Research Note

COVID-19 and young Greek researchers. The influence of the pandemic on their research activity

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This is a short research note of a very recent, nation-wide survey conducted by the Greek National Documentation Centre (EKT) in order to explore the difficulties, strains and opportunities faced by researchers during the COVID-19 pandemic in Greece. The survey resulted in a report ''COVID-19 and young Greek researchers. The influence of the pandemic on their research activity'' and can be found here: https://metrics.ekt.gr/publications/402. This research note has also been written in English for the purposes of informing EKT's non-native audience of its activities and results.

Introduction and problem setting

The rapidity and the lethality of the pandemic has thrown into question a great number of long established certainties. Accordingly, different research and policy communities have reacted by attempting to understand how their respective fields and practices will be altered. Examples abound. From entrepreneurial (HBS 2020) to social (Lewnard 2020) and economic practices (Baldwin & Evenett 2020), including sub-themes such as global value chains (Stellinger, 2020) to industrial restructuring (IDAP 2020, Financial Times 2020, Sachs 2020).

Concerning research as a distinct policy domain, three large patterns can be discerned. First, is the major shift of the Biomedical and Health Sciences to cope with this pandemic[1]. Similarly, reporting on how other scientific fields can contribute to achieving this objective/goal, e.g. artificial intelligence (OECD 2020a), digital education (OECD 2020b), the difficulties in protecting personal details and keeping them private (OECD 2020c) or even the rapid conclusion of an otherwise lengthy process in drug approval (Thepharmaletter 2020). In all, a general transformation of how the research system is attempting to cope with the pandemic is observed.

Secondly, this transformation can, also, be discerned in other parts of the research continuum. Huge, urgent and with less strings attached to them, sums of funds are being expediently provided by the public sector. In most cases, these are coupled by private funding sources of the same magnitude (ScienceBusiness 2020a, 2020b). Obviously, without this funding the multiple and parallel epidemiological research, gene sequencing, etc. global infrastructure exploitation necessary to increase the speed so as to find a cure for this virus could not happen.

1 It is impossible to provide a comprehensive account of the relative initiatives. What can be pointed out, though, is the bibliometric account of this rapid ascent, see Chahrour 2020, Lou 2020, Hossain 2020.

The third aspect of this transformation concerns the publication of science results. Editorial boards and science journals have entered into a fast-track mode of publishing COVID-19-related results, so as for the global community to be made aware of the relevant development as soon as possible. Associated with this is the decision by major journal owners to scrap fees for accessing papers. These steps have been enabled by the realisation that open science (OECD 2020d) is the only channel through which to keep abreast of new scientific developments, especially since conferences and other established means of science gatherings have also been annulled due to the lockdown.

What has been lacking, though, is a view on how the most important link of this science continuum, its people, the researchers themselves, have been coping with the pandemic. That is, a substantial portion of this global workforce, researchers, have not been studied as a distinct population group. In other words, we know next to nothing about the attitudes, fears, personal and family strains of this community of people. Given the increased significance of knowledge in the 21st century, not knowing how the prime knowledge producers cope under the pandemic is rather ironic.

To be fair, opinions on how researchers cope, what they fear, etc. have surfaced. Authored by young researchers (Science 2020a) or full professors (Science 2020b), they explore how individuals or specific groups live under lockdown rules, their feelings of stress (Science 2020c), potential impact on their research activities (Science 2020d), the ability to conduct fieldwork (Undark 2020, Science 2020e), as well the potential downsides to gender equality (Science 2020f, Minello 2020, Amano-Patiño *et al* 2020, Cluver *et al.* 2020). However, with the exception of Amano-Patiño *et al.* (2020) and Cluver *et al.* (2020) all these pieces are authored on the basis of their private opinions or the extent of the discussions held internally by small research groups that cannot be necessarily indicative on a more general level.

Objective

Given the above, EKT initiated a study that sought to understand the extent to which researchers have been affected by the COVID-19 pandemic, the subsequent lockdown and social distancing measures through a very recent, nation-wide survey.

Target population

Specifically, the publication presents the findings of a survey that was conducted by EKT between April 15 and May 5, 2020. EKT's investigation into the impact of the COVID-19 pandemic on the research community was a field survey in which an electronic questionnaire was sent to 4,557 researchers working in all scientific fields and participating in European Social Fund through the Operational Programme ‘‘Human Resource Development, Education and Lifelong Learning' (NSRF 2014-2020)’’. Within this Programme, a specific action was targeted for tertiary education (‘‘NSRF Actions on Tertiary Education’’). This has been the prime public funding mechanism through which to sustain the young, highly educated human capital. It was initiated during the years of

the economic crisis and is currently in its phasing out period (2017-present). Funded by the action were scientists a) preparing their doctoral dissertation, b) conducting postdoctoral research, c) being part of research teams and d) gaining academic teaching experience (Sachini *et al.* 2020). This study was addressed to all the recipients of this action (i.e. 4,557 researchers).

The questionnaire was successfully completed and submitted by 2,323 researchers, amounting to 51% of the total population. In terms of gender, 51.4% of the respondents were men and 48.6% women. In terms of age distribution, the greatest portion of the respondents (47.2%) ranged from 36 to 45 years of age, followed by those under 35 years (36.2%). The remaining 16.6% concerned researchers over the age of 46. In terms of the fields of science and technology, the researchers were classified as follows (6 major fields of science in descending order as well as the top 2-digit subcategory per field):

1) Social Sciences (23.5%)
    a) Economics and Business (28.8%)
2) Engineering and Technology (19.8%)
    a) Electrical engineering, electronic engineering, information engineering (24.6%)
3) Natural Sciences (19.2%)
    a) Physical sciences (19.6%)
4) Humanities (18.4%)
    a) Languages and literature (26.2%)
5) Medical and Health Sciences (13.6%)
    a) Health sciences (51.1%)
6) Agricultural Sciences (5.5%)
    a) Agriculture, forestry, and fisheries (42.5%)

It is to be noted that the science classification system followed in the study is the Frascati Field of Science classification system (OECD, 2007). All respondents were asked to select among the major 6 fields of science as well as their subcategories at the 2-digit level.

Questionnaire structure

Assuming that the researchers would be unwilling to fill in an extended questionnaire since the lockdown measures would have started to produce feelings of strain and uneasiness, it was decided to send out a short questionnaire instead. The questionnaire consisted of 5 questions. Each question had multiple variables. The questionnaire structure was as follows:

1) Transcription of the researchers' field and subcategory of science as well their age categories.

2) A 1 to 5 Likert scale question on their capacity to perform research activity/ies as a result of the COVID-19 pandemic and its subsequent lockdown and social distancing

measures. Variables were a) access to the information/digital infrastructure of the country and b) timely completion of research work,

3) A 1 to 5 Likert scale question on the psychological state of the researchers themselves as well as their family environment as a result of the COVID-19 pandemic and its subsequent lockdown and social distancing measures. Variables were a) personal mental strain and b) family mental strain.

4) A yes/no question on the manner in which the COVID-19 pandemic is being received by the researchers themselves. That is, is it being viewed exclusively as a situation of crisis or as a situation that presents itself also as an opportunity. For those researchers that selected the latter choice, a follow-up selection matrix of the following variables were presented. (a) Reduction of energy footprint, (b) Increase of digital collaboration, (c) Learning new skills, (d) Attending new online courses (MOOCS) (e) New research directions (f) More time for study and planning of future research activities and (g) Other. Each variable was structured in a yes/no format.

5) A yes/no question on whether the researchers appreciate that science and technology, as a distinct field of human endeavour, will come out of this pandemic in an enhanced or weakened position in the public sphere.

The questionnaire was uploaded in the LimeSurvey environment and was electronically sent to the researchers' email addresses. All relevant anonymisation steps were carried out. Accordingly, the data from the responses were saved within the LimeSurvey environment. After performing data processing (cleansing, wrangling, manipulation, etc), the Microsofts' Excel Suite was used for data export. For the analysis of the data, the SPSS software was utilised.

Survey findings

Hereafter a select range of findings are presented:

- Access to the information/digital infrastructure of the country and administrative support from academic and research institutions in terms of ensuring the smooth implementation of research activities, are rated very positively by researchers. Specifically, vital public infrastructures and services, such as the national information/digital infrastructure and the administrative support of tertiary education institutes, such as universities and research centres, are very positively rated by researchers, in terms of ensuring the smooth conduct of research. 65.1% of researchers say they have experienced little or no difficulty in terms of access to information infrastructure in their conduct of research activities. Respectively, 46.7% of the answers rated the administrative support provided by these public institutions to the researchers as good and very good (see Figure 1).
- COVID-19 and the need to socially distance has impacted the researchers' ability to access the required logistical infrastructure as well as the ability to conduct field research. Both of which are critical to the execution of the research project. This

is true for researchers in all fields of science, with 41.7% saying they faced great difficulty in accessing the logistical infrastructure necessary for their research activities (e.g. biomedical laboratories, mechanical equipment). Respectively, 53.4% of the researchers' state that they had great difficulty in performing field research (see Figure 2).

- The restriction on spatial movement has affected the timely completion of their research work as well as the completion of planned publications, participation in conferences (both international and national) and other related venues. Specifically, 36.6% of the researchers state that the pandemic has caused a long or very long delay in their research work, while 43.2% state that they face a long and very long delay in their scientific outputs. The effect, however, is not the same in all scientific fields. This is because some of these scientific outputs require physical presence, such as attending conferences, as opposed to others, such as publications in scientific journals, the submission of which can be performed electronically. This effect varies from field to field (see Figure 3).
- Respectively, the spatial restriction due to COVID-19 has also affected the psychological state of the researchers. According to their answers, 53.3% of the researchers are experiencing a high level to a very high level of personal psychological strain due to the lockdown and socially distancing measures. Additionally, 53.7% of the researchers say the lockdown has taken a toll on their family environment adding a further burden (see Figure 4)**.**
- As in any crisis, there is often room for opportunity. Indeed, the majority of the researchers view the pandemic (also) with optimistic eyes. The COVID-19 pandemic is being treated as an opportunity by 59.6% of researchers. Key individual reasons for this are the existence of more time for study and planning future research activities (77.9%), the prospects that are opened through the increase of digital collaboration (63.9%), as well as the possibility of learning new skills (46.2%). Reduction of the energy footprint constituted another reason accounting for 38.7% of researchers (see Figure 5).
- Interesting findings also emerge from the analysis of gender-based responses. Thus, for example, women's responses differ from those of men in that the former say they face a very large or large burden (7.8 percentage points more than men). The biggest difference lies in the completion of scientific outputs, where women report much greater difficulty than men by 13.1 percentage points. When it comes to treating pandemics as an opportunity, there were fewer affirmative responses from women than from men. The biggest difference is in the increase in digital collaboration, where women's positive responses lag behind by 7.3 percentage points. These results are compatible with what has been shown by Amano-Patiño *et al.* (2020) and Cluver *et al.* (2020) (see Figure 6).
- In times of intense misinformation and fake news, researchers believe that the position of science and technology will be upgraded in the public sphere after the pandemic. Accordingly, 72.4% of the survey's participants believe that science and technology, as a distinct field of human activity, will emerge enhanced from the pandemic (see Figure 7).

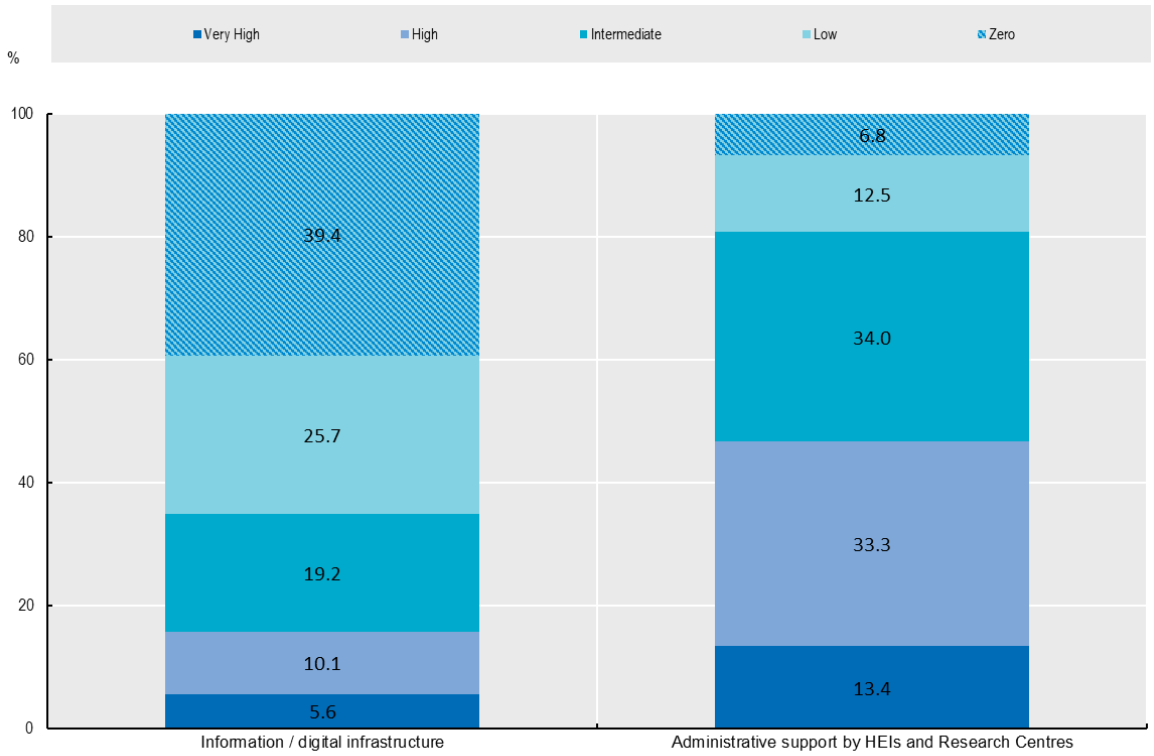

Figure 1. Distribution of respondents' answers (%) regarding COVID-19 effects on a) accessing the information/digital infrastructure and b) the administrative support provided by HEIs and Research Centres. [Likert scale: Very high to zero (1-5)].

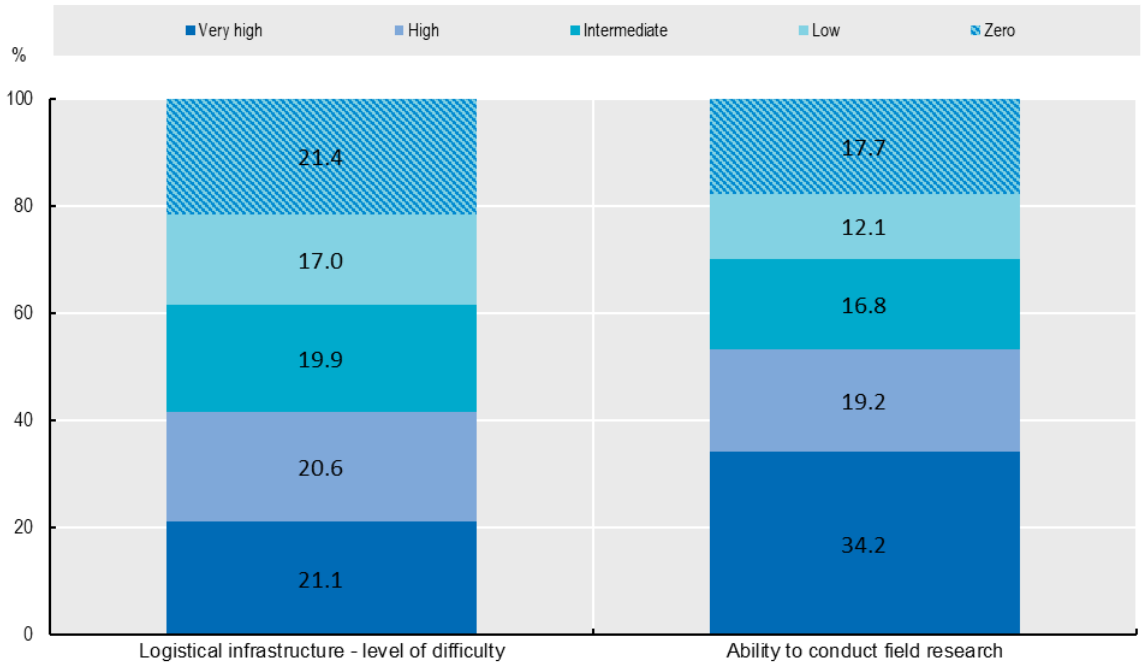

Figure 2. Distribution of respondents' answers (%) regarding COVID-19 effects on a) accessing the logistical infrastructure and b) the ability to conduct field research. [Likert scale: Very high to zero (1-5)].

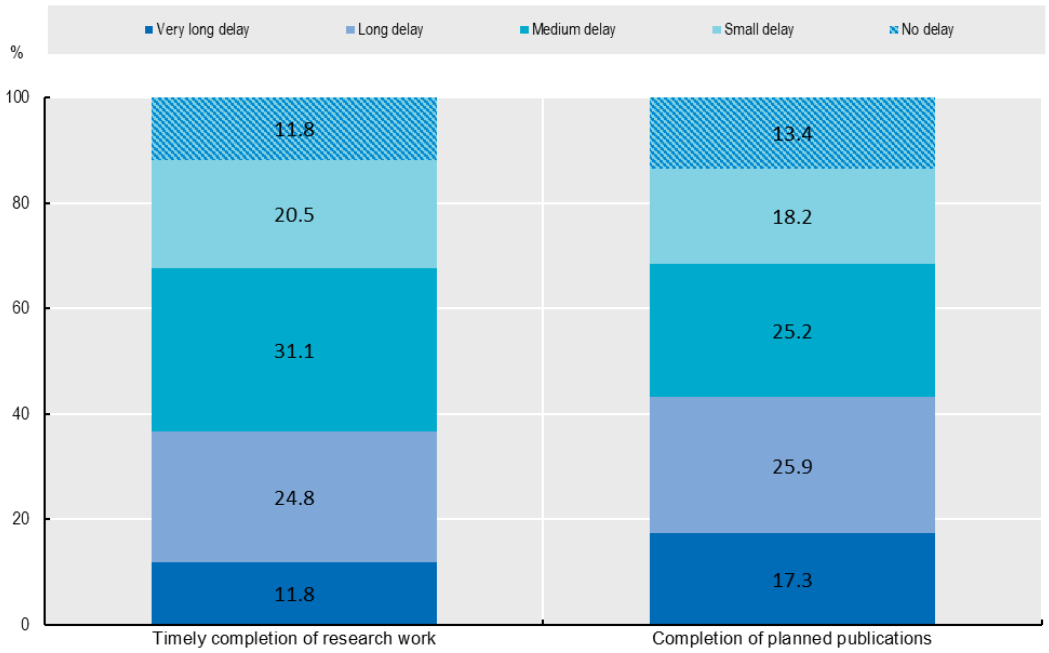

Figure 3. Distribution of respondents' answers (%) regarding COVID-19 effects on a) timely completion of research work and b) planned publications. [Likert scale: Very long delay to no delay (1-5)].

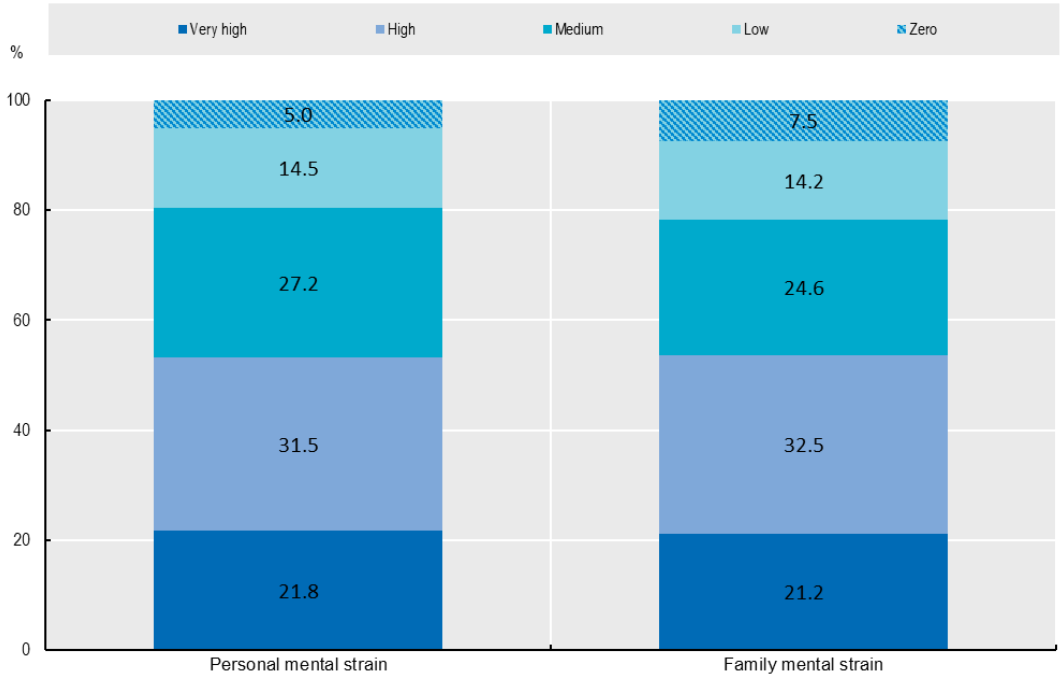

Figure 4. Distribution of respondents' answers (%) regarding COVID-19 effects on a) personal and b) family mental strain. [Likert scale: Very high to zero (1-5)].

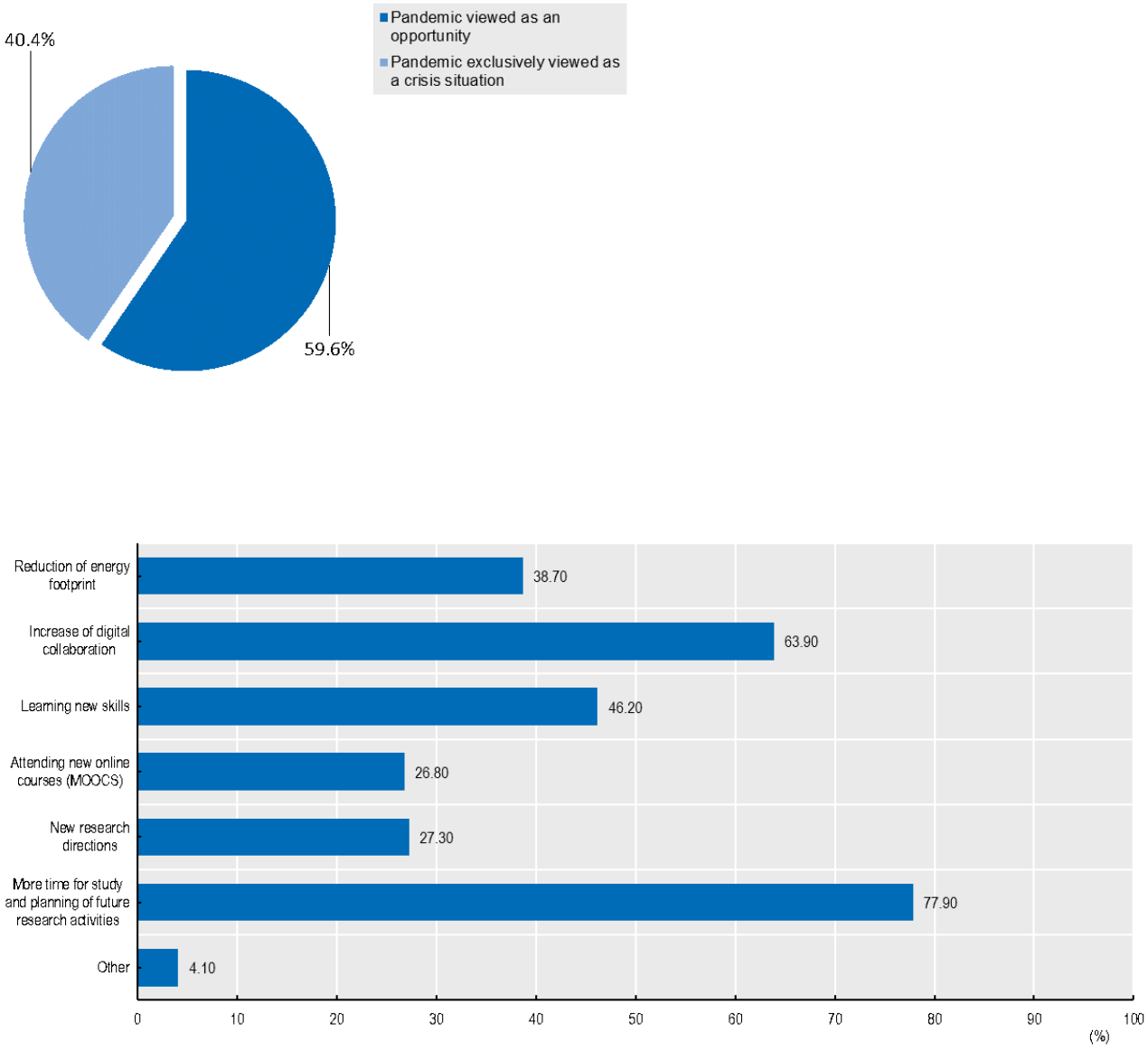

Figure 5. Distribution of respondents' answers (%) regarding whether COVID-19 can be ''viewed exclusively as a crisis situation'' or ''viewed also as an opportunity'' [Pie chart]. Frequency distribution (%) of selected reasons by researchers that viewed the pandemic ''also as an opportunity" [Bar plot].

Column1	Column2
a	Science and technology as human endeavors will be upgraded in the public sphere
b	More time for study and planning of future research activities.
c	New research directions
d	Attending new online courses (MOOCS)
e	Learning new skills
f	Increase of digital collaboration
g	Reduction of energy footprint
h	Pandemic exclusively viewed as a crisis situation
i	Logistical infrastructure
j	Information/digital infrastructure
k	Ability to conduct field research
l	Timely completion of research work
m	Completion of planned publications
n	Administrative support by HEIs and Research Centres
o	Personal mental strain
p	Inability to conduct research activity
q	Difficulty in conducting secondary research (e.g. bibliography reviews, meta-analysis, seminar participation)
r	Family mental strain

Figure 6. Gender-related distribution of respondents per each question of the questionnaire. Note: Selected scales/values presented in the Graph: ‘‘Very high’’/‘‘high’’ and ‘‘yes’’, ‘‘zero’’/‘‘low’’ and ‘‘no’’.

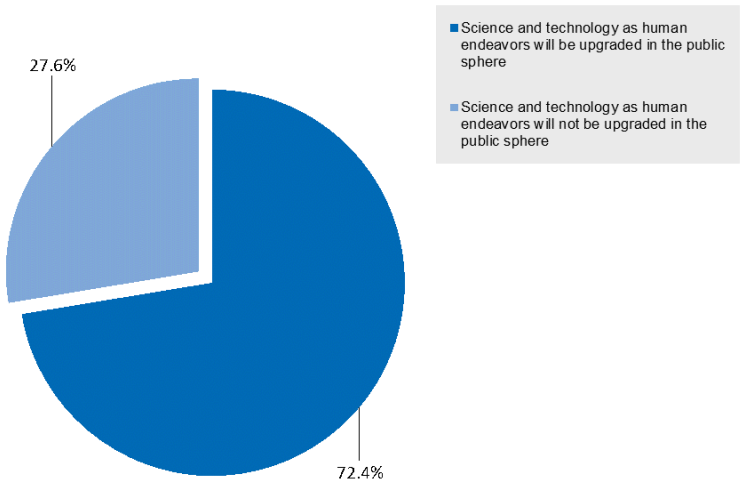

Figure 7. Distribution of respondents' answers (%) regarding whether they appreciate that science and technology, as a distinct field of human endeavor, will come out of this pandemic as having an enhanced or weakened position in the public sphere.

Conclusion

With this survey and the subsequent study, EKT attempted to monitor the effects the COVID-19 pandemic and the ensuing lockdown and social distancing measures have had on the research activities as well the private lives of the researchers. According to the authors' understanding, the scale of the studied population of researchers is certainly the highest in the Greek context and among the highest globally, thus making this study among the first to provide comprehensive data on a critical part of the research continuum - that of its people.

In terms of results, the survey provided evidence of a range of anticipated hypotheses. For example, spatial confinement has a negative impact on the ability to perform fieldwork as well as on accessing the logistical infrastructure necessary for their research activities (e.g. biomedical laboratories, mechanical equipment). Similarly, the pandemic has taken a toll on the researcher's mental and family wellbeing, due to the extra burden.

Other findings were less anticipated. The domestic information/digital infrastructure as well as the administrative support extended from academic and research institutions to the researchers were rated very positively. As in any crisis, some can discern opportunities. In line with the inquisitive researcher mind, the majority appreciate the existence of more free time in order to focus on studying and thinking out future research activities and enhance digital modes of collaboration.

In line with other studies, it was shown that women researchers face greater burdens than men, given their multiple roles.

Lastly, the majority of the researchers think that the fields of science and technology will be enhanced as a result of the COVID-19 pandemic. Significantly, characteristics such as rationality, well-rounded argumentation, evidence and a continuous reevaluation of data - characteristics inherent to the science enterprise - will help raise the bar of the public dialogue, in essence enhancing the footing of democracy itself.

The research community is a key pillar in the country's technological, economic and growth path. Its critical contribution to the discovery of new knowledge, its transformation into technology, and its ability to co-operate with both the public and private sectors to turn knowledge into innovation are such aspects, highlighting its importance. Consequently, the above findings could be a vital factor in formulating policy to mitigate the negative and enhance the positive dimensions identified by EKT's research concerning the COVID-19 pandemic.

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