

Impacts of the COVID-19 Lockdown on Gender Inequalities in Time Spent on Paid and Unpaid Work in Singapore

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Abstract

Objective: To examine the impact of the COVID-19 lockdown on gender inequalities in time spent on paid labor market work, housework, and childcare in Singapore.

Background: Widespread shifts to remote work, school closures, and job losses arising from the COVID-19 pandemic have affected gender inequalities in time spent on paid and unpaid work globally. Major gaps in the literature include a lack of longitudinal data to compare time use before and during the pandemic, a lack of examination of how gender and family resources intersect to create inequalities in time use during the pandemic, and a lack of focus on potential mechanisms through which the pandemic affects time use patterns across genders.

Method: We use a panel dataset of 290 married women interviewed before, during, and after the COVID-19 lockdown, and apply between-within models to examine changes in gender gaps in time use (defined as females' time use minus males' in this study).

Results: Gender gaps in housework hours increased during and persisted after the lockdown, even as the negative gender gap in paid work hours narrowed. The gap in childcare hours expanded among households with fewer resources but decreased among households with more resources. We also find that gender ideologies and resources may have both played important roles in how the pandemic affects gender inequalities in time use.

Conclusion: Our results highlight that gender and resources can interact, putting women in a vulnerable position when a pandemic strikes, especially among less-resourced households.

Introduction

The COVID-19 pandemic is a global health emergency with breath-takingly devastating consequences. It has created severe economic and geopolitical repercussions and substantial impacts on nearly all aspects of work and daily life that have multifaceted implications for global gender equality (International Labour Organization, 2020; Sachs et al., 2020). Unprecedented widespread shifts to remote work, school closures, and job losses arising from the COVID-19 pandemic have substantially changed gender inequalities in time spent on paid and unpaid work (Alon et al., 2020; Chung et al., 2021; Dunatchik et al., 2021; Hank & Steinbach, 2020). Mothers with young children may be particularly affected due to both the pandemic's disproportionate impacts on female-dominated industries and a simultaneous spike in childcare needs and other household duties (Alon et al., 2020). Although much scholarship has been devoted to gathering evidence on the crisis' impacts on marriages and families (e.g., Collins, Landivar, et al., 2021; Collins, Ruppanner, et al., 2021), its recency has resulted, understandably, in much being left unknown about how patterns of time use within households have shifted, particularly in non-western contexts.

A major gap in the literature on how the COVID-19 pandemic has impacted gender gaps in time use (females' time use minus males') is the lack of longitudinal data to compare fathers and mothers in the same households before and during the pandemic. Most existing studies have used cross-sectional data collected online during the pandemic. These participants tend to be more conservative and less extraverted (Valentino et al., 2020), which, due to sample selection and recall bias, may bias the estimates on changes in time use gender inequalities before and during the pandemic. Furthermore, the intersection of gender and family resources creation of inequalities in time use during the pandemic is less studied (Ishizuka, 2019). Finally, researchers

have pointed to time availability, resources, and gender ideologies as important drivers of time use gender inequalities (Bianchi et al., 2000; Lachance-Grzela & Bouchard, 2010; Perry-Jenkins & Gerstel, 2020). It is still not clear which of the mechanisms has played a more important role in shaping gender inequalities in time use during the pandemic. Understanding the mechanisms will help policymakers design effective policies to mitigate the unequal consequences of the pandemic among parents.

This study examines how the COVID-19 lockdown in 2020 affected gender inequality in parents' time use in Singapore. Prior to the pandemic, distribution of care work and other household responsibilities was highly unequal. It largely fell on married women, whether or not they engaged in paid labor (Jones, 2012). Although filial piety is strongly endorsed in this culturally conservative society, the prevalence of multi-generational households, particularly among Chinese Singaporeans, has declined over time (Phua & Loh, 2008). It now constitutes about 9% of local households (Singapore Ministry of Social and Family Development, 2019). Meanwhile, Singapore's number of female live-in foreign domestic workers has risen to about one in five households (Singapore Department of Statistics, 2020; Singapore Ministry of Manpower, 2021) compared to one in fifty households in the US (U.S. Census Bureau, 2022; Wolfe et al., 2020). This has occurred under the societal perception that it allows women to cope with multiple roles in and out of paid labor (Chan, 2006; Teo, 2016).

In 2020, Singapore's government declared a "circuit breaker" – a stay-at-home restriction order – from April 7th to June 1st. During this period, residents were allowed to leave their homes only for sanctioned reasons, such as seeking medical attention, buying groceries, or exercising (Government of Singapore, 2020b). All workers in non-essential services were required to work remotely, causing all childcare centers to close and schools to move to home-based learning.

Although households that hired domestic workers prior to the lockdown could continue to employ their services, there was little access to new helpers due to a clampdown on entry permits and a very limited supply of available personnel (Seow & Teh, 2020). Additionally, households were not allowed to hire professional services for help apart from essential services like food delivery, and parents were not allowed to rely on family members living in separate dwellings with very few exceptions (Government of Singapore, 2020b). After the circuit breaker ended, childcare centres and schools gradually reopened, but strict work and movement restrictions remained in place. House visits of up to two people from the same family were permitted, allowing grandparents to provide help, but professional cleaning services were still prohibited (Government of Singapore, 2020a).

Building on an ongoing project to understand time use and fertility among Singaporean families that started pre-pandemic, we collected two additional waves of data during and after the COVID-19 lockdown (see the timing of events in Table 1). Using a panel dataset of 290 married women with young children (97% of parents in our sample had children younger than age 6 in 2018), we first documented changes in gender inequality among parents in the time spent on housework, childcare, and paid labor market work. The inequalities were measured across the three time periods, with and without adjusting for sociodemographic characteristics and individual fixed effects. We then conducted subgroup analyses by income and presence of outside help to detect potential heterogeneous effects. Finally, we investigated potential mechanisms through which the pandemic may have affected gender inequalities in time use.

[Table 1 About Here]

In addition to the contributions through the usage of panel data, heterogeneity analyses, and analyses of mechanisms, this study represents the first effort to examine the pandemic's

impact on gender inequalities in time spent on paid and unpaid work in Singapore. Even prior to the pandemic, time use research in Singapore was relatively scarce and dated. While research in top social science journals have disproportionately been based on data from western contexts, the global nature of the pandemic and the heterogeneity in institutional responses make it important to include diverse experiences around the world.

Gender Inequality during the COVID-19 Pandemic

The COVID-19 crisis has caused global economic disruptions, resulting in disproportionate job losses. Many existing studies on the pandemic's consequences for work and family have been done in the U.S. context. In the U.S., mothers faced more drastic changes than fathers in their labor market contribution, as female-dominated industries tended to be more heavily affected than male-dominated industries (Alon et al., 2020). Moreover, due to the rise in childcare expectations and school closures during the pandemic, mothers in dual-earning families typically scaled back their work hours more than fathers in response to increased domestic needs (Collins, Landivar, et al., 2021; Petts et al., 2021). This often led to exits from the labor force (Collins, Ruppanner, et al., 2021; Petts et al., 2021).

However, the pandemic's effects on households globally are far from homogenous due to institutional responses to the pandemic and pre-existing differences in workforce structure and economic resilience. Gender gaps in employment loss tended to be larger in China, Italy and the U.S, when compared to Japan, South Korea, and the UK (Dang & Nguyen, 2021). Another cross-national study found that while women were more likely than men to experience reduced work hours and unemployment following a lockdown, gender gaps appeared to be smaller in Germany and Singapore than the US (Reichelt et al., 2020). In particular, among Singapore's worst-hit sectors during the pandemic (Monetary Authority of Singapore, 2020),

transportation/storage and hospitality constituted substantially larger and smaller sources of employment in Singapore, respectively, relative to the US (Lim, 2015; U.S. Bureau of Labor Statistics, 2021). Since employment in the transportation/storage sector is male-dominated while the hospitality industry is female-dominated (Lim, 2015), gender gaps in employment outcomes may be weaker in the Singaporean context.

Apart from total work hours, work environment and the timing of work hours also matter. The flexibility of non-standard work schedules may, on the one hand, exacerbate work-family conflict by allowing job demands to impinge upon the family domain, reducing control over time use. On the other hand, it may allow greater involvement of fathers in household production while their wives are working (Begall et al., 2015; Bianchi & Milkie, 2010). Evidence suggests that, among American couples that telecommute, gender gaps are smaller for childcare hours and wider for housework hours (Lyttelton et al., 2022).

Evidence from the US, Germany, Canada, Denmark, Brazil, Spain, and Argentina, shows that mothers still spent much more time on both housework and childcare than fathers during the pandemic (Costoya et al., 2020; Giurge et al., 2021; Hank & Steinbach, 2020). Even in Italy, the UK, and Australia, where the male contribution to domestic work increased during the pandemic, the increase was reflected more in childcare than housework (Craig & Churchill, 2020; Del Boca et al., 2020; Sevilla & Smith, 2020). In the US and the UK, gender gaps in time spent on household labor decreased in the early stage of the pandemic (Carlson & Petts, 2021; Carlson et al., 2020, May 6; Sánchez et al., 2021) but reverted to pre-pandemic levels as fathers' employment recovered (Carlson & Petts, 2021).

Although there are a great and continually growing number of studies examining the impact of the COVID-19 pandemic on gender inequality and division of household labor, few

have examined how gender and family resources interact to shape gender inequalities in time use during the pandemic. Additionally, potential mechanisms through which gender inequalities in time use during the pandemic have changed are more seldom examined.

Theoretical Framework

Existing Theories Explaining the Gendered Division of Paid and Unpaid Work

Globally, mothers on average perform more housework and childcare than fathers and spend less time on paid market work (Lachance-Grzela & Bouchard, 2010). Theories explaining the gendered division of paid and unpaid work take either a micro- or a macro-level perspective. The former consists of three major perspectives: 1) time availability, 2) resource-based, and 3) gender-based (Bianchi et al., 2000; Lachance-Grzela & Bouchard, 2010; Perry-Jenkins & Gerstel, 2020). The micro- and macro-level factors interact in complex ways to shape the gendered division of labor (Knudsen & Wærness, 2008).

The time availability perspective proposes that the division of labor is dependent on the availability of either household partner based on the number of domestic tasks that need to be done. It also suggests that mothers' and fathers' allocated time to domestic labor should be inversely correlated with their time spent on paid market work (Bianchi et al., 2000; Davis et al., 2007). Existing studies have provided some evidence supporting this, showing that labor force participation and longer work hours decrease women's time spent on housework and childcare, increase their partners' (Cunningham, 2007; Gupta, 2006; Hook, 2012), and that unemployed individuals tend to increase their time spent on household labor (Fauser, 2019; Gough & Killewald, 2011). However, the types of household labor affected by time availability tend to be gendered (Fauser, 2019), and women's employment status tends to be more predictive of couples' time spent on housework than men's (Cunningham, 2007).

The resource-based perspective comprises two different points of view. The absolute resource/autonomy perspective predicts that each spouse's absolute economic resources determine the number of domestic tasks they do (Gupta, 2006, 2007) in a most likely non-linear fashion (Killewald & Gough, 2010). The relative resource/bargaining perspective, however, suggests that the allocation of domestic tasks is dependent on the power dynamics between couples created by partners' relative resources (Bianchi et al., 2000; Bittman et al., 2003). More recent evidence suggests that women's absolute resources, which allow them to outsource household labor, tend to be more important than relative resources in determining the number of domestic tasks performed (Gupta, 2006, 2007; Gupta & Ash, 2008), and that relative resources only matter to women, especially mothers, with few absolute resources (Lam et al., 2012; Usdansky & Parker, 2011). However, the power of absolute resources is gendered and nonlinear: men's do not predict their housework engagement (Carlson & Lynch, 2017), and an increase only allows women to outsource certain domestic tasks, but not those with family- and gender-related symbolic meaning (Killewald & Gough, 2010).

Finally, the gender perspective argues that traditional gender expectations and cultural norms of the female role as the homemaker and the male as the breadwinner lead mothers to perform a disproportionate share of housework and childcare, regardless of time and financial pressures (Bianchi et al., 2000; Davis et al., 2007; Evertsson, 2006). One of the major gender perspectives (the 'gender socialization perspective') posits that internalizing gender norms is part of the socialization process, and these gender norms set up gender expectations for how men and women should behave (Cunningham, 2001). Another major gender perspective (the 'gender construction perspective') highlights the nature of domestic labor as a "symbolic enactment of gender relations" (Bianchi et al., 2000). Specifically, performing household labor is a major way

for women to demonstrate their femininity, and refusing household labor is a way for men to express their masculinity (Davis et al., 2007; Erickson, 2005). Existing studies have shown that women and their partners' gender ideologies and the interactions of those ideologies (Greenstein, 1996) generally predict how much housework they do (see Davis and Greenstein (2009) for a review), affecting their perceptions of fairness in the division of household labor (Nordenmark & Nyman, 2003). However, the evidence on whether ascribing to egalitarian gender ideologies leads to more time spent on household labor among men is mixed (see Lachance-Grzela and Bouchard (2010) for a review).

Scholars have increasingly realized the importance of institutional contexts in which individual behaviors occur and how structural factors shape the division of paid and unpaid work between couples (Hook, 2006). Many studies have examined the role of national contexts with mixed results (see Lachance-Grzela and Bouchard (2010)). Some have found that in regimes advocating for more egalitarian gender ideologies, it is more common for couples to share household labor equally (Craig & Mullan, 2011; Hook, 2006). Others have found that state policies facilitating women's employment and work-family balance alone do not necessarily lead to more equal division of household labor (Windebank, 2001). The mixed results are likely driven by lack of considerations of meso-level contexts such as workplace contexts (Lachance-Grzela & Bouchard, 2010).

Macro-Level Context in Singapore

In Singapore, economic success is marked by the society-wide obsession with high individual and organizational performance standards, driven by vulnerability to unpredictable external economic conditions and a sense of economic insecurity arising from growing competition from lower-cost neighbours (Chan et al., 2000). Working overtime is the norm

rather than exception, with one local survey estimating that around 70% of office workers stay at work beyond contractual hours (Evans, 2016).

Despite the high level of economic development, Singapore remains a culturally conservative country. Filial piety is strongly endorsed. Amidst material prosperity, rising tastes for independent living, advancements in geographical mobility and means of communication, and lack of diverse housing options have limited the prevalence of multi-generational households, particularly among Chinese Singaporeans (Phua & Loh, 2008). As a result, the proportion of multi-generational households, defined as households with three or more generations, fell from 11.3% to 8.7% between 2010 and 2017 (Singapore Ministry of Social and Family Development, 2019). Caring for children and the elderly, as well as housework, is largely viewed as women's duties. Therefore, despite the prevalence of dual-earner families, Singaporean women have picked up much of the care work and household chores (Jones, 2012). Physical, mental, and emotional exhaustion tend to be relatively common among married Singaporean women, due to their multiple roles in and out of work. Fatigue among married men tends to be confined to work-related causes (Aryeel, 1993). The uneven division of unpaid familial care responsibilities, along with discrimination and gender identity, has been cited as an explanation for the persistent overrepresentation of women in lower-paying occupations (Lee & Waite, 2005; Lin et al., 2020). A recent survey suggested that gender discrimination in the workplace is widespread, with around 40% of women encountering incidents, compared to 10% of men (Goh, 2021).

An unusual complication of this family dynamic is the availability of female low-wage domestic workers from neighbouring countries, primarily Indonesia and the Philippines. The number of female live-in foreign domestic workers increased from 231,500 to 261,800 between

2015 and 2019 for 1.3-1.4 million local households, representing around one per five households (Singapore Department of Statistics, 2020; Singapore Ministry of Manpower, 2021). Since these workers tend to co-reside with their employers, they provide round-the-clock aid with household work, particularly for energy- and time-intensive tasks like feeding children and home maintenance. In Hong Kong, where the use of domestic workers is also relatively common, these workers' presence in a household has been linked to increased probability of female labor participation (Chan, 2006). However, compared to their husbands, working mothers may still face more demands on their time. The cultural emphasis on academic excellence has created oppressive levels of stress not only for the child, but also for parents and, in particular, the mother, who is often viewed as the primary responsible party (Jones, 2012). Therefore, mothers often devote more time and energy to their children's education. It is estimated that unemployed and employed mothers spend an average of 5.6 and 3.2 hours, respectively, with young children during weekdays, while fathers spend only 1.75 hours, regardless of employment status (Yeung, 2020).

Moreover, while foreign domestic workers can help alleviate the weight of household duties placed on wives, women who ascribe to a gendered view of housework and adhere to a traditional gender-role may construe the outsourcing of these tasks as a threat to their femininity and seek to regain their identity through “ultra’ feminine” activities or other types of domestic work, including voluntarily taking on a supervisory role or additional care work (Chan, 2006). The ability of some families to outsource housework and childcare has somewhat backfired on Singaporean married women, lowering domestic labor’s social value and visibility and downplaying married women’s emotional and physical efforts required to maintain work-life balance. The brunt of the repercussions fall on those in less-resourced households who may not

have the means to support a foreign domestic worker (Teo, 2016).

Hypotheses

There are three aims of this study: 1) document changes in gender inequality among parents in the time spent on housework, childcare, and paid labor market work before, during, and right after the COVID-19 lockdown (*Aim 1*), 2) examine the heterogeneous patterns by family resources (*Aim 2*), and 3) investigate potential mechanisms through which the pandemic may have affected gender inequalities in time use (*Aim 3*). Similar to the pre-pandemic world (Lachance-Grzela & Bouchard, 2010), the three potential mechanisms are likely to have jointly shaped gendered division of household labor during the pandemic. Therefore, we focus on forming hypotheses on the first two aims.

Considering the institutional context in Singapore, such as the norm of long work hours and gender discrimination against women, the pandemic likely has disproportionate impacts on women's employment and work hours. Indeed, some evidence has shown that women in Singapore have disproportionately lost jobs in 2020 (Reichelt et al., 2020). Therefore, gender gaps in paid market work hours may have increased during the pandemic. The potentially disproportionate impact on women's employment suggests disproportionate decreases in mothers' income compared to fathers' income.

Reduced work hours may lead to more time available for domestic tasks among mothers. The time availability theory predicts that gender gaps in time spent on domestic tasks will increase (i.e., mothers on average spend even longer hours on domestic tasks than fathers) during the pandemic. Considering the implications on mothers' income, the resource-based perspective, regardless of absolute or relative, predicts that gender gaps in time spent on domestic tasks will increase during the pandemic. Similarly, the gender-based perspective also predicts that gender

gaps in time spent on domestic tasks and paid market work will increase. The pandemic has increased the total workload of domestic tasks due to its impact on schools, childcare centers, and businesses. Because the types of housework and childcare under increased demand during the pandemic are mostly ‘female types’ (Offer, 2014), such as cleaning, laundry, cooking, and routine childcare, the increased workload will likely disproportionately fall on mothers. The disproportionately increased household burden may in turn negatively affect mothers’ labor market outcomes (Noonan, 2001).

Although all three perspectives predict increases in gender gaps for domestic tasks during the pandemic, the magnitude of the increase can differ by the task’s type. Childcare differs from housework, because parents typically view caring for children as rewarding (Knudsen & Wærness, 2008; Sullivan, 2013). As a result, gender gaps in childcare hours are often smaller than gaps in housework hours (Altintas & Sullivan, 2017). Hence, fathers seem more likely to help with childcare than before the pandemic in response to increased demand. Additionally, considering the long-lasting nature of the pandemic, we can expect that the gender gaps in time use during the COVID-19 lockdown will persist following it. Therefore, we hypothesize that gender gaps in housework and paid work hours will increase during and after the lockdown, whereas gender gaps in childcare hours will not increase as much (**H1**).

The perspectives also provide consistent predictions relating to the heterogenous effects of family resources. Since mothers with more resources are more likely to work from home during the pandemic and, therefore, are less likely to lose their jobs or shorten their work hours, the time availability perspective predicts that gender gaps in paid work hours and domestic tasks will grow more among households with less resources. Subsequently, mothers with more resources are less likely to experience substantial income losses compared to their less-resourced

counterparts. In addition, households with a live-in helper pre-pandemic could continue outsourcing domestic tasks during a lockdown. This may have helped mothers maintain work hours and prevent income losses. Therefore, the resource-based perspective provides the same prediction. The gender-based perspective does as well, because higher-SES families tend to hold more egalitarian gender ideologies, and fathers in these families are more likely to step in when met with the pandemic's increased burden of domestic tasks. Research prior to the pandemic showed that income and presence of outside help may moderate gender gaps in time use. Prior research on income and parental time investment yielded mixed results (Monna & Gauthier, 2008), but some studies have found that income reduces mothers' but not fathers' childcare time (Hofferth, 2002). Having outside help may lessen gender gaps in time use, as the involvement of grandparents in childcare particularly increases mothers' labor force participation (Arpino et al., 2014). Overall, based on the theoretical predictions and prior evidence, we hypothesize that the increases in gender gaps will be greater among families with fewer resources (**H2**).

Data and Measures

We use three waves of a survey collected before, during, and after the COVID-19 lockdown. The first wave was collected between April and July 2018. A total of 660 married women were recruited via street intercept at central public spaces such as metro stations, bus depot walkways and shopping mall entrances, using non-probability sampling stratified by the five main geographical regions (i.e., Central, East, North, Northeast and West). All interviews were conducted in a public space or at respondents' homes. Participants met the following inclusion criteria: 1) currently married, 2) aged 25-34, and 3) either a citizen or married to a citizen. Data collected from 3 participants were discarded due to failure to meet age inclusion criteria. The purpose of the first wave of data collection was to investigate factors underlying

intervals between marriage and first births. As such, the 60-minute face-to-face survey collected data on participants' demographics, household composition, and birth dates of children. Information on both spouses' work hours, distribution of household responsibilities in terms of time use, and availability of outside help were also collected.

Fortunately for the purposes of this study, although unanticipated at the time of the first wave, 500 of the female participants consented to be re-contacted for follow-ups and were invited to participate in follow-up surveys to capture changes in household dynamics during and after the lockdown. Of these, 416 (83.2%) completed an online follow-up survey in May 2020 during the lockdown, and 399 (79.8%) completed a third in June 2020 after circuit breaker restrictions were eased. Only respondents who completed the second wave were invited to complete the third, due to the survey's incentive structure. Pseudo-sampling weights were constructed among respondents who completed the May follow-up survey to obtain a sample more representative of the age, racial, and educational distributions of the married female residents in this age range. The weights were based on published statistics from their respective years of the General Household Survey conducted by the Singapore Department of Statistics (Singapore Department of Statistics, 2015). We restricted the sample to married women with at least one child in the initial wave (105 women excluded). We then excluded 3 mothers who were divorced in later waves. Finally, we excluded mothers if they or their spouses had missing time use data in any wave (1 woman excluded). Our final sample includes data collected at three time points from 290 married mothers.

To investigate *Aim 1*, we examined couples' time use as reported by these married mothers for the following activities for each wave: 1) paid market work, 2) housework, and 3) childcare. Paid market work hours were measured by asking respondents "How many hours

do(es) you (your husband) usually work per week (Mon-Sun)?” Housework and childcare hours were measured by asking respondents “How many minutes per day do(es) you (your husband) spend on the following: a) household chores like cooking and cleaning (exclude childcare), b) caring for children (can include feeding and bathing or reading to them).” In the second and third waves, respondents based their responses on the past two weeks, hence the data were specific to time use during the lockdown and immediately after the lockdown, respectively.

To investigate *Aim 2*, we considered two aspects of family resources: income and outside help. Monthly individual income was measured in SGD, using an ordinal variable with the following categories: 1) less than \$2,000, 2) \$2,000-\$4,000, 3) \$4,000-\$6,000, 4) \$6,000-\$8,000, and 5) more than \$8000. For subgroup analyses, to identify groups with lower family resources, we placed everyone into two income groups based on whether workers in the family earned above \$4,000, which is approximately the median individual income of our sample. In the mechanism analyses, income loss was used as a dummy variable, indicating if there was an income drop before and during the lockdown based on the income categories. Respondents were also asked if they had a domestic helper (yes, no) and if grandparents helped with domestic tasks regularly (yes, no). We combined these two pieces of information to create another dummy variable indicating if a household had outside help.

For *Aim 3*, to investigate the mechanism of time availability, we examined fathers’ and mothers’ job losses during the lockdown as measured in Wave 2, as losing a job can increase one’s availability at home. Job loss information was obtained from the following questions: “Did you lose your job due to the COVID-19 crisis?” and “Did your husband lose his job due to the COVID-19 crisis?” There were three categories of answers: 1) “Yes, I/he lost my job and I’m/he’s currently not working”, 2) “Yes, I/he lost my job but I’m/he’s currently working in a

new job”, and 3) “No, I/he still have my/his job”. The first two categories were classified as having experienced job loss. When classifying only the first category as having experienced job loss, the results were highly consistent. To investigate the resource-based mechanism, we relied on information on how fathers’ and mothers’ incomes changed during and after the lockdown. Descriptive statistics for baseline sociodemographic characteristics and labor force responses during the lockdown are shown in Table 2.

[Table 2 About Here]

Analytical Strategy

We began by providing an overall view of how the lockdown affected gender differences in time use (*Aim 1*). We conducted OLS regressions to compute changes in time use in 1) paid labor market work, 2) housework, and 3) childcare using gender, survey wave, and gender-survey wave interactions. To help address omitted variable bias, we exploited the panel data structure using within-between models (Allison, 2009). Within-between models allow the estimation of within-person effects that net out time-invariant individual heterogeneity and time-invariant between-person differences in the same model. They do so by including two versions of time-varying variables, one in which the within-person mean is subtracted (a “de-meaned” variable), and a second that is simply the within-person time-invariant mean. When estimated using multilevel models, it is also possible to include time-invariant variables. This allows us to estimate pandemic-era changes in gender gaps in time use alongside baseline gender differences. Importantly, the within-person coefficients and standard errors are comparable to those produced by the standard individual fixed effects model in our case (Allison, 2009). The detailed model specification is

$$Time\ Use_{it} = \beta_0 + \beta_1 Gender_i + \beta_2 Wave_t + \beta_3 Gender_i \times Wave_t + \beta_4 X_{it} + \alpha_i + \varepsilon_i$$

(1)

where the coefficient for the interaction term β_3 shows changes in gender differences in time use, and X_{it} is a list of time-varying covariates, including number of children, age of the youngest child, presence of an infant, and an interaction term between gender and infant presence. Among these covariates, intuitively, number of children is positively associated with childcare burden. We control for age of the youngest child and presence of an infant, because children's age is one of the most important determinants of parental time investment (Zick & Bryant, 1996). In the U.S., gender gaps in paid work time have been largest for parents of young children (Collins, Landivar, et al., 2021). We interacted gender and infant presence, because post-partum mothers typically reduce their labor market participation more than fathers. The model controls for individual fixed effects α_i , which removes potential omitted variable bias, due to observed and unobserved determinants of time use that are relatively stable over a few years, such as the couple's educational and professional background and gender-role identity. Our model specification also removes unobserved time-varying characteristics that affect both spouses. To examine the heterogeneous effects by family resources (*Aim 2*), we repeat the analysis by income and presence of an outside helper in the household, all measured in Wave 1. All regression estimates are adjusted by pseudo-sample weights and error terms are clustered at the household level.

For *Aim 3*, to examine the time availability mechanism, we conducted two sets of analyses. First, we estimated a logistic regression of job loss by gender to examine if mothers were more likely to lose jobs than fathers. Because information on job loss is only available in Wave 2, we look at those who were employed in Wave 1 and examine who lost jobs during the lockdown. Our outcome is a dummy variable indicating if an individual experienced job loss. In

addition to gender, we also controlled for age (quadratic), number of children, age of the youngest child, presence of an infant, and an interaction term between gender and infant presence. Importantly, job loss was likely exogenous to time use, as the survey item explicitly asks about loss of employment due to the COVID-19 crisis, rather than voluntary changes. Second, we included an indicator of job loss during the lockdown in the within-between model predicting time spent on housework and childcare. We interacted it with gender to see if losing a job has a greater effect on mothers than on fathers. Considering the gender-neutral nature of the time availability perspective, if job loss has the same effects for mothers and fathers, it would be strong evidence supporting the time availability perspective. If the effects on time spent on domestic tasks are greater for mothers, it would be evidence supporting the gender-based perspective.

To examine the resource-based mechanism, we also conducted two sets of analyses. First, we investigated how gender gaps in income, capturing relative resources, changed during and after the lockdown. Because men on average have higher income than women in Singapore, a larger income gender gap indicates mothers' decreasing bargaining power within the household. We predicted changes in income gender gaps using the same within-between models in Equation (1) and income data before, during, and after the lockdown. Unemployed individuals were coded to have zero income. Second, we included a time-varying variable of income in the within-between models, predicting time use specified in Equation (1). We interacted it with gender to see if income changes had a greater effect on mothers than fathers. Considering the resource-based perspective's gender-neutral nature, if changes in income had the same effects for mothers and fathers, it would strongly support that perspective. If the effects were greater for mothers, it would support the gender-based perspective. We also controlled for unemployment in these

models, as employment can be a confounder in time use and income's relationship. We imputed employment in Wave 3 by assuming that respondents who fell into the bottom income category had lost employment and respondents who moved out of the bottom income category had gained employment. Estimating the model only using Waves 1 and 2 did not meaningfully change our results.

In addition to examining how fathers and mothers differentially responded to changes to income and employment during the pandemic, we further compared households in which the husband lost income during the lockdown but the wife did not and households in which the husband did not lose income. If the resource-based perspective holds, we would expect to see decreased gender gaps in hours spent on domestic tasks during and after the lockdown when husbands were the only spouse to lose income, as fathers' absolute resources and bargaining power decreased in these households. When comparing these households with those in which the husband did not lose income, the gender gaps in domestic tasks for the former may have decreased to a greater extent than for the latter. If the gender-based perspective holds, we would expect households in which husbands lost income to see stable or even increased gender gaps in unpaid work hours. When comparing these households with those in which the husband did not lose income, the gender gaps in unpaid work may have comparable changes or have decreased for the latter to a greater extent than for the former.

Results

Baseline Sociodemographic Characteristics and Work Characteristics During the Lockdown

Table 2 reports the baseline sociodemographic characteristics before the lockdown, by gender. On average, fathers were slightly older than mothers. Approximately 90 percent of mothers in our sample were ethnic Chinese, and 92.8 percent of couples had fewer than three

children. 44.8 percent of families had an infant. About 9.3 percent of families had a live-in domestic helper prior to the pandemic in our sample, and approximately 80 percent of them continued to have domestic helpers during the pandemic. The number of 9.3 percent is lower than that suggested by official statistics (around 19.1 percent), as a result of the couples' low ages and consequently high proportions with either few or very young children in our sample. Despite the low national prevalence of multi-generational households, 62.1 percent had grandparents' regular help with childcare. Most parents were professionals. The percentage of professionals was larger among fathers (84.1 percent) than among mothers (70.3 percent), and there were more unemployed or economically inactive mothers (15.9 percent) than fathers (1.0 percent). On average, mothers were more educated than fathers (63.1 vs. 59.7 percent college educated), but fathers made higher income.

Table 2 also shows work characteristics during the lockdown. About 5.3 percent of mothers and 4.6 percent of fathers employed in the first wave lost their jobs, and 30.3 percent of mothers and 42.1 percent of fathers experienced income loss. These statistics confirm previous findings of Singapore's reductions in employment and income during the pandemic (Kim et al., 2022). Interestingly, although fathers were marginally less likely to lose their jobs than mothers, they were more likely to lose income. 75.1 percent of mothers and 57.6 percent of fathers continuously employed in both the first and second waves worked mostly from home during the lockdown. As such, one possible implication is that the higher likelihood of income loss among fathers may be tied to the disadvantages faced by occupations where tasks and activities could not be effectively performed remotely during the pandemic.

Gender Inequalities in Time Use Before, During, and After the Lockdown

Results on the impact of the COVID-19 lockdown on gender gaps in time use as reported

by married women are shown in Figure 1. Descriptive statistics of time use and full model results are provided in Appendix Tables A1 and A2. To document raw changes in time use over the pandemic, Panel A shows predicted time use by wave and gender, with 95% confidence intervals. The values were obtained from OLS regression models without controlling for covariates. Before the lockdown, mothers spent more time on housework (67.6 vs. 43.5 minutes per day) and childcare (242.3 vs. 107.3 minutes per day) while fathers spent more time on market work (47.5 vs. 34.4 hours per week). During the lockdown, both fathers and mothers increased time spent on housework and childcare but decreased time spent on paid work. Mothers spent an additional 44.6 minutes per day doing housework, whereas the increase for fathers was only 19.7 minutes per day. The increase in childcare hours was more comparable: 28.8 minutes per day for mothers and 24.4 minutes per day for fathers. The decrease in work hours was 5.4 hours per week for mothers and 10.3 hours per week for fathers. After the lockdown, time spent on childcare and housework decreased for mothers but increased slightly for fathers (3 minutes per day for housework and 5 minutes per day for childcare). For mothers, the decrease in housework hours was small (4 minutes per day) but the decrease in childcare hours was much greater (25.8 minutes per day). Time spent on market work increased for both fathers and mothers by around 2-3 hours per week.

[Figure 1 About Here]

Figure 1 Panel B plots the gender gap in each outcome from within-between models, adjusting for covariates. Before the lockdown, there was a positive gender gap in housework and childcare hours, with mothers spending more time, and a negative gender gap in paid market work hours. The gender gap in housework increased significantly during the pandemic, with mothers doing additional 25.1 minute of housework compared to fathers during the lockdown,

and 18.1 additional minutes compared to fathers after the lockdown. In contrast, gender gaps in childcare hours did not grow significantly during or after the lockdown. The negative gender gap in market work hours significantly narrowed, shrinking by 4.2 hours per week during the lockdown, and 5.1 hours after.

Heterogeneous Effects

Results on the heterogeneous effects of the COVID-19 lockdown on gender inequalities in time use by family resources are presented in Table 3. We also plotted unadjusted gender gaps in time use by gender, wave, and subgroup in Appendix Figures A1 and A2. From Appendix Figure A1, we see that, prior to the pandemic, higher-income mothers spent the most time on childcare compared to lower-income mothers and fathers. They also spent less time on housework and paid market work than lower-income mothers. Higher-income fathers spent more time on childcare, less time on housework, and comparable time on paid market work compared to their lower-income counterparts. However, during and after the COVID lockdown, lower-income mothers increased their time spent on housework and childcare much more than higher-income mothers. They also spent less time during the lockdown and more time after the lockdown on paid market work than higher-income mothers. Fathers in both income groups increased their time spent on domestic tasks and decreased their time spent on paid market work during and after the lockdown. The magnitudes of these changes were greater for lower-income fathers.

[Table 3 About Here]

Panel A in Table 3 shows the results from within-between models by income. For the lower-income group, the gender gap in time spent on childcare increased during and after the lockdown, whereas the gender gap decreased for the higher-income group. The differences

between the two subgroups are significant at the 5% level. For housework, both income subgroups experienced increased gender gaps and the differences between the two subgroups were not statistically significant at the 5% level. Mothers spent fewer hours on paid work before the lockdown than fathers, and the gender gap narrowed during and after the lockdown for both income groups. The difference between changes for the two subgroups is not statistically significant at the 5% level. To summarize, the increases in the gender gap in time spent on childcare during and after the lockdown were larger in lower-income households.

From Appendix Figure A2, we see that prior to the pandemic, mothers without outside help spent more time on childcare and housework, and less on paid market work compared to mothers with outside help. Fathers without outside help spent more time on childcare and housework and a comparable amount of time on paid market work compared to fathers with outside help. During and right after the lockdown, mothers without outside help spent much more time on childcare and housework compared to mothers with help. Fathers with outside help increased their time spent on childcare much more than those without help during the pandemic. However, after the lockdown, the former decreased time spent on childcare, whereas the latter continued to increase childcare hours. Fathers without outside help increased housework hours more than those with help during and after the lockdown. Parents in both groups decreased time on paid work during the lockdown, but parents with outside help were better able to recover after than those without.

Panel B in Table 3 presents the results from within-between models by presence of outside help. There was an increase in the gender gap in childcare hours among households without outside help during the lockdown, whereas the gender gap decreased among households with outside help. The differences between these two subgroups during the lockdown were

significant at the 5% level. For housework, there were increases in the gender gap for both subgroups during and after the lockdown, and no significant subgroup differences were observed. The negative gender gap in formal work narrowed during and after the lockdown for both subgroups, but the magnitude was statistically larger in households without outside help during it. Separate analyses on having a domestic helper and the presence of a grandparent are provided in Appendix Tables A3-A4. Interestingly, the presence of a domestic helper increased gender gaps in paid work hours, possibly providing relief to mothers' paid employment, while the presence of grandparents significantly helped to reduce the gender gap in time spent on childcare. To summarize, the increase in the gender gap in time spent on childcare and the decrease in the negative gender gap in formal work hours were larger among households without outside help than those with it.

These results show that the insignificant findings on the gender gap changes in childcare hours observed in Figure 1 were driven by the increase in the gender gap among households with fewer resources (e.g., income, outside help) and the decrease in the gender gap among households with greater resources. The adverse effect of the lockdown disproportionately fell on mothers with fewer resources, exacerbating the existing inequality along both gender and the socioeconomic status lines. The increases in the gender gap in time spent on housework during and after the lockdown observed in Figure 1, on the other hand, were driven by all households regardless of resources. The decrease in the negative gender gap in formal work hours observed in Figure 1 was largely driven by households without outside help. In summary, we find that mothers in less resourced households were doing both more childcare and more formal work and hence likely having less leisure time relative to fathers during and after the lockdown compared to their counterparts in richer households.

Mechanisms

Results examining the time availability mechanism are shown in Table 4 Panel A.

Mothers were found to not be significantly more likely to lose their jobs during the lockdown than fathers after controlling for sociodemographic variables. Moreover, we have already seen that the gender gap in formal work hours decreased during the lockdown, indicating that working fathers' time availability increased more than working mothers'. These results suggest that changes in gender gaps in housework hours were less likely, due to larger increases in mothers' time availability than fathers'. Results examining the resource-based mechanism are presented in Table 4, Panel B. No evidence is found to support the claim that mothers lost more income than fathers during and after the lockdown.

[Table 4 About Here]

In contrast, we find strong evidence that gender ideologies contribute to changes in time use gaps during the pandemic. Becoming unemployed (Panel A) was not significantly associated with increased childcare or housework for fathers but was associated with large increases in time spent on domestic tasks for women. When mothers lost employment, they, on average, increased the time they spent on childcare more than fathers by an additional 89 minutes and increased the time they spent on housework by 39 minutes. Income changes (Panel B), similarly, differentially impacted fathers' and mothers' time use. Losing income was significantly associated with increased time spent on childcare and housework for both fathers and mothers, but the impact was larger for mothers. Dropping an income category was associated with 15 minutes of additional childcare hours and 8 additional minutes of housework hours for fathers. For mothers, dropping an income category was associated with an additional 28 minutes of childcare hours and 10 minutes of housework hours.

Finally, to further shed light on mechanisms, we examine gender inequalities in time use among households where the father lost income during the lockdown, but the mother did not, and compare the results for households where neither parent lost income. Results are shown in Table 5. We find that when only husbands lost income, the gender gap in time spent on childcare right after the lockdown decreased substantially, with no significant changes found for housework hours. Unsurprisingly, the negative gender gap in formal work hours decreased during and after the lockdown for these households. In contrast, when husbands did not lose income, gender gaps in childcare remained stagnant during or after the lockdown, while gender gaps in housework increased by 27 minutes during and 26 minutes after the pandemic. Gender gaps in paid work did not significantly increase during the pandemic for these households. Comparing coefficients across the two groups, the increases in the gender gaps in time spent on childcare and housework were significantly greater among households where the husband did not lose income, and unsurprisingly, the decreases in the gender gap in time spent on paid market hours were greater among households where the husband did. These results suggest that, in addition to gender-based mechanisms, resource-based mechanisms may have played a role in time use's observed gender inequalities.

[Table 5 About Here]

Conclusion and Discussion

This study uses a panel survey of married women interviewed before, during, and after the COVID-19 lockdown in Singapore to examine the impact of the lockdown on gender gaps in time spent on housework, childcare, and paid market work. We find that gender gaps in housework, as reported by married women, increased during and persisted right after the lockdown. Meanwhile, the negative gender gap in paid market work hours decreased. No

significant changes were observed for childcare hours, but this is a result of an increased gender gap among households with fewer resources and a decreased gender gap among households with greater resources. Our results imply larger declines in mothers' leisure time compared to fathers', especially in less-resourced households. Our findings are in favour of both the gender-based and the resource-based perspectives. No evidence was found suggesting that the pandemic disproportionately increased mothers' time availability.

Part of our findings are consistent with the experience of many western countries, including Italy, the UK, and Australia, where increases in fathers' help have been in childcare rather than housework (Craig & Churchill, 2020; Del Boca et al., 2020; Sevilla & Smith, 2020). Results from our heterogeneous analyses additionally show that fathers' increased help in childcare may have been concentrated among families with more resources. However, unlike in some other countries, we found that the pandemic had relatively limited impacts on exacerbating gender inequality in employment outcomes, including work hours, income, and job loss. This may be partly due to differences in labor force distributions across key affected sectors in the Singaporean economy, particularly in transportation/storage and hospitality (Lim, 2015; Monetary Authority of Singapore, 2020; U.S. Bureau of Labor Statistics, 2021). In addition, our unique data also allowed us to examine periods both during and after the lockdown. Many of the patterns we observed during the lockdown persisted over time. However, when comparing households with and without pre-pandemic outside help, the differences in gender gaps in childcare and paid work hours during the lockdown were more prevalent than after the lockdown. This is because more households had outside help after it.

Our finding of a decreased negative gender gap in paid market hours during the pandemic is also likely related to the substantially higher proportion of mothers relative to fathers who

worked mostly from home (Appendix Table A5). Given the abrupt and involuntary nature of the shift to telecommuting and closure of school and childcare services, mothers may have been more likely than fathers to face synchronous distractions from children staying home, which may have led to mothers working less efficiently and clocking more hours than fathers (Feng & Savani, 2020; Papanikolaou & Schmidt, 2020). In this sample, even though both fathers' and mothers' time spent on formal work decreased during and after the lockdown, the magnitude of the decrease was smaller for mothers.

A distinct feature of the Singaporean context, compared to many western countries, is the increasingly common practice of hiring live-in domestic helpers (Singapore Ministry of Manpower, 2021), with around 9.3% of the sample co-residing with one. We provide evidence for the first time that access to domestic helpers helps reduce gender gaps in housework hours during the pandemic. More generally, our results highlight the importance of outside help, either from a domestic helper or grandparents, in the traditional nuclear family's functioning during the lockdown. In particular, mothers without helpers did both more housework and more paid market work than fathers in these families (Appendix Table A3). Interestingly, the presence of a domestic helper was not associated with a smaller gender gap in childcare hours, which may indicate mothers' desire to contribute to more relationally oriented domestic tasks in response to threatened feminine identity (Chan, 2006). However, since we only had 54 respondents with domestic helpers, the results may be underpowered.

There are several limitations in this study. First, and most importantly, all data were collected only from mothers, which may suffer from reporting biases for fathers' time use. Previous studies found that in the U.S., wives may underestimate their spouses' contributions while overstating their own (Lee & Waite, 2005), and a local study found that Singaporean married

men tend to underestimate the extent to which primary responsibilities for household tasks fall on married women (Ipsos, 2021). While the longitudinal nature of the dataset can account for time-invariant reporting biases, it is possible that the exceptional nature of the pandemic may have accentuated this tendency. For example, shifts in telecommuting status may have made it easier for individuals working from home to observe spousal contributions. Second, time use was not separately collected for weekdays and weekends in our data, and both Singaporean parents' involvement with children tends to differ on weekdays and weekends (Yeung, 2020). Third, participants were recruited using a non-probability sampling method clustered by geographical region. Although pseudo design-based weights were applied to obtain a more representative sample, this estimation method relies on strong assumptions that respondents are representative of non-respondents within age and educational categories (Buelens et al., 2015). This may not be valid if time-scarce individuals are more likely to decline interviews. Fourth, the sample consists of married parents in their late twenties to late thirties who tend to have young children, and therefore our results should not be generalized to cohabitating couples without children or couples with older children. Fifth, the analysis does not take into account other domestic tasks especially elderly care and may hence understate the divergence in gender inequalities in time use. Finally, the sample sizes for some sets of analyses are relatively low, and therefore these analyses may be underpowered. However, even though we only had 94 respondents in households where the father lost income but the mother did not, we still observed many significant patterns.

Despite these limitations, the gender inequality patterns documented in this study are instructive and point to potential long-term impacts on intra-household labor divisions from the perspective of married women. The expansion in gender gaps in housework with the widespread

shift to telecommuting is sobering, particularly in the context of Singapore's rapid demographic change. Despite the availability of foreign domestic workers to help with household duties and a package of pro-natalist incentives, including paid parental leave, tax relief, and childcare subsidies, Singapore's fertility rate is one of the lowest in the world (Chen et al., 2018). More recently, the government has signalled a strategy change from focusing on monetary benefits to building more flexible work arrangements and encouraging more paternal involvement (Teng, 2019), efforts which are likely to further intensify in the aftermath of the pandemic. Besides childcare, our results suggest that policies should also take gender inequality in other domestic duties into account.

Another set of policy-relevant evidence from this study is the predictable, yet urgent finding that adverse consequences of the lockdown on time spent caring for children disproportionately fell on poorer mothers, exacerbating existing both gender and socio-economic inequalities. Our analysis shows that these inequalities persisted even after the lockdown ended and schools and childcare centres reopened. Potential solutions modelled after existing policies, such as the Netherlands' institutional childcare support and equal paid leaves for employed fathers and mothers who perform family care, are needed in a time-sensitive fashion. These policy interventions could minimize the widening of inequalities caused by the pandemic (Blum & Dobrotić, 2021; Meekes et al., 2020) and prevent them from becoming a permanent fixture of the new post-COVID normal.

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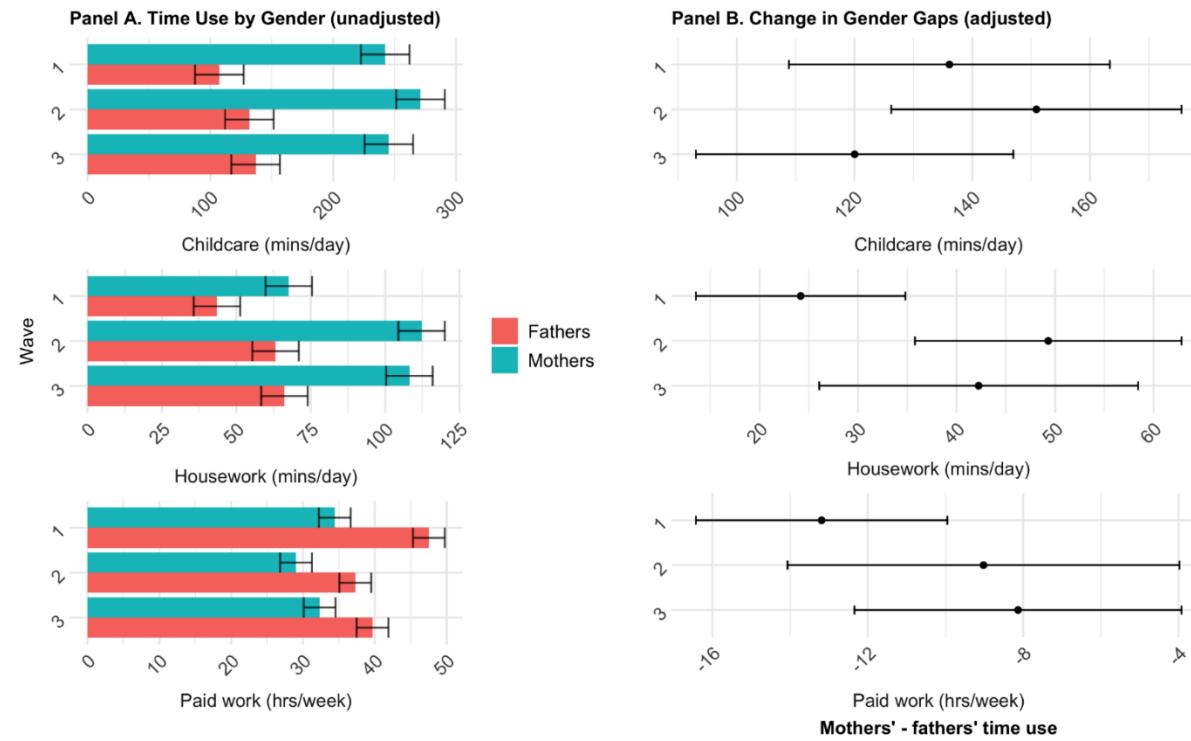
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Figures

Figure 1. Gendered Patterns in Time Use Before, During, and After the COVID-19 Lockdown



Note: Data: 290 couples interviewed before, during and after pandemic lockdowns in Singapore. Panel A shows the predicted time use by wave and gender, with 95% confidence intervals from OLS models with no controls. Panel B shows gender gaps in time use by wave from within-between (fixed effects) models with controls for number of children, age of youngest child, and presence of an infant interacted with gender. All estimates are calculated using

Tables

Table 1. Key Dates of the COVID-19 Pandemic and Survey Data Collection

	April-July 2018	January 2020	April 2020	May 2020	June 2020
Pandemic timeline	Pre-crisis	First confirmed case	Circuit breaker began	Circuit breaker ongoing	Circuit breaker ended
Data collection timeline	Wave 1 (in person)			Wave 2 (online)	Wave 3 (online)

Table 2. Baseline Characteristics and Work Characteristics During the Lockdown

	Mother	Father	% Missing
<i>Sociodemographic Characteristics</i>			
Age	31.17 (2.38)	34.08 (3.87)	0.00%
Chinese	90% (261)		0.00%
Number of children			0.00%
1	55.86% (162)		
2	36.90% (107)		
3	5.86% (17)		
4	1.03% (3)		
5	0.34% (1)		
Have an infant	44.83% (130)		0.00%
Have a domestic helper	9.31% (27)		0.00%
Grandparents help regularly	62.07% (180)		0.00%
Occupation			0.00%
Non-professionals	13.79% (40)	14.83% (43)	
Professionals	70.34% (204)	84.14% (244)	
Unemployed	15.86% (46)	1.03% (3)	
Have a college degree	63.10% (183)	59.66% (173)	0.00%
Monthly income			0.00%
Less than \$2,000	22.41% (65)	5.52% (16)	
\$2,000-\$4,000	38.28% (111)	30.69% (89)	
\$4,000-\$6,000	27.59% (80)	32.07% (93)	
\$6,000-\$8,000	8.62% (25)	17.24% (50)	
Greater than \$8000	3.10% (9)	14.48% (42)	
<i>Work Characteristics During the Lockdown</i>			
Job loss	5.26% (13)	4.59% (13)	14.83% (mother), 2.41% (father)
Income loss	30.34% (88)	42.07% (122)	0.00%
Work mostly from home	75.11% (178)	57.56% (156)	18.28% (mother), 6.55% (father)

Note: N = 290 households. We report mean (SD) for continuous variables and % (N) for categorical variables. Information on job loss, income loss, and workplace is from Wave 2, and information on all other variables is from Wave 1. The missing values for job loss are driven by 14.83% mothers and 2.41% fathers who were not employed in Wave 1. The missing values for working from home are driven by 18.28% mothers and 6.55% fathers who either were not employed in Wave 1 or lost their jobs in Wave 2. Unemployed individuals were included in the income distributions by setting their income to 0. All estimates are calculated using pseudo-sampling weights.

Table 3. The Impact of the Lockdown on Gendered Time Use by Family Resources

	Childcare		Housework		Formal Work	
<i>Panel A: By Income</i>	< \$4,000	≥ \$4,000	< \$4,000	≥ \$4,000	< \$4,000	≥ \$4,000
Female x Wave 2	68.972 *† (28.347)	-16.350† (20.107)	18.537 (13.898)	28.565 *** (7.444)	8.160 * (3.838)	2.643 (2.250)
Female x Wave 3	35.998† (28.347)	-46.066 *† (20.107)	30.207 * (13.898)	11.210 (7.444)	4.422 (3.838)	6.072 ** (2.250)
Female	61.279 ** (21.348)	124.705 *** (15.846)	26.751 * (10.467)	21.609 *** (5.867)	-7.120 * (2.890)	-13.427 *** (1.773)
Wave 2	4.788 (23.015)	0.471 (18.444)	28.287 * (11.284)	20.850 ** (6.828)	-15.047 *** (3.116)	-5.546 ** (2.064)
Wave 3	24.184 (23.015)	-2.310 (18.444)	29.681 ** (11.284)	24.704 *** (6.828)	-7.952 * (3.116)	-5.725 ** (2.064)
N	162	418	162	418	162	418
<i>Panel B: By Presence of Outside Help</i>	No helper	With helper	No helper	With helper	No helper	With helper
Female x Wave 2	64.555 *† (28.255)	-19.248† (19.836)	22.559 (12.104)	26.755 *** (7.906)	9.358 **† (3.495)	0.649† (2.327)
Female x Wave 3	12.639 (28.255)	-35.792 (19.836)	25.157 * (12.104)	13.103 (7.906)	5.198 (3.495)	4.976 * (2.327)
Female	111.170 *** (21.934)	93.538 *** (15.369)	33.047 *** (9.396)	16.901 ** (6.126)	-16.179 *** (2.713)	-7.163 *** (1.803)
Wave 2	-4.592 (27.063)	11.491 (16.705)	32.532 ** (11.593)	19.651 ** (6.658)	-13.390 *** (3.347)	-7.712 *** (1.960)
Wave 3	21.441 (27.063)	2.303 (16.705)	36.366 ** (11.593)	22.053 *** (6.658)	-9.357 ** (3.347)	-6.427 ** (1.960)
N	202	378	202	378	202	378

Note: *** p < 0.001; ** p < 0.01; * p < 0.05. N is the number of individuals. Childcare and housework are in minutes/day, formal work is in hours/week. Income refers to whether workers in the family earned above \$4,000. Models control for age of youngest child, number of children in the household, the presence of infants, and the interaction between the presence of infants and gender.

† indicates a significant (p < 0.05) subgroup difference. All estimates are calculated using pseudo-sampling weights.

Table 4. The Role of Time Availability, Relative Bargaining Power, and Gender Norms in Pandemic Gender Gaps in Time Use

<i>Panel A: Time Availability</i>		Job loss	Childcare	Housework
Female x Unemployment			89.269 *	39.460 **
			(36.123)	(14.389)
Female	-0.814	84.687 ***	18.963 ***	
	(0.876)	(13.440)		(5.354)
Unemployment		14.576	0.640	
		(30.073)		(11.979)
Female x Wave 2		10.646	22.536 ***	
		(16.619)		(6.620)
Wave2		9.620	25.274 ***	
		(15.077)		(6.047)
N	454	580	580	580
<i>Panel B: Resources</i>		Income change	Childcare	Housework
Female x Income		-28.207 **	-10.030 **	1.573
		(9.812)	(3.804)	(0.878)
Female	-0.555 ***	149.058 ***	39.660 ***	-8.560 ***
	(0.073)	(27.257)	(10.567)	(2.439)
Income		-14.655 *	-8.103 **	3.849 ***
		(7.100)	(2.753)	(0.635)
Female x Wave 2	0.026	14.647	24.987 ***	3.262 *
	(0.094)	(16.973)	(6.581)	(1.519)
Female x Wave 3	0.071	11.135	-1.776	-3.424
	(0.094)	(30.619)	(11.863)	(2.726)
Wave2	-0.080	2.477	25.839 ***	-5.639 ***
	(0.081)	(15.139)	(5.869)	(1.354)
Wave3	-0.107	10.004	46.038 ***	13.003 ***
	(0.081)	(29.003)	(11.239)	(2.586)
Unemployment		22.693	3.796	-31.484 ***
		(18.031)	(6.990)	(1.613)
N	580	580	580	580

Note: *** p < 0.001; ** p < 0.01; * p < 0.05. N is the number of individuals. Childcare and housework are in minutes/day, formal work is in hours/week. The presence of infants and its interaction with female, number of children, and age of youngest child were controlled for in all models. All estimates were calculated using pseudo-sampling weights. In Panel A, models for childcare and housework hours were estimated using within-between models. The model for job loss was estimated using a logistic regression model, and robust standard errors were reported. The quadratic form of age was additionally controlled for in this model. In Panel B, all models were estimated using within-between models.

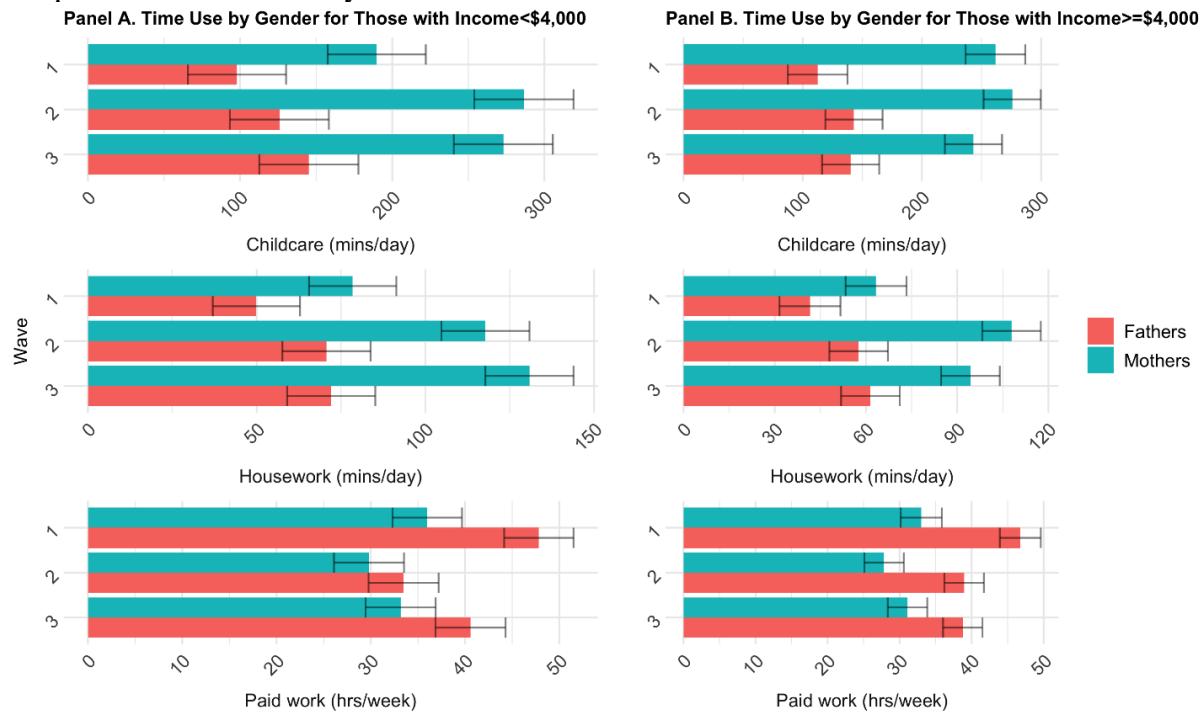
Table 5. The Impact of the Lockdown in Households Where the Husband Didn't Lose Income and Where the Husband Lost Income but the Wife Did Not

	Childcare		Housework		Formal Work	
	Didn't lose income	Lost income	Didn't lose income	Lost income	Didn't lose income	Lost income
Female x Wave 2	32.101 †	-61.124 †	27.421 ***	20.010	0.052 †	18.509 *** †
	(18.237)	(41.529)	(7.339)	(17.641)	(2.102)	(5.206)
Female x Wave 3	10.549 †	-135.522 ** †	25.548 *** †	-14.302 †	0.842 †	21.959 *** †
	(18.237)	(41.529)	(7.339)	(17.641)	(2.102)	(5.206)
Female	84.661 ***	163.737 ***	18.686 **	38.581 **	-8.388 ***	-22.852 ***
	(14.102)	(31.271)	(5.675)	(13.284)	(1.626)	(3.920)
Wave 2	-8.826	44.031	12.628 *	67.231 ***	-6.550 ***	-17.657 ***
	(15.758)	(35.537)	(6.341)	(15.096)	(1.817)	(4.454)
Wave 3	-3.003	47.132	13.473 *	78.679 ***	-4.016 *	-15.885 ***
	(15.758)	(35.537)	(6.341)	(15.096)	(1.817)	(4.454)
N	458	94	458	94	458	94

Note: *** p < 0.001; ** p < 0.01; * p < 0.05. N is the number of individuals. Models include individual fixed effects and further include age of youngest child, number of children in the household, the presence of infants, and the interaction between the presence of infants and gender. Childcare, housework and all activities are in minutes/day, formal work is in hours/week. † indicates a significant (p < 0.05) subgroup difference. All estimates are calculated using pseudo-sampling weights.

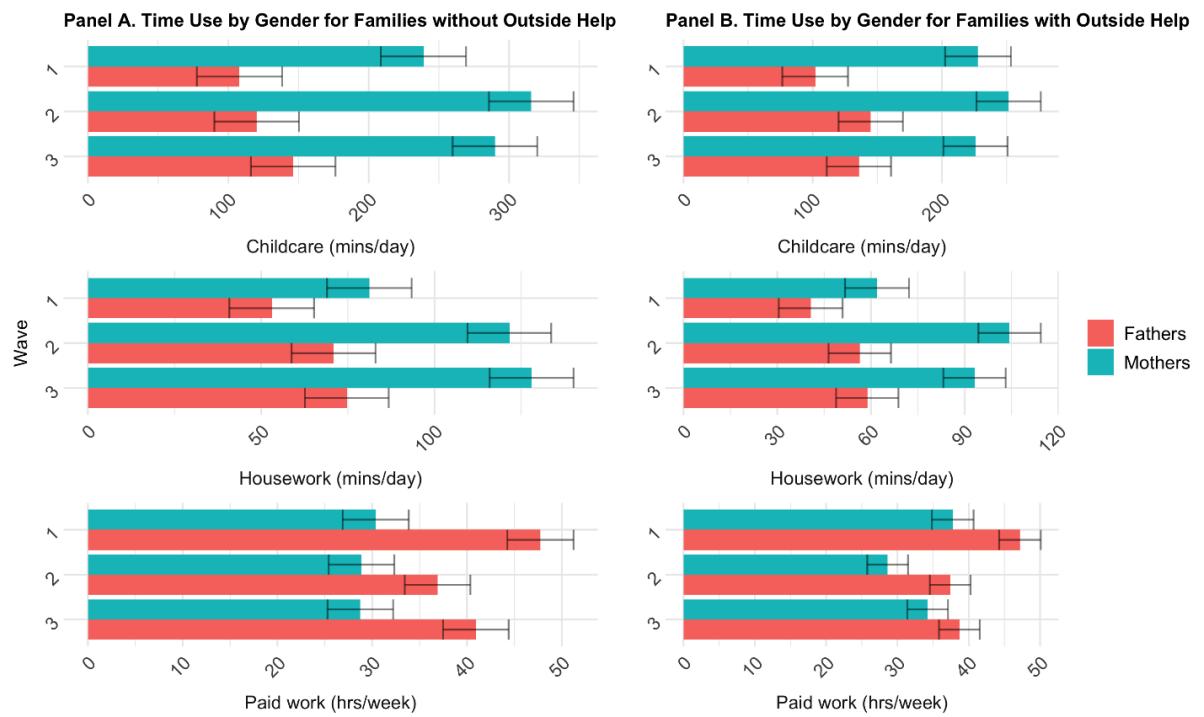
Appendix Figures

Appendix Figure A1. Heterogeneous Effects of the COVID-19 Lockdown on Gender Inequalities in Time Use by Income



Note: Data: 290 couples interviewed before, during and after pandemic lockdowns in Singapore. Income refers to whether workers in the family earned above \$4,000. Predicted time use with 95% confidence intervals from OLS models with no controls were plotted. All estimates are calculated using pseudo-sampling weights.

Appendix Figure A2. Heterogeneous Effects of the COVID-19 Lockdown on Gender Inequalities in Time Use by Presence of Outside Help



Note: Data: 290 couples interviewed before, during and after pandemic lockdowns in Singapore. Predicted time use with 95% confidence intervals from OLS models with no controls were plotted. All estimates are calculated using pseudo-sampling weights.

Appendix Tables

Appendix Table A1. Time Use by Gender and Wave

	Wave 1		Wave 2		Wave 3	
	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers
Work time (hours/week)	34.407 (17.522)	47.522 (10.21)	29.025 (22.439)	37.27 (21.364)	32.312 (21.893)	39.668 (19.065)
Housework time (minutes/day)	67.638 (59.737)	43.492 (44.247)	112.249 (76.329)	63.188 (71.486)	108.161 (77.287)	66.17 (71.572)
Childcare time (minutes/day)	242.323 (201.895)	107.329 (100.387)	271.076 (200.738)	131.763 (143.953)	245.282 (207.561)	136.840 (148.162)

Note: Weighted mean and SD in parentheses are reported. N = 290 households. All estimates are calculated using pseudo-sampling weights.

Appendix Table A2. Gendered Time Use Before, During, and After the COVID-19 Lockdown

	Childcare		Housework		Formal Work	
	OLS	Fixed Effects	OLS	Fixed Effects	OLS	Fixed Effects
Female x Wave 2	4.319 (20.166)	14.778 (16.405)	24.915 ** (7.960)	25.142 *** (6.707)	4.870 * (2.256)	4.166 * (1.968)
Female x Wave 3	-26.551 (20.166)	-16.093 (16.405)	17.845 * (7.960)	18.072 ** (6.707)	5.759 * (2.256)	5.056 * (1.968)
Female	134.994 *** (14.260)	100.739 *** (12.720)	24.147 *** (5.628)	23.402 *** (5.201)	-13.115 *** (1.595)	-10.810 *** (1.526)
Wave 2	24.434 (14.260)	4.494 (14.155)	19.696 *** (5.628)	23.659 *** (5.787)	-10.252 *** (1.595)	-9.373 *** (1.698)
Wave 3	29.511 * (14.260)	9.571 (14.155)	22.678 *** (5.628)	26.641 *** (5.787)	-7.854 *** (1.595)	-6.975 *** (1.698)
Infant		14.658 (16.858)		11.400 (6.892)		1.328 (2.023)
Female x Infant		94.985 *** (14.826)		2.064 (6.061)		-6.390 *** (1.779)
Number of children		51.755 * (20.986)		-15.425 (8.580)		-1.685 (2.518)
Age of youngest child		10.701 * (4.768)		1.297 (1.949)		-0.386 (0.572)
N	580	580	580	580	580	580

Note: *** p < 0.001; ** p < 0.01; * p < 0.05. N is the number of individuals. Childcare, housework and all activities are in minutes/day, formal work is in hours/week. All estimates are calculated using pseudo-sampling weights.

Appendix Table A3. The Impact of the Lockdown on Gendered Time Use, for Households with and without a Domestic Helper

	Childcare		Housework		Formal Work	
	No helper	With helper	No helper	With helper	No helper	With helper
Female x Wave 2	21.026	-88.133	24.796 ***	12.821	5.586 **†	-10.148 †
	(16.974)	(64.865)	(7.125)	(19.247)	(2.044)	(7.573)
Female x Wave 3	-15.570	-45.924	17.420 *	9.661	5.609 **	1.802
	(16.974)	(64.865)	(7.125)	(19.247)	(2.044)	(7.573)
Female	99.447 ***	120.704 *	23.402 ***	35.017 *	-11.395 ***	-7.645
	(13.211)	(47.002)	(5.545)	(13.946)	(1.591)	(5.488)
Wave 2	-8.358	1.288	21.000 **	9.864	-10.743 ***	-1.927
	(16.668)	(61.026)	(6.996)	(18.108)	(2.008)	(7.125)
Wave 3	-3.851	13.634	23.936 ***	13.446	-7.851 ***	-5.844
	(16.668)	(61.026)	(6.996)	(18.108)	(2.008)	(7.125)
Infant	21.962	-24.727	16.250 *	-22.027	0.630	9.622
	(17.724)	(67.779)	(7.440)	(20.111)	(2.135)	(7.914)
Female x Infant	90.770 ***	157.913 **	-2.372	37.709 *	-5.126 **	-12.703 *
	(15.537)	(53.931)	(6.522)	(16.002)	(1.871)	(6.297)
Number of children	59.320 *	142.424	-10.829	9.372	-0.080	-6.837
	(25.332)	(74.761)	(10.633)	(22.183)	(3.051)	(8.729)
Age of youngest child	19.562 *	7.300	4.119	-0.796	0.071	-0.528
	(7.801)	(6.729)	(3.274)	(1.997)	(0.940)	(0.786)
N	526	54	526	54	526	54

Note: *** p < 0.001; ** p < 0.01; * p < 0.05. N is the number of individuals. Childcare, housework and all activities are in minutes/day, formal work is in hours/week. † indicates a significant (p < 0.05) subgroup difference in change in time use gender gaps. All estimates are calculated using pseudo-sampling weights.

Appendix Table A4. The Impact of the Lockdown on Gendered Time Use, for Households with and without a Grandparent's Help

	Childcare		Housework		Formal Work	
	No help	With help	No help	With help	No help	With help
Female x Wave 2	58.942 *†	-17.974 †	24.109 *	26.356 **	7.331 *	1.788
	(27.027)	(20.370)	(11.505)	(8.111)	(3.390)	(2.339)
Female x Wave 3	8.223	-33.862	27.436 *	11.437	4.014	5.853 *
	(27.027)	(20.370)	(11.505)	(8.111)	(3.390)	(2.339)
Female	112.888 ***	91.941 ***	32.894 ***	16.127 *	-15.399 ***	-7.392 ***
	(20.869)	(15.845)	(8.884)	(6.309)	(2.617)	(1.819)
Wave 2	-1.547	11.345	25.199 *	22.910 **	-10.684 ***	-8.132 ***
	(22.972)	(18.211)	(9.779)	(7.251)	(2.881)	(2.091)
Wave 3	22.507	2.096	28.890 **	25.358 ***	-7.405 *	-6.400 **
	(22.972)	(18.211)	(9.779)	(7.251)	(2.881)	(2.091)
Infant	34.442	0.918	19.876	5.321	-2.970	4.888 *
	(27.781)	(20.972)	(11.826)	(8.350)	(3.484)	(2.408)
Female x Infant	69.567 **	112.280 ***	-11.970	12.472	-6.202 *	-6.401 **
	(24.241)	(18.522)	(10.319)	(7.375)	(3.040)	(2.127)
Number of children	6.916	77.777 **	-21.909	-11.777	5.393	-6.480 *
	(36.978)	(25.261)	(15.741)	(10.058)	(4.638)	(2.900)
Age of youngest child	8.414	11.538	1.437	0.990	0.359	-1.032
	(7.484)	(6.474)	(3.186)	(2.578)	(0.939)	(0.743)
N	220	360	220	360	220	360

Note: *** p < 0.001; ** p < 0.01; * p < 0.05. N is the number of individuals. Childcare, housework and all activities are in minutes/day, formal work is in hours/week. † indicates a significant (p < 0.05) subgroup difference in change in time use gender gaps. All estimates are calculated using pseudo-sampling weights.

Appendix Table A5. The Impact of the Lockdown on Telecommuting Status

	Work mostly from home
Female	1.012 ** (0.348)
Infant	0.298 (0.446)
Number of children	-0.647 * (0.253)
Age of youngest child	-0.022 (0.082)
Age	0.647 (0.350)
Age squared	-0.007 (0.005)
N	439

Note: *** p < 0.001; ** p < 0.01; * p < 0.05. N is the number of individuals. All estimates are calculated using pseudo-sampling weights.