

# Chapter 5

## Agile working and well-being during the COVID-19 pandemic

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### ABSTRACT

This chapter aims to shed light on well-being dimensions and on the implications of the implementation of agile working in the Italian Public Research Organisations (PROs). The empirical investigation is based on an original web-based survey administered during the COVID-19 pandemic to researchers and technologists (R&Ts) of the CNR – the National Research Council of Italy – and INAF – the National Institute of Astrophysics. This study focuses on the main determinants of improvements and/or deteriorations of R&Ts' well-being. Does agile work favour the reconciliation between work and free/family time? Are there specific characteristics that influence the respondents' well-being? We combined quantitative and qualitative analyses to answer to these research questions, and we estimated a multinomial logistic model to identify the main determinants of perceived changes in R&Ts' work-family balance and qualitative methodology to obtain further insights on the perceived benefits and limits of agile working. Since well-being during agile working can be affected by personal, environmental, and organisational factors, the analysis of advantages and criticalities can help developing better strategies to implement agile working in the post-pandemic world.

**KEYWORDS:** smart working, Public Research Organisations, worker's wellbeing, workaholism, work-family balance.

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## 1. INTRODUCTION AND RESEARCH QUESTIONS

This chapter aims to analyse the implementation of agile working in the Public Research Organisations (PROs) through an in-depth analysis of its well-being dimensions and implications. The empirical investigation is based on data from an original web-based survey, administrated in Italy between February and March 2021 by CNR-IRCrES, to researchers and technologists (R&Ts) of CNR – the National Research Council of Italy – and INAF – the National Institute of Astrophysics, i.e., the two main PROs under the supervision of the Italian Ministry of University and Research. This research does not include R&Ts from Universities, because of the huge differences in work organization (see Fabrizio et al., 2021).

The R&Ts' perceptions concerning well-being in agile working has been analysed in the peculiar COVID-19 lockdown situation, when the great majority of people were compelled to work from home, as well as the students who attended their lessons online. The aim of the study is to take advantage of this unprecedented real-world experimentation of smart working models (Loia & Adinolfi, 2021) to investigate the main determinants of improvements and/or deteriorations in R&Ts' well-being. In fact, well-being during agile working can be affected by personal, environmental, organisational factors and the analysis of advantages and criticalities can help developing better strategies to implement agile working in the post-pandemic world.

Our main research interests concern how R&Ts' perceptions on well-being differ by gender, age groups, family composition, commuting and working habits, contractual and sectoral aspects, the perceived benefits, and the limits of smart working in pandemic: does agile working favour the reconciliation between work and free/family time? Are there specific characteristics that influence respondents' well-being?

Using data from the survey questionnaires (see Chapter 2 for details), this chapter combines quantitative and qualitative analyses to investigate the changes experienced by PROs R&Ts' in well-being, as well as an assessment of the main benefits and limits of agile working. In particular, a multinomial logistical model is estimated to identify the main determinants of the perceived changes in R&Ts' work-family balance when working from home during the lockdown, compared to the pre-pandemic situation. The quantitative approach is complemented by a qualitative methodology applied to obtain further insights on the perceived benefits and limits of agile working during the pandemic. More in details, the econometric model is based on the question (F3) *During the COVID-19 emergency, how does agile working affect your work-family balance?*, while the qualitative analysis concerns text-based answers to two open-ended mode questions (D11 and D12): *Based on your experience, please indicate the most relevant limits of the agile working during the COVID-19 health emergency; Based on your experience, please indicate the most relevant benefits of the agile working during the COVID-19 health emergency.*

The rest of the chapter is organized as follows: section 2 overviews the main literature on agile workers' well-being, its main dimensions, and its determinants; section 3 introduces data and methods; section 4 discusses the results of the qualitative and quantitative analyses; and lastly, section 5 concludes the analysis.

## 2. AGILE WORKING AND WELL- BEING: AN OVERVIEW

The onset of the COVID-19 pandemic has led to a rapid reorganization of work processes in all sectors, including research. Since 2020, many studies have started to analyse the phenomenon in its various facets, investigating the benefits and limits of this new work structure. The large-scale shift to agile working (mostly from home) caused by the pandemic gave to researchers the opportunity to study in a real-world experimentation the impact on workers' wellbeing , and the possibility of reorganizing the work processes towards more flexible schemes.

The lessons learned about agile working during the pandemic time can also provide guidance for an effective implementation of long-term policies for a strategic reorganisation of work

processes in the future post-pandemic era. The complexity of the topic under analysis is due to the implication that agile working (and working from home in our specific case) has on several aspects of workers' lives. In fact, well-being during agile working can be affected by personal, environmental, organisational factors. The multidimensionality of the phenomenon requires a deep literature analysis to detect the several dimensions, both from the sphere of life and from that of work. Although there is a lot of literature on the topic, there are not many studies that have analysed the particular population investigated in this contribution, namely researchers and technologists of the Public Research Organisations. The intent of the contribution is precisely to describe the well-being in relation to this population, which has very specific characteristics compared to other workers (e.g., autonomy, flexibility, but also the need for suitable spaces and equipment to be able to carry out intellectual work).

Working during the pandemic mostly means working from home, in spaces not designed for this purpose, poorly equipped, and often not acoustically isolated from other family members. This way of working also means no direct contact with colleagues, the organization of numerous online meetings and the renunciation of informal exchanges; at worst, it can also mean isolation (Albano et al., 2019; Malzani, 2018). Social relations in the workplace are also an important source of job satisfaction therefore, the reduction of social relationships due to agile working is likely to affect the quality of the working life, too.

The literature that studies well-being in relation to smart working, especially in the last two years, mainly analyses three topics: the family's characteristics, the gender gap, and the ability to define barriers between working time and free/family time. According to George et al. (2021), it seems that the interference of work in personal life is a key factor causing stress. The main problem seems to be connected to the inability to maintain boundaries between work and non-work life activities (Eddleston & Mulki, 2017). This is especially true if working from home with the partner and or with children. Working time can easily become blurred, fragmented and expanded over a longer period of time, as it becomes necessary to take care of the children or manage the household chores (Grant et al., 2019). According to Shamir & Salomon (1985), the stress associated with the inability to distinguish between working and non-working hours is even greater for workers in occupations that require greater concentration, who cannot turn off their work and return to it immediately. In relation to the fluidity of time and spaces dedicated to paid work and private life, Romens (2021) speaks of *spread working*, which spreads everywhere and at any time, overcoming the concept of smart.

Working from home exposes to the risk of being swallowed up by *workaholism*: the colonization of work on other aspects of life. This implies the failure to exercise the right to disconnect, on which many countries have begun to legislate after the COVID-19 pandemic outbreak (Albano et al., 2019). The priority in this context is to limit the negative effects of smart working, protecting employees' non-working time with the possibility of an endless work (Eurofound & ILO, 2017). The intense use of this way of working has brought out the importance of imposing time limits on work activities, to encourage the balance between the work and the private life of the employees.

The analysis of the advantages and the limits of agile working inevitably places us in a gender perspective, especially in Italy, where in the pre-pandemic 2019 only 6% of male and female workers worked from home, and women have had more difficulties than their colleagues to access flexible ways of working, in terms of time and space (ISTAT, 2020). In this context, it is necessary to investigate whether smart work allows to improve the reconciliation between working time and care time (domestic and family), or free time. In Italy, literature on the topic points out that the reconciliation is an issue that concerns, above all, the women, because of the specific characteristics of the family welfare. Care work falls on families and, in particular, on women (Naldini & Saraceno, 2012), due to the weak state support for early childhood services and to the unbalanced distribution of unpaid domestic work.

According to Sørensen (2017), the reconciliation issues are closely related to the migratory background, ethnicity, social class, because many women do not have the possibility to stay at

home without a paid work and, thanks to those women, the ones from wealthier social classes can afford to do remote work.

Furthermore, before the pandemic, the literature on the subject highlighted how many smart workers took on domestic and family commitments, precisely because of the increased flexibility guaranteed. For this reason, some authors speak of a strengthening of the roles traditionally attributed to the gender and of the perpetuation of the asymmetry (Hilbrecht et al., 2008).

According to the literature from the pandemic period, several studies proved the strengthening of the division of traditional roles, confirming the man as the breadwinner and the woman as the principal holder of care jobs (Hodder, 2020; McLaren et al., 2020). Especially during the lockdowns, when schools were closed and it was impossible to outsource childcare to grandparents and babysitters, the unequal division of care and household care appeared clearly (Mangiavacchi et al., 2021; Farré et al., 2020; Alon et al., 2020).

An interesting study carried out in Italy in 2020 (Del Boca et al., 2020), on a representative sample of working women, shows that, during the COVID-19 pandemic, 61% of the women vs 51% of the men spend more time in childcare than previously and, controlling for educational attainment, it emerges that parents with higher educational levels (at least with a university degree) are more likely to spend time with their children. Cultural capital seems to have an important role on the recovery of children's educational gaps, especially in recent years of intermittent access to formal courses. Although this study finds an increase in family care duties by both sexes, the analysis of the professions demonstrates the imbalance of family work: especially for working women with young children, conciliation appears to be a mirage, especially when the partner returns to work in presence. The most serious aspect of this imbalance in the management of family care is the risk of an ever-widening gender gap in the economy, but several European studies suggest that co-working from home can help in the rebalancing process in favour of women and it has positive effects on the perceived well-being of workers, in terms of income and life in general (Mas & Pallais, 2020; Angelici & Profeta, 2020; Arntz, et al., 2019; Virick et al., 2010).

Another interesting result emerged from the studies conducted in 2020-2021 is related to the working women's satisfaction. It seems that unemployed women, during the first phase of the pandemic outbreak, are less satisfied about their life in comparison to women working from home (despite all the difficulties described). Once again education plays an important role: more educated women felt less insecure about their future and they presented higher levels of perceived well-being than the less educated ones (Del Boca et al., 2020).

Martucci (2021) compared, in a recently published study, through a qualitative analysis on text-based answers to open-ended question, American professionals and academics who are mothers. It is interesting to refer to this study because it obtained different results from those which we will present in ours, on a rather similar population, but in a different national context. Martucci's hypothesis is based on the idea that the factor that determines the division of care with the partner, and the consequent positive family experience during the lockdown, is the perceived flexibility of the woman's job. The reason seems to be related to the increasing number of working hours and the possibility of interrupting work when it is necessary to carry out care duties. Only 16% of academics mentioned a balance between work and family as a positive aspect of the lockdown: for the majority, it was more likely a conflict with the partner. Flexibility seems to create tension both from the family and from the Academia side, because the possibility to work whenever and wherever can be a negative aspect if colleagues and students can contact you at any time of the day (Rafnsdóttir & Heijstra, 2013). Flexibility, therefore, does not seem to be an advantage of the smart working itself: in fact, it can become a trap and a ploy to delegate care tasks to the partner who works from home and who can interrupt work at any time.

Summing up, the studies presented seem to indicate a path of partial regulation of the spatial-temporal flexibility of the workers, to prevent them from being overwhelmed by the dilution of the working time over several hours during the day, but they leave an open discussion on how to reduce the gender gap with respect to care activities. Some argue that one of the main advantages of working-from-home, from the point of view of the employee's well-being, is the elimination of the stress involved in commuting to work. However, this general statement must be qualified.

It has been suggested that for a considerable number of employees the journey to and from work provides a buffer of time and space between home and workplace that may give them the opportunity to “refresh” and prevent the transfer of stress from one life sphere to the other (Albano et al., 2019; Grant et al., 2019; Salomon & Salomon, 1984).

### 3. DATA ANALYSIS: DESCRIPTIVE STATISTICS AND METHODS

This section introduces the data and the qualitative and quantitative methodologies applied to investigate R&Ts’ well-being during the agile working experience over the COVID-19 pandemic.

The data comes from the survey Agile working in Public Research Organizations: organizational factors and individual behaviours in knowledge creation (*Il lavoro agile negli enti di ricerca: fattori organizzativi e comportamenti individuali nella produzione di conoscenza*) administered between February and March 2021 by CNR-IRCrES (see Fabrizio et al., 2021). The database collects the questionnaires filled by R&Ts from CNR and INAF, the two Public Research Organisation involved in the survey. Out of 2,921 respondents, 388 come from INAF and 2,533 from CNR. The questionnaire was intended to deepen several dimensions of agile working but, in this chapter, we will analyse those related to wellbeing.

In order to answer to our main research questions (does agile working favour the conciliation between work and free/family time in the case of R&Ts? Are there any characteristics that influence the well-being of the respondents?), we consider several aspects, including gender, age group, family composition, commuting and working habits, contractual and sectoral aspects, and the perceived benefits and limits of smart working during the pandemic.

These data come from multiple sections of the questionnaire (see the Annex of this book), in particular:

- (C1) gender (37 missing values);
- (C2) age group, recoded in three classes ( $\leq 44$ ; 45-54;  $\geq 55$ );
- (C4) population class of the municipality of residence;
- (C5) approximate size (Sqm) of the house used for agile working;
- (C6) number of cohabitants and (C7—11) specific number of adults or minor children, partners, and parents;
- (C13) type of contract and (C14) professional position;
- (C15) scientific disciplinary area and (C16) type of research activity (experimental, non-experimental, project technical support, laboratory technical support);
- (D3) pre-pandemic agile worker;
- (D11-12) Based on your experience, please indicate the most relevant limits of the agile working during the COVID-19 health emergency, and based on your experience, please indicate the most relevant benefits of the agile working during the COVID-19 health emergency (multiple choice and open-ended questions, that are analysed by text-based methods in section 4).

In particular, in (D11) we analysed the following items:

- a. work overload;
- f. feeling of isolation;
- g. fragmentation of work due to domestic needs and family care.

Concerning (D12), the items analysed are as follows:

- a. saving time on commuting from home to work;
- f. increase of productivity.

(E5) type of technical problems when working from home;  
(F1) work schedule during the pandemic (see fig. 5);  
(F3) During the COVID-19 emergency, how does agile working affect your work-family balance? which provides 4 answer items:

- a. agile working does not affect the time balance,
- b. agile working determines a redefinition of time in favour of family/leisure with respect to work,
- c. agile working determines a redefinition of time in favour of work with respect to family/leisure,
- d. agile working favours the conciliation between family/leisure time and work time (this is the outcome variable of the logit model referred to in section 4);

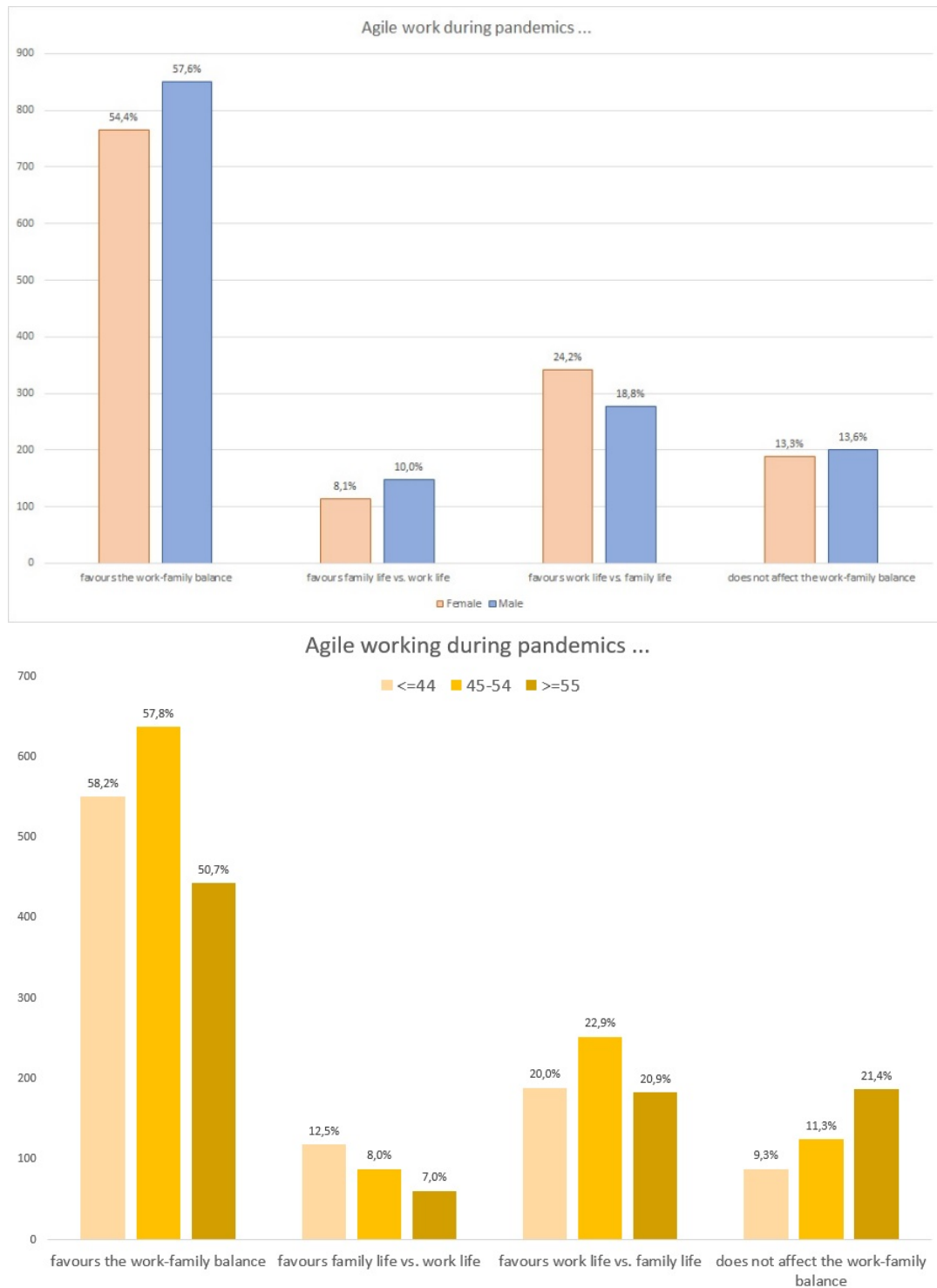
(F4) use of the right to disconnect;  
(F5) behavioural problems when working from home;  
(G2) usual commuting time round-trip (minutes);  
(H1-2) desire for post-pandemic agile working (days per week).

The quantitative analyses described in section 4 included many covariates, but most of them were not significant in the econometric choice model. Subsection 3.1 describes in detail the relevant variables, neglecting the non-significant ones, which have been omitted from the final model due to parsimony. Subsections 3.2 and 3.3 respectively introduce the quantitative and the qualitative methodologies applied in section 4.

### 3.1. Characterizing the main variables in the analysis

The focus of this chapter is the well-being and the work-family balance experienced by R&Ts when working at home during the pandemic emergency. The main determinants of the workers' perceptions will be analysed by a multinomial choice model in section 4. In particular, we are interested in analysing the implications on workers' well-being. This section explores the main relevant covariates; the rest of the variables are described in Chapter 2.

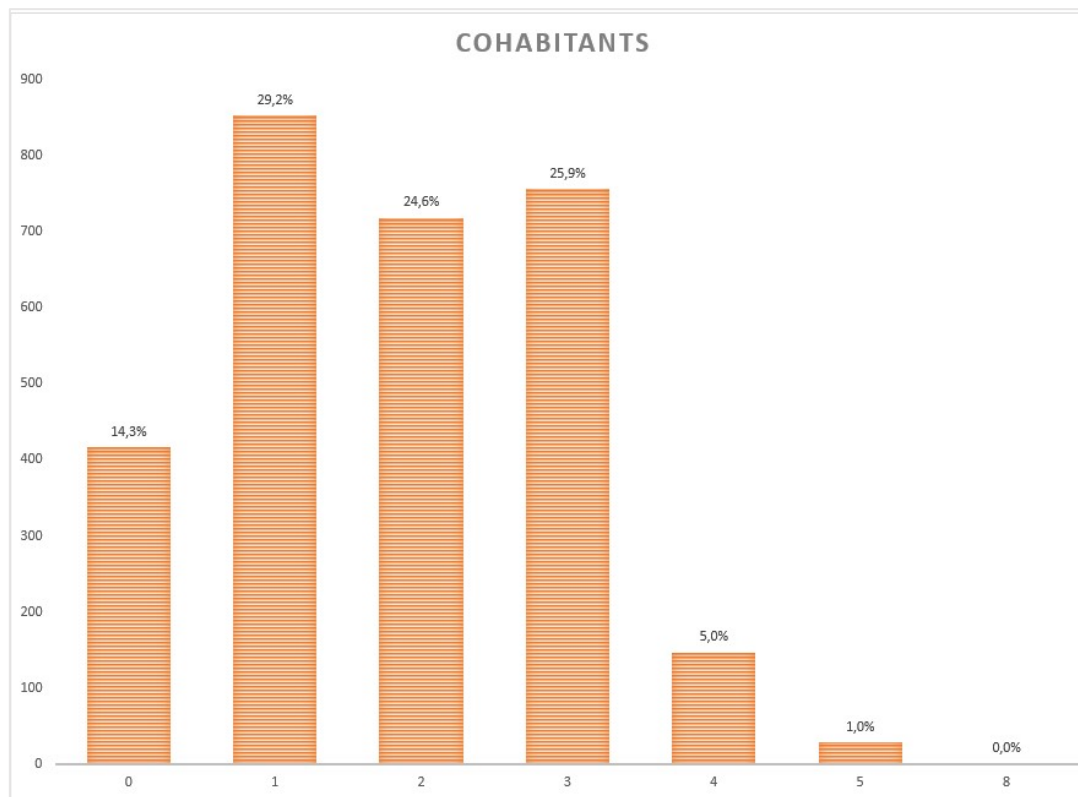
In Figure 5.1, the upper panel shows how the outcome categories (F3) of our quantitative model are distributed by gender: more than half of the respondents feels that agile working helps to improve their work-family balance (57.6% males, 54.4% females), while 13 respondents over 100 do not perceive changes compared to the pre-COVID period. About one in four females and one in five males feel that working at home favours work rather than family; the opposite is experienced by about one in 10 R&Ts. Overall, gender specificities are rather mild, as the quantitative analysis will confirm.



**Figure 5.1.** Work-family balance: agile workers' perceptions during the pandemic, by gender (upper panel) and by age class (lower panel). Absolute and percentage values. Source: authors' elaboration of survey data.

On the contrary, the age class is relevant (Figure 5.1, lower panel): older workers (aged 55 and more) are less likely to perceive changes in their work-family balance, while about three of five younger workers (aged no more than 54) perceive an improved balance during the pandemic.

Overall, about one in five workers feels that work life is favoured when working from home. This issue will be explored by the econometric model in section 4.



**Figure 5.2.** Number of cohabitants. Absolute and percentage values. Source: authors' elaboration of survey data.

Another relevant issue when working from home is the family composition, particularly in lockdown contingency. Figure 5.2 shows how the number of cohabitants is distributed on the sample: about 14% of R&Ts live alone, with no problems of space sharing during work activities. The rest of the sample (2,504 respondents) has a cohabitant or more: 70.6% of them (1,769 respondents) live with at least one child and/or with a parent. Table 5.1 explores the types of cohabitants for this particular subset of respondents: the great majority lives with minor children (74.0%), a bit more than 1 in 4 with adult children (28.3%), while just 7.2% of them has a parent at home. Finally, 76.8% of R&Ts living with children/parents lives with a partner too. These data are interesting for our analysis, since smart workers' well-being is affected by the sharing of the space and the load of family-care, which generally increases when minor children and not self-sufficient parents are at home, especially if the family-care cannot be shared with a partner.

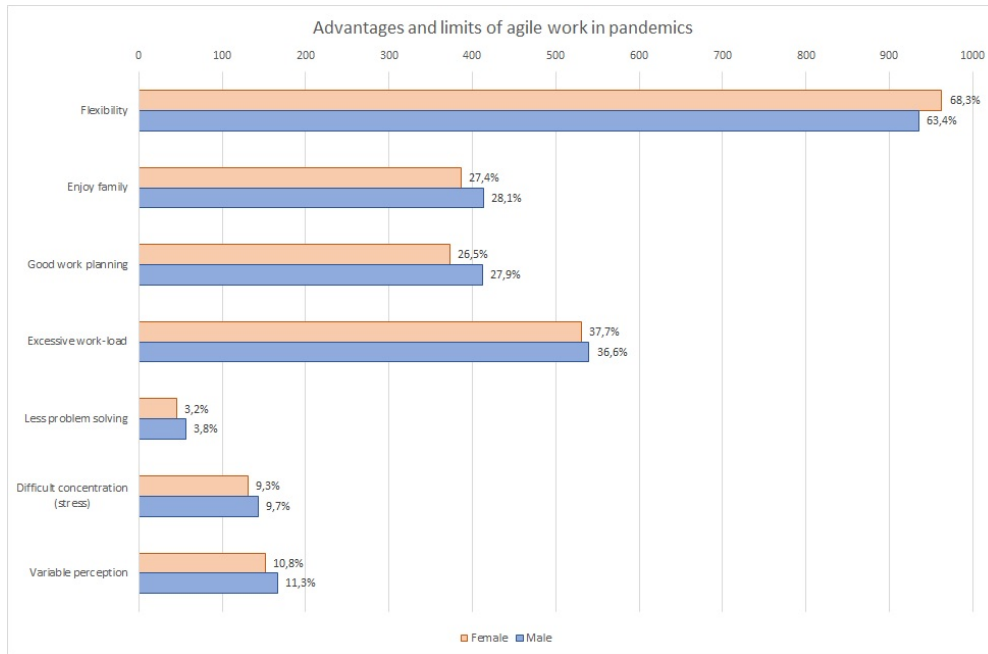
**Table 5.1.** Type of cohabitants for respondents living with a child or, at least, a parent . Absolute values and percentage

Type of cohabitant(s)	Yes		No		Total
	#	%	#	%	
Minor son(s)	1309	74,0%	460	26,0%	1769
Adult son(s)	500	28,3%	1269	71,7%	1769
Parent(s)	128	7,2%	1641	92,8%	1769
Partner	1359	76,8%	410	23,2%	1769

Source: Authors' elaboration of survey data.

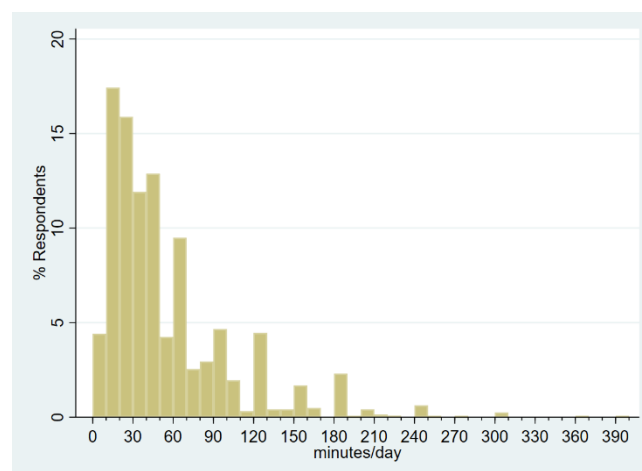


The multinomial logit model in section 4 embodies a number of regressors concerning the advantages and the limits of agile working during the pandemics (Figure 5.3; they are derived from questions D11, D12, F5; see paragraph 3 for further insights). Overall, about 65% of respondents appreciate its flexibility, while 27% of them acknowledge the opportunity to enjoy the family when working from home. However, more than one in three workers experiences an excessive work-load. Also, in this case, gender differences are very soft.



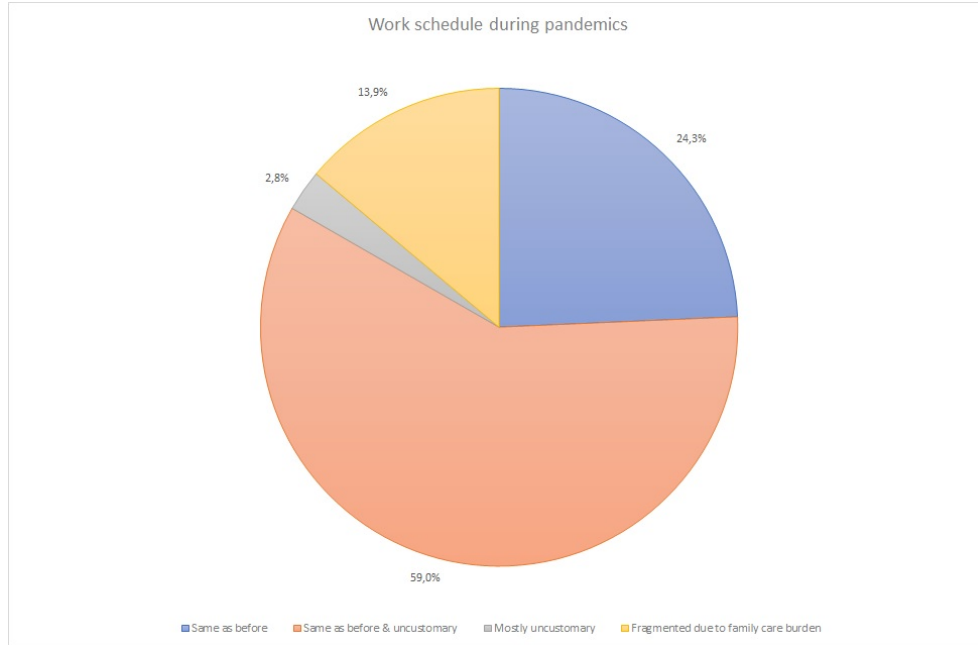
**Figure 5.3.** Agile working: Main advantages and limits during pandemics, by gender. Absolute values and percentage. Source: authors' elaboration of survey data.

Another relevant issue for investigating workers' perceptions about working from home concerns the time generally spent in commuting (see Chapter 7 for further details). Figure 5.4 shows that less than half of the respondents commute for no more than 30 minutes per day, while about 24% of them has to travel for more than one hour per day.



**Figure 5.4.** Distribution of the frequency of the workers' commuting time in a normal day, round-trip. Source: authors' elaboration of survey data.

Finally, the pie chart in Figure 5.5 shows that the great majority of the workers (59%) associate some unusual times or days to their customary schedule, while 14% of them is forced to split the working time due to the family care burden.



**Figure 5.5.** Workers' schedule during pandemics. Percentage values. Source: authors' elaboration of survey data.

### 3.2. Methods used in the quantitative analysis

The quantitative analysis presented in section 4 estimates a multinomial choice model, in order to characterize R&T agile workers' perceptions about their work-family balance during the COVID-19 pandemic.

The multinomial logistic regression models allow to characterize the choice between more than two unordered alternatives, that is a nominal outcome variable with more than two categories, describing how independent covariates affect the probability of choosing one outcome over a convenient reference category. Practically, log-odds ratios are modelled as linear combinations of attributes and individual characteristics. This means that the logarithm of the relative probability of outcome  $J$  with respect to the reference outcome  $K$  is expressed as a linear model of a vector of independent variables  $\mathbf{x}$ :

$$\ln \left[ \frac{\text{Prob}(Y_i=J|x_i)}{\text{Prob}(Y_i=K|x_i)} \right] = \mathbf{x}'_i (\boldsymbol{\beta}_j - \boldsymbol{\beta}_k), \quad (1)$$

Where  $Y_i$  is a random variable indicating the category of choice. A convenient normalization is  $\boldsymbol{\beta}_k = \mathbf{0}$ . For estimation, it is useful that the odds ratio  $P_j/P_k$  does not depend on the other alternatives. It is the so-called independence from irrelevant alternatives assumption (see Greene, 2012 for details).

In this framework, the estimated coefficients are interpreted as the variation in the relative log-odds of the outcome  $J$  with respect to the outcome  $K$ , due to a unit variation of the corresponding independent variable. In other words, the estimated coefficients are linked to the variation in the relative risk, i.e. the probability of choosing one outcome category with respect to the probability of choosing the reference category. The relative risk can be obtained by an exponentiating equation (1); in this case, the regression coefficients yield relative risk ratios for a unit change of the predictive variable. Practically, in section 4.1 we will introduce a multinomial logistic model

to describe workers' perceived variations in the work-family balance with respect to the pre-pandemic time, controlling for a number of covariates including career profiles, scientific sector, individual characteristics, and family characteristics.

### 3.3. The methods used in the qualitative analysis

The quantitative analysis was complemented by a qualitative textual exploration, both to confirm the results and to identify dimensions and problems that may have been overlooked.

The qualitative analysis was carried out on the 607 text-based answers to the two open-ended mode questions D11 and D12: "based on your experience, please indicate the most relevant limits of agile working during the COVID-19 health emergency"; "based on your experience, please indicate the most relevant benefits of agile working during the COVID-19 health emergency". The respondents who considered the drop-down list proposed by the questionnaire to not be exhaustive were free to express their answers through a text. Compared to the 607 responses, the limits were listed seven times more (536) than the benefits (71). Among the respondents of the textual part, 455 chose at least one other response mode from the proposed list, while 157 selected the open-ended mode question because they disagreed with all the other proposals.

According to Flick (2014), we analysed qualitative data in order to reduce their complexity, choosing an inductive data-driven approach able to shed light on areas and categories that emerged directly from the texts. We proceeded through theoretical sampling, that is a process by which new data sources are based on codes and categories derived through open coding (Glaser & Strauss, 1967). The four-step procedure is characterized by basic coding (the first general coding that allows emerging new dimensions and categories); fine coding (development of data-driven subcategories); hierarchization and merging of overlapping codes or categories; and analysis after completing the coding (visual tools, maps, frequency tables).

Through the in-depth analysis of the limits and advantages expressed by the respondents, it has been possible to bring out new dimensions that were not identified during the creation of the survey, shedding light on unexpected problems and advantages that will be described in section 4.2.

## 4. RESULTS

This section is dedicated to uncovering the main determinants of workers' perception about their work-family balance while working from home during the COVID-19 pandemic. The situation was peculiar, but the awareness about these determinants is nonetheless fundamental to develop organizational schemes that favour workers' well-being in future non-pandemic times. By combining quantitative and qualitative methodologies, we are able to identify weak and strong features of agile working, having a direct impact on well-being.

### 4.1. Work-family balance during pandemics: pros and cons of home working

R&Ts experienced different perceptions of their work-family balance when working from home during the pandemic. We model the perceived variations with respect to the pre-pandemic multinomial logistic regression times, controlling for career profiles, scientific sector, individual characteristics, and family characteristics. The nominal outcomes (from question F3) are:

- a. agile working does not affect the time balance (reference outcome);
- b. agile working determines a redefinition of time in favours of family/leisure with respect to in relation to work;
- c. agile working determines a redefinition of time in favour of work with respect to family/leisure;

d. agile working promotes the conciliation between family/leisure time and work time; The Hausman-Mc Fadden test confirms that independence of irrelevant alternatives (Long & Freese, 2014).

Table 5.2 shows the main covariates affecting log-odds, i.e., each coefficient represents how a unit change in the covariate affects the probability of perceiving that specific variation with respect to the reference outcome (no change perceived). For a complete understanding, Table 5.3 shows some z-tests assessing the effect of covariates through specific pairs of outcomes, i.e. by changing the category of reference outcome.

**Table 5.2.** Work-family balance: agile worker's perceptions

Agile working during pandemics favours ...	(1)	(2)	(3)
VARIABLES	family life	work life	work-family balance
Female	-0.156 (0.188)	0.233 (0.150)	-0.024 (0.130)
Age	<=44		
	0.789*** (0.237)	0.627*** (0.189)	0.628*** (0.159)
45-54	0.098 (0.234)	0.436** (0.172)	0.431*** (0.145)
>55	baseline	baseline	baseline
Children (#)	0.422*** (0.094)	0.325*** (0.077)	0.311*** (0.067)
Travel to work (mins)	0.002 (0.002)	0.000 (0.002)	0.007*** (0.002)
Working time			
Fragmented	2.120*** (0.331)	0.840*** (0.323)	0.585* (0.305)
Mostly uncustomary	0.480 (0.509)	-0.036 (0.423)	-0.071 (0.395)
Same + uncustomary	-0.527** (0.230)	-1.100*** (0.175)	-0.418*** (0.133)
Excessive work-load	-0.049 (0.212)	1.652*** (0.155)	0.001 (0.136)
Enjoy family	0.828*** (0.242)	0.577*** (0.214)	1.484*** (0.190)
Work flexibility	-0.057 (0.188)	0.004 (0.150)	0.601*** (0.130)
No difficulty	-1.040*** (0.267)	-0.598*** (0.186)	-0.080 (0.156)
Variable perception of difficulties	0.928*** (0.286)	0.790*** (0.256)	0.064 (0.245)
Good work planning	-0.361 (0.283)	-0.132 (0.189)	0.633*** (0.151)
Less problem solving	-0.441 (0.386)	-0.533 (0.371)	-0.884** (0.365)
Difficult work planning	0.663** (0.262)	0.657*** (0.239)	-0.465** (0.234)
Less interest for work	0.362	-0.534*	-1.029***

	(0.300)	(0.293)	(0.290)
Difficult concentration (stress)	0.718**	0.951***	-0.006
	(0.307)	(0.282)	(0.287)
Technologist	-0.180	0.261	0.132
	(0.310)	(0.221)	(0.191)
Temporary contract	0.380	-0.085	-0.072
	(0.498)	(0.417)	(0.360)
Sectoral areas	yes	yes	yes
Constant	-0.871*	-0.421	0.204
	(0.511)	(0.408)	(0.355)

Base-outcome	does not affect the work-family balance		
Observations	2,884	2,884	2,884
Pseudo R2	0.214	0.214	0.214

SE in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Multinomial logit model (base outcome: agile working does not affect the work-family balance during pandemics).

Concerning the career profiles, it is worth noticing that there are no differences between the contractual frameworks (i.e., researcher, technologist, director, but also temporary job, part-time employment), while some specificities appear across scientific sectors. In particular, medical scientists and economists are less likely to perceive an improvement in their work-family balance (see Table 5.3, sectoral area). However, there are neither specific effects in STEM (science, technology, engineering, mathematics) vs. non-STEM sectors, nor in experimental vs. non-experimental research (results not shown). At the very least, the distribution of the answers concerning the type of research activity (question C16) among the scientific sectors (C15) casts some doubts about the quality of this piece of information. Since the literature is rather limited on this issue, no comparison can be drawn.

The model shows that the trade-off is substantially affected by individual and familiar characteristics. Surprisingly, the gender effects are rather mild: women are a bit more likely to experience a deterioration of their leisure time rather than a deterioration of work time, or an improvement in their work-family balance. This may be due to the particular population under investigation: R&Ts are the most educated working communities, very far from representing the average working class in Italy, where gender gaps are more likely to emerge (Del Boca et al., 2020).

On the contrary, the age class proves to be relevant: younger people experience a significant difference in their work-family management during the pandemic, which decreases over age classes. This is probably related to family care and organization, which are generally more burdensome in younger families. The model can control for the number of children in the family, but care issues are manifold and difficult to measure. In any case, the family is the key point: each child increases the probability of reallocating time in either way, while the opportunity to enjoy the family when working from home is fundamental to improve the balance. Information on other cohabitants (partner, parents, other types) are not significant, as well as home surface (both total and per person), which could proxy either the space sharing during smart working or the household income. However, this variable could be particularly affected by measurement errors.

*Ceteris paribus*, another relevant element to improve the balance is saving the commuting time when working from home, while no difference emerges depending on the place of living (small, medium, large municipalities, metropolis).

**Table 5.3.** Difference in coefficients (outcome A vs. B): z-tests and pvalues

<i>Variable</i>	<b>b</b>	<b>z</b>	<b>P&gt; z </b>
<b>Outcome A vs. B</b>			
<i>Female</i>			
working life vs. home life	0,389	2,284	0,022
working life vs. balance	0,257	2,233	0,026
<i>Working time - Fragmented</i>			
home life vs. working life	1,280	5,997	0,000
home life vs. balance	1,535	7,737	0,000
home life vs. no effect	2,120	6,407	0,000
<i>Excessive work-load</i>			
working life vs. home life	1,702	8,986	0,000
working life vs. balance	1,652	14,032	0,000
working life vs. no effect	1,652	10,645	0,000
<i>Enjoy family</i>			
balance vs. home life	0,656	3,746	0,000
balance vs. working life	0,907	6,829	0,000
balance vs. no effect	1,484	7,805	0,000
<i>Sectoral area - Medical science</i>			
balance vs. no effect	-0,840	-2,183	0,029
balance vs. home life	-1,416	-2,221	0,026
<i>Sectoral area - Economics</i>			
balance vs. no effect	-1,158	-2,226	0,026

Finally, personal abilities in managing working routines are necessary: workers who improve their balance experience satisficing work planning and problem-solving, thus appreciating the flexibility implied by agile working. On the contrary, the technical problems experienced when working from home do not produce significant effects. Surprisingly, the ability to use the right to disconnect is not correlated with a specific outcome category (not shown), however the variable could suffer some measurement issue.

However, improving the work-family balance is just one side of the story. During the COVID-19 pandemic, the relative risk of perceiving a deterioration in leisure time is increased by the feeling of an excessive workload, while the relative risk of perceiving a deterioration in work time is dramatically increased by the domestic care burden, which causes a work fragmentation. Both perceptions are significantly associated with planning difficulties, low mental concentration due to stress, scarce resilience due to unstable perceptions.

Certainly, these aspects are sharpened by the pandemic contingency, but they are nonetheless critical if agile working is adopted in normal routines. In order to take full advantage of flexible organizational structures and increase their well-being, workers could benefit from specific training on stress and time management techniques. Overall, these results suggest the main relevance of work-family reconciliation policies to safeguard the workers' well-being.

#### 4.2. Limits and advantages of agile working during the COVID-19 pandemic through a qualitative analysis

The gender analysis of the closed question answers shows few differences between females and males. In general, the main limit of agile working, according to the respondents (55% females and 49% males), is the feeling of isolation. In second place for percentage, we have the fragmentation of the work due to domestic needs and family care, and the work overload (38% females and 37% males). Compared to the advantages of smart working, 78% of the females and

74% of the males declare a perceived increase in productivity, while 76.5% of the respondents declare to save time on commuting from home to work. As anticipated in the methodological paragraph, to deepen insights on the limits and on the advantages of agile working during the pandemic, we analysed the open-ended answers of the D11 and D12 questions through the Maxqda software. This analysis procedure brings out the range of perceptions not grasped through the closed responses. In fact, the procedure of coding and the analysis of the qualitative data allow us to divide the thematic areas of the perceived advantages into five points: life quality, new working tools and methods, free time and working time conciliation, efficiency, savings.

In the life quality dimension, 40% of the respondents declare to have a better management of time, being able to juggle better between work and extra commitments. The respondents appreciated also the possibility to experiment new working tools: for instance, 43% of the respondents declare to have had the opportunity to attend more online conferences than before the pandemic, when they almost exclusively occurred face-to-face. R&Ts also appreciated new tools (IT) and new working places, as well as a greater propensity to develop their work by goals.

Regarding the free time and the working time conciliation, 44% of the answers concern the improved possibility of looking after children and relatives, and they also mentioned, among the advantages, the increased time for housekeeping, the flexible management of working time and the possibility of helping children while they are in distance learning.

Compared to work efficiency, 56% of the segments coded in this dimension identify as an advantage the possibility to have fewer distractions while working from home, with respect to working in the office, and 33% of them claim that they perceived an improvement in terms of productivity. Among the advantages of smart working, they also indicated the promotion of work among teams spread over multiple locations. Finally, the last dimension mentioned in terms of benefits concerns the savings in commuting time (29%), the economic savings due to the lower number of trips, the savings in time lost into the traffic, and the economic savings for the institution (electricity, water, and heating).

While the segments coded for the advantages of smart working were 71, the limits were mentioned seven times more (536). These data describe the heterogeneity of the problems that have emerged and the difficulty of systematizing and plugging them in a closed-ended question. The analysis brought out seven areas of perceived limits: space and tools, workaholism, scientific partnership, family composition, social issues, rigidity of the institution, pandemic-related issues.

The working space and equipment available were the major limitations for the R&T respondents. In fact, 223 strings have been encoded in this area and among these, 43% of them claim as a major limit the difficulty of carrying out experimental activities. Weak internet connection and inadequate working space-equipment (shared family spaces, noisy environment, unsuitable workplace): these difficulties have been perceived more by researchers and technologists coming from STEM disciplines.

To define the second area of limits that emerged, we borrowed the term *workaholism*, introduced by Kreiner et al. (2009) to describe the colonisation of the private life by work. Among researchers and technologists, 26% of the segments coded in this area are related to the difficulty to disconnect. Working from home sometimes means making the barriers between working and free time/space indistinct and disconnecting from work becomes difficult. Respondents declare to remain available even outside the usual working hours, which has a negative impact on family and spare time. In fact, 20% of them declare that during smart working they are not able to distinguish working time from free time. Likewise, respondents detect the fragmentation and expansion of working time caused by household needs and family care. The interruptions impose a time dilation and make the distinctions blurred: these results are consistent with the multinomial logit model presented in the previous subsection.

An unexpected limitation of smart working (11%) is the hyper-connection: overload of telematic meetings, excessive exposure to PCs and other electronic devices such as phones / tablets.

Stress and difficulty of concentration are other limitations identified in the workaholism area: in fact, the interviewee talk about physical and psychological fatigue, less ability to maintain attention and work overload.

The third area is related to scientific partnerships and about 80% of the coded segments refer to the difficulty of maintaining interactions with the colleagues. Researchers and technologists also pointed out the difficulty of starting new research paths because of the difficult communication with colleagues and the different work schedules determined by family needs. Compared to the family composition, the interviewee pointed out that one of the major limits is determined by the presence at home of children to be cared for, especially if they are in distance learning. About this, being always available and present at home determines continuous requests for support, both from children and from partners. Finally, the last element that can impact in a negative way is the increase in personal costs due to smart working, which fall on the family budget.

Social issues also play an important role on the working well-being: the absence of informal meetings with colleagues is an important loss for researchers and technologists, as well as the loss of the sense of community associated with the organisation. The dimension named *rigidity of the institution* lists the limits associated with the unpreparedness of the institutions in the management of smart working during the pandemics. R&Ts complain about the difficulty of communicating with the institution during the smart working and the non-recognition for out-of-work activities. Finally, the last dimension is explicitly connected to the limits of smart working during the COVID-19 pandemic. Work delays, alienation, and inability to move are the three most cited limits.

## 5. CONCLUSIONS

Working from home during the COVID-19 pandemic has been challenging for researchers and technologists working at PROs, in Italy. For the first time, the concept of agile working overlapped with working from home, and seven R&Ts over ten did it with cohabitants in the same house, 74% of whom living with minor sons and daughters. In addition to this, 7.2% of them live with one parent at home.

These data are very interesting for our analysis, since the literature on smart workers' well-being argues that it could be negatively affected by the family-care burden, which generally increases when minor and not self-sufficient parents live together, especially if the family-care cannot be shared with a partner (Grant et al., 2019). More than 50% of the respondents, and unsurprisingly 57.8% of the men, feel that working from home improves the reconciliation between work and family/spare time. It is very interesting to notice that among R&T females, about 25% of them feel that working from home favours work rather than family. This result is probably due to the specific population of interests, having very high educational level and the propensity to work in autonomy, with flexibility. Despite that, even if our analysis does not provide strong evidence regarding the gender unbalance, it emerges that females are a bit more likely to experience a deterioration of their leisure time rather than a deterioration of work time, or an improvement in their work-family balance. According to previous research (Naldini & Saraceno, 2012; Hodder, 2020; McLaren et al., 2020; Mangiavacchi et al., 2021; Farré et al., 2020; Alon et al., 2020), it seems that women working from home take the greatest burden of care (family and home). Care needs are also significantly associated with planning difficulties, low mental concentration due to stress, and scarce resilience due to unstable perceptions. From a policy point of view, our results demonstrate that, if not adequately supported by external care services, women will set aside their free time to deal with family and work needs, and they will be more exposed to stressful events.

Concerning the covariates, our econometric model shows that the age class is relevant: older workers are less likely to perceive modifications in their work-family balance, while about three younger workers over five perceive an improved balance during the pandemic, probably due to the possibility to spend more time with their children and family than before. Furthermore, our



results show that another relevant variable in terms of wellbeing is the time saved for commuting: almost ¼ of the respondents has to travel more than one hour in order to reach the workplace. Some authors argue that one of the best advantages of agile working is the elimination of stress from displacement (Salomon & Salomon, 1984) and the possibility to invest the saved time in leisure activities or family time. This result is also confirmed by the appreciation of the flexibility demonstrated by the respondents: more than ¼ appreciated the opportunity to enjoy the family while working from home.

The qualitative analysis performed on text-based data supports the econometric model, allowing us to identify five areas of advantages: life quality, new working tools and methods, free time and working time conciliation, efficiency, and savings. In particular, when talking about the reconciliation issue, 44% of the respondents identify as an advantage the greater possibility of looking after their children and relatives. Besides that, they appreciated the increased time for housekeeping and the possibility of helping their children while they are in distance learning.

Among the limits, the most important one is the one related to the space and the tools available while working from home. This dimension is very important because it did not emerge from the closed-end question and, above all, it has made it possible to give voice to researchers and technologists working in the STEM field. The results of the qualitative analysis show seven areas of perceived limits: space and tools, workaholicism, scientific partnership, family composition, social issues, rigidity of the institution, pandemic-related issues. The difficulty of disconnecting from work and maintaining well-defined limits between working time and free-family time is a limit expressed by the interviewees. To confirm the econometric model, the lack of boundaries appears to be a source of stress for workers. The presence of minors in the family is confirmed as a source of stress for the worker, who is led to fragment his work and to expand it in terms of daily hours worked.

Finally, an interesting element is due to the scientific partnership: about 80% of the coded segments in this area refers to the difficulty of maintaining interactions with the colleagues. The analysis shows that the connections with the colleagues are not easy during agile working, especially in terms of coordination and development of new projects.

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