective time pressure is explained by their time spent at leisure, but that of women is not, Craig and Brown (2017) investigated whether these gender differences might be due to differences in the quality of leisure. Studying two-parent families, they found that multitasking in unpaid work led to an increase of feeling rushed among mothers, while multitasking during leisure time only negatively affected fathers' subjective time pressure. The amount of pure (i.e., uncontaminated) leisure negatively affected both mothers and fathers (Craig & Brown, 2017). These results are partly in line with those of a study by Offer and Schneider (2011), where multitasking (in general) was associated with negative emotions and psychological stress for women only.

Next to the quantity and quality of leisure (fragmentation and contamination), Anttila, Oinas, and Nätti (2009), following Sullivan (2007), investigated how cultural voraciousness, as an indicator of the pace of leisure, affected time famine (both subjective and objective) and found that, for both women and men, cultural voraciousness was positively associated with perceived time stress. Intensely attending various cultural activities leads to higher feelings of time strain because of competing time demands and potential coordination problems (Southerton & Tomlinson, 2005).

As the above literature review demonstrates, an overly restricted focus on leisure time that considers only the duration of leisure time leads to biased and inconclusive findings on correlates such as subjective time pressure. To fully understand the occurrence of subjective time pressure, other temporal dimensions also need to be considered (Zerubavel, 1981). Dimensions that have been used by others discussed above are the timing of leisure (such as weekend or weekday leisure time) (Chatzitheochari & Arber, 2012; Glorieux et al., 2010), the rate of recurrence as fragmentation of leisure (Bittman & Wajcman, 2000), multitasking or contamination (Craig & Brown, 2017) or cultural voraciousness (Sullivan, 2007).

In sum, this literature review demonstrates that (1) subjective time pressure is expected to decrease once people spend more time on leisure time, (2) although some studies find that this is only the case for men, and that, (3) paradoxically, simultaneously with the increase in time pressure over the past 50-plus years, leisure time also increased and that (4) this paradox might result

from an exclusive focus on the duration of leisure time. In this chapter, we therefore expand our focus and examine, using Flemish time diary data, how other dimensions of leisure time such as timing, fragmentation, contamination, and diversity of the leisure repertoire are related to subjective time pressure. Specifically, we respond to the following research questions:

(1) To what extent do different dimensions of leisure time contribute to subjective time pressure?

(2) To what extent do the relationships between subjective time pressure and different dimensions of leisure time differ according to gender?

Methods

Data

Data come from a Flemish (Belgian) online time diary study that was conducted in 2013 and 2014 (Minnen et al., 2014). In total, a random sample of 39,756 people aged 18 to 75 years and living in Flanders, Belgium, was selected from the Belgian National Register with equal probabilities of being chosen. The study took place online using the data-collection platform MOTUS (Minnen et al., 2020), which was developed to conduct time diary studies. The respondents were asked to complete a pre-questionnaire, keep a time diary for seven consecutive days (168 hours) and complete a post-questionnaire. Using seven-day time diary data is crucial for our analyses, because many leisure activities (e.g., sports activities) take place weekly, meaning that a large proportion of leisure activities are not recorded in time diary studies where respondents participate for one or two days only (Glorieux & Minnen, 2009). A total of 3,260 respondents agreed to participate in the study. For the analyses, only data from respondents who were working full- or part-time were included. Students, retirees, and others who were not employed at the time of the study were excluded, as time pressure is related to different social roles (Kleiner, 2014), of which the role related to paid work is an important one. The leisure patterns of the employed population are often also different from those who are not working because they have less leisure time and the timing of their leisure time differs too. To analyse the impact of leisure among this group we selected only employed respondents over the age of 25. A total of 1,685 (51.6 %) sampled individuals, of whom 775 (45.99 %) were women and 910 (54.01 %) were men, were used in the analyses.

Table 1. Factor loadings and scale statistics of the Time Pressure Scale (n = 1,685)

	1-dimension solution	2-dimension solution (oblique rotation)	
	(1)	(1)	(2)
I have never some time for myself	0.740	0.697	0.603
I do not have time to do the things I must do	0.718	0.715	0.541
I must do more than I want to	0.708	0.781	0.449
I often am not able to do the things I like to do in my leisure time	0.704	0.464	0.796
I am expected to do more than I can handle	0.692	0.812	0.383
It cost me a lot of effort to plan my leisure activities	0.685	0.446	0.781
I find it hard to relax during my leisure time	0.679	0.553	0.634
I never get finished	0.671	0.746	0.434
Too much is expected from me	0.664	0.796	0.348
There are so many things I would like to do during my leisure time that I often feel short of time	0.634	0.397	0.740
Too often I must take others into account during my leisure time	0.628	0.447	0.672
Too many of my leisure activities are fragmented	0.585	0.327	0.728
I often have to cancel appointments	0.516	0.492	0.414
Eigenvalue	5.765	4.884	4.660
Cronbach's alpha	0.893	0.884	0.859

Concepts

Time Pressure: Time pressure is measured using thirteen items. Originally, these items were derived from two different surveys. On the one hand, there are items that gauge a general feeling of lack of time or general time pressure (Ackaert & Swyngedouw, 1995) while, on the other, items gauge time pressure in leisure time (Peters & Raaijmakers, 1998). As indicated earlier, these items have already been used in many surveys by the TOR research group. All the items were rated on a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree (van Tienoven et al., 2017). Although the initial factor analysis suggests two dimensions with an eigenvalue higher than 1, the scree plot shows that the first component has a higher eigenvalue than the following factors (see Table 1). In addition, the two components have many overlapping items and correlate rather strongly (*r* = 0.55).[1] Consequently, a single component (see also Table 1)

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1 Items scoring high on the first dimension but not on the second gauge general time pressure (Ackaert & Swyngedouw, 1995), with no reference to leisure time pressure. The items that score high on the second dimension but not on the first dimension originate from a study

has high factor loadings (>0.5) and a strong Cronbach's alpha (α = 0.89). In this chapter, we therefore opt to use a single scale that measures subjective time pressure.

In the analyses, we used a sum scale that ranges from 0 to 100 in which a higher score refers to a higher subjective time pressure.

Duration of leisure time: The duration of leisure time was calculated by summing all the leisure activities the respondents participated in during the seven days they kept a diary. Leisure also included time spent on social activities such as speaking or visiting friends and family. Leisure time was measured in hours and centred on the mean for women and men separately. An increase of one unit should be interpreted as an increase of one hour from the mean by gender (32 hours for men; 27.3 hours for women).

Timing of leisure time: The timing was calculated based on the share (in %) of weekend leisure time. The weekend was defined as the time between Friday 18:00 and Sunday 12:00. The lowest score is 0 % on weekends, while the highest score is 100 %. To avoid an overly skewed distribution the lower bound was capped to 20 %, while the upper bound was capped to 90 %. The variable used in the analyses was centred on the mean (51.1 % for men; 50.5 % for women). A one-unit increase in the analyses thus indicates a one percentage point increase from these averages.

Fragmentation of leisure time: Fragmentation was measured by summing all the episodes of leisure time, which was subsequently divided by the full duration of leisure time (as described above). The variable expresses the number of activities per hour of leisure time. The mean is 0.6. We used three categories: 0 to 0.4 activities per hour, 0.4 to 0.6 activities per hour (reference category) and greater than 0.6 activities per hour.

Diversity of leisure repertoire: Diversity was calculated as the number of different leisure activity groups a respondent participated in over seven days. All the leisure and social activities were grouped in thirteen categories. The respondent had to spend at least ten minutes on an activity for it to be counted. A score ranging between 1 and 13 was obtained for every respondent. The mean is 4.7. The variable used in the analyses was centred on the mean (4.7 for men; 4.8 for women). A one-unit increase in the analyses thus indicates that the respondents participated in one additional activity group from these means.

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that measures leisure time pressure specifically (Peter & Raaijmakers, 1998). This suggests that general time pressure and leisure time pressure can be considered somewhat different concepts. However, there is a large degree of overlap between the two concepts.

Contamination of leisure time: Contamination measures the extent to which respondents combine leisure activities with (paid and unpaid) work activities. We use two dummies: 0 = no contaminated work time; 1 = at least one leisure activity contaminated by paid or unpaid work.

Control variables: We controlled for the effects of leisure time dimensions on subjective time pressure with different background variables. We investigated the following characteristics: age (younger than 40 [reference category], 40-49, 50-65 years old), level of education (no to lower secondary education, higher secondary education [reference category], tertiary education), having a partner (no partner [reference category], partner) and having children (no children [reference category], one or more children younger than seven, one or more children between seven and 25 but no children younger than seven years old).

Analytic strategy

In a first step, we examined the degree of time pressure in a linear regression with the duration of leisure time only and controlled directly for the background variables. In a second step, we added the other dimensions (timing, fragmentation, diversity, and contamination) of leisure time to Model 1. In a final step, we checked for meaningful interactions between the dimensions of leisure time and the background variables. All the models were run separately depending on gender (male, female).

Results

Model 1 in Table 2a-b demonstrates that, when controlled for background characteristics, the duration of recreative time has a significant negative effect on subjective time pressure for both men and women. The more time is spent on leisure activities, the less time pressure both men and women experience. For every hour more recreative time that men have, their subjective time pressure decreases with 0.25 (on a scale from 0 to 100). For women, this decreases by 0.35 per additional hour of leisure. The impact of the background variables differs somewhat between women and men in Model 1. For men, Model 1 shows that the educational level affects subjective time pressure. Working men with a degree in higher education (tertiary education) experience more time pressure (b = 2.85) than men without a degree in higher education. Regarding the subjective time pressure of women, Model 1 shows that age, educational level and having a child younger than seven years old are important. Women between

40 and 49 years of age experience less subjective time pressure (b = –3.74). In addition, Model 1 demonstrates that women with a child younger than seven (b = 4.14) and women with a child between seven and 25 years of age (b = 3.15) experience higher subjective time pressure than women who do not live with any children. Having children therefore increases the feelings of time pressure for women. Finally, we find that women with a degree in secondary education experience more time pressure than women with a degree in higher education (b = –3.82) and women with a no degree or a lower than secondary education (b = –4.57). This is somewhat contradictory to what we would expect and is also in contrast with what we find for working men, where the higher-educated experience most time pressure. We discuss this in the next section.

In Model 2 we add the four other dimensions of leisure time to the variables in Model 1. Interestingly, the betas for the number of hours of leisure time were roughly equal between men and women in Model 1. In Model 2, the beta of the number of hours of leisure time decreases substantially for women (from β = –0.19 in Model 1 to β = –0.15 in Model 2), while it increases slightly for men (from β = –0.18 in Model 1 to β = –0.20 in Model 2). This suggests that the relationship between subjective time pressure and the number of hours of leisure time for women decreases once the way women spend their leisure time is examined, whereas for men it increases slightly.

For men, Model 2 does not show any additional significant effects. None of the other dimensions of leisure time have a significant impact on men's subjective time pressure. The duration of leisure time proves to be the only dimension that affects time pressure. The results regarding the background characteristics remain stable after the insertion of the other dimensions of leisure time.

For women, Model 2 demonstrates important effects of two other leisure-time dimensions. Diversity in the leisure repertoire is negatively associated with time pressure. This means that the more diverse the repertoire of leisure activities that women engage in, the less time pressure they experience. In addition, the contamination of leisure activities (with paid or unpaid work) is detrimental for subjective time pressure. Women who combine at least some of their leisure time with work activities experience more time pressure than those women who do not combine their leisure with work (b = 2.89). While this quality of leisure does not affect the subjective time pressure of men, it is important in explaining some of the variation in women's time pressure. Finally, the duration of leisure time remains the most important dimension, although the effect has decreased to –0.26 now that more dimensions of leisure time are added.

Table 2a. Multiple linear regression analyses of Subjective Time Pressure for men (n = 910)

	Model 1					Model 2				
				CI [95 %]					CI [95 %]	
	b	sig.	β	Lower	Upper	b	sig.	β	Lower	Upper
(Constant)	37.037	***		34.014	40.059	36.133	***		32.71	39.556
Leisure Time Dimensions										
LT in hours *(centred)*	-0.251	***	-0.182	-0.343	-0.16	-0.276	***	-0.2	-0.392	-0.161
% of LT in weekend *(centred)*						0.059	n.s.	0.05	-0.019	0.137
Fragmentation of LT *(ref.: 0.4-0.6 activities per hr)*										
0-0.4 activities per hr						2.39	n.s.	0.066	-0.225	5.005
>0.6 activities per hr						0.725	n.s.	0.022	-1.765	3.216
Diversity of LT *(centred)*						0.341	n.s.	0.036	-0.373	1.055
Contamination of LT *(ref.: no contamination)*										
Contaminated LT						1.265	n.s.	0.04	-0.812	3.342
Control variables										
Age *(ref.: ≤39 yrs)*										
40-49 yrs	0.313	n.s.	0.009	-2.404	3.031	0.248	n.s.	0.007	-2.477	2.974
50-65 yrs	1.206	n.s.	0.037	-1.49	3.902	1.064	n.s.	0.033	-1.637	3.764
Educational level *(ref.: higher secondary education)*										
Lower secondary education	1.788	n.s.	0.051	-0.75	4.326	1.876	n.s.	0.054	-0.68	4.431
Tertiary education	2.852	*	0.089	0.537	5.166	2.445	*	0.076	0.045	4.844
Partner in household *(ref.: no partner)*										
Partner	0.649	n.s.	0.015	-2.299	3.596	0.693	n.s.	0.016	-2.27	3.655
Children in household *(ref.: no children)*										
Youngest child ≤6 yrs	2.48	n.s.	0.065	-0.528	5.489	2.156	n.s.	0.056	-0.883	5.195
Youngest child 7-25 yrs	-0.391	n.s.	-0.012	-2.895	2.113	-0.612	n.s.	-0.019	-3.122	1.897
R²	0.052					0.06				

Notes: B = unstandardised regression coefficient, sig. = significance, β = standardised regression coefficient, CI = confidence interval.
Levels of significance: *** p ≤ 0.001, ** p ≤ 0.010, * p ≤ 0.050, n.s. = not significant

Table 2b. Multiple linear regression analyses of Subjective Time Pressure for women (n = 775)

	Model 1					Model 2				
				CI [95 %]					CI [95 %]	
	b	sig.	β	Lower	Upper	b	sig.	β	Lower	Upper
(Constant)	44.568	***		40.91	48.226	40.991	***		36.768	45.214
Leisure Time Dimensions										
LT in hours *(centred)*	-0.345	***	-0.192	-0.473	-0.217	-0.264	***	-0.147	-0.421	-0.108
% of LT in weekend *(centred)*						0.06	n.s.	0.046	-0.033	0.153
Fragmentation of LT *(ref.: 0.4-0.6 activities per hr)*										
0-0.4 activities per hr						2.138	n.s.	0.04	-1.856	6.132
>0.6 activities per hr						2.027	n.s.	0.059	-0.812	4.866
Diversity of LT *(centred)*						-1.056	*	-0.099	-1.947	-0.165
Contamination of LT *(ref.: no contamination)*										
Contaminated LT						2.885	*	0.083	0.445	5.326
Control variables										
Age *(ref.: ≤39 yrs)*										
40-49 yrs	-3.741	*	-0.102	-7.086	-0.395	-3.214	n.s.	-0.087	-6.567	0.139
50-65 yrs	-0.058	n.s.	-0.002	-3.289	3.172	0.581	n.s.	0.016	-2.686	3.848
Educational level *(ref.: higher secondary education)*										
Lower secondary education	-4.572	*	-0.094	-8.216	-0.929	-4.247	*	-0.088	-7.907	-0.588
Tertiary education	-3.819	**	-0.11	-6.434	-1.204	-3.259	*	-0.094	-5.942	-0.576
Partner in household *(ref.: no partner)*										
Partner	0.385	n.s.	0.009	-2.542	3.313	0.519	n.s.	0.013	-2.402	3.439
Children in household *(ref.: no children)*										
Youngest child ≤6 yrs	4.14	*	0.086	0.152	8.128	3.075	n.s.	0.064	-0.968	7.119
Youngest child 7-25 yrs	3.156	*	0.091	0.263	6.048	2.922	*	0.084	0.025	5.819
R²	0.07					0.086				

Notes. B = unstandardised regression coefficient, sig. = significance, β = standardised regression coefficient, CI = confidence interval.
Levels of significance: *** p ≤ 0.001, ** p ≤ 0.010, * p ≤ 0.050, n.s. = not significant.

Model 2 shows that the effects of the background variables have shifted for women after adding the other dimensions of leisure time. Age no longer affects subjective time pressure, nor does having a child under the age of seven. Many of the effects that were found in Model 1, although still significantly affecting time pressure, have decreased in effect size after adding the other leisure-time dimensions. Similarly with the findings in Model 1, women with a degree in secondary education experience more time pressure than women with a lower (b = −4.25) or tertiary degree (b = −3.26). Although this might seem to be contradictory, additional analyses (not shown here, but available on request from the first author) reveal that a possible explanation for this observation lies in the total workload of women: women with a degree in secondary education spend the most amount of time on work (both paid and unpaid work) than the other two educational groups.

For women, we found several interaction effects between background characteristics and two leisure-time dimensions: diversity in leisure activities and contamination of leisure activities (Figure 1). First, the negative effect of diversity on feelings of time pressure does not hold up for women without young children (up to seven years of age). For women without children and those who have children between the ages of seven and 25, a rich repertoire in leisure activities is associated with lower feelings of time pressure. When young children live in the household, a very diverse leisure repertoire only leads to more subjective time pressure for working women. The interactions between diversity and age are also in line with this: for women in the busy age (25-39 years of age) a high level of diversity in leisure activities is associated with higher time pressure, while for older women a high diversity in leisure activities is associated with lower time pressure. Second, contaminated leisure time weighs more on the time pressure of women in the busy age and on women with young children. For women with children under the age of seven, time pressure is already high without contamination of their leisure time, but contamination additionally proves to increase those feelings of strain. The gap in experienced time pressure between women with young children and women with older children becomes visibly bigger in the case of contaminated leisure time.

Comparing the impact on women and men of several dimensions of leisure time, the results demonstrate that for men the duration of leisure is the only dimension that affects subjective time pressure. However, for women, the results prove to be more complex. Although the duration of leisure is important for women too, other dimensions such as the diversity of the leisure repertoire and the contamination of leisure time, are also important dimensions to consider when studying women's time pressure. For women in busy age groups,

Figure 1. Interactions of Contamination and Diversity of Leisure Time with age category and children in the household for working women (n=775)

Contamination*Age category

— 25 to 39   ⋯⋯ 40 to 49   — 50 to 65

Contamination*Children in the household

— No children   ⋯⋯ At least one child <7 yrs   — At least one child 7-25 yrs

Figure 1. Continued

Diversity of LT*Age category

Diversity of LT*Children in the household
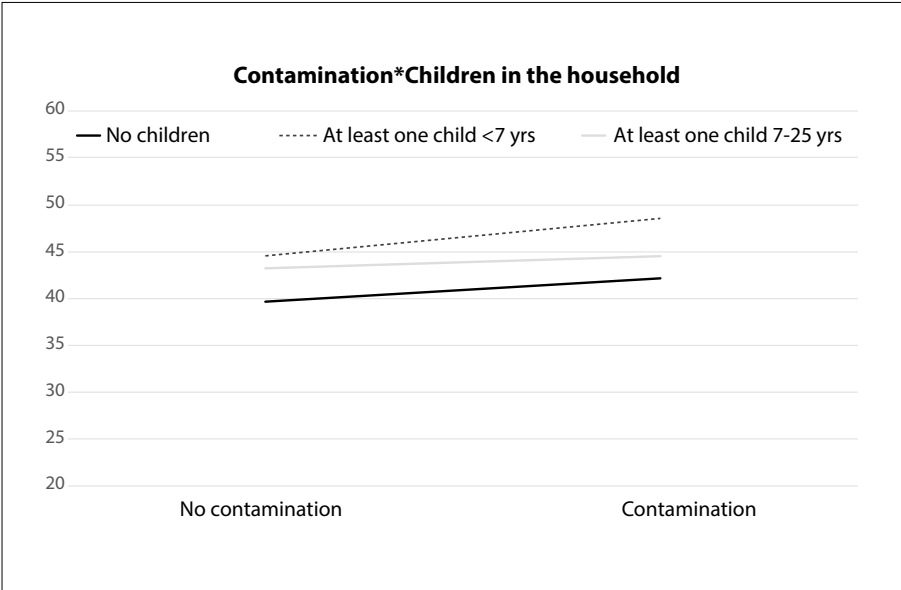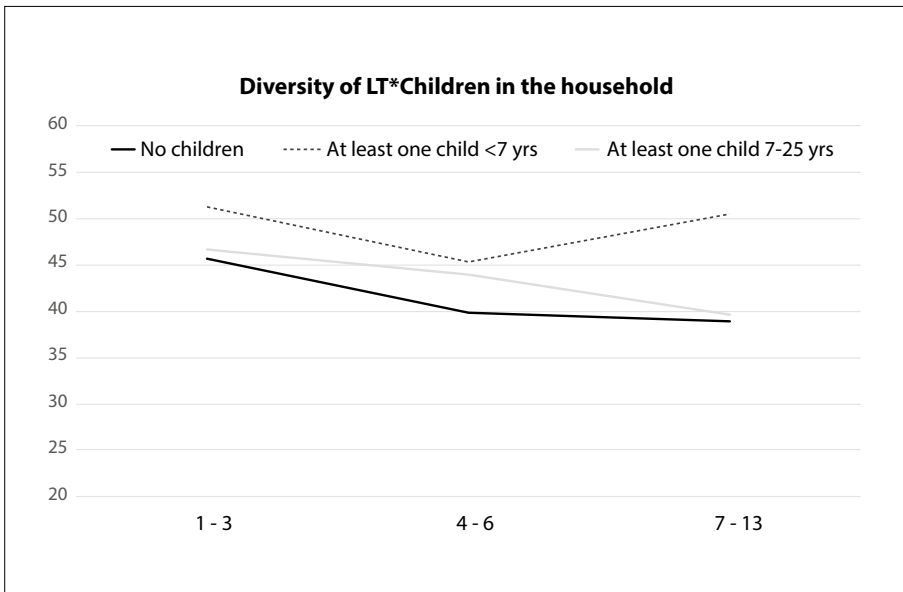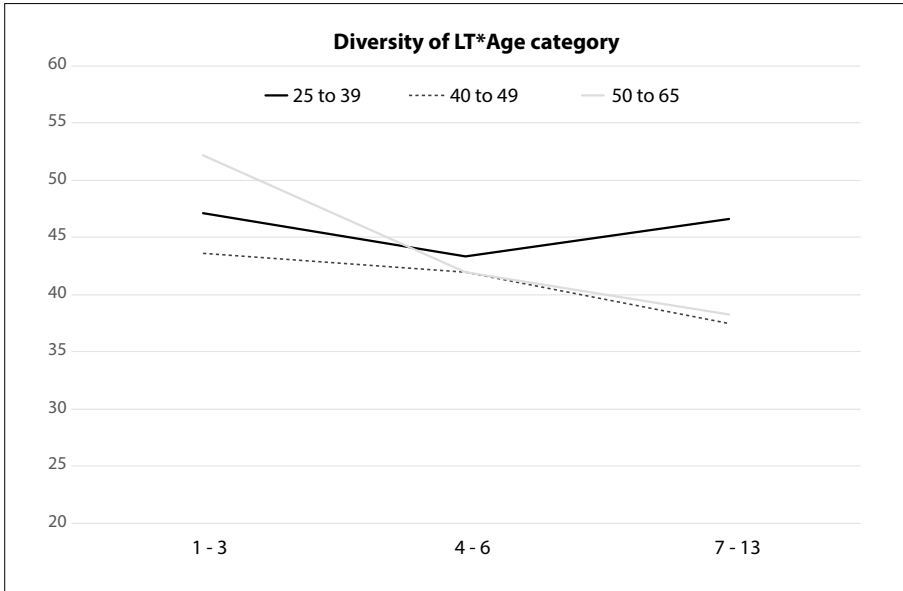
who daily face heavy time demands, a higher diversity in leisure activities is associated with high levels of time pressure. Contamination also weighs more heavily on the experienced time pressure of mothers with young children and women in their late 20s and 30s.

Discussion and Conclusion

Trying to gain a better grasp of the seeming paradox between the increase in leisure time and the simultaneous increase in subjective time pressure over time (Gershuny, 2000; Robinson & Godbey, 2005), the aim of this chapter was to investigate the extent to which different dimensions of leisure time beyond duration contribute to subjective time pressure. As several authors have found differences in women's and men's time use (Chatzitheochari & Arber, 2012), their quality of time (Bittman & Wajcman, 2000) and their differential impact of the duration of free time on subjective time pressure (Mattingly & Sayer, 2006), we stratified our analyses by gender.

We used time use data from the Flemish time diary study of 2013 to investigate the dynamics between feelings of time pressure of the employed (above the age of 25) and the temporal dimensions of their leisure time. The effect of the most common dimension of time, duration, was tested against other less frequently addressed dimensions, being fragmentation, timing, and contamination (by paid and unpaid work activities). Given the focus on leisure time and the voraciousness and volatile consumption of leisure in our contemporary society, we included the diversity or repertoire of leisure activities as a final indicator.

We conclude that the duration of leisure time is the most important and only dimension of leisure time that affects working men's subjective time pressure. Other leisure-time dimensions, as indicators of the way men spend their leisure time, do not affect the subjective time pressure of men. The relationship between time pressure and leisure time for employed women is more complex than that of working men. In addition to the duration of leisure time, the contamination of leisure (leisure activities combined with paid or unpaid work) and the diversity of the leisure repertoire affect women's subjective time pressure. The way women attribute their time to leisure activities proves to have an important impact. This is in line with Zukewich's (1998) findings, which demonstrate that explaining women's subjective time pressure is more complex than explaining that of men. Time spent in paid work is correlated with time spent in leisure, which also was the only important dimension in our analyses for working men. The impact of women's leisure-time dimensions

is linked to their roles and life stages. Employed women who have a more diverse repertoire of leisure activities experience lower subjective time pressure. However, this is not the case for women with young children at home and for women aged 25-39 (which is also called the "rush hour of life"; Moens, 2004). More diversity in the type of leisure activities of women with young children is associated with more subjective time pressure. We hypothesise that this is caused by the diversity of their leisure time not being the result of a free choice by these women but rather a consequence of various activities which are imposed on them by their children. For them, leisure is then not "the time with the fewest commitments" (Glorieux et al., 2010, p. 165) and a diverse leisure repertoire could instead be a sign of "intensive mothering" (Hays, 1996). In addition, and in line with findings from Offer and Schneider (2011), the "rush hour of life", in which many different roles are combined, is also associated with a higher contamination of leisure and this leads to much higher time pressure for employed women. As a result of gendered time norms and cultural ideology, employed women combine several important, contradictory, roles in their lives, whereas for men the most important role, by far, is their work role (Coser, 1991; Epstein, 2004). Women are still expected to spend disproportionately more time on childcare and household work activities in addition to spending time in paid work. The combination of multiple roles leads to more problems in time allocation and coordination for women (Coser, 1991) and, among other things, it affects the quality of their leisure time (Bittman & Wajcman, 2000). It is thus clear that the combination of different roles as worker and caretaker affect the different dimensions of leisure time for working women; and, as our findings show, these in turn affect their subjective time pressure. The focus on the duration of (leisure) time is thus justified when studying the subjective time pressure of working men. However, for working women the contamination of leisure time and the diversity of their leisure repertoire, in addition to the duration of leisure, are important to consider in future research. In line with Mattingly and Sayer (2006), the results presented in this chapter indicate that access to quality leisure time (uncontaminated by either paid or unpaid work) and a diverse repertoire of one's own choice are important aspects of gender equality. The paradox discussed above can thus be explained partially by looking beyond the duration of leisure and recognising that there are more (temporal) elements at play when dealing with changes in subjective time pressure, at least for women.

Referring to the quotation with which we started this chapter, it is not only time in general (Glorieux et al., 2006), but also leisure time in particular that has become a sensitive issue. This is particularly noteworthy because previous studies indicated that a higher amount of leisure time can effectively reduce

time pressure. A lack of time and feelings of time pressure can be reduced by more and better fulfilment of leisure time. For both men and women, society would do well to find more time for leisure. And for women specifically it is important to ensure that they find the time or the peace of mind to enjoy their leisure.

References

Ackaert, L. & Swyngedouw, M. (1995). *Onderzoeksrapport "culturele verschuivingen in Vlaanderen". Het ontwikkelen en uittesten van een vragenlijst ten behoeve van het ministerie van de Vlaamse Gemeenschap*. Centrum voor toegepaste multivariate statistiek, faculteit politieke en sociale wetenschappen, KUB.

Aguiar, M. & Hurst, E. (2007). Measuring trends in leisure: The allocation of time over five decades. *The Quarterly Journal of Economics*, *122*(3), 969-1006.

Anttila, T., Oinas, T., & Nätti, J. (2009). Predictors of time famine among Finnish employees – Work, family or leisure? *Electronic International Journal of Time Use Research*, *6*(1), 73-91.

Bittman, M. & Wajcman, J. (2000). The rush hour: The character of leisure time and gender equity. *Social Forces*, *79*(1), 165-189.

Chatzitheochari, S. & Arber, S. (2012). Class, gender and time poverty: A time-use analysis of British workers' free time resources. *British Journal of Sociology*, *63*(3), 451-471.

Coser, R. L. (1991). *In defense of modernity: Role complexity and individual autonomy*. Stanford University Press.

Craig, L. & Brown, J. E. (2017). Feeling rushed: Gendered time quality, work hours, nonstandard work schedules, and spousal crossover. *Journal of Marriage and Family*, *79*(1), 225-242.

Epstein, C. F. (2004). Border crossings: The constraints of time norms in transgressions of gender and professional roles. In C. F. Epstein & L. Kalleberg (Eds.), *Fighting for time: Shifting boundaries of work and social life*. Russel Sage Foundation.

Gershuny, J. (2000). *Changing times: Work and leisure in post-industrial societies*. Oxford University Press.

Gimenez-Nadal, J. I. & Sevilla-Sanz, A. (2011). The time-crunch paradox. *Social Indicators Research*, *102*(2), 181-196.

Glorieux, I. (2022). Measuring gender equality by means of time-use data: Bringing quality differences to the surface. *44th International Association for Time Use Research Conference, 17-19 August 2022, Montréal, Canada*.

Glorieux, I., Koelet, S., Mestdag, I., Minnen, J., Moens, M., & Vandeweyer, J. (2006). *De 24 uur van Vlaanderen. Het dagelijkse leven van minuut tot minuut*. LannooCampus.

Glorieux, I., Laurijssen, I., Minnen, J., & van Tienoven, T. P. (2010). In search of the harried leisure class in contemporary society: Time-use surveys and patterns of leisure time consumption. *Journal of Consumer Policy*, *33*(2), 163-181.

Glorieux, I. & Minnen, J. (2009). How many days? A comparison of the quality of time-use data from 2-day and 7-day diaries. *Electronic International Journal of Time Use Research*, *6*(2), 314-327.

Hays, S. (1996). *The cultural contradictions of motherhood*. Yale University Press.

Hill, R., Tranby, E., Kelly, E., & Moen, P. (2013). Relieving the time squeeze? Effects of a white-collar workplace change on parents. *Journal of Marriage and Family*, *75*(4), 1014-1029.

Jang, Y.-J., Lee, K.-Y., & Choe, H. (2012). Relationship between leisure time and time pressure: Gender differences in the moderating effect of gender role attitudes. *Korean Family Resource Management Association*, *16*(4), 195-211.

Kleiner, S. (2014). Subjective time pressure: general or domain specific? *Social Science Research*, *47*, 108-120.

Knulst, W. & van den Broek, A. (1998). Do time-use surveys succeed in measuring "busyness"? Some observations of the Dutch case. *Loisir et Société / Society and Leisure*, *21*(2), 563-572.

Laurijssen, I. (2012). Tijd voor half werk. Over deeltijds werk als combinatiestrategie. In M. Elchardus & I. Glorieux (Eds.), *Voorspelbaar uniek. Dieper graven in de symbolische samenleving* (pp. 52-81). LannooCampus.

Laurijssen, I. & Glorieux, I. (2013). Balancing work and family: A panel analysis of the impact of part-time work on the experience of time pressure. *Social Indicators Research*, *112*(1), 1-17.

Linder, S. B. (1970). *The harried leisure class*. Columbia University Press.

Mattingly, M. J. & Bianchi, S. M. (2003). Gender differences in the quantity and quality of free time: The U.S. experience. *Social Forces*, *81*(3), 999-1030.

Mattingly, M. J. & Sayer, L. C. (2006). Under pressure: Gender differences in the relationship between free time and feeling rushed. *Journal of Marriage and Family*, *68*(1), 205-221.

Minnen, J., Glorieux, I., van Tienoven, T. P., Weenas, D., Deyaert, J., van den Bogaert, S., & Rymenants, S. (2014). Modular online time use survey (MOTUS) – Translating an existing method in the 21st century. *Electronic International Journal of Time Use Research*, *11*(1), 73-93.

Minnen, J., Nagel, E., & Sabbe, K. (2020). *SOURCE TM: software outreach and redefinition to collect e-data Through MOTUS. Towards a modular online time use survey.* https://ec.europa.eu/eurostat/documents/9986036/10970806/847218_BE_final+report_Main+document.pdf

Moens, M. (2004). Under pressure. Time and time pressure in Flanders. *International Workshop Time Competition: Disturbed Balances and New Options in Work and Care, 24-25 June 2004, ICS, Utrecht, Netherlands.*

Moens, M. (2006). *Handelen onder druk. Een sociologische analyse van tijdsdruk als meervoudige ervaring.* Onderzoeksgroep TOR, Vakgroep Sociologie, Vrije Universiteit Brussel.

Mullens, F. & Glorieux, I. (2023). Not enough time? Leisure and multiple dimensions of time wealth. *Leisure Sciences, 45*(2), 179-198.

Offer, S. & Schneider, B. (2011). Revisiting the gender gap in time-use patterns: Multitasking and well-being among mothers and fathers in dual-earner families. *American Sociological Review, 76*(6), 809-833.

Pääkkönen, H. (1998). Are busy people under- or over-represented in national time budget surveys? *Loisir et Société / Society and Leisure, 21*(2), 573-582.

Peters, P. & Raaijmakers, S. (1998). Time crunch and the perception of control over time from a gendered perspective: The Dutch case. *Loisir et Société / Society and Leisure, 21*(2), 417-433.

Robinson, J. P. & Godbey, G. (1997). *Time for life: the surprising ways Americans use their time*. Pennsylvania State University.

Robinson, J. P. & Godbey, G. (2005). Busyness as usual. *Social Research, 72*(2), 407-426.

Rosa, H. & Scheuerman, W. E. (2009). *High-speed society: social acceleration, power, and modernity.* Pennsylvania State University Press.

Roxburgh, S. (2002). Racing through life: The distribution of time pressures by roles and role resources among full-time workers. *Journal of Family and Economic Issues, 23*(2), 121-145.

Rudd, M. (2019). Feeling short on time: Trends, consequences, and possible remedies. *Current Opinion in Psychology, 26*, 5-10.

Schwartz, B. (2004). *The paradox of choice. Why more is less*. HarperCollins.

Scitovsky, T. (1976). *The joyless economy*. Oxford University Press.

Sharif, M. A., Mogilner, C., & Hershfield, H. E. (2021). Having too little or too much time is linked to lower subjective well-being. *Journal of Personality and Social Psychology, 121*(4), 993-947.

Southerton, D. & Tomlinson, M. (2005). "Pressed for time" – the differential impacts of a "time squeeze". *The Sociological Review, 53*(2), 215-239.

Sullivan, O. (2007). Cultural voraciousness – a new measure of the pace of leisure in a context of "harriedness". *Electronic International Journal of Time Use Research, 4*(1), 30-46.

te Braak, P., van Tienoven, T. P., Minnen, J., & Glorieux, I. (2022). Bias in estimated working hours in time diary research: The effect of cyclical work time patterns on postponing designated registration days. *Time and Society, 31*(4), 508-534.

te Braak, P., van Tienoven, T. P., Minnen, J., & Glorieux, I. (2023). Data quality and recall bias in time diary research: The effects of prolonged recall periods in self-administered online time-use surveys. *Sociological Methodology, 53*(1), 115-138.

van der Lippe, T. (2007). Dutch workers and time pressure: Household and workplace characteristics. *Work, Employment and Society, 21*(4), 693-711.

van Tienoven, T. P., Minnen, J., & Glorieux, I. (2017). *The statistics of the time pressure scale*. Vrije Universiteit Brussel, Onderzoeksgroep TOR.

Vandeweyer, J. (2010). *Werkt Loopbaanonderbreking? Arbeidsoriëntaties, tijdsbesteding en drukte bij loopbaanonderbrekers in Vlaanderen*. VUBPRESS.

Vickery, C. (1977). The time-poor: A new look at poverty. *The Journal of Human Resources, 12*(1), 27-48.

Wajcman, J. (2015). *Pressed for time: The acceleration of life in digital capitalism.* University of Chicago Press.

Zerubavel, E. (1981). *Hidden rhythms: Schedules and calendars in social life.* University of Chicago Press.

Zukewich, N. (1998). *Work, parenthood and the experience of time scarcity.* Statistics Canada, Housing, Family and Social Statistics Division.

Zuzanek, J. (2004). Work, leisure, time-pressure and stress. In J. T. Haworth & A. J. Veal (Eds.), *Work and leisure* (*Issue 1*, pp. 123-144). Routledge.

Zuzanek, J. (2017). What happened to the society of leisure? Of the gap between the "haves" and "have nots" (Canadian time use and well-being trends). *Social Indicators Research*, *130*(1), 27-38.

Zuzanek, J. & Beckers, T. (1999). Time pressure, time use, and leisure: What makes people feel rushed in Canada and The Netherlands? *Ninth Canadian Congress on Leisure Research, Wolfville (NS) 12-15 May 1999.*

Time use research and media studies: from mutual inspiration to a joint research outlook

Ike Picone • Ruben Vandenplas

In Belgium and beyond, the media landscape continues to change at an increasing pace. If we compare data from the previous Flemish (Northern region of Belgium) Participation Survey (PaS) 2014 (Lievens et al., 2015) to more recent data on media use (Sevenhant et al., 2022, p. 27), for example, we can note several landslide changes in the rapid emergence of media such as smartphones and streaming platforms, and their prominent position within media diets. While this growth in media empowers users by opening them up to an increasing variety of different practices to choose from, anytime, anywhere (Dwyer, 2010, p. 6), the contemporary mediascape also comes with significant challenges to audience researchers.

Concretely, how can we continue to capture and explore media practices when these practices are becoming increasingly ubiquitous (while scattered across time and space), and multiplex (while converging and coinciding with one another)? Indeed, while authors have argued that the cross-media practices of contemporary audiences are hardly a novel feat, in the sense that they are brought about by the process of digitalisation (e.g., Schrøder, 2011, p. 6), today's media landscape has certainly amplified the extent to which contemporary users can and do engage in cross-media practices.

This complexity leads audience researchers to grapple with the following questions. On a conceptual level, how can we capture the various media practices that users engage in, as well as the different locations, situations, and times in which they take place – and which strongly impact how users experience them (cf. Courtois et al., 2013; Evens et al., 2022; Silverstone, 1994)? At a methodological level, how can we design an instrument that allows for explorations of cross-media practices that can grasp the multitude of media interactions users engage in while also withstanding the continuous evolution and changes of the media landscape?

As Schrøder notes with regard to longitudinal surveys on media use, the rapidly changing media environment has significant implications for the replicability and meaningfulness of the questionnaire (Schrøder, 2015, p. 64). Indeed, recent trend data from the PaS demonstrates how several brands and technologies have come and gone since the last survey in 2014. Some forms of participation might remain stable for five years, but half a decade is a lifetime when it comes to media. As a result, even yearly surveys on media use such as the Digital News Report (e.g., Newman et al., 2022) are prompted to continuously re-evaluate the different media brands and platforms active in the media landscape.

In this chapter, we look back at the Modular Online Time Use Survey (MOTUS) project and how it kicked off an inspiring dialogue between media studies and time use research that held the promise of tackling some of these conceptual and methodological challenges. We discuss how this dialogue resulted in a more refined way to survey media in the MOTUS time use survey, on the one hand, and in a more future-proof way to probe media use in the most recent iteration of the PaS (carried out by the Knowledge Centre Culture and Media Participation from 2020 to 2022), on the other hand.

We then build on that experience to look forward and discuss the contributions that can thus be made by time use research to the development of cross-media approaches within audience studies. More specifically, we argue for using media-related activities (e.g., watching, listening, reading) rather than media devices as an entry point into surveying a user's cross-media practices. By turning the primary focus to activities rather than specific media devices or brands, we argue that the main skeleton of media use surveys gains a more durable character that facilitates much-needed longitudinal explorations of media exposure.

We then also identify a series of hurdles that need to be overcome for time use surveys to be implemented in media studies. More possible integrations do remain on the horizon, especially with the media repertoire approach in media studies. Hasebrink and colleagues (Hasebrink & Domeyer, 2012; Hasebrink & Hepp, 2017), for example, indicate the socio-spatial context of media use as a potential dimension in the construction of media repertoires, but this has yet to be implemented more commonly in quantitative operationalisations of repertoires – although some notable examples exist in previous studies (e.g., Schrøder, 2015). We therefore conclude with a first go at entering the media repertoire approach into a conversation with time use studies, convinced that it could provide an answer to questions relating to the role of the socio-spatial context in audience studies.

Looking back on MOTUS – a collaboration between media scholars and time use researchers

The MOTUS project was set up by time use researchers, but also included media scholars, which made for a fruitful dialogue between media studies and time use research. Admittedly, some of the more ambitious prospects for cross-fertilisation between both strands of research we envisioned back then failed to materialise – which we will come back to in the final section of this chapter. Nevertheless, this dialogue informed both the time use research in the MOTUS project and then later the audience research in the PaS-2020.

Navigating time use research into the era of cross-media use

MOTUS was a pilot project to build an online and modular infrastructure for the registration of time use (Minnen et al., 2014). The modular aspect entailed the possibility to include thematic modules in the survey with additional questions. Our research group in media and technology studies was responsible for helping design the media module, one of the two modules to be integrated into the data collection.

At the time, media scholars were realising that ever more aspects of people's daily lives were mediated, which led Mark Deuze (2011) to coin the term "media life". Media use had now truly "left the building" as digital and mobile technologies made it possible to consume media content anytime and anywhere. The widespread availability of mobile devices was increasingly detaching objects from specific contexts (Courtois et al., 2013, p. 5). For example, the consumption of audio-visual news used to be largely confined to the living room, but media scholars already envisioned the media world of today, where the consumption of mobile video news is widely adopted.

Traditionally, media studies are greatly informed by the notion of media as content and media as a device, what seminal media scholar Roger Silverstone called the double articulation of media (Livingstone, 2016, p. 6). The fact that all kinds of media could now be used anytime, anywhere incited a discussion on a triple articulation, one where media gets its meaning through an articulation of device, content, and the specific socio-spatial context in which its consumption takes place (Courtois et al., 2013; Hartmann, 2006). This was, in broad strokes, the backdrop against which the exchange of thoughts between our two teams took place. How did our research into media audience then inform the time use research in the MOTUS project?

At that time in time use research, media activities were very often considered as a means or as a secondary activity, making it very likely to be underreported. As Joeri Minnen (2014, p. 77) and his colleagues working on MOTUS then noted:

> People can listen to music while they work, use their media device to read a book or watch a movie on their tablet PC while traveling by train. Often in these cases, respondents would only report their main activities.

This observation resulted in a first adaptation of the flow of the questionnaire in the media module: for each logged activity, respondents were asked whether they used a media device. When people would report having used a media device during their activity, further questions would be asked regarding the nature of this media activity.

Devising these extra questions is a second aspect where we were able to contribute as media scholars to the pilot project, and here, we were inspired by the triple articulation approach. From a personal point of view, it was rather remarkable to see a discussion on the importance of the socio-spatial context for media use emerge in our field just when we got involved in a time use survey, where questions about the company one keeps and about the location one performs activities in are traditionally part of the research design. While we as media scholars saw the potential for probing this bespoke third articulation right there, we noticed on the other hand that the articulation of media as device and content was lacking in time use research so far.

In general, in time use research, media use was probed by including media-related activities in the activity list. These activities were still formulated in "analogue" terms, namely attaching specific modes of consumption to specific devices. Examples are "watching TV", "listening to the radio", or "reading an online newspaper". In a digital, converged world, "watching television", for instance, acts as a "black box" obfuscating what is happening. Does it mean "watching via a television device"? Or does it mean "watching content made for television"? In this example, the importance of the double articulation of media becomes apparent: when probing media activities, it is crucial to differentiate between the device used and the content consumed. To reflect this differentiation, we adapted the media activities list and the flow of questions.

We were inspired by the work of Sonck and Pennekamp (2014) for the Dutch planning bureau monitoring sociocultural well-being in The Netherlands. They set up a time use study that focused on media. Their activity list of media practices included activities that were detached from the device used or content consumed. At first, respondents were asked whether they watched,

listened to, or read any piece of content, supplemented by questions asking whether they communicated via ICT or played video games. Only then, at a secondary level, were the respondents asked to choose from a list of respective activities to indicate a more specific one, for example, for watching: watch a television programme at the time of broadcast; watch a television programme at another time; watch movies, documentaries, series, news or sports (that were not on television); watch other videos; or view photos. In addition, for each media activity registered, the respondents were also asked on which device they performed it.

For MOTUS, we adopted this approach but went a step further in differentiating between media as device and media as content by adding an extra step, and asking people what kind of media content they consumed. Also, the participants in the media module were given the additional question "did you use any media during this activity?" when completing their activities. This could act as an "incentive" for the respondent to still enter the media activity as a secondary or even tertiary activity. It turns out that as many as 89 % (compared to only 57 % for the whole sample) of those who were in the media module indicated listening to music and radio during the week. Of those who reported listening to radio and music, proportionately 42 % indicated doing so as a secondary and 53 % as a tertiary activity. These findings show that listening to music and radio is increasingly happening in the background and often unconsciously, because when not implicitly asked, this activity is often not recorded either (de Korte et al., 2016, p. 26).

This is a good illustration of why a dedicated approach for probing media use in time use research is relevant to account for the often subtle ways in which media use permeates everyday life. In combination with questions about where and with whom activities were taking place, this approach made for a future-proof media module in time use research, even though, as we will discuss in the final part, it is not without challenges.

Drawing upon time use research to redevelop the PaS-2020

While the interdisciplinary nature of the PaS-2014 provided a salient context for the exploration of macro-sociological processes such as the mediatisation of cultural participation (Vandenplas & Picone, 2021), the questionnaire on media use was far from ideal for the exploration of media repertoires: a concept which captures all of the media that users engage with regularly to explore media practices cross-medially (e.g., Hasebrink & Domeyer, 2012; Hasebrink & Hepp, 2017; Hasebrink & Popp, 2006). This led us to revise the media questionnaire of the Participation Survey for its next iteration, built from the

ground up with media repertoires in mind, and with a sustainable goal that requires minimal changes to the questionnaire over time. As Kim Schrøder notes with regard to longitudinal surveys on media use, the rapidly changing media environment has significant implications for the replicability and meaningfulness of the questionnaire (Schrøder, 2015, p. 64). A challenge which we sought to overcome by drawing upon media time (Sonck & Pennekamp, 2014) and time use research (Minnen et al., 2014; Picone, 2016) and by adopting media-related activities such as watching, listening, or reading as an entry-point into our survey of media practices.

What's more, the focus of the PaS-2014 on the use of specific media devices as a proxy for media practices (e.g., using a television set as a proxy for watching audiovisual content) struggled to account for the various ways in which users can access media content in the age of convergence (Bjur et al., 2014, p. 15; Peil & Sparviero, 2017, p. 4). As recent data on media use in Flanders shows, Flemish media users have rapidly adopted different devices and platforms for the consumption of content, as watching television through online platforms, or the use of streaming services, has grown significantly in the past five years (Sevenhant et al., 2022).

Concretely, these insights led to the construction of a layered questionnaire (see Figure 1) which (1) first identifies the range of devices an individual used in the past month as a baseline for the rest of the survey and after gauging (2) whether a respondent engaged in a certain activity in the past month departs from (3) specific activities (e.g., watching, listening, reading) to identify the different types of media content that person used. Finally, (4) respondents were asked to indicate which devices (out of those they owned) were used for that activity. This allows one to gather not only which devices a person has used throughout the last month, but also which of these devices were used for a specific activity. In doing so, this layered approach adds more complexity and nuance to the construction of media repertoires in general and in addition opens up the possibility to delve more deeply into specific subsets of the repertoire, such as a person's audio or gaming repertoire.

Figure 1. Visual overview of the layered approach to the PaS-2020 questionnaire
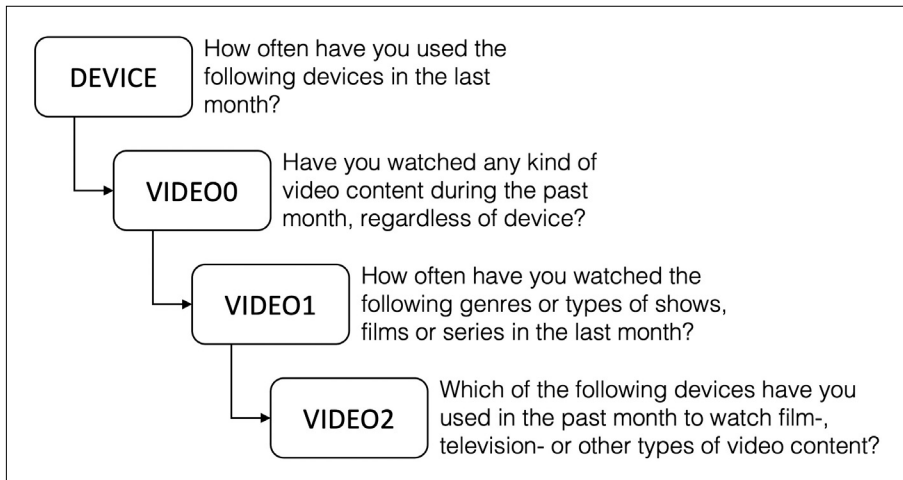
Applications of the layered approach to media exposure

Before looking at the future that MOTUS might hold for researching media use, we give a short overview of concrete applications of this layered approach inspired by time use research.

Constructing media repertoires

The layered approach that we implemented in the PaS-2020 is made in such a way that it facilitates the construction of a user's entire media repertoire. As briefly discussed earlier in this chapter, media repertoires are a concept put forward prominently in the work of Uwe Hasebrink, which captures "the entirety of media he or she regularly uses" (Hasebrink & Domeyer, 2012, p. 758). Key to this concept is the idea that all media within the repertoire are in some way interrelated with one another (Hasebrink & Domeyer, 2012; Hasebrink & Hepp, 2017). Indeed, rendered even more visible by the process of convergence, the same devices can be used for a wide range of activities, and within a single activity, such as viewing or reading (news), users often rely on a range of platforms and devices to fulfil their needs.

Taking the example of news repertoires specifically, accounts of a user's news routines often highlight how these different practices both fit within the everyday routines of the user (Vandenplas et al., 2021), but also complement

one another in meaningful ways. Reading the news in the morning on one's smartphone might be one's first daily encounter with news, which is further supplemented with occasional newsletters or news through social media feeds, and a daily viewing of the evening news broadcast on TV. While every single one of these news practices could be captured and looked at in isolation, exploring how these practices are interrelated with one another, however, is "key to understanding people's media use" (Hasebrink & Domeyer, 2012, p. 757) and getting a real sense of how they engage with media and the role that it plays in their everyday lives.

In their outline of an agenda of media repertoire studies, Hasebrink and Domeyer (2012) identify different salient components for the construction of media repertoires, although this consists of a non-exhaustive list: (1) media types, (2) genres, (3) topics, (4) concrete products or brands, or (5) social contexts. Most commonly, however, authors have constructed media repertoires based on the different media devices, platforms, and types of media content a user engages with regularly. Nevertheless, some examples that include lesser-used components such as sociospatial context exist (Evens et al., 2021; Schrøder, 2015) and also explorations of smaller subsections of the general repertoire such as news (Edgerly et al., 2018; Picone & Vandenplas, 2021; Strömbäck et al., 2018; Truyens & Picone, 2021) or audiovisual repertoires (Evens et al., 2021).

In our research based on the PaS-2014, we similarly constructed media repertoires by using components that indicate both the use of media devices and content (through the use of specific media brands) (e.g., Picone & Vandenplas, 2021; Vandenplas & Picone, 2021). However, in its newest iteration, we moved away from surveying specific media brands in favour of extending the questionnaire into questions that probed respondents on media-related activities – in line with time use research (Minnen et al., 2014) – their engagement with media genres (which often extend beyond a single activity, thus allowing for further comparability) and their use of specific devices for each activity (see Table 1 below for a comparison between both iterations of the PaS survey).

Table 1. Overview of components in the construction of media repertoires

PaS-2014	PaS-2020
Media devices	Media devices
Media brands	Media-related activities
	Media genres
	Devices used for activity

This layered approach thus allows for the construction of media repertoires that is less prone to consist of time-sensitive components such as specific media brands or platforms. This does limit the potential for these media repertoires to speak to the omnivorousness of repertoires in terms of combinations of highbrow or elevated brands with lowbrow or popular brands (e.g., Picone & Vandenplas, 2021; Vandenplas & Picone, 2021). However, the diversity of the different repertoires can be evaluated based on the range of genres related to the various activities that users of the repertoire engage with (e.g., a repertoire which combines genres of video content related to documentary, culture, or news with popular genres such as reality-TV or sitcom).

Moreover, whereas the PaS-2014 questionnaire struggled to account fully for processes of convergence, the layered PaS-2020 questionnaire can more thoroughly engage with the different ways in which users employ the same devices for different activities within the current media landscape. What's more, as recent studies highlight that social stratification in media use persists (Hartley, 2018; Kim, 2016; Lindell, 2018; Lindell & Hovden, 2017; Sevenhant et al., 2022; Vandenplas & Picone, 2021;), doing so allows us to also speak to which users have benefited most in the age of convergence, and are most enabled to engage in cross-media practices, and which users are potentially left behind and hardly reap the benefits of a high-choice and converged media landscape.

Spotlight media-related activities

Aside from being built with the construction of media repertoires in mind, the new layered approach centred on media-related activities in the PaS-2020 questionnaire also allows for heightened flexibility in the different perspectives from which the data can be analysed. Concretely, the layered structure of the questionnaire can also be used to highlight specific subsections of a user's repertoire. It thus provides a glimpse of the user's video, audio, or gaming repertoire, mapping the various genres that the user engages in for that activity, in addition to the devices they rely on to do so.

Whereas this approach to analysing the questionnaire is reminiscent of studies on news and information (Peters et al., 2022; Picone & Vandenplas, 2021; Truyens & Picone, 2021), audio-visual (Evens et al., 2022), or channel repertoires (Heeter, 1985), it retains an emphasis on exploring cross-media practices by foregrounding the activity that users engage in and on foregoing a media-centric approach that studies the different channels or brands a user engages with on a single device.

Deep dive into specific media devices

Finally, the questionnaire allows one to highlight specific media devices, such as the PC or smartphone, to further explore the different ways in which contemporary media users employ the range of devices available to them. One such example can be found in the increasing number of cord-cutters (Sevenhant et al., 2022), users who forego watching television on their TV-set, and instead use their computer or laptop to stream audio-visual content on demand. To these users, the computer has become a hub for a large part of their media activities, while the television set appears to be uprooted from their repertoire. However, the growing number of cord-cutters does not necessarily mean that all users have uprooted traditional media devices from their repertoires.

Preliminary explorations of the PaS-2020 data on media repertoires indicate that a small yet significant number of users retain a limited repertoire that still relies primarily on traditional devices for media-related activities, such as watching media content on their TV, listening to media content through the radio, and getting their news from newspapers. As a result, not all media users have resorted to highly converged digital media such as smartphones and PC's as "Swiss army knives" in their repertoires that they employ for a wide range of activities. This, in turn, re-emphasises the different ways in which these various approaches to studying media exposure in a high-choice and convergent media landscape can bring to light the remaining issues of social stratification in (cross-)media use.

The future of media (and) time use research

As discussed in this chapter, the constructive dialogue we as media researchers started with time use research a decade ago through our participation in the MOTUS project have helped further our thinking about how to probe media use in a transforming media landscape. Thinking in activities has allowed us to redesign an existing survey questionnaire for media use in a future-proof way, allowing us to register large categories of media use over time while allowing the flexibility necessary to incorporate new media devices, genres, and practices. The other way around, untangling media activities into device use and content consumption has made for a more accurate measuring instrument in the MOTUS project.

However, it is fair to admit that the potential we envisioned at the time for MOTUS – and by extension time use research – for media studies has not been fully realised in the ten years since. The reasons for this vary. Many of them are,

however, likely to resonate with researchers across the social sciences trying to "digitise" the collection of quantitative data about social practices. To conclude this chapter, we look to the future, at both the potential of time use research in media studies and the hurdles it needs to overcome.

Promise of automated logging of behavioural data

Survey research can capture important aspects of media use sufficiently to use it to compile quantitative mappings of a person's media repertoire. But media use today is so ubiquitous and ephemeral that other methods are necessary to capture these ephemeral and fleeting forms of media use (Picone, 2018). The example discussed above of participants forgetting to register listening to music or radio in their diaries unless explicitly prompted is a good illustration of how self-reporting falls short of grasping relevant media activities. But also, the opposite has been identified repeatedly in survey research: media consumption being over-reported or affected by social desirability (Bach et al., 2022, p. 2; Makhortykh et al., 2021, p. 261).

One way forward, as we argued before (Picone, 2016), is to integrate into time use research metered data, also called web-tracking data or digital trace data: behavioural data that are "generally collected from a sample of participants who willingly install or configure, onto their devices, technologies that track digital traces left when people go online" (Bosch & Revilla, 2022, p. 1). We can think of the URLs or apps visited or the terms used in search engines or the content all of which can give us an indication of the type of content that participants have been exposed to, at what time, and for how long. Especially through smartphones, metered data can be complemented with geolocation data obtained through a tracking application installed on participants' mobile devices that registers at least the GPS coordinates (Revilla, 2022). This in turn can give an indication of where people were while consuming media, which is especially interesting to grasp media use "on the go".

In comparison to (diary) survey data, these data types have the advantage that they can be collected right when activities take place free of recall issues, with a granularity not achievable by surveys, and without the burden of self-reporting activities throughout the day (Bosch & Revilla, 2022; Revilla, 2022). Initially, this prospect made the proponents of metered data suggest that it could replace traditional data sources such as survey data, but recent work emphasises instead the role of digital trace data to enrich and augment survey data (Bach et al., 2022, p. 2).

From the outset, MOTUS was envisioned as an infrastructure that would comprise other data streams to complement the digital diary survey the

project intended to provide. MOTUS would then act not only as a digital and mobile diary survey, but also as a data management platform, where different data streams, including metered data provided by tracking apps, could be integrated, and connected to one participant. Housing these data streams in one infrastructure would also allow the metered data to act as a trigger for additional short survey questions (experience sampling) to be presented to the participants in the app.

However, until now, this remains difficult to materialise. It is fair to say that we tried very hard to put these ideas into practice, and these efforts were mainly directed at obtaining the funding necessary to develop MOTUS into such a data collection and management tool. Often much to our surprise, our proposals were not met with the same enthusiasm or sense of urgency as ours. Admittedly, there were many liabilities. The complexity of the task at hand was bound to result in an incremental process, building the necessary infrastructure one API at a time. Especially for social researchers, this can be daunting, let alone ten years ago when the use of metered data in social sciences was even lower than it still is today. Of course, the team behind MOTUS has been further developing the infrastructure in the past years into a sound digital data-collection platform (see below). However, we have been lacking the resources to apply it to media use studies so far and cannot help but wonder what we could have achieved in this regard by now if some key research funding would have come our way. Maybe, this was too ambitious for two small teams to undertake, which brings us to our next point.

Need for collaboration and standardisation in automated time use research

Combining diary surveys with metered data is an intricate endeavour. Tracking is often characterised by low participation rates attributed mostly to privacy and security concerns and a lack of incentives for participants, but the main challenge lies in the complex technical infrastructure it requires (Makhortykh et al., 2021, p. 261). Indeed, the combination of survey records with metered data confronts social scientists with new considerations (Bach et al., 2022, p. 2): the need to develop new data-collection and sampling designs that represent the targeted population; the need to anticipate new errors, for example, from incomplete observation of web browsing activities due to people using multiple devices or over-coverage of activities due to devices being used by multiple users, and the difficulty of extracting meaningful measurements from often very large web browsing data sets that are not easily analysed by the explanatory

regression modelling or descriptive approaches commonly used in the social sciences.

From the outset, MOTUS looked promising as an infrastructure for combining online and mobile diary surveys with metered data. MOTUS was explicitly conceived as more than a digital, portable diary tool. This was because its modularity encompassed the option not only to easily include topical modules to a base survey, but also to supplement this with various other data streams connected to a specific participant.

We back then immediately envisioned plenty of useful applications. Tracking participants' location through GPS data in combination with the websites and apps they use on their mobile phones would allow us to get a detailed view of media use while traveling or commuting. On top of that, location or media use could be programmed to work as a trigger for additional questions probing participants' experience or attitude during or right after consumption. And data from social media and other platforms that do not easily disclose data could be included through data donations – European data-protection regulation forces platforms to provide users the data they collect about them on request, which users then voluntarily donate to academic research (Ohme & Araujo, 2022).

However, implementing these options proved far more difficult than expected. Certainly, back then, no "plug-and-play" tracking applications were readily available. Developing them would not only be time-consuming but would also require programming expertise that was not present in our research departments. We, therefore, reached out to colleagues in computer sciences and wrote various research applications together, but failed to secure the funding necessary to take MOTUS that one step further. Concerns about the ethical handling of such privacy-sensitive data were certainly also at play.

That kind of collaboration with computer scientists is necessary, but also daunting. As we experienced ourselves when working on a joint research proposal to integrate new data streams into MOTUS, not every demand for developing a tracking tool is relevant for computer scientists and not all data collected are relevant for social scientists. Both disciplines have different research priorities and are evaluated differently. The field of computational social sciences where computational methods are applied to novel sources of digital data to develop theories of human behaviour is certainly in development (Edelmann et al., 2020). And interdisciplinarity is widely acknowledged, but it is not easy to make the case for more insights into human behaviour before a jury that is used to see engineers strive to accelerate their algorithms by a few seconds. Therefore, we often still need to choose between social sciences or computational sciences when handing in research projects, which is hampering this necessary collaboration.

Luckily, we were far from alone in looking into the possibilities of metered data, and in the meantime, many researchers succeeded in exploring the combination of self-reported and tracking data. In The Netherlands, for example, Kleppe and Otte (2017) developed an online monitoring application that allowed them to continuously track the news consumption of 42 university students. For four months, it recorded the URLs of the sites visited by each participant, the time-point and thus frequency, as well as the content, which was stored in text and images. While offering an interesting perspective on how to develop such a tracking app, the scope of participants remained limited. Also in The Netherlands, Merten et al. (2022) succeeded in scaling up this approach. By launching a call for participation through an existing representative panel and asking participants to use a browser plug-in they previously developed themselves (Moeller et al., 2019; Vermeer et al., 2020), they were able to complement survey data of 413 respondents with tracking data from one year. What is particularly promising in these studies, is that the tracking apps are developed in collaboration with computer scientists, a necessary process if social scientists want to pursue these methods.

Here, it is interesting to see social scientists from different research institutes use each other's tracking tools. But it also shows that for now these tools are being developed by specific teams. Collaborations and exchange of best practices happen on an ad hoc basis. To the best of our knowledge, no large efforts are being made to come to a standardised toolset or approach. In time use research, standardisation has played a big role. Many national institutes of statistics have adopted similar approaches, which make comparative analyses of time use surveys across countries relatively easy (e.g., Craig et al., 2020).

With MOTUS too, the idea was to try to set a standard for the digital collection of time use data. MOTUS was initially funded as a research infrastructure for the social sciences, much like other similar efforts such as joint online probability panels. This sensitivity to standardisation to advance the field is something that stuck with us, and that we believe could play an important role in pooling the efforts for developing tracking tools across disciplines. MOTUS being a research infrastructure that not only collects time use data but also connects it to other data streams could offer a model for such joint efforts.

When looking back at these initial challenges, it is all the more remarkable to see how the team behind MOTUS has taken on these challenges to further develop the tool into the data collecting infrastructure it is today. MOTUS now has multiple components. The core collection includes information gathered from different sources such as web and mobile, but also from various microservices. One example of such a microservice is geolocation information

which is provided to the core collection via an Adapter API and can be made available to the front-offices. This can then be used, for example, to trigger short survey questionnaires based on specific locations (e.g., home, commute, work, gym) using notifications to the respondents. Another future application could be passively measuring media exposure as a microservice and use it as a trigger.

Tracked and reported data as the key to insights in (media) time use research

Studies using web trace data are still confronted with limitations, such as the smallness of the sample limiting representativity and the exclusion of mobile data and messaging apps due to privacy concerns. Other studies such as the one by Van Damme et al. (2015) succeeded in collecting mobile tracking data, but only from 30 participants, who also participated in qualitative face-to-face interviews, offering a valuable approach on its own but showing the difficulties of scaling up to a representative sample. Next to other challenges identified in these studies in terms of developing tracking tools, lacunae in reported data due to technical hiccups or limitations of these tools, and the cleaning and meaningful analysis of large sets of complex behavioural data, we would like to point out a few more limitations relevant to time use research.

First, while these studies combine data on media use from surveys and tracking data, they do not include activities tracked through diary surveys. While this is understandable from the perspective of media scholars, for which, as discussed, time use research is not a traditional go-to option, it shows there are plenty of opportunities to be explored here. Judging by a quick search for "tracking" or "digital trace" data in the *Journal of Time Use Research*, this potential has hardly been explored in the community of time use researchers. Online and mobile diary tools such as MOTUS – see also other existing platforms such as MyTimeUse (Rinderknecht et al., 2022) – are a first and necessary step in this direction.

Second, when media scholars are turning to web tracking data they do so mainly to assess one specific aspect of online media use – for example, news use through a computer browser or app use on a smartphone. These studies offer relevant insights and are important first steps in applying digital methods. However, as discussed, media use is increasingly cross-media. Media users experience media content across devices and in doing so configure unique media repertoires. This would require scholars to follow media users across the various components of their media repertoires.

For now, following media users across media remains a methodological conundrum that metered data only partly solve. Take news use for example.

While web tracking data can offer researchers a granular view of what news a respondent has been exposed to online and for how long, it does not tell us anything about that person's use of television or radio news consumption. There is a future scenario where these data can be accessed too via data donations, or even via streaming platforms sharing their data for research purposes. But as best practices for the privacy-friendly analysis of such sensitive data are still limited (Boeschoten et al., 2022) and the reluctance of social media platforms to share data with social scientists remains high (Hegelich, 2020), methodologies that put users central and try to follow them across the media they use in their daily lives remain extremely valuable. This is especially the case when they, like MOTUS, foresee in their design the possibility to integrate passive behavioural data once these data streams become more openly available.

Finally, between now and the – utopian or dystopian, we leave that to the reader – moment that our every single move will be tracked, and our choices will be predicted before we even make them, we will still need to observe individuals in their contexts of use; and they will in turn have to tell us about their perceptions of and attitudes towards the media they use. If, indeed, the socio-spatial context in which media are being used affects our media experiences, then time use research offers a way to probe and analyse media use as an activity embedded in people's other daily activities. The combination of passively collected tracked behavioural data and actively observed or self-reported ethnographic data could prove to be the ideal combination (Picone, 2018, p. 50). And here, too, a tool such as MOTUS offers an important starting point.

References

Bach, R. L., Kern, C., Bonnay, D., & Kalaora, L. (2022). Understanding political news media consumption with digital trace data and natural language processing. *Journal of the Royal Statistical Society. Series A, Statistics in Society*, *Advance online publication*, 1-24.

Bjur, J., Schrøder, K. C., Hasebrink, U., Courtois, C., Adoni, H., & Nossek, H. (2014). Crossmedia use – unfolding complexities in contemporary audiencehood. In N. Carpentier, K. C. Schrøder, & L. Hallett (Eds.), *Audience Transformations. Shifting Audience Positions in Late Modernity* (pp. 15-29). Routledge.

Boeschoten, L., Mendrik, A., van der Veen, E., Vloothuis, J., Hu, H., Voorvaart, R., & Oberski, D. L. (2022). Privacy-preserving local analysis of digital trace data: A proof-of-concept. *Patterns*, *3*(3), 100444.

Bosch, O. J. & Revilla, M. (2022). When survey science met online tracking: Presenting an error framework for metered data. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, 1-29.

Courtois, C., Verdegem, P., & De Marez, L. (2013). The triple articulation of media technologies in audiovisual media consumption. *Television & New Media*, *14*(5), 421-439.

Craig, L., Churchill, B., & van Tienoven, T. P. (2020). Young people's daily activity in a globalized world: A cross-national comparison using time use data. *Journal of Youth Studies*, *23*(9), 1195-1216.

de Korte, K., Glorieux, I., & Deyaert, J. (2016). *De mediatisering vna het dagelijks leven: Resultaten van de VLaamse tijdsbestedingsonderzoeken (TOR13 TOR04 TOR99)* (p. 43) [Research Report]. Steunpunt Cultuur.

Deuze, M. (2011). Media life. *Media, Culture & Society*, *33*, 137-148.

Dwyer, T. (2010). *Media Convergence*. Open University Press.

Edelmann, A., Wolff, T., Montagne, D., & Bail, C. A. (2020). Computational social science and sociology. *Annual review of sociology*, *46*(1), 61-81.

Edgerly, S., Vraga, E. K., Bode, L., Thorson, K., & Thorson, E. (2018). New media, new relationship to participation? A closer look at youth news repertoires and political participation. *Journalism & Mass Communication Quarterly*, *95*(1), 192-212.

Evens, T., Henderickx, A., & De Marez, L. (2021). Generation stream: The audiovisual repertoire of teenagers. *Journal of Broadcasting & Electronic Media*, *65*(2), 185-204.

Hartmann, M. (2006). The triple articulation of ICTs. Media as technological objects, symbolic environments and individual texts. In T. Berker, M. Hartmann, Y. Punie, & K. Ward (Eds.), *Domestication of media and technology* (pp. 80-102). Open University Press.

Hartley, J. M. (2018). "It's something posh people do": Digital distinction in young people's crossmedia news engagement. *Media and Communication*, *6*(2), 46-55.

Hasebrink, U. & Domeyer, H. (2012). Media repertoires as patterns of behaviour and as meaningful practices: A multimethod approach to media use in converging media environments. *Participations*, *9*(2), 757-779.

Hasebrink, U. & Hepp, A. (2017). How to research cross-media practices? Investigating media repertoires and media ensembles. *Convergence, 23*(4), 362-377.

Hasebrink, U. & Popp, J. (2006). Media repertoires as a result of selective media use. A conceptual approach to the analysis of patterns of exposure. *Communications*, *31*(3), 369-387.

Heeter, C. (1985). Program selection with abundance of choice: a process model. *Human Communication Research, 12*(1), 126-152.

Hegelich, S. (2020). Facebook needs to share more with researchers. *Nature*, *579*(7800), 473-474.

Kim, S. J. (2016). A repertoire approach to cross-platform media use behavior. *New Media & Society*, *18*(3), 353-372.

Kleppe, M. & Otte, M. (2017). Analysing and understanding news consumption patterns by tracking online user behaviour with a multimodal research design. *Digital Scholarship in the Humanities*, *32*(2), 158-170.

Lievens, J., Siongers, J., & Waege, H. (2015) *Participation in Flanders. Participatie in Vlaanderen. Base data from the Participation Survey 2014*. ACCO.

Lindell, J. (2018). Distinction recapped: Digital news repertoires in the class structure. *New Media & Society, 20*(8), 3029-3049.

Lindell, J. & Hovden, J. F. (2018). Distinctions in the media welfare state: Audience fragmentation in post-egalitarian Sweden. *Media, Culture & Society, 40*(5), 639-655.

Makhortykh, M., Urman, A., Gil-Lopez, T., & Ulloa, R. (2022). To track or not to track: Examining perceptions of online tracking for information behavior research. *Internet Research, 32*(7), 260-279.

Merten, L., Metoui, N., Makhortykh, M., Trilling, D., & Moeller, J. (2022). News won't find me? Exploring inequalities in social media news use with tracking data. *International Journal of Communication, 16*(2022), 1127-1147.

Minnen, J., Glorieux, I., van Tienoven, T. P., Daniels, S., Weenas, D., Deyaert, J., ..., & Rymenants, S. (2014). Modular Online Time Use Survey (MOTUS) – translating an existing method in the 21st century. *Electronic International Journal of Time Use Research, 11*(1), 73-93.

Moeller, J., van de Velde, R. N., Merten, L., & Puschmann, C. (2019). Explaining online news engagement based on browsing behavior: Creatures of habit? *Social Science Computer Review, 38*(5), 616-632.

Newman, N., Fletcher, R., Robertson, C. T., Eddy, K., & Nielsen, R. K. (2022). *Reuters Institute Digital News Report 2022*. p. 164.

Ohme, J. & Araujo, T. (2022). Digital data donations: A quest for best practices. *Patterns, 3*(4), 100467.

Peil, C. & Sparviero, S. (2017). Media convergence meets deconvergence. In S. Sparviero, C. Peil, & G. Balbi (Eds.), *Media Convergence and Deconvergence* (pp. 3-30). Springer International Publishing.

Peters, C., Schrøder, K. C., Lehaff, J., & Vulpius, J. (2022). News as they know it: Young adults' information repertoires in the digital media landscape. *Digital Journalism, 10*(1), 62-86.

Picone, I. (2016). Grasping the digital news user. *Digital Journalism, 4*(1), 125-141.

Picone, I. (2018). Vloeibaar nieuwsgebruik vatten met digitale etnografie. *Tijdschrift Voor Communicatiewetenschap, 46*(1), 41-57.

Picone, I. & Vandenplas, R. (2021). Windows to the world: Imagining Flemish news audiences and their views on society through the lens of news repertoires. *Digital Journalism, 10*(1), 87-108.

Revilla, M. (2022). How to enhance web survey data using metered, geolocation, visual and voice data? *Survey Research Methods, 16*(1), 1-12.

Rinderknecht, R.G. & Sayer, L. C. (2022). MyTimeUse: An Online Implementation of the Day-Reconstruction Method. *Journal of Time Use Research*, 1.

Schrøder, K. C. (2011). Audiences are inherently cross-media: Audience studies and the cross-media challenge. *Communication Management Quarterly, 18*(6), 5-27.

Schrøder, K. C. (2015). News media old and new: Fluctuating audiences, news repertoires and locations of consumption. *Journalism Studies, 16*(1), 60-78.

Sevenhant, R., Stragier, J., de Marez, L., & Schuurman, D. (2022). *Imec.digimeter 2021: Digitale trends in Vlaanderen*. imec-MICT.

Silverstone, R. (1994). *Television and everyday life*. Routledge.

Sonck, N. & Pennekamp, S. (2014). *Media:Tijd 2014. Research Report*. Sociaal Cultureel Planbureau.

Strömbäck, J., Falasca, K., & Kruikemeier, S. (2018). The mix of media use matters: Investigating the effects of individual news repertoires on offline and online political participation. *Political Communication*, *35*(3), 413-432.

Truyens, P. & Picone, I. (2021). Audience views on professional norms of journalism. A media repertoire approach. *Journalism and Media*, *2*(2), Article 2.

van Damme, K., Courtois, C., Verbrugge, K., & De Marez, L. (2015). What's APPening to news? A mixed-method audience-centred study on mobile news consumption. *Mobile Media & Communication*, *3*(2), 196-213.

Vandenplas, R. & Picone, I. (2021). Media as the great emancipators? Exploring relations between media repertoires and cultural participation in Flanders. *Convergence*, *27*(5), 1439-1461.

Vandenplas, R., Truyens, P., Vis, S., & Picone, I. (2021). Tuning out the news. A cross-media perspective on news avoidance practices of young news users in Flanders during the COVID-19 pandemic. *Journalism Studies*, *22*(16), 2197-2217. https://doi.org/10.1080/1461670X.2021.1990788

Vermeer, S., Trilling, D., Kruikemeier, S., & de Vreese, C. (2020). Online news user journeys: The role of social media, news websites, and topics. *Digital Journalism, 8*(9), 1114-1141.

Is travel time wasted?

Evidence from the MOTUS time use survey in Flanders, Belgium

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Wardman and Lyons (2016) suggest that the decreasing disutility of travel time provides arguments for the re-evaluation of current transport planning practice and resources could be reallocated to projects that improve our abilities to spend travel time with worthwhile activities.

Mokhtarian and Salomon (2001) argue that travel may have a positive utility due to three elements: activities carried out at the destination, activities during travelling, and travelling as an activity itself. An affinity towards travelling may be influenced by a combination of these factors. The way travel time is spent is determined by the type of activities we have to or we can carry out while travelling. *Active* activities require cognitive attention (e.g., reading, writing an email, driving a car), while *passive* activities require less cognitive attention. Therefore, two or more activities – that is, one active and one or more passive activities – are compatible with each other or one another (Kenyon, 2008). Whereas recent research has focused on the *productive* use of travel time – that is, multitasking for work and school activities during travelling, activities that do not at first appear worthwhile (e.g., window gazing, sleeping, watching other people) can be beneficial to both employees and employers. These *time-outs* can provide breaks that can help us to remain creative and to solve problems (Holley et al., 2008).

Recently, an increasing number of studies have provided empirical evidence about travel time use. For a comprehensive overview of the empirical evidence on travel-based multitasking see the review of Keseru and Macharis (2018). Collecting information about what people are doing while travelling requires additional efforts compared to standard travel behaviour surveys and travel diaries in terms of the depth of information that is required from respondents. Previous research addressed this issue by tailor-made survey

instruments combining questions on travel satisfaction and travel time use (Ettema et al., 2012; Singleton, 2018), web-based intercept surveys (Krueger et al., 2019), observation of public transport passengers (Groenesteijn et al., 2014; Keseru et al., 2020; Russell et al., 2011), specially tailored questions from national travel surveys in France (Mokhtarian et al., 2014) and in Hungary (Munkácsy et al., 2022), focus group interviews (Jain & Lyons, 2008), a combination of observation and on-board surveys (Ohmori & Harata, 2008) or a dedicated smartphone application (Malichová et al., 2022). Since activities during travelling are closely linked to the daily activity chains of people and the duration of both the main and auxiliary activities during travelling are important, several researchers applied different variations of time use surveys. These included activity-based time use surveys on smaller samples of public transport passengers (Gripsrud & Hjorthol, 2012; Vilhelmson et al., 2011), a combination of qualitative interviews and a two-day time use diary (Holley et al., 2008), a specially designed *accessibility diary* recording the use of information and communication technologies during travel activities (Kenyon, 2006) or an online time use survey (Teodorovicz et al., 2022). This indicates an increasing interest in using time use data for activity-based travel demand analysis since they provide a much more detailed account of one's activities than conventional travel diaries (Axhausen, 2008). Using existing, regular time use surveys to study multitasking can significantly reduce the data-collection efforts, provide larger sample sizes and an extensive array of contextual information to activities during travelling. This chapter demonstrates how a large-scale time use survey can be used for collecting data on activities during travelling. For this purpose, we have analysed data from a large-scale, online time use survey carried out in Flanders (the Dutch-speaking part of Belgium) in 2013-2014. In this chapter, we show what information can be extracted from the time use survey that can provide additional empirical evidence for the worthwhile use of travel time. In addition, we also highlight potential attributes of trips and travellers that can influence the choice of activities while travelling. At the same time, the limitations of non-tailor-made time use surveys will also be shown that can assist in designing better surveys in the future. The novelty of this chapter lies in the coverage of all transport modes whereas previous research mostly focused on time use during trips on public transport.

This chapter is structured as follows: the first section describes the methodology of the data collection; the next section shows how relevant data on multitasking has been extracted and analysed from the survey database; then follows a section that presents the results of the data analysis, and a final section concludes the chapter with a description of further analysis steps and recommendations for better survey design based on the limitations of this data analysis.

Survey methodology

Data were collected as part of a large-scale time use survey (Modular Online Time Use Survey – MOTUS) carried out among the Dutch-speaking population of Flanders, Belgium. It is based on a seven-day diary registration method with a pre- and a post-questionnaire. The pre-questionnaire included questions on socio-economic and demographic attributes and social networks, whereas the post-questionnaire posed questions about any irregularities that had happened in the registration week compared to a regular week. The complete research process was administered through a webtool using the MOTUS online time use survey software (Minnen et al., 2014).

The fieldwork started in January 2013 and ended in February 2014. A sample of 39,756 persons between 18 and 75 years of age was drawn randomly from the National Population Register. An invitation letter and at most two reminders were sent by post. About 35 % of all persons approached logged in to the webtool. The remainder included a large number of non-responses, but also contained a substantial percentage of people without sufficient access to a computer and an internet connection (at least for seven consecutive days). In 2013, 13 % of the Flemish population said that they had previously never used the internet (Eurostat, 2015). They were therefore unable to participate in the survey.

The MOTUS software facilitates the fieldwork setup and process using four important features: Direct Data Storage (DDS), Respondent Management System (RMS), Respondent Tracking System (RTS), and Customised Survey System (CSS). The DDS directly stores any input respondents make. The RMS includes an algorithm that assigns respondents over the survey period and over different survey days of the week and handles automatic e-mails accordingly. The RTS manages notifications or reminders via e-mail or text messages in case respondents pass predefined *states* of the survey. Such states might be "not having registered any activity for the past 24 hours" or "having completed the time diary but not the post-questionnaire". In addition, the RTS stores the respondents' paradata such as logging times, browser type, and time lapse of completing certain aspects of the time use survey. Finally, the CSS allows the creation of several unique survey setups since every parameter of the software is adjustable in order to capture the best detail in relation to the research question.

Once logged in to the system more than 90 % of the respondents completed the pre-questionnaire (n=11,978) and about 52 % started using the time diary. For this analysis we selected only the 3,260 respondents who filled in the pre-questionnaire, the seven consecutive diary days (168 hours) and a post-questionnaire and met strict cleaning criteria (e.g., a certain number of activities, a limited amount of non-registered time).

The data are weighted based on a post-stratification weighting procedure. The basic underlying principle is that a weight is assigned to each case in the dataset. This weight is based on a comparison to a reference database for the population and takes into account the age, sex and educational level of the respondents. For 2013, the most reliable population data available was the 2013 edition of the Labour Force Survey (LFS13). The highest weighting factor was 2.93 for women older than 54 years with no formal educational qualification. The lowest factor was for women younger than 34 years with a higher degree of education (weighting factor = 0.5).

Data extraction from the time use survey

Since the time use survey was not tailor-made for the purposes of this research, several transformations had to be carried out. The diary module registered "main" and "auxiliary" activities. The respondents were able to indicate one main and one auxiliary activity for each time slot they selected. For both activity types, the same list of possible activities was selectable grouped at three levels: the first level is the most general with ten activity types (e.g., paid work, shopping and visiting services, travel), the second level has 42 activity types while the third and most detailed level has 225 activity types (e.g., listening to the radio, filling in crossword puzzles, reading a book). While it was mandatory to indicate the main activity at the lowest level, the indication of the secondary activity was optional.

The database contains 371,991 main activities in total: 159,399 auxiliary activities were registered, which is 42.9 % of all the main activities. The most frequent auxiliary activities were having a conversation (13.6 %), listening to the radio (11.9 %), personal hygiene (4 %), watching TV (3.7 %), and listening to music (3.5 %). Our focus was on activities where the main activity was travel: 61,230 travel activities were carried out during the registration period (16 % of all activities).

We analysed the distribution of the auxiliary activities linked to travel as a main activity. Originally, respondents reported an auxiliary activity while travelling in 23,636 cases. In many cases, however, the auxiliary activity was not a *typical* auxiliary activity. For example, 7.4 % of the responses indicated *shopping*, 2.2 % *visiting* and 1.3 % *waiting before and between trips* as auxiliary activities. Apparently, many respondents indicated either the purpose of the trip or activities carried out while travelling from a main origin to a main destination (trip chaining: e.g., shopping on the way home). We did not include these 7,169 responses in our final dataset, because these activity indications cannot be classified as multitasking activities *while* travelling. We also discarded

activities which are not normally possible on certain transport modes (e.g., reading a book while driving a car). This way, we dropped a further 895 cases. The final dataset contains 15,572 activities (25.4 % of all travel activities); 2,166 respondents carried out an auxiliary activity while travelling.

Results

In this section we present some of the headline results of the data analysis. The types of activity carried out during travelling are determined by multiple interrelated factors. On the one hand, the availability of equipment to the individual (e.g., mobile phone, laptop, tablet, books, games) and socioeconomic status, state of health or age may determine the ability to spend travel time on certain activities. On the other hand, the attributes of the journey such as crowdedness, availability of seating, travel comfort, familiarity, duration and stage of the journey may all influence the nature of time use during travelling (Lyons & Urry, 2005).

We used descriptive statistics and simple inferential statistics (contingency tables, chi-square test, Cramer's V) to highlight potential relationships between different demographic (gender, age) and trip-related (duration, purpose, transport mode) attributes.[1] Then, we tested the relationship between the propensity to multitask and presence of other people during the trip.

Auxiliary activities while travelling

The respondents indicated 48 different types of auxiliary activities that they carried out while travelling. For the easier analysis and display of results we have grouped these activities under seven broad categories. The more detailed list of auxiliary activities is included in Appendix 1. The frequencies of these activity categories are shown in Table 1.

The most frequent auxiliary activity is related to listening to and, to a smaller extent, watching digital media (radio, music, videos). The second most frequent activity is conversation, including chatting, having an argument, helping children with their homework, playing with and talking to children. These two categories cover 92.3 % of all the auxiliary activities. The proportion of reading (including paper and digital newspapers, magazines and books), communication (using the phone, text messages, online chat) and relaxing

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1   A confidence interval of 95% has been applied in the analysis.

(doing nothing, thinking, sleeping) is well below the 5 % mark, while working activities represent only 0.7 % of all auxiliary activities.

Table 1. The distribution of auxiliary activities (n=15,209; based on the answers of 2,166 respondents)

Trip purpose	Number of activities	Percentage (of all auxiliary activities) (%)
Media activities: Listening to radio, music, watching videos	10,200	67.1
Conversation	3,834	25.2
Reading	575	3.8
Communication: calling, text messages, email	440	2.9
Relaxing, sleeping, doing nothing, thinking,	253	1.7
Other	160	1.1
Work, study	109	0.7
Total	15,209	100.0

Main transport mode

Transport mode is a major determinant of the type of activities travellers can carry out during their trips. Public transport is suitable for activities that require more attention (i.e., activities that cannot be accomplished while driving a car). Activities during driving, on the other hand, may be more related to the private life (listening to music [immersion in sound], talking to friends and relatives through the speakerphone) (Lyons & Urry, 2005).

Table 2 shows the distribution of auxiliary activities by the main transport mode of the primary travel activity. In this table, we compare it to the modal distribution of trips where no auxiliary activity was carried out. By and large, the distribution of auxiliary activities reflects the overall modal split of trips with a marked majority of trips by car either as a driver or as a passenger. If we compare the distribution of non-multitasking and multitasking trips by transport mode, however, we can see considerably higher proportions for car and public transport and smaller proportions for walking and cycling. This reflects the ability to multitask using different transport modes.

Table 2. The distribution of auxiliary activities by transport mode of the primary transport activity

Transport mode	Multitasking trips		Non-multitasking trips	
	Frequency	Percentage	Frequency	Percentage
Walking	813	5.2	5,491	12.4
Cycling	651	4.2	7,415	16.7
Motorbike	29	0.2	395	0.9
Car as driver	10,011	64.3	22,771	51.3
Car as passenger	2,604	16.7	5,800	13.1
Public transport	1,334	8.6	2,023	4.6
Car as driver + public transport*	38	0.2	186	0.4
Car as passenger + public transport*	92	0.6	221	0.5
Other	0	0.0	114	0.3
Total	15,572	100.0	44,415	100.0

Note: These were combined trips by car and public transport. It was, however, not possible to identify a main transport mode.

To identify the types of activities that are characteristic as auxiliary activities for each transport mode, we created a cross tabulation of transport mode and activity types (see Figure 1: the chart gives an overview of the propensity of each transport mode for different auxiliary activities). Driving a car is the most limited activity type since it is dominated by background listening (radio and music) and conversation. Working and studying are more frequent on public transport, although car drivers can also make phone calls that can be classified as work activity. It is interesting that 12.7 % of walking trips and 8 % of cycling trips are accompanied by auxiliary activities. For walking, the most frequent activity is conversation (72.9 %) for cyclists listening to music or the radio and conversation dominates.

Gender

There is a significant but weak (V = 0.093) relationship between gender and the types of auxiliary activities as it is shown in Table 3. Women engage in conversation in a significantly higher proportion than men. The reason is probably because this activity category also includes activities related to childcare (playing with/talking to children) which are traditionally more often carried out by women.[2] Women also engage in media related activities less

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2   According to the MOTUS survey, men carry out 35.9 % of activities in the category 'childcare and care for other household members' whereas women carry out 64.8 % of these same activities.

Figure 1. The proportion of auxiliary activities by main travel mode (proportion of all trips within the registration week)
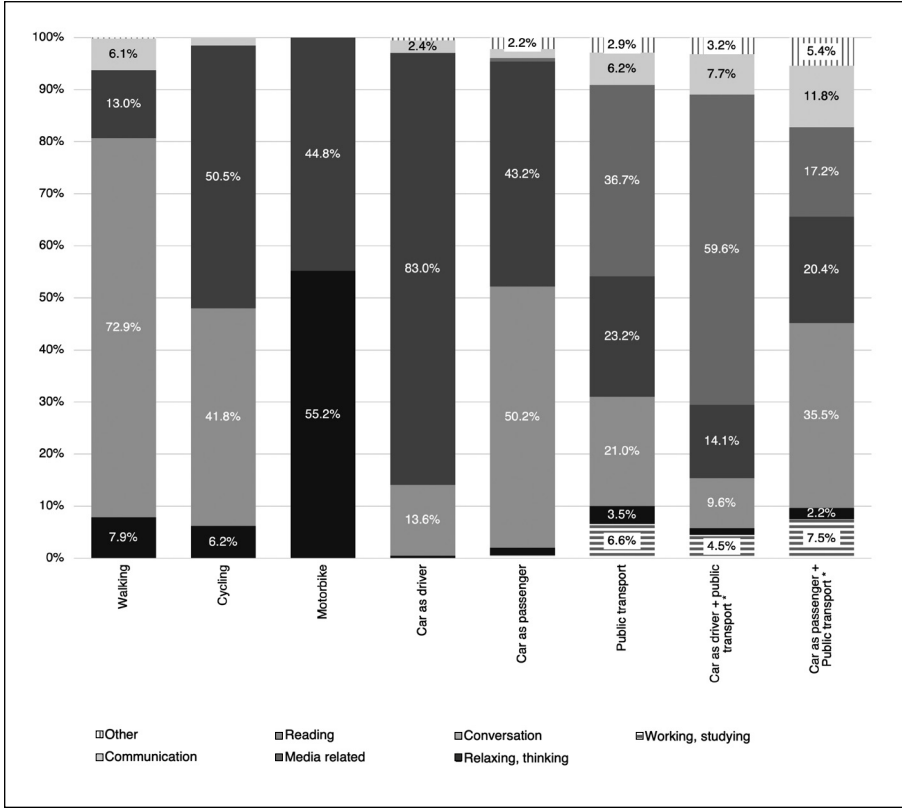
χ^2 (42) = 10,913.757; V = 0.342; p = 0.001 n = 15,574
Note: Shares smaller than 2% are not labelled. * indicates combined trips by car and public transport for which it was not possible to identify a main transport mode.

frequently than men. This may be because most of these activities are actually listening to the radio in a car, and cars are driven by male drivers to a higher proportion.[3] There is also a slight difference in reading activities: more males read while travelling than women. A possible explanation is that women are more often accompanied by other people (e.g., children) therefore conversation replaces solitary activities.

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3   54.7 % of trips made by car drivers were by males and 45.3 % by females. For trips made as car passengers the percentages are 25.6 % and 74.4 % respectively.

Table 3. Distribution of auxiliary activities by gender.

Activity	Gender		
	Male (%)	**Female (%)**	**All (%)**
Working, studying	0.7	0.7	0.7
Relaxing, thinking	1.3	1.9	1.6
Conversation	20.9	28.2	24.6
Media activities	69.1	62.0	65.5
Reading	4.2	3.2	3.7
Communication	2.8	2.9	2.8
Other	1.0	1.1	1.0
Total	100.0	100.0	100.0

$\chi 2$ (6) = 135.076; V = 0.093; p<0.001 n = 15,573

Age

Table 4 shows the cross tabulation of age category and types of activities while travelling. There is a significant relationship between age and the auxiliary activity, but the relationship is weak (V = 0.065). The most significant differences can be observed for the youngest age group (18-27 years). They have the highest proportion of work and study activities, with a slightly higher-than-average proportion of conversation, lower-than-average media use, and a relatively high number of communication activities. Older adults (between the age of 38 and 67), however, have a higher proportion of activities related to relaxation.

Table 4. The distribution of auxiliary activities by age group

Activity	Age groups (%)						All
	18-27	**28-37**	**38-47**	**48-57**	**58-67**	**68-75**	
Working, studying	1.6	0.5	0.5	0.4	0.1	0.0	0.7
Relaxing, thinking	1.2	1.0	2.2	1.8	2.1	1.5	1.6
Chatting	28.8	26.2	21.1	21.6	25.9	22.6	24.6
Media activities	59.8	65.8	69.1	68.8	62.8	70.9	65.5
Reading	3.2	3.5	3.4	4.5	4.4	2.5	3.7
Communication	3.3	2.6	3.4	2.4	1.9	2.0	2.8
Other	2.0	0.4	0.2	0.5	2.8	0.5	1.0
Total	100	100	100	100	100	100	100

$\chi 2$ (30) = 327.954; V = 0.065; p<0.001 n = 15,572

Trip purpose

We have found a significant, moderately strong (V= 0.145) relationship between trip purpose and types of secondary activities (Table 5). Overwhelmingly, irrespective of trip purpose, media related activities and especially listening to the radio or music dominate most trips with a proportion of higher than 50 % for all trip purposes. Working and studying evidently mostly occurs during trips to work and school. It is also not surprising that the proportion of relaxation activities is significantly higher during leisure trips. Conversation rarely occurs during trips to/from work also because 89.8 % of these trips are by car with no other passenger. Conversation is, however, replaced by solitary media activities, primarily listening to the radio or music and reading. Communication activities (text messages, calling) are slightly more frequent on trips to school reflecting our previous finding above for the youngest age group.

Table 5. The distribution of auxiliary activities by trip purpose

Auxiliary activities	Trip purpose							All
	To/from work	To/from school	Shopping, visiting services	Child-care	Leisure	Social activities with family	Other	
Working, studying	1.2	3.8	0.1	0.0	0.2	0.3	0.0	0.7
Relaxing, thinking	1.5	1.9	1.6	0.8	2.3	1.0	0.9	1.6
Conversation	8.7	31.6	23.0	38.6	38.4	31.4	35.8	24.6
Media activities	75.1	51.3	71.5	58.6	54.0	63.1	57.5	65.5
Reading	8.9	3.9	0.5	0.2	1.8	0.9	0.9	3.7
Communi-cation	3.4	6.5	2.1	1.7	2.2	2.4	4.7	2.8
Other	1.2	1.0	1.2	0.1	1.0	1.0	0.0	1.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

$\chi 2$ (36) = 1,968.935; V = 0.145; p<0.001 n = 15,572

Travel companions

The type of auxiliary activities is also determined by the presence of other people and the relationship of the traveller to these people while travelling. According to Wardman and Lyons (2016), vehicle occupancy might have a positive impact

on the value of travel time because companions might make the journey more interesting.

Respondents were required to indicate if they carried out each activity alone or accompanied by somebody. In the latter case, they also had to indicate who the accompanying person was (e.g., partner, husband/wife, child, parent, friend, neighbour, colleague, schoolmate, stranger): 50.9 % of all multitasking trips were undertaken with someone else.

Figure 2 shows the proportion of multitasking trips that were carried out in the presence of other people. The most frequent travel companion was the husband, wife or partner (45 %), own children (24.9 %), friends and acquaintances (17.1 %), and other family members (11.1 %).

Figure 2. Proportion of trips where an auxiliary activity was carried out and somebody else was present (100 % = all auxiliary activities linked to travel where somebody else was present)
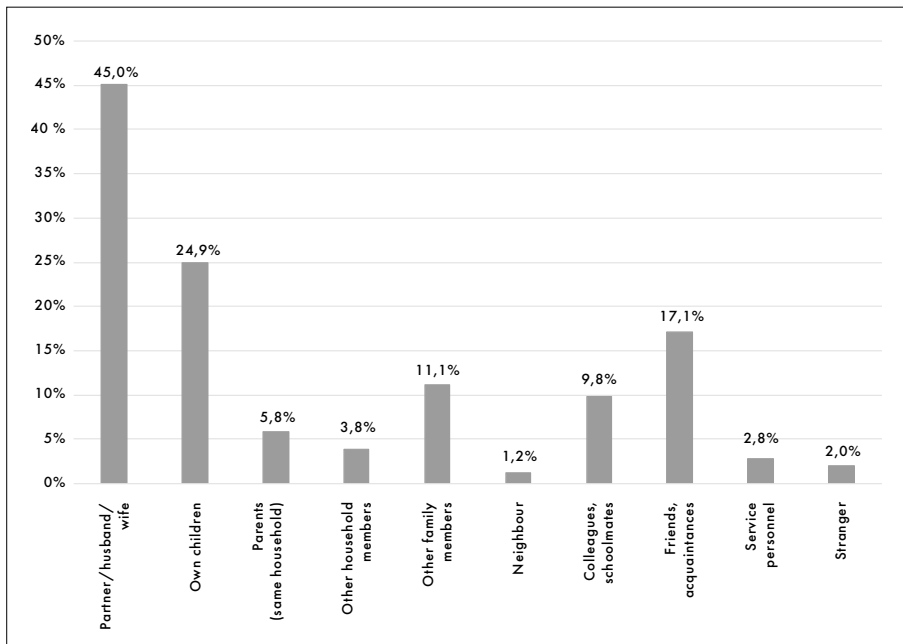
Discussion and conclusion

In this chapter, we have presented some headline results of the analysis of a large-scale time use survey to provide new empirical evidence for the use of travel time for other activities that might have an impact on how travel time is valued. Current evaluation methods such as cost-benefit analysis considers travel time as a key value to assess which project option is considered more useful for the users. Travelling in general is considered as a waste of time and the more time passengers spend travelling, the less benefits are assigned to that project option (e.g., when comparing the costs and benefits of different alternatives for motorways or train lines). This value of travel time (VTT) is usually estimated for leisure and business travellers. The VTT is usually higher for business travellers as they *lose* more in efficiency while travelling due to the time not used for *productive activities*. Nevertheless, if sufficient empirical evidence is collected on the prevalence of travel-based multitasking, this paradigm of *wasteful travel* can be questioned (Cornet et al., 2022).

According to the overall results, our survey found that at least one auxiliary activity is carried out in case of a quarter of all travel activities. This is somewhat lower than the 38.8 % reported by Papon (2012) who carried out a similar analysis based on the French National Travel Survey. We expect that there is a degree of underreporting in our survey compared to face-to-face surveys or observation studies since the original purpose of the survey was not specifically to collect information about multitasking and the reporting happened retrospectively.

Our results show that most auxiliary activities are passive (listening to the radio or music). It is followed by conversation, which may not be viewed as a *productive* activity, but it may have its social relevance in building up and maintaining healthy relationships or training the intellect. According to our results, the proportion of productive activities (working, studying, reading, communication) is quite low. This corresponds to the findings of Vilhelmson, Thulin and Fahlén (2011), who concluded that travel time was used for productive work in relatively few cases and most travellers used travel time for leisure activities. Our result of 6.6 % for public transport trips is similar to the results of Ettema and colleagues (2012), who found that between 6.6 % and 8.5 % of public transport passengers worked or studied, although the percentage went up to 17.5-19.4 % for train travellers. Their results regarding conversation on trains (16.4-20.6 %) are also similar to ours (21 %).

In this chapter, we focused on gender, age, trip purpose, travel mode and the presence of travel companions. We found significant but weak relationships between the types of auxiliary activity and gender, age and travel mode, while

the relationship with trip purpose is significant and moderate. The analysis also pointed out that in regions such as Flanders the importance of productive multitasking activities is very limited since most of the trips are carried out by car, bicycle or walking, which do not provide opportunities for working, studying, or reading. In addition, the quality of the public transport services (crowdedness, vehicle comfort, number of interchanges, duration of trips) may also limit the opportunities to carry out productive multitasking activities. Further research is needed to highlight these aspects in assessing the propensity of multitasking while using public transport.

According to our results, working and studying are more relevant to younger people, since they also take public transport more often. Therefore, it is important to look at the context of multitasking in terms of modal shift and the spatial delimitation of impacts (in urban areas where public transport use is higher, we would expect more multitasking).

It is, however, notable that socially relevant activities such as having a conversation with a family member or friends are very relevant. Further research is needed to identify the extent to which a person's social network, attitude to other people and daily social interactions determine their activities while travelling. In more than half of the cases when people multitask, there is somebody present as a travel companion, which provides an opportunity for spending the journey enjoyably. While this is not considered generally as a productive activity that increases the utility of travel time, we agree with Holley, Jain and Lyons (2008) that relaxation and social contacts may have a positive impact on the productive activities that follow.

Our second objective was to investigate whether our web-based time use survey is a suitable instrument to extract data on multitasking. During the analysis we faced the following difficulties:

- In the basic module of the survey, transport activities were not broken into trip segments. When a journey is multimodal it was not possible to distinguish between the different segments of the trips.
- In the transport module, each segment of a trip chain was registered but the auxiliary activities were only registered for the 'main' travel activity (the whole trip chain). Therefore, it was not possible to indicate multiple activities for a trip chain.
- There was inconsistency in registering secondary activities. The distinction of the activity to be carried out at the destination from the activities exclusively carried out during travelling was not straightforward to respondents. This is a problem that similar surveys (see, e.g., Mokhtarian & Salomon, 2001) encountered.

- Only one auxiliary activity could be indicated as the main activity, therefore, in case of multiple auxiliary activities one or more activities were missed.
- It was not possible to indicate different durations for primary and auxiliary activities (e.g., travelling for two hours but working only for 60 minutes and then sleeping for 60 minutes).

These are all issues that can be investigated in further surveys since the MOTUS software is easily configurable. It must also be noted that the survey has a limited reach due to its online nature; therefore it can be considered representative only of the population using the internet regularly (at least once a week).

On the other hand, the extensive time use survey provides information about the frequency and duration of secondary activities for a longer period than previous surveys including weekdays, and weekends since the registration covered a whole week. Another advantage is that, similarly to previous studies (e.g., Kenyon & Lyons, 2007), the participants registered secondary activities in the context of the primary activity, which allowed auxiliary activities to be identified easily.

This chapter demonstrated how a time use survey not specifically designed to capture auxiliary activities while travelling can be applied and adapted to collect data on travel-based multitasking. The MOTUS survey demonstrates best practice for other future time use surveys to include secondary activities in the activity registration process. The fact that the data was collected through an online survey interface made it easier and more feasible for respondents to answer questions about their secondary activities.

References

Axhausen, K.W. (2008). Social networks, mobility biographies, and travel survey challenges. *Environment and Planning B: Planning and Design*, *35*(6), 981-996.

Cornet, Y., Lugano, G., Georgouli, C., & Milakis, D. (2022). Worthwhile travel time: A conceptual framework of the perceived value of enjoyment, productivity and fitness while travelling. *Transport Reviews*, *42*(5), 580-603.

Ettema, D., Friman, M., Gärling, T., Olsson, L. E., & Fujii, S. (2012). How in-vehicle activities affect work commuters' satisfaction with public transport. *Journal of Transport Geography*, *24*(September), 215-222.

Eurostat. (2015). *Individuals who used the internet, frequency of use and activities*. Eurostat. http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do

Gripsrud, M. & Hjorthol, R. (2012). Working on the train: From "dead time" to productive and vital time. *Transportation, 39*(5), 941-956.

Groenesteijn, L., Hiemstra-van Mastrigt, S., Gallais, C., Blok, M., Kuijt-Evers, L., & Vink, P. (2014). Activities, postures and comfort perception of train passengers as input for train seat design. *Ergonomics, 57*(8), 1154-1165.

Holley, D., Jain, J., & Lyons, G. (2008). Understanding business travel time and its place in the working day. *Time & Society, 17*(1), 27-46.

Jain, J. & Lyons, G. (2008). The gift of travel time. *Journal of Transport Geography, 16*(2), 81-89.

Kenyon, S. (2006). The "accessibility diary": Discussing a new methodological approach to understand the impact of Internet use upon personal travel and activity participation. *Journal of Transport Geography, 14*(2), 123-134.

Kenyon, S. (2008). Internet use and time use: The importance of multitasking. *Time & Society, 17*(2-3), 283-318.

Keseru, I., Heyndels, E., Dat Ton, T., & Macharis, C. (2020). Multitasking on the go: An observation study on local public transport in Brussels. *Travel Behaviour and Society, 18*(January), 106-116.

Keseru, I. & Macharis, C. (2018). Travel-based multitasking: Review of the empirical evidence. *Transport Reviews, 38*(2), 162-183.

Krueger, R., Rashidi, T. H., & Auld, J. (2019). Preferences for travel-based multitasking: Evidence from a survey among public transit users in the Chicago metropolitan area. *Transportation Research Part F: Traffic Psychology and Behaviour*, *65*(August), 334-343.

Lyons, G. & Urry, J. (2005). Travel time use in the information age. *Transportation Research Part A: Policy and Practice*, *39*(2-3), 257-276.

Malichová, E., Cornet, Y., & Hudák, M. (2022). Travellers' use and perception of travel time in long-distance trips in Europe. *Travel Behaviour and Society*, *27*(April), 95-106.

Minnen, J., Glorieux, I., van Tienoven, T.-P., Daniels, S., Weenas, D., Deyaert, J., van den Bogaert, S., & Rymenants, S. (2014). Modular online time use survey (MOTUS) – Translating an existing method in the 21st century. *Electronic International Journal of Time Use Research, 1*(11), 73-93.

Mokhtarian, P. L., Papon, F., Goulard, M., & Diana, M. (2014). What makes travel pleasant and/or tiring? An investigation based on the French national travel survey. *Transportation, 42*(6), 1103-1128.

Mokhtarian, P. L. & Salomon, I. (2001). How derived is the demand for travel? Some conceptual and measurement considerations. *Transportation Research Part A: Policy and Practice, 35*(8), 695-719.

Munkácsy, A., Keserű, I., & Siska, M. (2022). Travel-based multitasking on public transport: An empirical research in Hungary. *Periodica Polytechnica Transportation Engineering, 50*(1), Article 1.

Ohmori, N. & Harata, N. (2008). How different are activities while commuting by train? A case in Tokyo. *Tijdschrift voor Economische en Sociale Geografie, 99*(5), 547-561.

Papon, F. (2012). *Traveling to reach destination, or for the sake of it: A typology of trips after French national travel survey data*. IATBR International Association for Travel Behaviour Research Conference, 26 pp. https://hal.archives-ouvertes.fr/hal-00851166

Russell, M. L., Price, R., Signal, L., Stanley, J., Gerring, Z., & Cumming, V. (2011). What do passengers do during travel time? Structured observations on buses and trains. *Journal of Public Transportation, 14*(3), 123-146.

Singleton, P. A. (2018). How useful is travel-based multitasking? Evidence from commuters in Portland, Oregon. *Transportation Research Record, 2672*(50), 11-22.

Teodorovicz, T., Kun, A. L., Sadun, R., & Shaer, O. (2022). Multitasking while driving: A time use study of commuting knowledge workers to assess current and future uses. International *Journal of Human-Computer Studies*, *162*(June), 102789.

Vilhelmson, B., Thulin, E., & Fahlén, D. (2011). ICTs and activities on the move? People's use of time while traveling by public transportation. In S. D. Brunn (Ed.), *Engineering Earth* (pp. 145-154). Springer Netherlands.

Wardman, M. & Lyons, G. (2016). The digital revolution and worthwhile use of travel time: Implications for appraisal and forecasting. *Transportation*, *43*, 1-24.

Appendix

Table A1. Correspondence table for aggregate activity groups

Activity in original survey	Aggregate group
Paid work	Work, study
Nonpaid overtime (work)	Work, study
Doing the homework, studying (school or university)	Work, study
Self-study for a course	Work, study
Making a shopping list, planning the day/week	Other
Other activities related to household administration and organisation	Other
Helping children with the homework, talking with children about the school	Conversation
Reading aloud, playing and talking to children (not for school)	Conversation
Sleeping	Relaxing
Conversation, discussion (also argument)	Conversation
Smoking	Other
Resting, meditating	Relaxing
Relaxing, doing nothing	Relaxing
Thinking	Relaxing
Solving crossword puzzles	Other
Playing games	Other
Listening to live radio	Media activities
Listening to the radio (website, podcast)	Media activities
Listening to music/audio (CD, mp3, vinyl, audio books)	Media activities
Listening to music on the internet (YouTube, Spotify, Last.fm ...)	Media activities
Watching live television	Media activities
Watching recorded TV programmes	Media activities
Watching films, documentaries series (online, on demand, downloaded or purchased)	Media activities
Reading a book (paper or digital)	Reading
Reading a periodical (paper or digital)	Reading
Reading a daily newspaper (paper or digital)	Reading
Reading local newspaper/news (paper or digital)	Reading
Reading promotional leaflets, catalogues, (paper or digital)	Reading
Other reading	Reading
Writing letters or postcards	Communication
Phoning (also mobile)	Communication
Video calling (Skype, GTalk, Facetime)	Communication
Sending, organising and reading e-mails	Communication
Sending text messages (SMS, MMS, WhatsApp …)	Communication
Chatting (MSN, Facebook chat, …)	Communication

Table A1. Continued

Activity in original survey	Aggregate group
Posting information on blogs, Facebook, Twitter, Instagram, LinkedIn, Netlog, internet forums, zoekertjes ...	Communication
Calling, writing to, e-mailing organisations, services, institutes	Communication
Other communication	Communication
Surfing on social network sites (Facebook, Twitter, Instagram, LinkedIn, Netlog …)	Communication
Surfing on the internet	Other
Playing online computer games (also on the smartphone)	Other
Playing offline computer games (also Nintendo, Xbox, Playstation, …)	Other