Identity, Effort, and Employee Mental Health

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Abstract

This paper explores the relationship between employee mental health and their organization, through the lens of an identity-based framework of employee motivation. Leveraging a unique opportunity to survey employees in one organization during the Covid-19 pandemic, we find that self-reported overall mental health declined most for workers who report the organization does not share their values. Furthermore, workers who say work is important to them and that the organization does not share their values report exerting more effort but accomplishing less relative to a pre-pandemic benchmark. These factors are also all associated with concurrent mental health distress, in particular elevated levels of stress and anxiety. The relationships hold across job roles (faculty vs. staff) and the number of children in employees' households. The research suggests a new direction in the study of organizations: the links between intrinsic motivation, relationship to the organization, and mental health of workers.

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This paper explores the connections between organizations, employee mental health, and work through the lens of an identity framework of employee motivation. In particular, we consider employees' intrinsic motivations and their relationships with the organization when there are changes in the effort necessary to complete their work. Traditionally, economics has emphasized monetary incentives. However, a growing literature posits that workers have intrinsic motivations to do their jobs well. In addition, employees who have a sense of shared values and mission with their organization also derive direct benefits from their work (e.g., Kreps (1997), Akerlof & Kranton (2000, 2005), Bénabou & Tirole (2003), Besley & Ghatak (2005), Gartenberg, Prat & Serafeim (2019)). This paper leverages a unique opportunity to study these motivations at a time when effort and productivity likely changed, and we investigate how employees fare in terms of their mental health.

In the data from a survey of employees of a university during the Covid-19 pandemic, we find value-match with the university, work as part of employee identity, effort expended, and sense of accomplishment are all inter-related, and they all are associated with emotional well-being. Three main themes emerge. First, employees who report relative lack of shared values with the university are worst off; lack of shared values is conditionally associated with needing more effort and accomplishing less relative to a no-Covid hypothetical, higher levels of stress and anxiety, and greater decline in mental health relative to before the pandemic. Second, employees who are more likely to report that work is important to their sense of self do not show a decline in mental health, but a stronger work identity is conditionally associated with needing more effort to accomplishing the same amount relative to a no-Covid hypothetical and elevated levels of stress and anxiety. Third, the direct mental health associations are amplified by interactions between these motivations and effort and productivity measures. For example, the association between instrinsic motivation and stress is reinforced if employees also felt they

accomplish less. Taken together, the findings suggest a potentially rich new domain in research about work incentives and organizations: the salience of non-pecuniary motivations and employee mental health.

The context of this study allows a focus on employee's work identity and their relationship to their organization. The Covid-19 pandemic disrupted normal operations providing a window into how people respond to new challenges in the absence of any immedidate, direct incentives from the organization. The university we study guaranteed employment throughout the pandemic and instituted a universal pay cut (in the form of suspended retirement contributions). Rewards or sanctions based on performance during this time were therefore delayed or indirect (including from third parties,concurrently or in the future).

The study analyzes responses to a confidential IRB-approved, faculty-run survey that canvassed all university employees by email in the spring of 2021. The survey asked respondents to describe their role in the university, to self-assess how much effort they put into their work and how much they had accomplished over the past year relative to a hypothetical without Covid, and to rate the extent to which the university shares their values. The survey further asked employees to rate aspects of their personal identity, including the importance of their work to how they think of themselves. The survey assessed employees' mental health using the Center for Epidemiologic Studies of Depression (CES-D) 20-item screening tool for depression, two questions about anxiety and stress not included in CES-D, and self-reported overall mental well-being at the time of the survey and before the onset of the pandemic. Over four thousand employees responded to the survey.

The first set of the results uncovers robust relationships between four self-reported identity and work measures—the importance of work to the employee, shared values with the organization, effort, and accomplishment. Theories of intrinsic motivation, in which workers

derive direct utility from work and doing their jobs well, predict workers would exert higher effort to do so when necessary (Kreps (1997), Akerlof & Kranton (2005), Cassar, & Meier (2018)). We find employees who indicate work is important to their sense-of-self also report exerting significantly higher effort than the no Covid hypothetical and accomplish about the same amount relative to the same hypothetical. These patterns do not differ for faculty relative to non-faculty employees.

Sharing values with an organization could be a feature of the selection of employees to a workplace (Besley & Ghatak (2005)), but also could vary with organizational policies which can alter the nature and difficulty of tasks, as occurred during the pandemic.[1] We find that employees who are more likely to report that the university does not share their values also report needing significantly higher effort than the no Covid hypothetical and accomplishing less relative to the same hypothetical. This pattern, which also does not differ between faculty and non-faculty employees, does not fully support theories that workers exert higher effort when they feel more affinity with their firm (Besley & Ghatak (2005), Akerlof & Kranton (2005) and empirical findings reviewed below). The finding rather supports an interpretation that employees are more likely to think an organization does not share their values when the organization's policies lead to more employee effort needed to accomplish tasks. This latter interpretation is supported by the finding that this relationship between sharing values and accomplishment is stronger when work is important to the employee.

The second set of results establishes associations between these identity and work measures and employee mental health. Almost half of the employees report worse mental health

[1] An emerging literature studies employees' preferences for different work arrangements and examines the implications of remote vs. in-person work on productivity, where observed differences in productivity could arise both from the nature of the workplace itself and from the selection of differently productive workers into the workplaces. See, for example, Gibbs, Mengel & Siemroth (2023)

at the time of the survey (during the pandemic) relative to before the pandemic. At the time of the survey, employees report high levels of stress and anxiety. Answers to the CES-D screener indicate over forty percent report significant depressive symptoms.[2] These levels match those in other populations (https://covid19.nih.gov/covid-19-topics/mental-health), despite the low risk of loss of income and employment and some feasibility of remote work, at least in principle, for this population.

We find that this mental health distress is neither a uniform nor random phenomenon but rather varies systematically with employees' non-pecuniary motivations and their reported levels of effort and accomplishment. Stress and anxiety are each higher for workers who are more likely to agree that work is more important, who are more likely to agree that the university does not share their values, who report needing more effort than the no Covid hypothetical benchmark, and who report accomplishing less. Moreover, stress and anxiety show stronger associations and pick up patterns not seen in the responses to the CES-D. These findings also do not differ by job role (faculty vs. non-faculty). We study whether employees with school-age children may have had an additional mental health burden since children were attending school remotely. We see evidence supporting this possibility but the presence of children in the household does not affect our conclusions about the relationships between the work and identity indicators or the links between those indicators and emotional well-being.

Broadly, the results indicate that investigating worker identity and worker attachment to their workplace is important to understanding worker effort, productivity, and well-being.

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[2] Using the 2019 National Health Interview Survey (NHIS) sample re-weighted to match the organization's demographics, Thomas et al. (2021) find significantly elevated prevalence and severity of depressive symptoms and anxiety among the respondents to the first wave of the ROUSE survey fielded in October-November, 2020.

Further, the development of new, intentional measures, such as those of stress and anxiety, to better elucidate these relationships is likely to be especially valuable.

This paper contributes to the growing theoretical and empirical literature in economics on work incentives, organizations, and employees' non-pecuniary motivations. Drawing on findings in psychology and sociology, a theoretical literature posits that employees can have intrinsic, rather than extrinsic (monetary), incentives to exert effort on the job; these intrinsic incentives include enjoyment of a particular work activity itself, the satisfaction of a job well done, deriving meaning from the work, as well as work as part of an individual's identity (e.g., Kreps (1997), Bénabou & Tirole (2003), Akerlof & Kranton (2005), Prendergast (2008), Cassar & Meier (2018)). Employees can also have social incentives for job performance, such as enjoying the esteem of co-workers, recognition by the employer, and respect of the organization (Ellingsen, Tore & Johannesson (2008), Ashraf & Bandiera (2018)). A worker's motivation can also depend on how a worker feels about the employer. People might identify with their workplace, as an "insider" or feel alienated from their workplace as an "outsider," with implications for job satisfaction and incentive pay (Akerlof & Kranton (2005). These patterns may reflect self-selection of workplaces by workers based on their perception of the values or mission of the employer (Besley & Ghatak (2005)).

Much research provides evidence of employees' intrinsic motivations: In lab experiments, workers forgo wages in order to work at a job that has more purpose or "meaning" (Kesternich, Schumacher, Bettina Siflinger, & Schwarz (2021)) and have higher levels of output (Kosfeld, Neckermann, & Yang (2017)). Consistent with preferences to complete a task well, a field experiment with gig workers shows reduction in incentive pay leads to little reduction in effort; workers had higher performance when facing flat wages, which provided better insurance (Butschek, González Amor, Kampkötter & Dirk Sliwka (2002)). Relative to monetary rewards,

non-financial rewards led to higher performance of public health workers in Zambia, except for the poorest workers in the sample (Ashraf (2012)).

Studies also indicate the importance workers place on an organization's mission. In lab experiments, engineering and science students indicate preferences for working in commercial organizations that focus on innovation and sustainability (Non, Rohde, Andries de Grip & Dohmen (2022)). Subjects accept lower wages, and a prosocial mission increases effort (Cassar (2019)).[3] In a field study recruiting public sector workers, Ashraf, Bandiera, Davenport & Lee (2020) find the posited trade-off between attracting those who share the mission versus those concerned about career advancement is more nuanced since talented workers who care about their careers were also more socially minded. Gartenberg, Prat, and Serafeim (2019) find that firms whose middle level employees believe in and have a clear sense of the organization's purpose perform better. Considering the political affiliations of federal civil servants in the United States and those of United States Presidents who set agencies' priorities, Spenkuch, Teso & Xu (2023) find worker performance decreases when personal ideology is less aligned with that of the agency.

In contrast to lab or field experiments, this paper is an observational study of an organization in real-time with survey participation of employees with a range of job roles and demographics during a period of substantial workplace upheaval. The analysis considers both workers' intrinsic motivations and the value match between the worker and the organization. The study is thus able to consider the possible relationship between these two factors in employees' self-reported effort and productivity. We find that stronger work identity boosts the relationship

[3] Some studies indicate that Corporate Social Responsibility (CSR) initiatives, argued as ways to inject meaning into some tasks or motivate socially minded employees, can be ineffective (Briscese, Feltovich & Slonim (2021)) and have perverse results (List & Momeni (2021)) since employees, it is argued, would then have "moral license" to shirk in other dimensions.

between sharing organizational values and effort and accomplishment. In particular, the relationships between not sharing organizational values and required effort and not sharing organizational values and lower accomplishment are both stronger for employees whose work is important to them.

This paper also advances the literature on employee well-being and employee mental health.[4] Much of the research on mental health and work considers the links between poor mental health, on one hand, and lower on-the-job productivity, fewer hours worked, and diminished participation in the labor force, on the other hand. (See, e.g., Ettner, Frank & Kessler (1997), Chatterji, Alegria & Takeuchi (2011), Beck et. al. (2011), Ringdal & Rootjes (2022).)[5] We find an opposing pattern: higher levels of effort are associated with higher stress, anxiety, and risk of depression. The amplification of this pattern for employees who do not share the values of the organization suggests workplace conditions and policies that relate to productivity are important for employee emotional well-being. Classic research in organizational psychology posits that autonomy, workload, and organizational context are central to employee well-being and performance (e.g., Karasek (1979)). In recent work using large-scale survey data, De Neve and Grant (2025) find employee well-being derives from factors like belonging, autonomy, and

[4] In Gosnell, List & Metcalfe (2020)'s field experiment with commercial airline captains, job satisfaction is interpreted as employee "well-being," and the study draws conclusions on the impact of different management practices on the measured performance and mental health. The employees in question are highly "identity- and mission-driven" with significant human capital investment in the occupation which has a high degree of professionalism. The study found that performance monitoring, feedback, and incentives (but not contributions to charity) had significant effects on discretionary performance measures, without compromising safety. A post-experiment survey indicates these performance-enhancing management practices also improved employees' job satisfaction.

[5] In experimental studies in India, Angelucci & Bennett (2022) find that pharmacological intervention to treat depression results in reduced earnings, but that the intervention when coupled with livelihood support decreased depressive symptoms. Kaur, Mullainathan, Oh & Schilbach (2021) show, by staggering wage payments, that financial constraints impede concentration and worker productivity. Economists are increasingly studying the broader relationship between individual economic outcomes and mental health. Ridley, Rao, Schilbach & Patel (2020), for example, consider poverty as a cause of anxiety and depression, and vice versa.

purpose. Two key contributions of this paper are, first, we examine employees in a single organization with variation in how they relate to the organization and, second, we elicited information about mental health over time and in specific domains. Overall, we find robust relationships between mental health, work, and sharing organizational values. The results furthermore suggest the importance of particular mental health indicators that are likely related to work; stress and anxiety, more than depression, capture the emotional well-being of workers as it relates to the value-match with the organization and employees' own intrinsic motivation.

Finally, this paper contributes to studies of Covid-19 and workers and firms. A prominent theme in this literature is the effect of work-from-home on short-term and long-term productivity and the impact of Covid-19 on work hours per se (e.g., Freeman and Ganguli (2023), Goda and Soltas (2023)). Drawing on two cross-sectional samples in the United States, Sundaram-Stukel et. al. (2024) describes the mental health of those who became unemployed and those who remain employed during Covid-19. They document that unemployment is associated with higher mental distress. Among employed workers, worse work-life balance, lower job security, lower productivity and lower connectivity with co-workers are all associated with higher mental distress measured as a composite of answers about feeling anxious, worried, lacked interest or feeling down. Neither sample has information about employers or the importance of work to the respondent. Our study focuses on workers in a single workplace where the immediate threat of job loss was extremely low. We consider differential manifestations of the Covid-19 pandemic on effort, productivity, and mental health of employed workers with different roles, and the relationships with the worker's identity and their attachment to the organization. The study thus provides a view on general questions concerning worker motivation, the relationship between employees and the organization they work for, and emotional well-being. The findings indicate the importance of both non-pecuniary motivations and work-specific mental health distress.

This paper proceeds as follows. Section I describes the data collection, and Section II summarizes main features of the data. Section III presents the findings on work, accomplishment, and the non-pecuniary motivations, and Section IV shows the relationships to employee mental health. Section V shows the robustness of the patterns to heterogeneity in jobs and household composition. Section VI concludes with a discussion of the findings and avenues for future research.

I. Institutional Background, Data Collection, and Sample Characteristics

The setting for this survey represents an unusual opportunity to study work motivations and mental health. The data draws from a survey of employees of Duke University, a private, non-profit institution located in Durham, North Carolina.[6] The Covid-19 shock changed the way employees did their work but did not fundamentally affect employment or compensation. As detailed below, when this survey was conducted in the spring of 2021 employees universally enjoyed essentially guaranteed continued employment until the end of the pandemic with a slight decline in total compensation. While many tasks could be performed remotely, albeit potentially less efficiently for some, many tasks required investment in new skills and workarounds which were possibly costly to the employee, potentially impinging on the quality and quantity of their work as well as necessitating adjustments in home life given the remote operation of local schools.

The longitudinal survey Reopen Our University Safely and Effectively (ROUSE) was approved by the Duke University Institutional Review Board and launched in October 2020.

[6] Duke University is a highly selective private university, and Covid-19 policies, as elaborated below, were largely in line with those of peer institutions.

ROUSE sent emails to every duke.edu email address, excluding students, inviting the recipient to participate in the study.[7] The email invitations were sent from a dedicated ROUSE@duke.edu email address and signed by faculty in the ROUSE research team. The invitation emphasized that ROUSE is an independent faculty-run scientific study and that all responses would be confidential. The emails contained individual-specific links to the survey, and participants provided electronic informed consent before beginning the questionnaire. In the first wave, 6,938 recipients of the emails clicked on the provided links, and 4,992 individuals completed at least part of that survey. We use data collected in the third survey wave which was fielded in March-May 2021. Of the 4,338 people who started the survey, 166 respondents did not answer at least one of the work or identity questions and are thus excluded from the analysis, yielding our analytical sample of 4172 respondents.

The March-May 2021 survey included questions about non-pecuniary motivations, work effort and accomplishment over the past year relative to a no-Covid hypothetical, roles at the university, mental and physical health, and demographics. As shown in Appendix Table 1 panel C, 20% of the respondents are faculty and the rest are research, administrative and support staff. About 60% work in the College of Arts and Sciences or the professional schools, which we will collectively refer to as the "college," and the rest of the respondents work in the medical school. The sample is 70% female, 80% white and 21% identify as Hispanic. The sample is also well-educated: 87% have completed a college degree and 30% have also completed a doctorate. Respondents vary in age from 20 through 82 years with an average age of 47.6 years.

[7] The university-wide emailing was approved by the Provost, and the recipients included all full-time and part-time employees at the university's schools and colleges but excludes employees of the Duke University Health System. ROUSE only includes an anonymized identifier for each respondent. The email master list included former employees and undergraduate students who were working part time for the university; these respondents are not included in this study. The master list is not informative about the number of eligible employees at the time of the survey, so response rates among eligible employees is not knowable. Characteristics of the eligible population were also not provided so it is not possible to evaluate the representativeness of the sample.

At the time of the March-May 2021 survey, Duke University was operating under special pandemic provisions. Soon after the start of the pandemic, the university instituted a hiring freeze, pledged steady employment, and suspended employer contributions to retirement accounts, all of which were still in place during our study period.[8] Eighty percent of classes were online and most activities were remote, with the exception of research labs which had largely resumed operations by summer 2020.[9] The Covid-19 vaccine was becoming available; anyone aged 65 or older was eligible to receive the vaccine in January 2021 and all adults were eligible by mid-March 2021. Eligible workers could receive the vaccine at the university as well as other locations.[10] All local public-school systems and most private schools continued to operate remotely until the end of the spring semester in May 2021.[11]

II. Key Measures: Summary Statistics, Distributions, and Demographic Correlates.

@@switch@@ In this section we describe and provide summaries of the variables of key interest. First, we describe the four measures reflecting an employee's work, identity, and relationship to the organization: self-reported effort and accomplishment relative to a pre-Covid benchmark, non-pecuniary motivations linked to the importance of work and agreement about whether the university does not share one's values. Second, we describe our mental health measures: stress, anxiety, CES-D, and an overall self-assessment of mental health at the time of

[8] https://coronavirus.duke.edu/2020/04/securing-our-financial-future/, https://coronavirus.duke.edu/2020/03/duke-to-continue-pay-for-employees/)
[9] https://today.duke.edu/2020/05/duke-labs-begin-phased-deliberate-march-toward-reopening, https://medschool.duke.edu/stories/research-labs-reopen-under-new-normal.
[10] https://coronavirus.duke.edu/2021/03/vaccination-of-remaining-faculty-and-staff/
[11] https://abc11.com/durham-public-schools-dps-pascal-mubenga/9448346/, https://www.newsobserver.com/news/local/education/article248681960.html, https://abc11.com/wcpss-board-meeting-remote-learning-wake-county-schools-covid-19/9654857/, https://spectrumlocalnews.com/nc/triangle-sandhills/news/2021/03/24/wake-county-public-schools-heading-back-to-the-classroom.

the survey and retrospectively before Covid-19. We also describe the demographic predictors of these survey responses (Tables A2 and A3 in the Appendix). We consider respondent age and respondent role in the university, as faculty or not faculty. We also distinguish between medical and non-medical school employees, since the medical school functioned substantially differently during the pandemic. The medical school had more continuing in-person activity (such as clinics) and a responsibility for helping the university to manage the pandemic in its operations.

II.A. Effort and Accomplishment

The ROUSE survey asked respondents how much they felt they had accomplished over the past year relative to a no-Covid hypothetical and then asked for an assessment of the effort needed to accomplish that amount also relative to the no-Covid hypothetical. Answers were on a 1-5 Likert scale, corresponding to 1-Much less, 2- Somewhat less, 3 About the same, 4-Somewhat more, 5-Much more. We first discuss the effort respondents felt they needed and then turn to how much they felt they accomplished. Since a higher number indicates greater effort, we reverse code the responses for accomplishment so that a higher number indicates less accomplishment.

Effort: Overall, survey respondents indicate needing to exert more effort over the past year than if the pandemic had not occurred. The average score is 3.9 (s.d.=1.0) (Appendix Table 1 panel A), and the proportion of respondents who selected each option are shown in Figure 1 Panel A, in blue which codes for effort in all figures. The modal response is “Somewhat more” effort, selected by 40% of respondents. Another 30% of respondents indicated “Much more” effort was needed, indicating that for about three-quarters of the respondents, Covid was accompanied by an increase in effort.

Accomplishment: In contrast, survey respondents report a wider range of accomplishment levels over the past year relative to a no-Covid hypothetical. Figure 1 panel B

shows the distribution of responses, in red. The distribution is essentially symmetric around "3. About the same" indicating that overall the additional effort during Covid (in blue) did not translate into greater levels of accomplishment (in red). About 37% respondents indicated they accomplished more than if the pandemic had not occurred, and about 35% reported accomplishing less. The modal and average score is 3 "About the same" (s.d.=1.3) (Appendix Table 1 panel A).

Demographic Predictors of Effort and Accomplishment: Appendix Table 2 reports regressions that relate these work measures to demographic characteristics of respondents. To facilitate comparisons, effort and accomplishment have been converted to z-scores using the respective sample means and standard deviations. Each demographic is measured with an indicator variable, and the excluded covariate for each group is listed in the table. Conditional on all other demographics, older respondents report needing less additional effort to accomplish tasks than younger respondents, and they report accomplishing more. The age cohort which, conditionally, reports accomplishing the least relative to the no Covid hypothetical are those aged 30-39 years. College and medical school faculty report needing significantly more effort than non-faculty than if the pandemic had not occurred, and employees with higher levels of education felt they needed much more effort than those who had not completed college. These same groups, faculty and those with higher education, also report significantly less accomplishment than non-faculty and those with no college degree.

Appendix Table 3 extends the demographic correlates to consider the (conditional) relationships between household composition and these work variables. Wave 2 of the survey, conducted in January/February 2021, included questions about household members. For the 58% percent of respondents who completed both waves 2 and 3 of the survey, we count the number of children aged <5 years, 5-14 years and 15-19 years plus the number of household members

excluding the respondent aged ≥20 years. To maintain a consistent sample, the sample average number of household members in each age group is assigned to respondents who did not complete wave 2, and each model includes an indicator identifying these respondents. We find that employees with more children aged 5-14y report significantly more effort needed over the past year; none of the other composition covariates is significant and none of the conclusions described above is affected. Children are not a driving factor in these models.[12]

II.B. Non-Pecuniary Motivations

We now turn to the survey questions aimed to capture an employee's intrinsic value of work and value match to the workplace. Respondents were asked to rate agreement to the statement "My work is important to me and how I think about myself," using a scale of 1 to 10 where 1 is strongly disagree and 10 is strongly agree. Respondents were also asked to rate agreement to the statement "The university shares my values," on a scale of 1-10. We reverse code the responses to the shared-values question so that in later analysis higher responses indicate, respectively, that the employee agrees more that work is more important to them and the employee agrees more that the university does not share their values.

Work is important: Employees indicate a high level of agreement that work is important to them. The mean response is 8.3 (s.d.=1.7), and the modal response is the maximum, "10. Agree" (Appendix Table 1 panel A). Figure 2 panel A provides the distribution, in green, and shows that about 93% of respondents answered that they agreed work is important to them (scores 6 and above; i.e. to the right of the vertical dashed line).

University not Share Values: In contrast, as seen in Figure 2 panel B, in yellow, workers' agreement on university not sharing their values is more diffuse. While the mean response is

[12] Conclusions about the role of children in the models are not different if the sample is restricted to those who completed both waves 2 and 3 of the survey.

below 5, at 4.2 (s.d.=2.2), about 27% of respondents agree to some extent that the university does not share their values (scores 6 and above) (Appendix Table 1 panel A).

Demographic Predictors of Work Identity and University Shares Values: As shown in columns 3 and 4 of Appendix Table 2, older workers are both most likely to agree that work is important to them and least likely to agree the university does not share their values. This latter gradient could of course reflect selection of those who have worked at the university longer. Work is significantly more important to faculty than to non-faculty, and college faculty are most likely to agree the university does not share their values. The only significant difference between college and medical school faculty is the extent to which they agree that the university does not share their values. The divergence could possibly reflect the mission of the medical school during a public health emergency, or it may reflect differences in policies related to operations as labs and clinical work resumed while much of the college remained closed. Respondents who have completed college but not a doctorate are the least likely to report that work is important to them, and respondents with doctoral degrees are significantly more likely to agree the university does not share their values. In the extended model with controls for different-aged children in the household (Appendix Table 3), none of the additional covariates is significant individually or taken together and, again, none of the patterns above are affected by adjusting for household composition.

II.C. Employee Mental Health

Mental health was measured with a series of questions. Respondents first completed the 20-item CES-D where each question asks about a symptom experienced during the previous week (Radloff, 1977). For each question, the respondent answered using a scale ranging from "rarely" (<1 day), "some" (1-2 days), "occasionally" (3-4 days), to "most of the time" (5-7 days). The responses are scored 0, 1, 2 and 3, respectively, with each question coded so that worse

mental health is assigned a higher score. The total CES-D score ranges from 0 to 60. In the general population, a score at least 16 has been shown to identify people at risk of moderate depression, and a score of at least 23 indicates risk of severe depression (Lewinsohn, Seeley, Roberts and Allen, 1997). The CES-D battery covers four broad primary domains of mental distress: depressed affect, low positive affect, somatic complaints, and inter-personal problems. Given the context of Covid-19 and the goals of this study, we supplemented the CES-D battery with specific questions which included whether the respondent "felt stressed out" or "felt anxious," using the same 0-3 scale as the CES-D questions.

In addition, to assess overall mental health at the time of the survey and retrospectively pre-pandemic, respondents were asked to rate their current “overall mental health” using a five-point scale (Excellent, Very Good, Good, Fair, Poor). Respondents were then asked to rate their "overall mental health" in January 2020, immediately before the pandemic. We chose an overall assessment for pre-pandemic mental health for two reasons. First, recall bias is mitigated when a question is salient, which is likely to be the case for a single summary question relative to a series of questions about specific symptoms (Sudman, Bradburn and Schwarz, 1996). Second, the burden of 20 CES-D symptoms plus levels of stress and anxiety recalling from the pre-Covid-19 period was likely to result in high rates of exit from the survey. Below, we first report the responses to the specific domains of stress and anxiety, and we then turn to the more general CES-D and overall assessments.

Stress and Anxiety: As seen in Figure 3 panel A about 32% of employees reported feeling stressed out occasionally in the past week and 15% report feeling stressed out most of the time. Figure 3 panel B shows about 25% of employees reported feeling anxious occasionally and 10% most of the time.

CES-D: Given population benchmarks (Lewinsohn, Seeley, Roberts and Allen, 1997), in our survey respondents' answers to the CES-D questions indicate high levels of depression symptoms. The average score is 26.1 (s.d. 17.2) (Appendix Table 1 panel A). Figure 4 provides the score distribution. Forty-four percent of employees report symptoms placing them at risk of mild depression (indicated by the density to the right of the shorter dashed line at 16) and 24% at risk of severe depression (density to the right of the longer dashed line at 23).

Overall Mental Health: Figure 5 displays self-assessed overall mental health pre-pandemic (in panel A) and during the pandemic (in panel B) ranging from excellent (on the left of the scale) to poor (on the right of the scale) to so that a higher number indicates worse health, consistent with the measures discussed above.

Over two-thirds of respondents reported excellent or very good mental health in the pre-pandemic period. That fraction declines to less than 44% for the pandemic period. The overall rightward shift of the distribution from before to during the pandemic indicates that individual mental health declined during the pandemic. Since respondents assess mental health at both points in time, the individual-specific difference is a measure of the change in mental health during the pandemic which is displayed in panel C of Figure 5. Again, a higher number indicates worsening of mental health. Very few people reported improved mental health, over 40% reported no change and almost 50% reported worse overall mental health.

The correlations among the mental health measures are reported in panel D of Appendix Table 1. All of the measures of concurrent mental health are positively correlated; stress and anxiety are closely linked (ρ=0.70, p<0.001) as are the CES-D score and reports of overall mental health (ρ=0.71, p<0.001). The latter correlation indicates the single question about overall mental health provides an informative signal about the 20 symptoms in the CES-D assessment. The assessments of pre-pandemic mental health are positively correlated with each of the

concurrent measures, but the correlation is about half as high. This pattern indicates that there is both persistence and change in mental health status over this period. Moreover, since pre-pandemic mental health is negatively correlated with change in mental health, those who were in excellent or very good health pre-pandemic tended to experience the most increase in mental distress.

Demographic Predictors of Mental Health: Appendix Table 4 provides the demographic correlates of the mental health measures. To facilitate comparisons, each measure is scaled to range from 0 — no symptoms or in best mental health—to 100 —worst symptoms or poorest mental health. The regressions indicate a steep age gradient: the youngest respondents are much more likely to report poor mental health for every concurrent measure. For example, relative to those above 60 years old, respondents below the age of 30 are 20 percentage points higher on the stress and anxiety scale and their CES-D score is 11 percentage points higher. The differences between each age group are large and statistically significant. Some of this gradient reflects pre-existing differences by age (as shown for the pre-pandemic overall measure in column 5). The gradient for the change between pre-pandemic and the time of the survey is also less steep but remains large in magnitude and statistically significant.

Controlling for all other demographics, there is no difference between faculty and non-faculty in stress levels. However, medical school faculty have the lowest anxiety levels and CES-D scores and highest overall mental health both before and during the pandemic as well as the smallest change in overall mental health. Medical school employees who are not faculty have lower CES-D scores and better self-assessed overall mental health during the pandemic relative to college staff but these differences are largely driven by pre-pandemic differences. There are no significant differences between medical school and college staff in the change in overall mental

health, and there are no significant differences in any of the mental health measures between college faculty and non-faculty employees.

Stress and anxiety levels are significantly higher among those with at least a college degree relative to those who have not completed a college degree, and those who only completed a college degree have higher CES-D scores. Females and whites have significantly worse mental health.

Appendix Table 5 extends the model of demographics to include household composition. More young children (aged<5 years) in the household is associated with lower CES-D scores, and more children age 5-14 years and more adult household members are each associated with better pre-pandemic overall mental health. We interpret these associations as possibly capturing unmeasured factors shared between fertility choices, living arrangements, and mental health. None of our conclusions regarding the predictors of mental health are affected by the inclusion of household composition controls.

III. Associations among Accomplishment, Effort, and Non-Pecuniary Motivations

We turn next to the relationships between respondents' reports of effort, accomplishment, the importance of work to them, and agreement about whether the university does not share their values. As with the regressions in Appendix Tables 2 and 3 discussed above, each indicator has been converted to a z-score to facilitate comparisons, and, as above, a unit change in each indicator is interpreted as a standard deviation (sd) shift in that measure.

Table 1 provides the associations in separate OLS multivariable regression models. The coefficient on a covariate indicates the association between the two measures conditional on the other indicators in the model. All estimates of standard errors and test statistics are robust to arbitrary forms of heteroscedasticity (Huber, 1967).

We begin with the economic variables of effort and accomplishment relative to the hypothetical of no Covid. We find the patterns match a basic theoretical premise of worker productivity: the more effort needed to accomplish a task, the less a worker accomplishes. Reports of more work effort relative to a hypothetical of no pandemic (in column 1) and less accomplishment relative to the same hypothetical (in column 2) are significantly positively correlated (column 1 row B and column 2 row A), conditional on the non-pecuniary identity-related indicators. For example, an increase in effort by one sd is associated with 0.065 sd lower accomplishment.

As for the identity-related, non-pecuniary indicators, work is important is negatively correlated with less sharing of university values (Table 1 column 3 row D and column 4 row C). A sd increase in work is important to the employee is associated with a 0.289 sd decrease in the measure university does not share my values.

We consider next the relationships between the pecuniary outcomes and the non-pecuniary motivations, finding both consistencies and inconsistences with theoretical arguments. First, those for whom work is important (row C) report significantly higher effort (with an effect size of 0.087 sd). However, work is important is not a significant predictor of accomplishment (column 2). The same qualitative conclusions are drawn from the results in column 3. This relationship is consistent with the theoretical arguments that workers who have intrinsic motivations exert more effort. Second, university not sharing an employee's values is associated with significantly higher levels of effort but significantly lower levels of accomplishment with effect sizes of 0.093 sd and 0.059 sd, respectively, for a sd increase in reporting the university not sharing values. This relationship is not consistent with theoretical arguments that not sharing values of the organization would be associated with lower worker effort.

We next consider interactions among the covariates: whether the link between value-sharing with the organization and work being important varies with effort expended and the amount accomplished. On one hand, for those for whom work is more important, if they had to exert additional effort, they may be inclined to feel the university does not share their values. Similarly, if they accomplish less, they may be more inclined to feel the university has not helped them achieve their goals and thus does not share their values. In column 5 of Table 1, we extend the model in column 4 by adding interactions between work being important to the respondent and the accomplishment and effort indicators. The results support these interpretations. The positive relationship between effort and university not sharing values is significantly stronger the greater the importance of work. Similarly, the positive relationship between less accomplishment and not sharing university values is stronger, the greater the importance of work.

IV. Mental Health and Work, Accomplishment, and Identity

In this section, we investigate the relationships between each of the mental health measures and the work, accomplishment, and identity measures. Our primary focus is on levels of stress and anxiety, the CESD score and the change in overall mental health since before the pandemic; we also examine the relationships with the overall assessments of concurrent and pre-pandemic overall mental health. To facilitate comparisons across the mental health measures, each is scaled to range from 0—no symptoms or in best mental health—to 100—worst symptoms or poorest mental health, as in Appendix Tables 5 and 6. The work and identity variables are specified as z scores as above. All models control for age (in years) and an indicator for whether the respondent is male.

We begin with models that include the work and identity indicators as linear predictors of mental health in OLS regressions. Table 2a presents the results, and the first column in each pair

of Figure 6 (labeled 1.Direct) displays the magnitudes of the estimated coefficient for each of the work and identity indicators, depicted by the colors blue (effort), red (accomplishment), green (work is important), and yellow (university does not share values). Results for stress and anxiety are displayed in columns (1) and (2), respectively, of the table. Increases in each of the work and identity measures are associated with significantly higher stress and with significantly higher anxiety, taken one at a time as well as taken jointly (as shown by the p-value for the joint test for all four indicators at the bottom of the table). The estimated effect sizes are largest for expending more effort (shown in blue in Figure 6): a sd increase in effort is associated with a 7.58 percentage point increase in feeling stressed and a 5.21 percentage point increase in feeling anxious. The magnitudes of the estimates are about half as those for university not sharing one's values and roughly a quarter of those for both accomplishing less and for work being important to the respondent. The effect sizes are larger for feeling stressed for every indicator other than accomplishing less which has an almost identical magnitude in the two models.

Estimates for CES-D and worsening of overall mental health over the pandemic are displayed in columns (3) and (4) of Table 2a, respectively. They are also depicted, respectively, in the first bars in the last two pairs in Figure 6. The patterns for these broad measures of mental health generally mirror those for stress and anxiety: more effort is the strongest predictor of mental health distress followed by university not sharing one's values. There are, however, two important differences. First, the effect sizes are smaller in magnitude than those for stress and anxiety with 3.18 and 3.80 percentage points for CES-D and worse overall mental health, respectively. Second, respondents' reports about work being important to them is not significantly related to the broader measures indicating that stress and anxiety are mental health outcomes more closely aligned with attitudes towards work.

Results for employees' assessments of their overall mental health before and during the pandemic, displayed in columns (5) and (6) in Table 2a, respectively, provide further insights. Those who felt work was important to them report being in better overall mental health pre-pandemic, and those who report putting in more effort relative to the no-Covid hypothetical report their mental health was better pre-pandemic. In contrast, those who felt they accomplished less relative to that hypothetical do not have significantly different reports of pre-pandemic mental health that other respondents. However, those who felt the university did not share the same values were in worse overall mental health. The impact of the pandemic is reflected in the difference between the pre- and during-pandemic associations, which are the estimates reported in column (5) of the table. Work being important to one's sense of self and the university sharing one's values are protective both before and during the pandemic indicating longer-term associations with mental health.

We draw two conclusions about employee mental health from these results. First, the pandemic took a heavy toll on the stress and anxiety levels of those who identified work as important to them and that stress and anxiety could be important work-specific domains of emotional well-being. Second, whether one's organization does not share one's values is both salient over the long term and can be associated with mental health differently in different periods. After the onset of the pandemic, the results indicate its salience significantly increased with respect to worsened mental health. This is reflected in stress, anxiety and the CES-D score, at the time of the survey, and by the decline in overall mental health since before the pandemic. All the indicators point to significantly worse mental health if a respondent reports the university does not share their values indicating a potentially important link between value-alignment with an organization and mental well-being, adjusting for productivity differences.

Finally, we note the mental health patterns mimic patterns by sex and age established in the literature (Blazer et al., 1994; Nolen-Hoeksema and Girgus, 1994; McLean et al., 2011). As shown in panel B of Table 2a, males and older respondents report being in significantly better mental health across all specific measures relative to females and younger respondents, respectively. These patterns are also clear in the overall assessments pre-pandemic, and these gender and age differences were exacerbated during the pandemic.

Mental health and interactions among work and identity indicators. Work and identity variables could be associated with mental health directly and they could also interact with one another. For example, employees who put in more effort could be particularly worse off if they also felt that they had accomplished less; similarly, they may be worse off if they felt that work was important to them or if they felt the university did not share their values. We extend the regression models above to include interactions among each of the four indicators. Results for these fully saturated models are displayed in Table 2b, and Figure 6 summarizes the results in Tables 2a and 2b. For each of the four primary mental health outcomes, the first column in each pair, which were discussed above, shows the total effect size in the models with only direct effects. The second column in each pair displays in purple the additional contributions of all the interactive effects.

Two results are immediate. First, the direct effects, discussed above, are essentially identical whether or not interactions are included in the models. Second, the interactive effects, reported in panel B of Table 2b, are substantial in magnitude. All the interactions are also jointly statistically significant for all of the mental health measures (as shown by the p-values in the fifth row of the F test statistics at the bottom of the table). Most of the interactions are individually significant and all but two of the significant interactions are positive indicating reinforcement of the significant direct effects in Table 2a which are all positive.

For example, stress and anxiety levels are elevated if more effort was expended relative to pre-Covid and this effect was reinforced if less was accomplished relative to pre-Covid, if work was more important, or if the university did not share one's values. The estimated direct effects are much larger than each of the interactive effects but, in combination, the interactive effects substantially increase the estimated total increase in stress and anxiety. A sd increase in all four work and identity indicators is associated with a 12.2-percentage-point increase in stress and a 9-percentage-point increase in anxiety. The patterns are substantively similar for both CESD and worse mental health except that the magnitudes are about half the estimated total effect sizes for stress.

The results are summarized in Figure 7 for each work and identity indicator and for each mental health outcome. The height of each bar is the sum of the direct effect plus each of the interactive effects. Panel 1 displays results for the direct effect of more effort plus the interactive effects for each of the four mental health indicators. Panel 2 summarizes results for accomplishing less relative to the no-Covid hypothetical. The direct effects are not as dominant as in the case of more effort: if the respondent reported both accomplishing less and expending more effort, there is a doubling in the magnitude of the rise in stress and anxiety. If work is important for those who accomplish less, it is only stress that is significantly elevated. In contrast to these results, the more the respondent agrees the university does not share their values (in yellow) mitigates the negative relationship between accomplishing less on levels of stress and anxiety. The interactions are neither large in magnitude nor statistically significant for CES-D symptoms and overall mental health.

As shown in Panel 3, stress and anxiety levels are elevated for those for whom work is important which is reinforced if the respondent expended greater effort, accomplished less or if the university did not share their values. The estimated direct and interactive effects are similar

in magnitudes and the total effect sizes are very similar for stress and anxiety. The direct association between work being important and CES-D symptoms is not significantly different from zero but if the respondent expended greater effort or felt the university did not share their values, reported symptoms were higher. Overall mental health is significantly worse only among those for whom work is important and they expended more effort.

Finally, as shown in Panel 4, all of the contemporaneous mental health outcomes are worse if the university does not share one's values, and this association is magnified if the respondent expended more effort. If work is also important, anxiety and CESD symptoms are significantly elevated.

For the overall assessments of mental health, as shown in column 5 of Table 2b, taken together, the interaction terms are not statistically significant predictors of pre-pandemic overall health. The only individually significant estimate indicates that pre-pandemic mental health was worse if the respondent felt work was important to them and the university did not share their values. Overall mental health at the time of the survey is worse as more effort is expended, which is exacerbated if less was accomplished or the respondent felt the university did not share their values.

V. Robustness: job role in the university and household composition

In this section we report our findings that the above patterns hold in general for employees with different roles in the organization and for the presence of young children in the household.

Heterogeneity by role in the university.

It is possible that the relationships described thus far pertain only to faculty whose roles in the university can be substantively different from those of staff. We investigate this possibility by re-estimating the models separately for faculty and other employees. Results are reported in

Appendix Tables 6, 7a and 7b for the same models that are reported in Tables 1, 2a and 2b, respectively.

We find the work and identity indicators are significantly related to one another for faculty and other employees for every indicator, as shown by the p-values for tests of joint significance at the bottom of Appendix Table 6. In some cases, the specific associations are very similar for faculty and other employees; in other cases, they are not. For example, both faculty and non-faculty who report expending more effort also report they feel the university does not share their values and report work is important to them. (The latter estimate for faculty is not statistically significant which likely reflects lack of power since faculty sample size is one-quarter of the size of other employees.) The estimated magnitudes for faculty and other employees are very similar, except for the association between work effort and accomplishment: only faculty report feeling they accomplished less for a higher level of effort, relative to the pre-Covid hypotheticals.

The relationships between the mental health measures and the work and identity indicators separating faculty and other employees are reported in Appendix Tables 7a and 7b. For both faculty and non-faculty employees, the work and identity indicators are significant predictors of each mental health measure. While the directions of the associations are the same, their magnitudes differ in some cases. None of the differences is statistically significant for feeling stressed out or the change in mental health relative to pre-pandemic (panels A and D, column 3). The largest differences in the associations lie in feelings of anxiety which are particularly elevated for faculty apart from amount accomplished. Agreeing that the university does not share their values is also more strongly related to anxiety for faculty than for other employees, as are CES-D scores.

We conclude that, in general, the patterns uncovered in this paper are not driven only by faculty or by other employees. However, the associations are not identical across these two sets of employees, which may reflect differences in their roles in the university, the nature of their work, how the university policies affected their work and factors that affect their future career advancement.

This interpretation is reinforced by the differences within faculty between those who work in the medical school and those who work in the rest of the university. As shown in Appendix Table 6, the work and identity indicators are no different for non-faculty employees in either part of the university. However, faculty outside the medical school relative to medical school faculty are more likely to feel their work is important to them, and they are more likely to report the university does not share their values. It is tempting to interpret these patterns in the context of Covid-19 when the medical school faculty continued with the clinical aspects of their work and labs in the medical school opened earlier than those in the rest of the university. In contrast, many faculty in the college completed their research and teaching from home. Medical school faculty were involved in the university response to the pandemic itself, perhaps enhancing their connection to the university mission.

Household composition.

The Covid-19 pandemic involved other lockdowns that possibly affected employees through changed family dynamics; schools and other care-giving facilities were closed and school-age children attended classes remotely. These policies possibly impacted employees' effort and productivity as well as their emotional well-being. To investigate these possibilities, we extend the models above to include household composition. Appendix Table 8 reproduces Table 1 relating the work and identity indicators with one another. More children in the household (aged 5-14 years) are associated with more effort and less accomplished relative to a

no-Covid hypothetical. Those for whom work is important co-reside with more adults. However, the estimates in Appendix Table 8 are essentially identical to those in Table 1; none of our conclusions regarding the associations among work and identity indicators are amended by the inclusion of household composition in the models.

Results for mental health measures are reported in Appendix Table 9, which corresponds to Table 2b. The overall conclusions are the same in these extended models: the relationships between work and identity indicators and mental health are not substantively different whether or not household composition is taken into account. Household composition does, however, appear to have a direct association with mental well-being: children aged 5-14y are associated with significantly lower levels of CES-D symptoms and better concurrent and pre-pandemic health. CES-D scores are also significantly lower for respondents with children aged <5y in the home. The results for pre-pandemic health could reflect selection of those with children which is also possibly the case for the concurrent mental health associations.

VI. Conclusion: Discussion and Directions for Further Research

This paper is an empirical investigation of employee mental health, employees' motivations for work, and their relationship to the organization. Using data from a survey of employees designed for this research, this paper considers workers and their mental health during a challenging period where work required high effort for many.

Although not representative of all workers, the sample has three distinct advantages. First, the respondents answered questions about their relationship with the sole employer so that variation in those responses primarily reflects individual-level variation in perceptions and connection. The respondents also answered complex questions about work, effort, what they accomplished and their mental well-being in ways that are consistent, indicating substantial attention to answering the questions. Second, all respondents who were not allowed on campus

during the Covid-19 lockdown were able to work from home, albeit at some cost in terms of reduced productivity or additional effort to adapt. Third, concern about immediate job loss was minimal as respondents did not face a threat of layoffs, although the impact of the pandemic on productivity and thereby possibly future promotion or job prospects may have weighed on their minds.

In this context, we collected information about each employee's relationship with the employer, their attitude to work per se, and, relative to a hypothetical counter-factual of no-Covid, how much they felt they accomplished, and the effort involved. We link these employee and employee-employer characteristics to mental health status. We have three main findings. First, exerting more effort and accomplishing less at work, respondent's identities in terms of the importance of work and respondents' feeling of not sharing values with the employer are all correlated with one another. Second, each of these indicators is associated with greater mental distress about a year after the start of the Covid-19 pandemic, conditional on the other three work and identity indicators. Third, these direct links are only part of the story: there are interactions between the work and identity indicators that also predict mental distress. For example, respondents who expended higher levels of effort relative to a no-Covid hypothetical reported worse mental well-being, with levels of stress particularly elevated. This association was accentuated if the respondent also reported accomplishing less relative to the no-Covid hypothetical, if work was important to them, and if they felt the employer did not share their values. Relative to the direct link between effort and stress, the inclusion of these interactions increases the effect size by almost two-thirds. A respondent who reported, relative to the mean, a standard deviation more effort, less accomplished, work is more important, and the employer did not share their values also reported a stress level about 25% higher than the level reported by the average respondent.

The results have implications for theories about employees' identities and relationships with the organizations they work for. For example, workers who reported accomplishing less also reported even greater mental distress if their work is important for their sense of self which is consistent with theories that workers have intrinsic motivations for work and suffer disutility when not able to achieve what they would hope to achieve. The patterns are also accentuated among employees who agree more that the organization does not share their values. These patterns are not consistent with theoretical arguments that employees who share the mission of an organization would have higher utility from exerting more effort to accomplish tasks. The pattern could instead reflect judgment among those who felt their efforts were not valued by the university and/or the university did not provide support for their work. This outcome would be especially true for those workers whose identity is tied to their work. The difference between medical school faculty, who agree less that the medical school does not share their values, and non-medical school faculty supports this interpretation.

The study points to new lines of inquiry for the theory and empirics of organizations: the mental health of employees and their identification with their organization, work input and work output. For example, for self-motivated employees, organizational policies that facilitate accomplishment could have particularly high benefits for both the organization and the employee in terms of greater productivity, while also resulting in better mental health of the employee. That is, there are possibly complementarities between employee’s intrinsic motivations and the value and mission match between employees and firms. Future research could delve further into how different mental health domains relate to work effort, productivity, and organizational policies. Such research, which would advance understanding of these complementarities and different aspects of workers’ mental health, is likely to lead to new insights of employee motivations and organizational policies.

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Table 1. Relationships among work and identity indicators.

	Relative to hypothetical of no Covid		Work is important to my sense of self	University does not share my values	University does not share my values
	More effort	Accomplished less			
	[1]	[2]	[3]	[4]	[5]
A. More effort rel to hypothetical of no Covid		0.065*	0.081*	0.086*	0.084*
		[0.018]	[0.016]	[0.015]	[0.015]
B. Accomplish less rel to hypothetical of no Covid	0.064*		0.011	0.054*	0.052*
	[0.018]		[0.015]	[0.015]	[0.015]
C. Work is important to my sense of self	0.087*	0.012		-0.289*	-0.283*
	[0.017]	[0.016]		[0.016]	[0.016]
D. University not share my values	0.093*	0.059*	-0.290*		
	[0.016]	[0.017]	[0.018]		
E. More eff rel no Covid*Work important					0.031*
					[0.016]
F. Accomp less rel no Covid*Work important					0.050*
					[0.016]
Sample size	4,172	4,172	4,172	4,172	4,172
R^2	0.02	0.01	0.09	0.09	0.10
F(joint significance all covariates)	21.58	9.24	94.87	123.30	77.10
[p value]	0.000	0.000	0.000	0.000	0.000

Notes: All indicators are measured as z scores. Heteroscedasticity robust standard errors are in parentheses, * indicates significant at 5%.

Table 2a. Relationships between mental health, work, and identity indicators

	Felt stressed out	Felt anxious	CES-D score	Worsened overall mental health (Col [6]-[5])	Overall poor mental health pre-pandemic	Overall poor mental health at survey
	[1]	[2]	[3]	[4]	[5]	[6]
Panel A: Direct effects						
More effort rel no covid	7.58*	5.21*	3.18*	3.80*	-0.94*	2.86*
	[0.50]	[0.49]	[0.28]	[0.35]	[0.28]	[0.40]
Accomplish less rel no covid	1.71*	1.77*	1.17*	1.08*	0.02	1.10*
	[0.46]	[0.48]	[0.27]	[0.35]	[0.27]	[0.38]
Work important to sense of self	1.83*	1.55*	0.06	-0.26	-1.20*	-1.46*
	[0.51]	[0.51]	[0.29]	[0.36]	[0.30]	[0.41]
University not share my values	3.73*	2.31*	2.54*	1.55*	1.14*	2.69*
	[0.50]	[0.51]	[0.29]	[0.36]	[0.29]	[0.42]
Panel B: Other controls						
Male [indicator var]	-5.75*	-5.99*	-3.10*	-1.55*	-2.98*	-4.53*
	[0.99]	[1.01]	[0.54]	[0.68]	[0.58]	[0.83]
Age [years]	-0.60*	-0.60*	-0.24*	-0.20*	-0.32*	-0.52*
	[0.04]	[0.04]	[0.02]	[0.03]	[0.02]	[0.03]
Constant	78.48*	72.63*	38.44*	28.30*	39.91*	68.21*
	[1.84]	[1.90]	[1.05]	[1.36]	[1.17]	[1.52]
Sample size	4172	4172	4172	4172	4172	4172
R^2	0.159	0.112	0.115	0.068	0.071	0.117
F test statistic for joint significance (p value)						
All direct effects taken together	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Dependent variables are all scaled to 100 with higher values indicating worse mental health. All identity covariates are measured as z scores. Heteroscedasticity robust standard errors are in parentheses, * indicates significant at 5%.

Table 2b. Relationships between mental health, work, and identity indicators including work and identity interactions

	Felt stressed out	Felt anxious	CES-D score	Worsened overall mental health (Col [6]-[5])	Overall poor mental health pre-pandemic	Overall poor mental health at survey
	[1]	[2]	[3]	[4]	[5]	[6]
Panel A: Direct effects						
More effort rel no covid	7.65*	5.26*	3.18*	3.80*	-0.91*	2.89*
	[0.49]	[0.49]	[0.28]	[0.35]	[0.28]	[0.41]
Accomplish less rel no covid	1.27*	1.36*	0.99*	0.96*	-0.09	0.87*
	[0.48]	[0.49]	[0.27]	[0.35]	[0.28]	[0.39]
Work important to sense of self	1.64*	1.22*	-0.15	-0.28	-1.42*	-1.70*
	[0.50]	[0.51]	[0.29]	[0.36]	[0.31]	[0.42]
University not share my values	3.55*	2.16*	2.46*	1.46*	1.15*	2.61*
	[0.49]	[0.51]	[0.29]	[0.36]	[0.29]	[0.42]
Panel B: Interactive effects						
More eff rel no Covid*Accomp less	1.47*	1.40*	0.51*	0.40	0.39	0.79*
	[0.45]	[0.44]	[0.26]	[0.33]	[0.26]	[0.37]
More eff rel no Covid*Work important	1.73*	1.13*	0.62*	0.85*	-0.15	0.70
	[0.50]	[0.48]	[0.29]	[0.36]	[0.32]	[0.41]
More eff rel no Covid*Univ not share values	1.32*	1.24*	0.72*	1.15*	-0.24	0.91*
	[0.51]	[0.51]	[0.32]	[0.39]	[0.29]	[0.43]
Accomp less rel no Covid*Work important	1.09*	1.01	0.50	0.55	-0.18	0.37
	[0.50]	[0.52]	[0.30]	[0.39]	[0.32]	[0.42]
Accomp less rel no Covid*Univ not share values	-1.04*	-0.99*	-0.41	-0.62	-0.03	-0.65
	[0.48]	[0.50]	[0.30]	[0.40]	[0.29]	[0.41]
Work important*Univ not share values	0.73	0.99*	0.62*	0.13	0.55*	0.68
	[0.44]	[0.43]	[0.25]	[0.33]	[0.27]	[0.38]
Panel C: Other controls						
Male [indicator var]	-5.87*	-6.13*	-3.19*	-1.61*	-3.01*	-4.62*
	[0.99]	[1.01]	[0.54]	[0.68]	[0.58]	[0.83]
Age [years]	-0.59*	-0.58*	-0.23*	-0.19*	-0.31*	-0.51*
	[0.04]	[0.04]	[0.02]	[0.03]	[0.02]	[0.03]
Constant	77.92*	72.14*	38.24*	28.03*	39.90*	67.93*
	[1.84]	[1.90]	[1.05]	[1.35]	[1.17]	[1.52]

Table 2b continued. Relationships between mental health, work, and identity indicators including work and identity interactions

	Felt stressed out	Felt anxious	CES-D score	Worsened overall mental health (Col [6]-[5])	Overall poor mental health pre-pandemic	Overall poor mental health at survey
	[1]	[2]	[3]	[4]	[5]	[6]
Sample size	4,172	4,172	4,172	4,172	4,172	4,172
R^2	0.169	0.12	0.122	0.074	0.073	0.122
F test statistics (p values)						
1. More effort	0.000	0.000	0.000	0.000	0.005	0.000
2. Accomplished less	0.000	0.000	0.000	0.002	0.656	0.003
3. Work important	0.000	0.000	0.012	0.025	0.000	0.000
4. University shares values	0.000	0.000	0.000	0.000	0.000	0.000
5. All interactions taken together	0.000	0.000	0.001	0.005	0.324	0.013

Notes: Dependent variables are all scaled to 100 with higher values indicating worse mental health. All identity covariates are measured as z scores. Heteroscedasticity robust standard errors are in parentheses, * indicates significant at 5%.

Appendix Table 1. Summary statistics

	Mean	Std.Dev.	Min	Max
A. Identity variables				
Effort relative to hypothetical of no Covid (1=much less, …. 5=much more)	3.9	1.0	1	5
Accomplished relative to hypothetical of no Covid (1=much less, …. 5=much more)	3.0	1.3	1	5
Work is important to my sense of self (1=disagree, 10=agree)	8.3	1.7	1	10
University does not share my values (1=disagree, 10=agree)	4.2	2.2	1	10
B. Mental health measures				
Felt stressed out	48.3	31.4	0.0	100.0
Felt anxious	42.5	31.4	0.0	100.0
CES-D score	26.1	17.2	0.0	96.7
Overall poor mental health at survey	42.3	25.3	0.0	100.0
Overall poor mental health pre-pandemic	23.9	17.7	0.0	80.0
Worsened overall mental health (at survey relative to pre-pandemic)	18.4	20.7	-60.0	100.0
C. Demographic and socioeconomic covariates				
Age (years)	47.57	11.98	20.00	82.00
(1) if age <30	0.07	0.25		
(1) if age 30-39	0.21	0.41		
(1) if age 40-49	0.26	0.44		
(1) if age 50-59	0.27	0.45		
(1) if age >=60	0.18	0.38		
(1) if College faculty	0.12	0.33		
(1) if College not faculty	0.49	0.50		
(1) if Med school faculty	0.08	0.27		
(1) if Med school not faculty	0.30	0.46		
(1) if faculty	0.20	0.40		
(1) if Med school	0.38	0.49		
(1) if not completed college	0.12	0.32		
(1) if completed college but not doctorate	0.57	0.49		
(1) if completed doctorate	0.30	0.46		
(1) if male	0.30	0.46		
(1) if black	0.10	0.31		
(1) if not white or black	0.10	0.31		
(1) if Hispanic	0.21	0.41		
# children in HH aged <5y	0.15	0.33	0.00	4.00
# children in HH aged 5-14y	0.36	0.53	0.00	4.00
# children in HH aged 15-19y	0.19	0.37	0.00	3.00
# other HH members (aged≥19y)	1.11	0.66	0.00	8.00
% respondents completed HH roster	0.58	0.49		

D. Correlations among mental health measures

	Felt stressed out	Felt anxious	CES-D score	Overall poor mental heath At survey	Pre-pandemic
Felt anxious	0.70				
CES-D score	0.64	0.65			
Overall poor mental health at survey	0.52	0.54	0.71		
Overall poor mental health pre-pandemic	0.22	0.28	0.33	0.59	
Worsened overall mental health	0.45	0.42	0.58	0.72	-0.14

Sample size: 4,182

Appendix Table 2. Demographic and job role predictors of effort, accomplishment, and identity

	More effort rel no covid [1]	Accomplish less rel no covid [2]	Work important to sense of self [3]	University not share my values [4]
Indicator (1) if				
Age <30 years	0.272*	0.069	-0.366*	0.405*
	[0.071]	[0.074]	[0.079]	[0.071]
Age 30-39 years	0.245*	0.102*	-0.230*	0.192*
	[0.050]	[0.048]	[0.050]	[0.050]
Age 40-49 years	0.309*	-0.022	-0.101*	0.133*
	[0.045]	[0.045]	[0.046]	[0.049]
Age 50-59 years	0.157*	-0.100*	-0.045	0.082
	[0.045]	[0.043]	[0.045]	[0.049]
(Ref: Age ≥60 years)				
College faculty	0.271*	0.273*	0.263*	0.151*
	[0.057]	[0.061]	[0.050]	[0.060]
Medical School faculty	0.166*	0.165*	0.130*	-0.083
	[0.067]	[0.069]	[0.059]	[0.068]
Medical School not faculty	-0.002	-0.087*	0.035	-0.035
	[0.037]	[0.036]	[0.036]	[0.036]
(Ref: Not faculty, College)				
Completed college but not doctorate	0.247*	0.041	-0.253*	0.065
	[0.048]	[0.046]	[0.050]	[0.053]
Completed doctorate	0.283*	0.205*	0.002	0.175*
	[0.062]	[0.060]	[0.059]	[0.064]
(Ref: Not completed college)				
Male	-0.196*	0.057	-0.187*	0.092*
	[0.035]	[0.034]	[0.034]	[0.035]
(Ref: Female)				
Black	-0.083	-0.177*	-0.076	0.108*
	[0.053]	[0.051]	[0.058]	[0.052]
Not Black or White	-0.150*	-0.103*	0.208*	0.003
	[0.054]	[0.050]	[0.043]	[0.052]
Hispanic	0.018	-0.048	0.063	-0.054
	[0.038]	[0.039]	[0.037]	[0.038]
(Ref: White)				
Constant	-0.390*	-0.077	0.232*	-0.245*
	[0.055]	[0.053]	[0.058]	[0.060]
Sample size	4,172	4,172	4,172	4,172
R^2	0.04	0.04	0.06	0.02
F test statistics				
1. F(joint significance all covariates)	14.37	14.54	21.23	6.49
p value	0.000	0.000	0.000	0.000
2. F(Med School covariates sig)	3.27	7.48	2.50	0.96
p value	0.038	0.001	0.082	0.382
3. F(Med School:Faculty=Other)	6.00	12.83	2.53	0.49
p value	0.014	0.000	0.112	0.484
4. F(Faculty:Med School=College)	2.56	2.34	5.55	11.11
p value	0.110	0.126	0.019	0.001

Notes: All dependent variables are measured as z scores. Heteroscedasticity robust standard errors are in parentheses, * indicates significant at 5%.

Appendix Table 3. Demographic, job roles and household composition predictors of effort, accomplishment and identity

	More effort rel no covid [1]	Accomplish less rel no covid [2]	Work important to sense of self [3]	University not share my values [4]
Indicator (1) if				
Age <30 years	0.272*	0.065	-0.364*	0.401*
	[0.071]	[0.074]	[0.078]	[0.071]
Age 30-39 years	0.216*	0.074	-0.218*	0.178*
	[0.052]	[0.050]	[0.052]	[0.052]
Age 40-49 years	0.246*	-0.058	-0.099*	0.138*
	[0.048]	[0.048]	[0.049]	[0.052]
Age 50-59 years	0.137*	-0.108*	-0.049	0.083
	[0.046]	[0.044]	[0.045]	[0.049]
(Ref: Age ≥60 years)				
College faculty	0.266*	0.268*	0.263*	0.149*
	[0.057]	[0.060]	[0.051]	[0.060]
Medical School faculty	0.151*	0.152*	0.130*	-0.081
	[0.067]	[0.069]	[0.059]	[0.069]
Medical School not faculty	-0.004	-0.092*	0.033	-0.032
	[0.037]	[0.036]	[0.037]	[0.037]
(Ref: Not faculty, College)				
Completed college but not doctorate	0.238*	0.033	-0.249*	0.07
	[0.049]	[0.046]	[0.050]	[0.053]
Completed doctorate	0.273*	0.198*	0.006	0.177*
	[0.062]	[0.060]	[0.059]	[0.064]
(Ref: Not completed college)				
Male	-0.201*	0.055	-0.188*	0.091*
	[0.035]	[0.034]	[0.034]	[0.035]
(Ref: Female)				
Black	-0.075	-0.169*	-0.077	0.105*
	[0.053]	[0.052]	[0.058]	[0.052]
Not Black or White	-0.140*	-0.093	0.206*	-0.002
	[0.054]	[0.051]	[0.043]	[0.052]
Hispanic	0.022	-0.036	0.064	-0.066
	[0.041]	[0.041]	[0.040]	[0.040]
(Ref: White)				
Household composition				
# HH members aged <5y	0.047	0.064	-0.035	0.084
	[0.051]	[0.048]	[0.049]	[0.049]
# HH members aged 5-14y	0.104*	0.054	0.003	-0.02
	[0.030]	[0.031]	[0.030]	[0.030]
# HH members aged 15-19y	0.054	0.015	0.013	0.005
	[0.037]	[0.041]	[0.042]	[0.045]
# HH members aged ≥20y	-0.006	-0.009	0.031	0.01
	[0.026]	[0.024]	[0.021]	[0.023]
(1) if completed HH roster	0.016	0.032	0.003	-0.028
	[0.034]	[0.034]	[0.034]	[0.035]
Constant	-0.409*	-0.092	0.193*	-0.245*
	[0.065]	[0.062]	[0.066]	[0.069]

Appendix Table 3 cont. Demographic, job roles and household composition predictors of effort, accomplishment and identity

Covariates	More effort rel no covid	Accomplish less rel no covid	Work important to sense of self	University not share my values
	[1]	[2]	[3]	[4]
Sample size	4172	4172	4172	4172
R^2	0.04	0.04	0.06	0.02
F test statistics				
1. F(joint significance all covariates)	11.41	10.96	15.39	4.96
p value	0.00	0.00	0.00	0.00
2. F(HH composition covars sig)	3.66	1.31	0.70	0.91
p value	0.01	0.26	0.59	0.46

Note. All dependent variables are measured on a scale of 0-100, with 100 being the worst state. Heteroscedasticity robust standard errors are in parentheses, * indicates significant at 5%.

Appendix Table 4. Demographic and job role predictors of mental health

	Felt stressed out	Felt anxious	CES-D score	Worsened overall mental health (Col [6]-[5])	Overall poor mental health pre-pandemic	Overall poor mental health at survey
	[1]	[2]	[3]	[4]	[5]	[6]
Indicator (1) if						
Age <30 years	24.02*	22.12*	11.00*	7.78*	13.17*	20.95*
	[2.12]	[2.21]	[1.27]	[1.60]	[1.39]	[1.75]
Age 30-39 years	20.53*	18.51*	8.47*	7.91*	9.68*	17.60*
	[1.50]	[1.51]	[0.83]	[0.99]	[0.85]	[1.20]
Age 40-49 years	15.04*	12.19*	5.81*	6.12*	6.32*	12.45*
	[1.45]	[1.44]	[0.78]	[0.91]	[0.78]	[1.14]
Age 50-59 years	8.08*	5.62*	3.50*	3.43*	3.60*	7.04*
	[1.41]	[1.39]	[0.75]	[0.88]	[0.76]	[1.13]
(Ref: Age >=60 years)						
College faculty	2.64	-0.07	0.57	0.03	-2.72*	-2.69
	[1.10]	[1.10]	[0.61]	[0.75]	[0.64]	[0.88]
Medical School faculty	1.87	-4.71*	-4.10*	-3.12*	-4.30*	-7.42*
	[1.50]	[1.51]	[0.84]	[1.01]	[0.84]	[1.20]
Medical School not faculty	-1.54	-1.70	-1.83*	-0.82	-1.56*	-2.38*
	[1.87]	[1.88]	[1.05]	[1.27]	[1.08]	[1.52]
(Ref: Not faculty, College)						
Completed college but not doctorate	6.15*	7.18*	2.05*	1.76	-0.54	1.22
	[1.50]	[1.51]	[0.84]	[1.01]	[0.84]	[1.20]
Completed doctorate	7.82*	7.53*	1.37	-0.48	-1.37	-1.85
	[1.87]	[1.88]	[1.05]	[1.27]	[1.08]	[1.52]
(Ref: Not completed college)						
Male	-8.07*	-7.33*	-3.34*	-1.47*	-2.24*	-3.71*
	[1.77]	[1.79]	[0.98]	[1.21]	[1.03]	[1.47]
(Ref: Female)						
Black	-9.67*	-6.87*	-2.71*	-2.10*	-1.73*	-3.83*
	[1.52]	[1.56]	[0.85]	[1.01]	[0.87]	[1.19]
Not Black or White	-5.27*	-3.99*	-0.70	-0.15	-1.60	-1.76
	[1.56]	[1.60]	[0.85]	[1.09]	[0.90]	[1.24]
Hispanic	1.17	0.37	-0.34	0.48	-0.37	0.10
	[1.16]	[1.18]	[0.65]	[0.81]	[0.68]	[0.94]
(Ref: White)						
Constant	33.86*	30.04*	21.66*	13.82*	21.28*	35.10*
	[1.76]	[1.76]	[0.96]	[1.12]	[0.96]	[1.38]

Appendix Table 4 continued. Demographic and job role predictors of mental health

	Felt stressed out	Felt anxious	CES-D score	Worsened overall mental health ([6]-[5])	Overall poor mental health pre-pandemic	Overall poor mental health at survey
	[1]	[2]	[3]	[4]	[5]	[6]
Sample size	4,172	4,172	4,172	4,172	4,172	4,172
R^2	0.09	0.08	0.05	0.03	0.06	0.09
F test statistics						
1. F(joint significance all covariates)	33.98	28.48	19.21	9.98	20.77	34.06
p value	0.00	0.00	0.00	0.00	0.00	0.00
2. F(Med School covariates sig)	1.76	3.05	9.01	2.63	8.13	11.19
p value	0.17	0.05	0.00	0.07	0.00	0.00
3. F(Med School:Faculty=Other)	2.57	2.01	3.95	2.71	5.63	8.81
p value	0.11	0.16	0.05	0.10	0.02	0.00
4. F(Faculty:Med School=College)	0.13	4.65	16.31	5.10	1.91	7.43
p value	0.72	0.03	0.00	0.02	0.17	0.01

Note. All dependent variables are measured on a scale of 0-100, with 100 being the worst state. Heteroscedasticity robust standard errors are in parentheses, * indicates significant at 5%.

Appendix Table 5. Demographic, job role and household composition predictors of mental health

	Felt stressed out	Felt anxious	CES-D score	Worsened overall mental health ([6]-[5])	Overall poor mental health pre-pandemic	Overall poor mental health at survey
	[1]	[2]	[3]	[4]	[5]	[6]
Indicator (1) if						
Age <30 years	23.92*	22.12*	11.13*	7.72*	13.25*	20.98*
	[2.12]	[2.22]	[1.27]	[1.60]	[1.39]	[1.75]
Age 30-39 years	20.19*	18.40*	9.00*	7.76*	9.99*	17.75*
	[1.56]	[1.58]	[0.86]	[1.03]	[0.89]	[1.26]
Age 40-49 years	14.75*	12.22*	6.40*	6.04*	6.92*	12.96*
	[1.55]	[1.54]	[0.84]	[0.98]	[0.84]	[1.22]
Age 50-59 years	8.00*	5.85*	3.73*	3.36*	3.80*	7.15*
	[1.43]	[1.42]	[0.77]	[0.89]	[0.77]	[1.15]
(Ref: Age ≥60 years)						
College faculty	2.56	-0.05	0.69	-0.01	-2.62*	-2.63
	[1.78]	[1.79]	[0.99]	[1.21]	[1.03]	[1.48]
Medical School faculty	1.67	-4.74*	-3.84*	-3.11*	-4.08*	-7.19*
	[2.10]	[2.11]	[1.13]	[1.40]	[1.14]	[1.69]
Medical School not faculty	-1.68	-1.71	-1.70*	-0.77	-1.48*	-2.25*
	[1.12]	[1.11]	[0.62]	[0.76]	[0.65]	[0.89]
(Ref: Not faculty, College)						
Completed college but not doctorate	6.09*	7.06*	2.08*	1.88	-0.58	1.3
	[1.50]	[1.51]	[0.85]	[1.01]	[0.85]	[1.20]
Completed doctorate	7.80*	7.43*	1.39	-0.41	-1.39	-1.8
	[1.87]	[1.89]	[1.05]	[1.27]	[1.08]	[1.52]
(Ref: Not completed college)						
Male	-8.10*	-7.27*	-3.25*	-1.54*	-2.13*	-3.67*
	[1.05]	[1.05]	[0.57]	[0.71]	[0.59]	[0.86]
(Ref: Female)						
Black	-9.55*	-6.82*	-2.81*	-2.19*	-1.75*	-3.94*
	[1.53]	[1.57]	[0.86]	[1.03]	[0.87]	[1.20]
Not Black or White	-5.16*	-3.89*	-0.8	-0.28	-1.6	-1.88
	[1.58]	[1.62]	[0.85]	[1.11]	[0.91]	[1.25]
Hispanic	1.39	0.55	-0.46	0.19	-0.35	-0.16
	[1.24]	[1.26]	[0.69]	[0.87]	[0.73]	[1.00]
(Ref: White)						

Appendix Table 5 continued. Demographic, job role and household composition predictors of mental health

	Felt stressed out	Felt anxious	CES-D score	Worsened overall mental health ([6]-[5])	Overall poor mental health pre-pandemic	Overall poor mental health at survey
	[1]	[2]	[3]	[4]	[5]	[6]
Household composition						
# HH members aged <5y	1.110	-0.17	-1.76*	0.97	-0.79	0.18
	[1.54]	[1.54]	[0.85]	[1.00]	[0.82]	[1.14]
# HH members aged 5-14y	0.38	0.18	-0.87	0.17	-1.40*	-1.22
	[0.98]	[0.94]	[0.51]	[0.64]	[0.51]	[0.77]
# HH members aged 15-19y	0.02	-1.22	-0.47	0.21	0.09	0.3
	[1.30]	[1.26]	[0.68]	[0.91]	[0.76]	[1.02]
# HH members aged ≥20y	0.38	-0.79	-0.73	0.61	-1.10*	-0.49
	[0.71]	[0.72]	[0.45]	[0.52]	[0.41]	[0.57]
(1) if completed HH roster	0.6	0.36	-0.4	-0.65	-0.06	-0.7
	[1.06]	[1.06]	[0.59]	[0.73]	[0.61]	[0.86]
Constant	33.02*	30.90*	22.94*	13.34*	22.80*	36.14*
	[2.00]	[2.02]	[1.12]	[1.36]	[1.12]	[1.60]
Sample size	4172	4172	4172	4172	4172	4172
R^2	0.09	0.08	0.06	0.03	0.07	0.09
F test statistics						
1. F(joint significance all covariates)	24.68	20.72	14.64	7.37	15.83	24.87
p value	0.00	0.00	0.00	0.00	0.00	0.00
2. F(HH composition covars sig)	0.26	0.57	2.63	0.65	3.98	0.82
p value	0.90	0.68	0.03	0.63	0.00	0.51

Appendix Table 6. Relationships among work and identity-related indicators stratified by faculty/not faculty

	A. More effort rel to hypothetical of no Covid			B. Accomplish less rel to hypothetical of no Covid			C. Work is important to my sense of self			D. University not share my values			E. University not share my values		
	Faculty [1]	Other [2]	Diff [3]	Faculty [1]	Other [2]	Diff [3]	Faculty [1]	Other [2]	Diff [3]	Faculty [1]	Other [2]	Diff [3]	Faculty [1]	Other [2]	Diff [3]
A. More effort relative to hypothetical of no Covid				0.23* [0.04]	0.01 [0.02]	0.21* [0.04]	0.05 [0.03]	0.07* [0.02]	-0.03 [0.03]	0.08* [0.04]	0.08* [0.02]	0.00 [0.04]	0.06 [0.04]	0.08* [0.02]	-0.02 [0.04]
B. Accomplish less relative to hypothetical of no Covid	0.20* [0.04]	0.02 [0.02]	0.18* [0.04]				-0.02 [0.03]	-0.01 [0.02]	-0.01 [0.03]	0.04 [0.03]	0.04* [0.02]	-0.01 [0.04]	0.02 [0.04]	0.04* [0.02]	-0.02 [0.04]
C. Work is important to my sense of self	0.07 [0.04]	0.08* [0.02]	-0.01 [0.05]	-0.03 [0.05]	-0.01 [0.02]	-0.02 [0.05]				-0.32* [0.04]	-0.30* [0.02]	-0.02 [0.05]	-0.34* [0.04]	-0.29* [0.02]	-0.05 [0.05]
D. University not share my values	0.08* [0.03]	0.09* [0.02]	-0.01 [0.04]	0.04 [0.04]	0.04* [0.02]	-0.01 [0.04]	-0.20* [0.03]	-0.32* [0.02]	0.13* [0.03]						
E. More eff rel no Covid* Work important													0.08* [0.04]	0.03 [0.02]	0.06 [0.04]
F. Accomp less rel no Covid* Work important													0.05 [0.04]	0.05* [0.02]	0.00 [0.05]
[1] if Medical School	-0.03 [0.07]	0.02 [0.04]	-0.05 [0.07]	-0.05 [0.07]	-0.07 [0.04]	0.02 [0.08]	-0.18* [0.05]	0.03 [0.03]	-0.22* [0.06]	-0.24* [0.07]	-0.01 [0.03]	-0.24* [0.07]	-0.25* [0.07]	-0.01 [0.03]	-0.24* [0.07]
Sample size	850	3,322	4,172	850	3,322	4,172	850	3,322	4,172	850	3,322	4,172	850	3,322	4,172
R^2	0.06	0.01	0.03	0.05	0.00	0.04	0.07	0.10	0.12	0.08	0.10	0.10	0.09	0.11	0.11
F(joint significance all covariates)	10.69	7.82	15.65	9.26	3.01	16.40	14.38	64.95	47.21	17.06	82.18	45.71	14.06	56.32	33.67
[p value]	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.64

Note. All indicators are measured as z scores. Heteroscedasticity robust standard errors are in parentheses, * indicates significant at 5%.

Appendix Table 7a. Relationships between mental health and work and identity, with demographic controls

	A. Felt stressed out			B. Felt anxious			C. CES-D score			D. Change in mental health Time of survey - pre pandemic		
	Faculty	Other	Diff	Faculty	Other	Diff	Faculty	Other	Diff	Faculty	Other	Diff
Covariates	[1]	[2]	[3]	[1]	[2]	[3]	[1]	[2]	[3]	[1]	[2]	[3]
Panel A: Direct effects												
More effort rel no covid	9.31*	7.14*	2.16	7.32*	4.92*	2.40*	3.88*	3.14*	0.73	4.86*	3.78*	1.08
	[1.10]	[0.56]	[1.23]	[1.09]	[0.55]	[1.22]	[0.61]	[0.31]	[0.69]	[0.78]	[0.39]	[0.87]
Accomplish less rel no covid	1.08	1.61*	-0.53	0.54	2.12*	-1.58	0.84	1.36*	-0.51	0.28	1.49*	-1.21
	[1.00]	[0.53]	[1.13]	[1.03]	[0.55]	[1.17]	[0.59]	[0.31]	[0.67]	[0.77]	[0.39]	[0.86]
Work important to sense of self	2.33	1.62*	0.72	5.85*	1.03	4.82*	1.07	0.02	1.05	-1.03	0.06	-1.09
	[1.29]	[0.56]	[1.40]	[1.33]	[0.55]	[1.44]	[0.70]	[0.32]	[0.77]	[0.90]	[0.40]	[0.98]
University not share my values	5.37*	3.24*	2.13	5.24*	1.61*	3.63*	4.62*	2.05*	2.57*	2.78*	1.35*	1.43
	[1.04]	[0.57]	[1.18]	[1.04]	[0.58]	[1.19]	[0.62]	[0.32]	[0.70]	[0.73]	[0.41]	[0.83]
Panel B: Other controls												
Male [indicator var]	-6.08*	-6.31*	0.24	-5.37*	-6.06*	0.69	-3.65*	-2.76*	-0.89	-0.41	-1.18	0.77
	[2.01]	[1.18]	[2.33]	[2.06]	[1.20]	[2.37]	[1.12]	[0.64]	[1.29]	[1.41]	[0.80]	[1.62]
Age [years]	-0.46*	-0.64*	0.18	-0.45*	-0.62*	0.17	-0.14*	-0.26*	0.12*	-0.21*	-0.18*	-0.02
	[0.09]	[0.04]	[0.10]	[0.09]	[0.04]	[0.10]	[0.05]	[0.02]	[0.05]	[0.05]	[0.03]	[0.06]
Med School	2.25	-1.49	3.74	-1.42	-1.58	0.16	-2.71*	-1.64*	-1.08	-2.34	-0.9	-1.44
	[2.03]	[1.05]	[2.28]	[2.08]	[1.07]	[2.33]	[1.08]	[0.59]	[1.23]	[1.34]	[0.72]	[1.52]
Faculty			-8.88			-12.77*			-8.08*			-2.14
			[5.04]			[5.23]			[2.76]			[3.26]
Constant	71.84*	80.72*	80.72*	62.18*	74.94*	74.94*	32.23*	40.32*	40.32*	26.49*	28.62*	28.62*
	[4.58]	[2.14]	[2.14]	[4.74]	[2.23]	[2.23]	[2.48]	[1.23]	[1.23]	[2.84]	[1.62]	[1.62]
Sample size	850	3322	4172	850	3322	4172	850	3322	4172	850	3322	4172
R^2	0.192	0.154	0.162	0.155	0.108	0.119	0.185	0.109	0.126	0.109	0.064	0.076
Identity covariates	0.000	0.000	0.131	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.069
All covariates	0.000	0.000	0.121	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note. Dependent variables are all scaled to 100 with higher values indicating worse mental health. All identity covariates are measured as z scores. Heteroscedasticity robust standard errors are in parentheses, * indicates significant at 5%.

Appendix Table 7b. Relationships between mental health and work and identity, and interaction among them, conditional on demographics and job roles

	A. Felt stressed out			B. Felt anxious			C. CES-D score			D. Change in mental health (At survey - pre pandemic)		
	Faculty	Other	Diff	Faculty	Other	Diff	Faculty	Other	Diff	Faculty	Other	Diff
	[1]	[2]	[3]	[1]	[2]	[3]	[1]	[2]	[3]	[1]	[2]	[3]
Panel A: Direct effects												
More effort rel no covid	9.03*	7.47*	1.56	6.83*	5.21*	1.62	3.58*	3.27*	0.32	4.36*	3.92*	0.44
	[1.17]	[0.56]	[1.30]	[1.10]	[0.55]	[1.22]	[0.56]	[0.32]	[0.65]	[0.81]	[0.40]	[0.90]
Accomplish less rel no covid	0.97	1.34*	-0.37	0.7	1.81*	-1.11	1.09	1.23*	-0.14	0.59	1.42*	-0.83
	[1.14]	[0.54]	[1.26]	[1.11]	[0.56]	[1.24]	[0.59]	[0.31]	[0.67]	[0.81]	[0.40]	[0.90]
Work important to sense of self	2.37	1.63*	0.74	5.70*	0.81	4.89*	1.2	-0.1	1.3	-0.84	0.15	-0.99
	[1.41]	[0.55]	[1.51]	[1.43]	[0.56]	[1.53]	[0.75]	[0.32]	[0.81]	[0.93]	[0.40]	[1.01]
University not share my values	5.25*	3.04*	2.21	5.11*	1.47*	3.65*	4.49*	1.97*	2.52*	2.77*	1.22*	1.55
	[1.13]	[0.56]	[1.26]	[1.16]	[0.58]	[1.29]	[0.70]	[0.32]	[0.77]	[0.82]	[0.40]	[0.91]
Panel B: Interactive effects												
More eff rel no Covid*	0.88	1.59*	-0.71	-0.1	1.83*	-1.94	-0.21	0.77*	-0.99	-0.07	0.65	-0.71
Accomplished less	[0.96]	[0.50]	[1.08]	[0.97]	[0.50]	[1.08]	[0.57]	[0.30]	[0.64]	[0.72]	[0.37]	[0.80]
More eff rel no Covid*	0.76	1.85*	-1.09	1.07	0.91	0.16	1.11	0.54	0.58	1.39	0.85*	0.54
Work is important	[1.55]	[0.53]	[1.63]	[1.38]	[0.52]	[1.47]	[0.84]	[0.32]	[0.89]	[1.08]	[0.40]	[1.14]
More eff rel no Covid*	0.25	1.40*	-1.15	1.46	0.92	0.54	0.49	0.62	-0.12	1.38	1.02*	0.36
University not share values	[1.09]	[0.58]	[1.23]	[1.14]	[0.58]	[1.27]	[0.81]	[0.35]	[0.88]	[0.86]	[0.44]	[0.96]
Accomp less rel no Covid*	-0.97	1.45*	-2.42	-0.16	1.05	-1.21	-0.83	0.65	-1.49	-0.88	0.93*	-1.81
Work is important	[1.38]	[0.55]	[1.48]	[1.29]	[0.58]	[1.41]	[0.82]	[0.34]	[0.89]	[1.13]	[0.44]	[1.20]
Accomp less rel no Covid*	-0.07	-1.39*	1.32	-0.43	-1.42*	0.99	0.21	-0.82*	1.02	-0.28	-0.84	0.57
University not share values	[1.04]	[0.56]	[1.17]	[1.05]	[0.58]	[1.20]	[0.76]	[0.34]	[0.83]	[0.88]	[0.46]	[0.99]
Work important*	0.3	0.67	-0.37	-0.15	0.98*	-1.13	-0.23	0.60*	-0.83	-0.62	0.12	-0.75
University not share values	[1.21]	[0.47]	[1.29]	[1.22]	[0.46]	[1.30]	[0.71]	[0.27]	[0.76]	[0.93]	[0.36]	[0.99]
Panel C: Other controls												
Male [indicator var]	-6.01*	-6.46*	0.45	-5.31*	-6.16*	0.86	-3.60*	-2.84*	-0.76	-0.31	-1.27	0.96
	[2.03]	[1.17]	[2.34]	[2.07]	[1.19]	[2.38]	[1.12]	[0.64]	[1.28]	[1.42]	[0.80]	[1.62]
Age [years]	-0.46*	-0.62*	0.17	-0.45*	-0.60*	0.15	-0.14*	-0.25*	0.11*	-0.20*	-0.18*	-0.03
	[0.09]	[0.04]	[0.10]	[0.09]	[0.04]	[0.10]	[0.05]	[0.02]	[0.05]	[0.05]	[0.03]	[0.06]
Med School	2.39	-1.45	3.84	-1.49	-1.57	0.07	-2.77*	-1.63*	-1.14	-2.42	-0.87	-1.56
	[2.04]	[1.04]	[2.28]	[2.10]	[1.06]	[2.34]	[1.09]	[0.58]	[1.23]	[1.35]	[0.72]	[1.53]
Faculty			-8.7			-12.22*			-7.99*			-2.21
			[5.11]			[5.33]			[2.82]			[3.28]
Constant	71.35*	80.05*	80.05*	62.06*	74.28*	74.28*	32.01*	40.00*	40.00*	26.05*	28.26*	28.26*
	[4.66]	[2.14]	[2.14]	[4.86]	[2.23]	[2.23]	[2.55]	[1.23]	[1.23]	[2.87]	[1.61]	[1.61]
Sample size	850	3322	4172	850	3322	4172	850	3322	4172	850	3322	4172
R^2	0.193	0.167	0.173	0.157	0.119	0.128	0.19	0.12	0.135	0.115	0.073	0.084
# p(value all Identity covariates)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.018	0.000	0.000

Note. Dependent variables are all scaled to 100 with higher values indicating worse mental health. All identity covariates are measured as z scores. Heteroscedasticity robust standard errors are in parentheses, * indicates significant at 5%.

Appendix Table 8. Relationships among work and identity-related indicators adjusting for household composition.

	More effort rel to hypothetical of no Covid	Accomplish less rel to hypothetical of no Covid	Work is important to my sense of self	University not share my values	University not share my values
	[1]	[2]	[3]	[4]	[5]
A. More effort rel to hypothetical of no Covid		0.060*	0.082*	0.087*	0.085*
		[0.018]	[0.016]	[0.015]	[0.015]
B. Accomplish less rel to hypothetical of no Covid	0.059*		0.013	0.054*	0.051*
	[0.018]		[0.015]	[0.015]	[0.015]
C. Work is important to my sense of self	0.088*	0.014		-0.289*	-0.284*
	[0.017]	[0.016]		[0.016]	[0.016]
D. University not share my values	0.093*	0.059*	-0.290*		
	[0.016]	[0.017]	[0.018]		
E. More eff rel no Covid*Work important					0.031*
					[0.016]
F. Accomp less rel no Covid*Work important					0.050*
					[0.016]
Number of household members aged					
<5years	0.098*	0.121*	-0.059	0.089	0.087
	[0.049]	[0.047]	[0.047]	[0.047]	[0.048]
5 - 14 years	0.148*	0.060*	0.002	-0.017	-0.02
	[0.029]	[0.030]	[0.027]	[0.027]	[0.027]
15 - 19 years	0.071	-0.015	0.032	0.002	0.004
	[0.036]	[0.042]	[0.039]	[0.043]	[0.042]
>19 years	-0.031	-0.021	0.047*	0.021	0.02
	[0.026]	[0.024]	[0.021]	[0.022]	[0.022]
[1] if completed household roster	0.048	0.024	-0.069*	-0.049	-0.049
	[0.031]	[0.031]	[0.030]	[0.030]	[0.030]
Constant	-0.074	-0.027	-0.011	-0.002	-0.003
	[0.040]	[0.039]	[0.036]	[0.036]	[0.036]
Sample size	4,172	4,172	4,172	4,172	4,172
R^2	0.026	0.011	0.09	0.093	0.097
F(joint significance all covariates)	13.35	5.139	37.68	47.12	39.1
[p value]	0.000	0.000	0.000	0.000	0.000

Note. All indicators are measured as z scores. Heteroscedasticity robust standard errors are in parentheses, * indicates significant at 5%.

Appendix Table 9. Relationships between mental health and identity including interactions among identity indicators and household composition.

	Felt stressed out	Felt anxious	CES-D score	Worsened overall mental health (Col [6]-[5])	Overall poor mental health at survey	Overall poor mental health pre-pandemic
	[1]	[2]	[3]	[4]	[5]	[6]
Panel A: Direct effects						
More effort rel no Covid	7.65*	5.30*	3.26*	3.82*	2.97*	-0.86*
	[0.50]	[0.49]	[0.28]	[0.35]	[0.41]	[0.28]
Accomplish less rel no Covid	1.26*	1.36*	1.03*	0.97*	0.90*	-0.07
	[0.48]	[0.49]	[0.27]	[0.35]	[0.39]	[0.28]
Work important to sense of self	1.65*	1.26*	-0.13	-0.31	-1.70*	-1.39*
	[0.51]	[0.51]	[0.29]	[0.36]	[0.42]	[0.31]
University not share my values	3.55*	2.17*	2.46*	1.44*	2.59*	1.15*
	[0.50]	[0.51]	[0.29]	[0.36]	[0.42]	[0.29]
Panel B: Interactive effects						
More eff rel no Covid*Accomp less	1.46*	1.41*	0.55*	0.41	0.83*	0.42
	[0.45]	[0.44]	[0.26]	[0.33]	[0.37]	[0.26]
More eff rel no Covid*Work important	1.73*	1.12*	0.62*	0.86*	0.72	-0.15
	[0.50]	[0.48]	[0.29]	[0.36]	[0.41]	[0.32]
More eff rel no Covid*Univ not share values	1.33*	1.23*	0.70*	1.15*	0.90*	-0.25
	[0.51]	[0.51]	[0.32]	[0.39]	[0.43]	[0.29]
Accomp less rel no Covid*Work important	1.10*	1.02*	0.53	0.54	0.39	-0.15
	[0.50]	[0.52]	[0.30]	[0.39]	[0.42]	[0.32]
Accomp less rel no Covid*Univ not share values	-1.03*	-0.99*	-0.4	-0.62	-0.63	-0.01
	[0.48]	[0.50]	[0.30]	[0.40]	[0.42]	[0.29]
Work important*Univ not share values	0.71	0.97*	0.62*	0.14	0.68	0.54*
	[0.44]	[0.44]	[0.25]	[0.33]	[0.38]	[0.27]
Panel C: Other controls						
Male [indicator var]	-5.85*	-6.01*	-3.06*	-1.66*	-4.55*	-2.89*
	[0.99]	[1.01]	[0.54]	[0.68]	[0.83]	[0.58]
Age [years]	-0.58*	-0.58*	-0.25*	-0.20*	-0.52*	-0.33*
	[0.04]	[0.04]	[0.02]	[0.03]	[0.03]	[0.02]
Panel D: Household composition						
Number of household members aged						
<5years	0.84	-0.58	-2.47*	0.4	-0.87	-1.27
	[1.37]	[1.42]	[0.79]	[0.94]	[1.08]	[0.80]
5 - 14 years	-0.21	-0.72	-1.43*	-0.33	-1.81*	-1.48*
	[0.89]	[0.85]	[0.46]	[0.59]	[0.72]	[0.48]
15 - 19 years	0.2	-1.37	-0.44	0.31	0.63	0.32
	[1.20]	[1.20]	[0.65]	[0.87]	[0.98]	[0.75]
>19 years	0.03	-1.11	-0.77	0.61	-0.48	-1.09*
	[0.67]	[0.71]	[0.43]	[0.52]	[0.56]	[0.41]

Appendix Table 9 continued. Relationships between mental health and identity including interactions among identity indicators and household composition.

	Felt stressed out	Felt anxious	CES-D score	Worsened overall mental health (Col [6]-[5])	Overall poor mental health at survey	Overall poor mental health pre-pandemic
	[1]	[2]	[3]	[4]	[5]	[6]
[1] if completed household roster	0.63	0.38	-0.56	-0.77	-0.92	-0.15
	[0.91]	[0.94]	[0.51]	[0.63]	[0.75]	[0.54]
Constant	77.19*	73.69*	41.23*	27.98*	70.33*	42.36*
	[2.20]	[2.30]	[1.28]	[1.62]	[1.82]	[1.39]
Sample size	4172	4172	4172	4172	4172	4172
R^2	0.169	0.121	0.127	0.074	0.124	0.077
F test statistics (p values)						
2. Accomplished less	0.000	0.000	0.000	0.000	0.000	0.007
1. More effort	0.000	0.000	0.000	0.001	0.002	0.593
3. Work important	0.000	0.000	0.010	0.021	0.000	0.000
4. University shares values	0.000	0.000	0.000	0.000	0.000	0.000
5. All interactions taken together	0.000	0.000	0.001	0.004	0.011	0.304

Note. Dependent variables are all scaled to 100 with higher values indicating worse mental health. All identity covariates are measured as z scores. Heteroscedasticity robust standard errors are in parentheses, * indicates significant at 5%.

Figure 1. Effort and Accomplishment

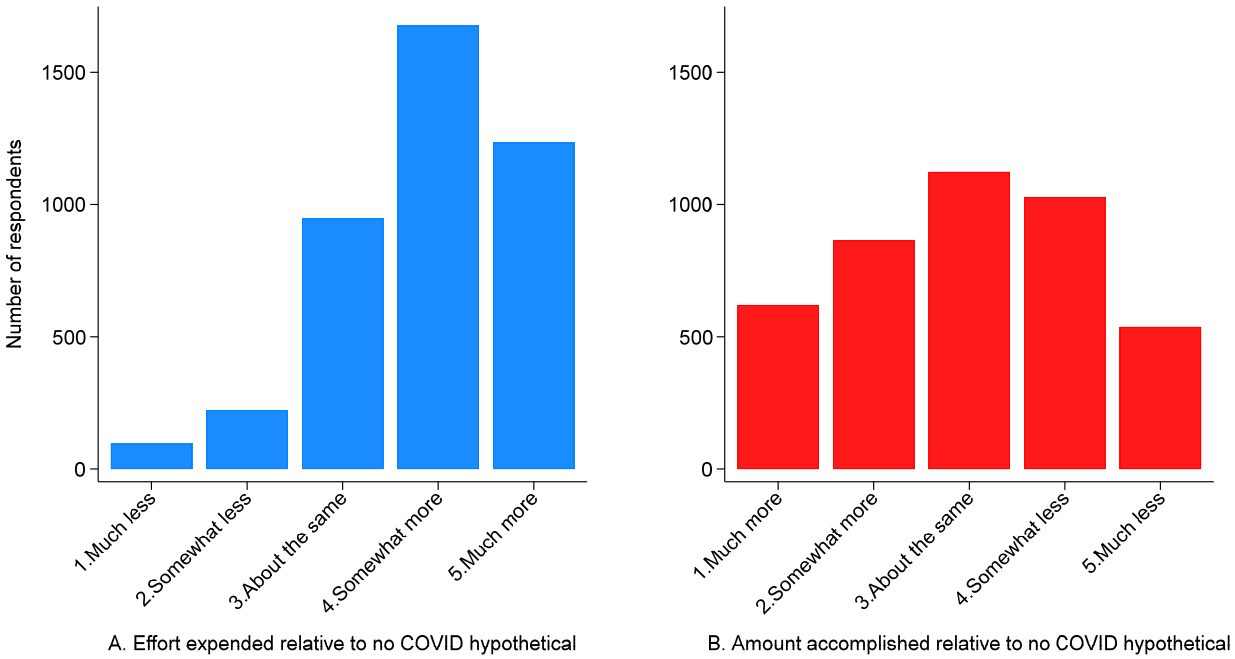


Figure 2. Work is Important and University Not Share Values

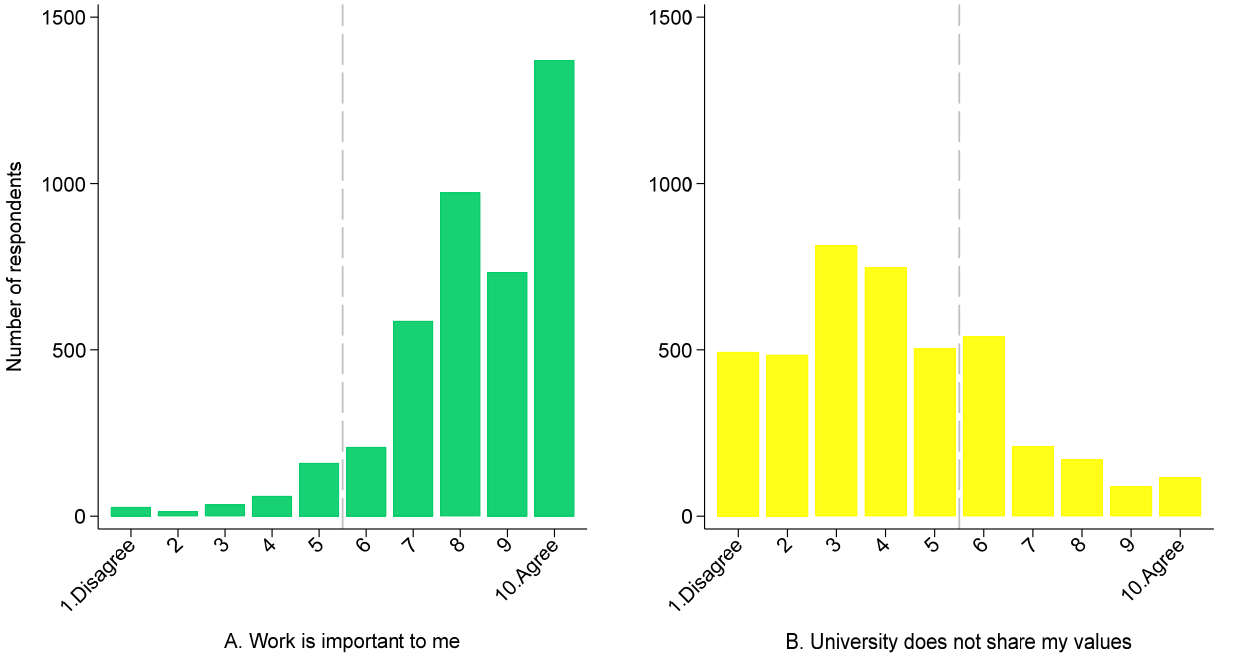


Figure 3. Stress and Anxiety

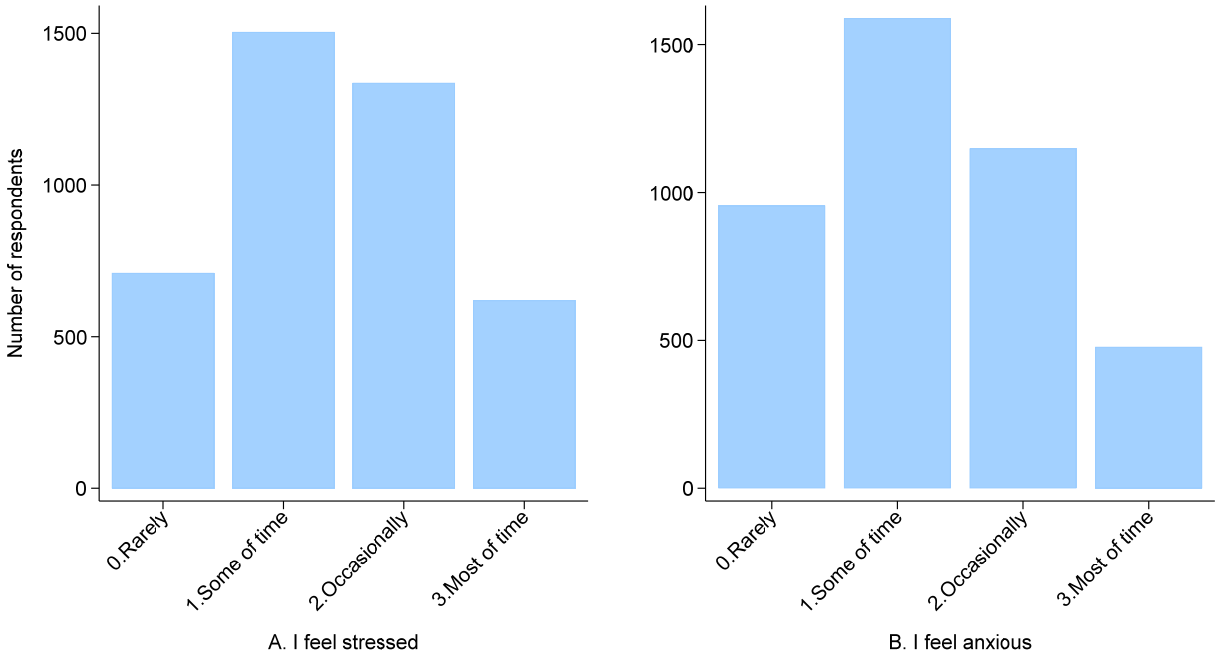


Figure 4. CES-D score

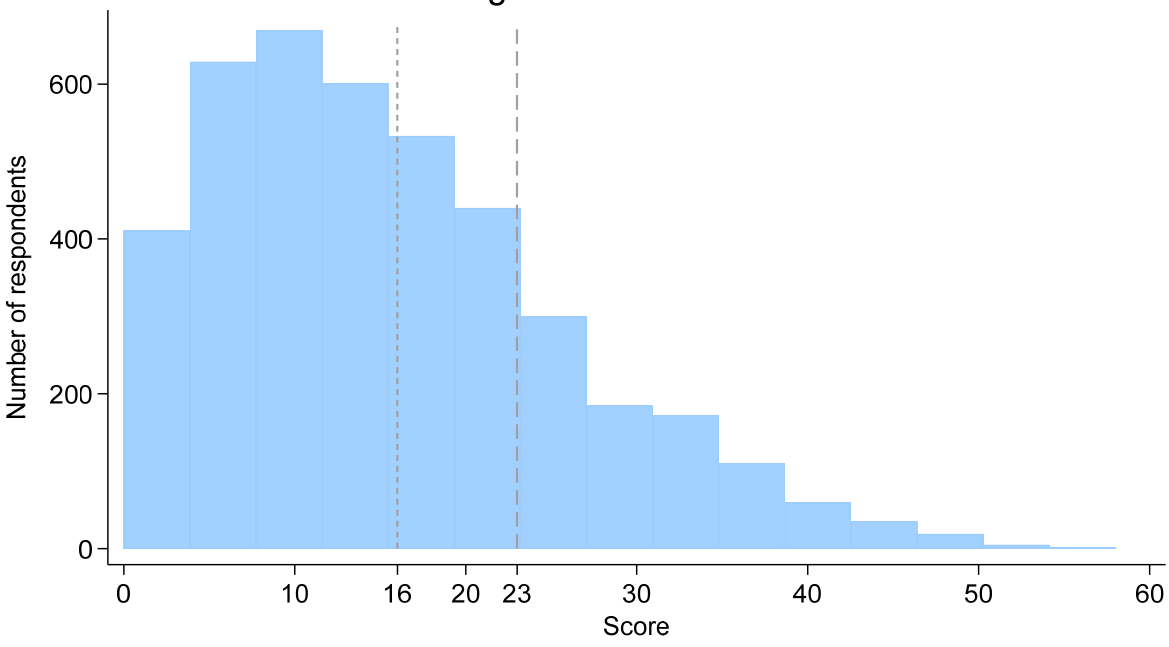
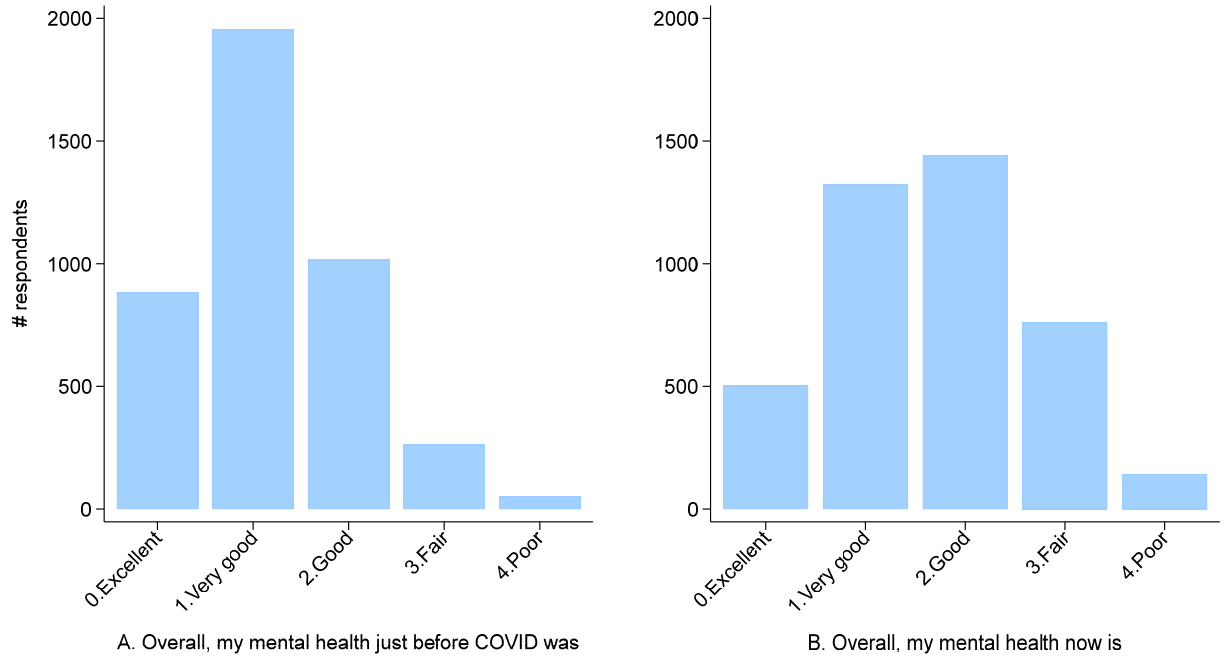
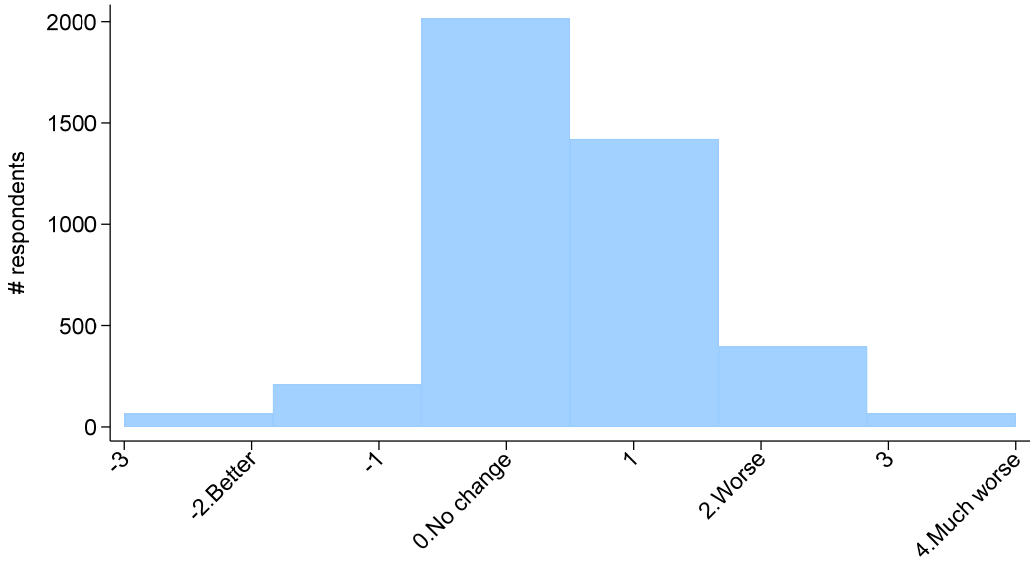


Figure 5. Overall Mental Health Before and During Pandemic



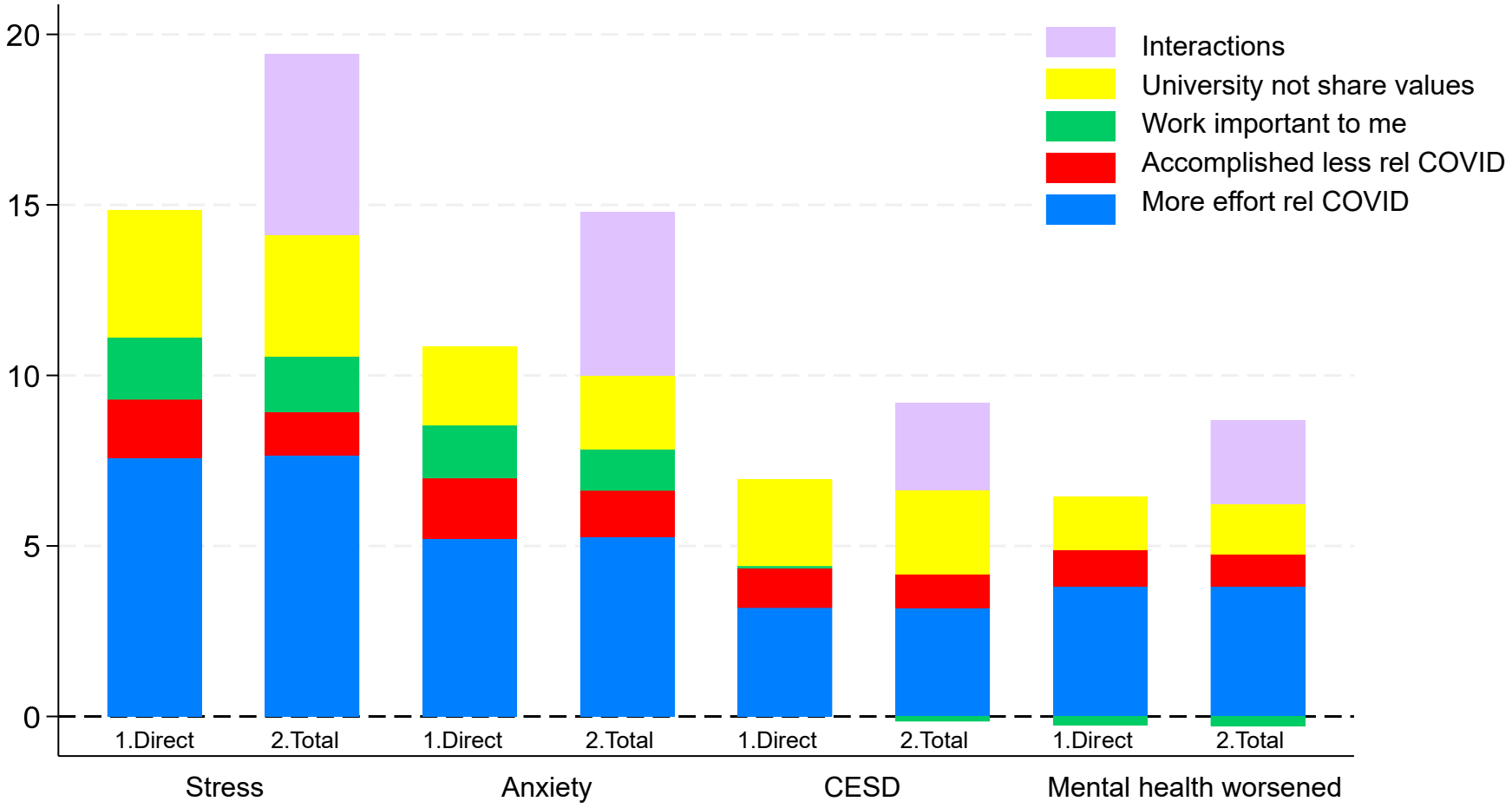
A. Overall, my mental health just before COVID was

B. Overall, my mental health now is



C. Change in mental health: Current minus Pre-COVID

Figure 6. Mental health outcomes, work and identity: Direct and total effect sizes



Note. Direct effect sizes are from regressions with only direct effects. Total effect sizes are from regressions that also include interactions.

Figure 7. Mental health outcomes, work and identity
Total effect sizes for each work and identity predictor from regressions with interactions

