Management Science

Publication details, including instructions for authors and subscription information:
http://pubsonline.informs.org

When Paid Work Gives in to Unpaid Care Work: Evidence from the Hedge Fund Industry Under COVID-19

Sara Ain Tommar, Olga Kolokolova, Roberto Mura

To cite this article:
Sara Ain Tommar, Olga Kolokolova, Roberto Mura (2022) When Paid Work Gives in to Unpaid Care Work: Evidence from the Hedge Fund Industry Under COVID-19. Management Science

Published online in Articles in Advance 08 Apr 2022

. https://doi.org/10.1287/mnsc.2022.4402

http://pubsonline.informs.org/journal/mnsc

MANAGEMENT SCIENCE
Articles in Advance, pp. 1–18
ISSN 0025-1909 (print), ISSN 1526-5501 (online)

When Paid Work Gives in to Unpaid Care Work: Evidence from the Hedge Fund Industry Under COVID-19

Sara Ain Tommar,[a] Olga Kolokolova,[b] Roberto Mura[b,*]

[a] NEOMA Business School, 76130 Mont-Saint-Aignan, France; [b] Alliance Manchester Business School, University of Manchester, Manchester M15 6PB, United Kingdom
*Corresponding author

Contact: sara.ain-tommar@neoma-bs.fr, https://orcid.org/0000-0003-0945-5020 (SAT); olga.kolokolova@manchester.ac.uk, https://orcid.org/0000-0001-5698-5062 (OK); roberto.mura@manchester.ac.uk, https://orcid.org/0000-0002-2872-5009 (RM)

Received: June 11, 2021
Revised: October 18, 2021
Accepted: November 9, 2021
Published Online in Articles in Advance: April 8, 2022

https://doi.org/10.1287/mnsc.2022.4402

Abstract. We examine how childcare inequalities in the home affect the work productivity of female talent, using unique data on the family structures of hedge fund managers and the exogenous shock from school closures during the early COVID-19 pandemic response. We find that female managers' ability to generate abnormal returns is curbed by 9% on average in the shock-month of school closures, providing a direct measure of the cost of unpaid care work. This effect is driven by mothers and especially mothers with young children. With increasing calls for more female representation in all layers of the economy and the efforts exerted toward that goal, there is reason for concern that these efforts might not factor in as the pandemic has uncovered how women in general and mothers in particular bear both the burden of unpaid care work and the subsequent cost to their paid work.

History: Accepted by Victoria Ivashina, finance.
Funding: This work was supported by Europlace Institute of Finance.
Supplemental Material: The online appendix and data are available at https://doi.org/10.1287/mnsc.2022.4402.

Keywords: hedge funds • COVID-19 • gender bias • unpaid care work

> The year 2020, marking the twenty-fifth anniversary of the Beijing Platform for Action, was intended to be ground-breaking for gender equality. Instead, with the spread of the COVID-19 pandemic even the limited gains made in the past decades are at risk of being rolled back.
> —United Nations Policy Brief (April 2020, p. 2)

1. Introduction

A thorn in the side of modern society is the persisting disparity across genders: women do not participate in the economy to the same extent that men do. A well-established strand of literature points to the motherhood penalty (Correll et al. 2007, Giuliano 2020) and the persisting differential roles men and women play in the household as key elements of this lasting gap (Bertrand et al. 2005, Bordalo et al. 2016, Brenøe 2018, Bertrand 2020, Core 2020, Zandberg 2021, Bennedsen et al. 2022).

Attempting to redress this global imbalance is a key priority of almost every government and major political organization in the world. For instance, UNESCO reports gender equality to be one of its top two global priorities.[1] The European Commission also lists "promoting gender equality" as a core activity of the European Union.[2] While significant progress has been made since the 1995 Beijing Declaration and Platform for Action, the current pandemic and resulting government policies have inadvertently exposed persistent gender disparities at home, calling out for immediate action.

Using the exogenous shock of the COVID-19 response, we show that childcare falls on the shoulders of women as the imposed lockdowns and nationwide school closures severely strained childcare options for working parents. Our empirical analyses exploit unique data on the family structures of individual hedge fund managers, which offer a near-ideal setting to examine this question. First, hedge funds are highly human capital–intensive (Zingales 2000, Bloom et al. 2017) and directly exhibit managerial abilities (Brunnermeier and Nagel 2004, Kosowski et al. 2007, Agarwal et al. 2013). Hedge fund performance can be attributed to specific teams of managers unlike other types of firms in which complex organizational structures hinder directly linking firm performance to specific groups of individuals. Second, hedge funds report monthly returns, allowing researchers to analyze performance outcomes in a timely fashion unlike other highly human capital–intensive industries, such as law firms and private equity firms, in which performance is measured over longer time horizons. Third, hedge funds are a well-suited laboratory to

study investment performance in times of crises and under limited managerial attention. Evidence shows that, when individual managers go through turbulent periods of personal life, such as marriages and divorces, their performances decrease around these events (Lu et al. 2016). At the same time, it is documented that the market-timing ability in hedge funds at both the aggregate and fund levels is especially pronounced when the market is in decline and when it is more volatile (Chen and Liang 2007). Thus, crushing markets and high return volatility during the COVID-19 pandemic present a unique window to measure the cost of unpaid care work while opportunities for managers to earn excess returns are high.[3]

In this quasi-natural social experiment, neither formal nor informal help can be arranged. Childcare duties have to be shared by the parents, who, at the same time, are forced to work from home. We document that, similar to the general population in which women still bear up to three times more unpaid care work than men (Ferrant et al. 2014, United Nations 2020), the lion's share of these duties is pronouncedly carried by women even in highly skilled and highly earning professions.

To gauge to what extent women shoulder the cost of unpaid care work, we start by looking at whether there are substantial differences in performance between male and female managers conditional on government restrictions regarding schooling. Our intuition is that this captures the immediate gendered effects of childcare on work productivity, whereby female managers' ability to generate excess return is curbed because of increased parenting duties during the lockdowns. We measure female representation in funds by a dummy variable that takes the value of one if the hedge fund counts at least one female manager, a dummy variable that takes the value of one if the proportion of women in the management team is higher than 50%, and the actual fraction of female managers in the team. We measure performance as the monthly ex post excess return relative to the Fung and Hsieh (2001) model. To the extent that both male and female managers are highly skilled workers and are optimally chosen by hedge fund investors, we should not observe any impact of gender on hedge fund performance as predicted by the human capital theory (Mincer 1958; Schultz 1959, 1960, 1961; Daniere 1965). Aggarwal and Boyson (2016) empirically test this prediction and report no difference in skill between male and female hedge fund managers in their sample of hedge funds from 1994 to 2013. This also holds under turbulent market conditions, such as the 2007–2008 financial crisis. We do not find any evidence that female managers underperform during September 2008 when Lehman Brothers defaulted or during the subsequent month. However, as we document, funds with female managers lost 9% abnormal returns on average during the shock-month of the first school closures in 2020.

A unique feature of our study is that we hand-collect information on the family composition of hedge fund managers, including the number of children and their ages. This allows us to identify managers with and without childcare responsibilities. This information is either found in managerial biographies on corporate websites, on their publicly available social media accounts, or news coverage and magazine interviews. Based on the publication date of the information on children and their ages in any of the publicly available sources, we construct time-varying variables as to whether a given manager has children as well as their ages in the month when the fund performance is measured. We consistently find that parent managers generate significantly lower abnormal return during imposed school closures and this effect is driven by mothers, especially mothers of young children. Childless managers and fathers do not suffer this decline, nor is this effect driven by school closures in general. Our tests show that abnormal returns are affected by neither gender nor parental status during normal school holidays when alternative childcare provisions can be planned ahead.

Our tests provide strong evidence that women bear both the burden of unpaid care work and the resulting cost to their paid work. There have been recurrent calls for more female representation in the economy in general and in the financial industry specifically. Not only is gender equality an important pillar of a modern society, but it is also an effective instrument to access unique value-driving resources, such as increased overall problem-solving capacity (Stiles 2001). Using survey data, more recent research points out the detrimental effect of the pandemic-related government responses on labor market participation (Coibion et al. 2020). Following studies document the negative impact the pandemic response has had on the work productivity of women in both the general population (Alon et al. 2020, 2022) and academia (Barber et al. 2021). We contribute to this literature by offering a unique perspective on money managers. The combination of the hedge fund industry structure and our unique data on managers' parental status allows us to offer novel and quantifiable evidence on the differential impact of the COVID-19 pandemic on women. Our results suggest that, despite the important progress in achieving gender equality, disparities persist even in the highly skilled jobs. This is reason for concern as working—and prospective—mothers may continue to be less favored by employers who would, in equilibrium, adjust to the maternity risk of working women by either optimally allocating

women to "less exposed" jobs or mitigate this risk by disfavoring equally skilled women (Aldrich and Pfeffer 1976, Pfeffer and Salancik 1978). This continues to pose a challenge to gender equality policy making.

2. Data

Hedge fund data are obtained from EurekaHedge and Lipper TASS, two of the most widely used databases in the hedge fund literature with global coverage (Joenväärä et al. 2021). We source managerial information from Orbis–Bureau van Dijk and merge it with our hedge fund data. To make sure that fund performance fully reflects that of the managerial team, we first identify all individuals working at a given hedge fund by matching the fund's name and legal information to Orbis' universe of covered firms. We augment this list with single hedge fund companies using their names and legal information. We manually check that none of the management companies is a bank or an investment trust and exclude funds of hedge funds.

As Orbis provides information on all people associated with a company, we keep only managers with roles that have a material impact on fund performance, such as portfolio managers or CEOs. We exclude secretarial and assistant roles as well as all roles related to human resources, public relations, accounting, and IT support. Orbis reports the start and end dates of employment for each employee. We use these dates to reconstruct a panel of observations such that each manager is assigned to a fund only during the months of their actual employment. This allows us to precisely attribute fund performance to a particular managerial team as opposed to relying only on the managerial profiles from the hedge fund databases. The latter contain only a snapshot of managerial teams as of the last day of the database update or may not contain individual manager information altogether.

The key managerial characteristic for our study is gender, which is reported by Orbis. We hand-collect this information when it is missing by cross-checking managerial profiles in the hedge fund databases. We verify salutations (Mr./Ms.) and the use of pronouns (his/her). Still, if the gender cannot be identified, we check company websites and managerial LinkedIn profiles. We further go through the profile of each female manager manually to make sure that potential family name changes do not result in double counting. We account for cases in which female managers change their names because of events such as marriage and are reported more than once because of such events.

As the lockdown policies are country-specific and only affect managers effectively residing in those countries, we identify the country of residence of each manager in the sample. To this end, we first use the explicitly reported managerial address from Orbis. When this is missing, we use fund countries as reported by EurekaHedge or TASS if they match the countries reported by Orbis.[4] We further require that, for each fund and each date, all managers have the same country of residence, to ensure that the entire team is subject to the same country-wise school closures (if any) at the same time. We exclude 41 hedge funds from the analysis in which managers live in different countries. We merge the information of managerial residence with the geographical data on COVID-19 from the World Health Organization and the COVID-19 datahub initiative (Guidotti and Ardia 2020).[5] The data contain the numbers of confirmed cases and deaths, among others, as well as the precise dates of school closures within countries and territories, which we use to time the exogenous school-closure shock on managers' ability to work.

The descriptive statistics in Panel A of Table 1 show that all-male funds have similar raw returns compared with funds with female managers on average. Mean and median returns are 0.67% and 0.50% per month for all-male funds and 0.62% and 0.49% for funds with female managers, respectively. All-male funds are more likely to use leverage; 76.69% of all-male funds report using leverage, whereas 23.31% of funds with female managers do so. Funds with female managers are bigger in size and have larger teams. In 2020, funds with female managers control US$429 million of assets with 5.55 team members on average, whereas all-male funds, on average, have 2.10 team members in charge of US$229 million. It is noteworthy that around half of all-male funds have a single manager in charge of investment, whereas the share of single female-managed funds is negligible.

In terms of female manager representation (Panel B of Table 1), out of 3,409 individual managers, 14% are female. They are rather evenly distributed across different hedge fund styles and geographical regions. The female managers in our sample are representative of the total population of female hedge fund managers as reported by AlphaMaven, one of the largest directories of hedge fund managers.[6] We provide a detailed comparison between our sample and AlphaMaven in the Online Appendix, Table S1.

3. Methodology and Empirical Results

3.1. Main Regression Specification

Using an estimation period (EP) of 24 months prior to 2020 for each hedge fund i, we estimate loadings β_{ik} on the factors F_k of the Fung and Hsieh (2001) model.[7]

Table 1. Descriptive Statistics

	Total sample		COVID-19 sample	
Panel A: HF characteristics				
	All male	With females	All male	With females
Fund returns				
Mean	0.67	0.62	−1.73	−1.57
Standard deviation	3.84	3.48	7.67	6.22
Median	0.50	0.49	−1.34	−1.12
p25	0.16	0.11	−3.90	−2.84
p75	0.90	0.85	0.40	0.07
Other characteristics				
Fund × month observations	53,824	13,528	824	170
Average team size	2.06	8.15	2.10	5.55
Mean AUM	149	205	229	429
Performance fee, %	17.28	17.02	15.98	15.73
Management fee, %	1.47	1.42	1.40	1.33
Lockup months	3.16	2.76	3.12	3.55
Notice period, days	36.34	33.55	34.75	35.07
Leverage, % of HFs	76.69	23.31	83.33	16.67
Panel B: Managerial distribution by style and geography				
	Total managers	Fraction women	Total managers	Fraction women
Total	3,409	0.14	930	0.11
Style				
Fixed income	283	0.19	77	0.25
Long short equity	1244	0.13	394	0.11
Multistrategy	265	0.12	94	0.14
Relative value	92	0.22	31	0.19
Other	1,525	0.13	334	0.06
Region				
North America	1,475	0.15	396	0.10
Europe excluding United Kingdom	457	0.11	130	0.07
United Kingdom	1,218	0.14	249	0.16
Asia Pacific	163	0.07	97	0.07
Rest of the world	96	0.11	58	0.12

Notes. This table reports the descriptive statistics of the returns and other characteristics of hedge funds in our sample (Panel A), and managerial distribution across hedge fund styles and regions (Panel B). The statistics are reported for the complete sample as well as for the available months of 2020.

We then compute for each fund the abnormal returns AR_{it} during the available months of year 2020 (the test period, TP). The abnormal returns are regressed on a shock to the schooling variable $School\_Closed_{it}$ and its interaction with the variables capturing female representation in the fund *FemaleVar*. We also control for fund size and the severity of the pandemic in different countries, measured as the natural logarithm of the fund's assets under management (*lnAUM*) and of the number of confirmed COVID-19 cases in the country of managerial residence (*lnConfirmed*), respectively.

In all our tests, we include both fund and month fixed effects (u_i and τ_t, respectively), and we double cluster standard errors by country and time. This framework has the benefit of controlling for fund-specific, time-invariant variables that may affect the estimated coefficients of our variables of interest. Moreover, month fixed effects remove any unobservable characteristic that may affect all funds in any given time period; hence, this specification has the potential to significantly reduce concerns of the omitted variable bias.[8]

$$R_{it} = \alpha_i + \sum_{k=1}^{n^F} \beta_{ik} F_{t,k} + \varepsilon_{it}, \text{ if } t \in EP$$
$$AR_{it} = R_{it} - \sum_{k=1}^{n^F} \hat{\beta}_{ik} F_{t,k} \text{ if } t \in TP, \quad (1)$$

$$AR_{it} = a_0 + \delta School\_Closed_{it} + \kappa FemaleVar_{it} \times School\_Closed_{it} + lnAUM_{it} + lnConfirmed_{it} + u_i + \tau_t + \eta_{it}. \quad (2)$$

The variable $School\_Closed_{it}$ takes the value of one if month t is the first month in which schools were closed for more than a week because of lockdown in the managers' country of residence and zero otherwise. If the unexpected school closure disproportionately affects female managers, we should observe a

negative and significant coefficient κ on the interaction term *FemaleVar* × *School_Closed*.

A unique feature of the first mandatory school closures compared with the follow-on ones is that they were accompanied by lockdowns, highly unexpected, and uniform country-wise, which provides a clean test of our hypotheses. Indeed, school reopening and end of lockdowns in the subsequent months show large differences in timing, scope, and scale across and even within the same countries. Such follow-on heterogeneity in school and government responses compromises the connection between the nominal school closure status and the required amount of care time compared with the first shock months. Table 2 reports the dates of school closures in the countries where managers are based in our sample as well as the months that we consider to be shock months. Figure 1 shows the timeline of school reopening for in-person instruction over the following year, highlighting substantial heterogeneity of the subsequent government actions across countries.

Another important feature of this period is the high market volatility as we discuss in detail in Section 3.5. Such market conditions provide perfect opportunities for skillful managers to earn high returns for their investors by implementing dynamic investment strategies (Chen and Liang 2007). If their attention is limited because of other duties, managers are more likely to move into less dynamic strategies that are closer to index investing as suggested by Lu et al. (2016). Such a strategy drift is likely to lead to substantial losses.

We consider several measures of female representation within funds (*FemaleVar*). We use a dummy variable that takes the value of one for funds with at least one female manager (*IsFemale*), a dummy variable that equals one for funds with more than 50% of female managers (*IsFemale*50), and the actual fraction of female managers in the fund (*Fraction_Females*). Table 3 lists all the variables used in the main regressions in alphabetical order with their definitions.

Our main regression results in Table 4 show that funds with female managers are severely affected by the school closure shock.[9] Abnormal returns of funds with at least one female manager decrease by about 9% as captured by the negative and significant coefficient κ (on *IsFemale* × *School_Closed*). It is important to stress that the 9% decline in abnormal returns measures the relative performance of funds with respect to their own expected performance given the previous return history. Hence, this can be seen as the monetary measure of the opportunity costs of not being able to devote 100% attention to the work during school closures. The opportunity costs can be large

Table 2. Timing of School Closures Across the World

Manager's residence country	First pandemic-related school closure date	Last date of schools being nationally closed	Considered shock month
Argentina	16-Mar-2020	8-Mar-2021	March
Australia	24-Mar-2020	15-Apr-2020	March
Brazil	12-Mar-2020	10-Nov-2020	March
Canada	16-Mar-2020	8-Sep-2020	March
Denmark	13-Mar-2020	15-Apr-2020	March
France	2-Mar-2020	11-May-2020	March
Germany	16-Mar-2020	4-May-2020	March
Hong Kong	26-Jan-2020	20-May-2020	January
India	13-Mar-2020	1-Oct-2020	March
Ireland	13-Mar-2020	26-Jun-2020	March
Israel	13-Mar-2020	3-May-2020	March
Italy	23-Feb-2020	21-Sep-2020	February
Japan	2-Mar-2020	1-Jun-2020	March
Luxembourg	16-Mar-2020	4-May-2020	March
Malaysia	14-Mar-2020	24-Jun-2020	March
Netherlands	16-Mar-2020	11-May-2020	March
Norway	12-Mar-2020	27-Apr-2020	March
Qatar	10-Mar-2020	1-Sep-2020	March
Singapore	8-Apr-2020	2-Jun-2020	April
South Africa	18-Mar-2020	8-Jun-2020	March
Spain	9-Mar-2020	26-May-2020	March
Switzerland	16-Mar-2020	11-May-2020	March
United Kingdom	18-Mar-2020	13-Aug-2020	March
United States	5-Mar-2020	3-Feb-2021	March

Note. The table reports the starting dates of nationwide school closures in the countries in our sample, the final date until which the schools were nationally closed, and the resulting month used as a shock month in our sample.

Figure 1. (Color online) Timeline of School Closures Across Different Countries

Notes. The figure depicts the timeline of COVID-19–related school closures throughout 2020 in the countries where managers are based in our sample. The data are from the COVID-19 datahub https://covid19datahub.io/.

and negative even if the total unadjusted performance is positive.

The estimated coefficient on the fraction of female managers ranges from −17.05 to −17.76. To put these numbers into the perspective of the opportunity cost for a representative fund, in our sample, only 16.7% of funds have female managers. Conditional on having a female manager, a median fund employs three managers in total, one of whom is a woman, whereas an average fund has 5.55 managers in a team and 1.8 female managers. The typical fraction of female managers in a fund is, hence, around one third if the funds employ at least one female manager. Taking an all-male fund with three managers as a benchmark, a similar fund with two male and one female managers is expected to have a negative 5.7% abnormal return $(-17.05 \cdot \frac{1}{3})$ on average during the month of school closures.

3.2. Regular School Holidays

To verify that the performance of female managers is not strained by school closures in general, we repeat our analysis during regular school holidays. The key difference between regular school holidays and school closures during the COVID-19 lockdowns is that the dates of regular school holidays are known well in advance, and alternative formal and informal childcare provisions can be planned ahead.

Similar to our main regression, we use a 24-month EP during years 2016–2017 and year 2018 as the TP. We replace the variable *School_Closed* in Equation (2) with the dummy variable *Holidays* for regular school closures, which takes the value of one during the months of scheduled school holidays. We use 2018 as a test year to ensure that the sample of managers is closest to our main regression sample while keeping a gap year (2019) to counterpoise any effect from the COVID-19 period. If regular school holidays do not affect the productivity of female managers given the possibility of advanced childcare planning, the estimated κ in Equation (2) should not be significant. A significantly negative κ indicates that female managers divert their attention from paid work to childcare also during regular school holidays.

The results reported in Table 5 do not indicate any significant difference in abnormal returns between

Table 3. Variable Definitions

Variable	Description
AR	Abnormal return: The monthly ex post excess return relative to the Fung and Hsieh (2001) seven-factor model
Attention_Hungry	Dummy that takes the value of one for hedge fund styles that conventionally invest in the asset classes with more time-consuming monitoring processes. These include arbitrage, convertible arbitrage, distressed debt, emerging markets, event-driven, fixed income, fixed income arbitrage, macro, relative value, and other styles.
Easy_Monitoring	Dummy that takes the value of one for hedge fund styles that conventionally invest in the asset classes with less time-consuming monitoring processes. These include long short equity, CTA/managed futures, equity market neutral and multistrategy styles.
Fraction_Fathers	Fraction of male fund managers with children relative to the total number of managers in a given month
Fraction_Fathers_mean12	Fraction of male fund managers with young children (average child age below 12 years) relative to the total number of managers in a given month
Fraction_Fathers_min12	Fraction of male fund managers with young children (minimum child age below 12 years) relative to the total number of managers in a given month
Fraction_Females	The fraction of female managers as of the reporting month, calculated as the number of active female managers in a fund divided by the total number of active managers
Fraction_Mothers	Fraction of female fund managers with children relative to the total number of managers in a given month
Fraction_Mothers_mean12	Fraction of female fund managers with young children (average child age below 12 years) relative to the total number of managers in a given month
Fraction_Mothers_min12	Fraction of female fund managers with young children (minimum child age below 12 years) relative to the total number of managers in a given month
Fraction_Not_Fathers	Fraction of male fund managers with no children relative to the total number of managers in a given month
Fraction_Not_Mothers	Fraction of female fund managers with no children relative to the total number of managers in a given month
Fraction_Parents	Fraction of fund managers with children relative to the total number of managers in a given month
Fraction_Parents_mean12	Fraction of fund managers with young children (average child age below 12 years) relative to the total number of managers in a given month
Fraction_Parents_min12	Fraction of fund managers with young children (minimum child age below 12 years) relative to the total number of managers in a given month
Holidays	Dummy that takes the value of one if, in the country of residence of managers, schools are closed for normal holidays and zero otherwise
IsFemale	Dummy that takes the value of one if at least one manager in the fund is female and zero otherwise
IsFemale50	Dummy that takes the value of one if at least 50% of managers in the fund are female and zero otherwise
Lehman	Dummy that takes the value of one in September 2008 and zero otherwise
lnAUM	Natural logarithm of the fund's assets under management, in million U.S. dollars
lnConfirmed	Natural logarithm of the official number of confirmed COVID-19 cases in the country of residence of managers in a given month
School_Closed	Dummy that takes the value of one during the first month when schools were closed for more than a week because of COVID-19 in the country of residence of managers and zero otherwise

Note. This table lists all the variables used in the regressions in alphabetical order with their definitions.

Table 4. Abnormal Returns During School Closure Shock

	(1)	(2)	(3)	(4)	(5)	(6)
School_Closed	2.35	−0.29	2.12	−0.26	2.37	−0.02
	(1.54)	(−0.15)	(1.39)	(−0.13)	(1.61)	(−0.01)
IsFemale · School_Closed	−9.87***	−9.52**				
	(−2.94)	(−2.52)				
IsFemale50 · School_Closed			−14.73***	−15.92***		
			(−3.11)	(−2.75)		
Fraction_Females · School_Closed					−17.05***	−17.76**
					(−2.72)	(−2.46)
lnAUM		4.87		5.26		5.06
		(0.95)		(1.02)		(0.98)
lnConfirmed		0.56		0.50		0.51
		(1.21)		(1.07)		(1.09)
Constant	0.19	−27.76	0.49	−28.82	0.32	−28.01
	(0.06)	(−1.14)	(0.14)	(−1.18)	(0.10)	(−1.15)
Fund and month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.14	0.19	0.14	0.20	0.14	0.19
Nobs	994	880	994	880	994	880

Notes. This table reports the estimation results for the regression in Equation (2) of the ex post hedge fund abnormal returns in 2020 for funds with different levels of female representation. All variable definitions are reported in Table 3. *t*-statistics are in parentheses. Standard errors are double clustered by country and time.

*, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

all-male funds and funds with different levels of female representation. This suggests that our results on the COVID-19 period are not driven by school closures per se. Rather, they are likely driven by the sudden increase in childcare duties that could not be delegated or outsourced in any way because of the binding lockdown measures.

3.3. A Counterfactual Experiment: Lehman Brothers Bankruptcy

An alternative explanation of the underperformance of funds with female managers during the shock-months of school closures could be that female managers generally respond differently to unexpected shocks to the system compared with their male peers. Therefore, we use the financial crisis period 2007–2008 as an additional test period to verify the plausibility of this alternative explanation. We estimate the model in the precrisis sample from 2005 to 2006 and rerun our tests with Lehman Brothers bankruptcy in September 2008 as a shock, thus focusing on the relative abnormal performance of funds with and without female managers in September 2008. As reported in Table 6, we find no evidence that funds with female managers

Table 5. Regular School Holidays

	(1)	(2)	(3)	(4)	(5)	(6)
Holidays	−0.46**	−0.48**	−0.40**	−0.42*	−0.43**	−0.45*
	(−2.20)	(−2.02)	(−2.01)	(−1.85)	(−2.11)	(−1.91)
IsFemale · Holidays	0.41	0.41				
	(1.26)	(1.13)				
IsFemale50 · Holidays			−0.03	−0.13		
			(−0.07)	(−0.21)		
Fraction_Females · Holidays					0.44	0.38
					(0.82)	(0.60)
lnAUM		0.55		0.56		0.56
		(0.59)		(0.60)		(0.59)
Constant	1.20***	−1.17	1.20***	−1.22	1.20***	−1.19
	(3.40)	(−0.29)	(3.38)	(−0.30)	(3.39)	(−0.29)
Fund and Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.11	0.12	0.11	0.12	0.11	0.12
Nobs	3,615	3,201	3,615	3,201	3,615	3,201

Notes. This table reports the estimation results for the regression of the ex post hedge fund abnormal returns during normal school holidays in 2018 for funds with different levels of female representation. *Holidays* is a dummy variable taking the value of one during the months of scheduled school holidays and zero otherwise. All variable definitions are reported in Table 3. *t*-statistics are in parentheses. Standard errors are double clustered by country and time.

*, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 6. The Lehman Brothers Bankruptcy Shock

	(1)	(2)	(3)	(4)	(5)	(6)
Lehman	−6.21***	−5.44***	−6.09***	−5.11***	−6.32***	−5.32***
	(−3.84)	(−3.09)	(−3.72)	(−2.90)	(−3.59)	(−2.82)
IsFemale · Lehman	2.39**	3.46***				
	(2.25)	(2.70)				
IsFemale50 · Lehman			5.21***	4.51***		
			(3.06)	(2.64)		
Fraction_Females · Lehman					7.87***	6.21**
					(2.99)	(2.47)
lnAUM		0.32		0.34		0.33
		(0.45)		(0.48)		(0.47)
Constant	0.22	−1.10	0.22	−1.18	0.22	−1.15
	(0.71)	(−0.34)	(0.71)	(−0.36)	(0.71)	(−0.35)
Fund fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.12	0.11	0.12	0.11	0.12	0.11
Nobs	3,069	2,306	3,069	2,306	3,069	2,306

Notes. This table reports the estimation results for the regression of the ex post hedge fund abnormal returns in 2007–2008 for funds with different levels of female representation. Lehman takes the value of one in September 2008. All variable definitions are reported in Table 3. *t*-statistics are in parentheses. Standard errors are double clustered by country and time.

*, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

underperform during the month of the Lehman Brothers' bankruptcy. In fact, they exhibited higher skills during this turbulent period. This finding is consistent with the prior literature. For example, Adams and Ragunathan (2017) find that banks with more women perform better than other banks, whereas Van Staveren (2014) concludes that female portfolio managers tend to outperform men under uncertainty. As we discuss in more detail in Section 3.5, the market conditions were as severe if not worse in the fall of 2008 as in March 2020. Yet there is no sign of decline in abnormal performance of funds with female managers in September 2008.

3.4. Family Structure Implications

To measure to what extent the decline in performance of female managers is driven by increasing childcare duties during the shock-month of school closures, we collect unique data on the family structures of fund managers. We start by looking up the professional managerial profiles on corporate websites and on LinkedIn. In about 10% of the cases, the information on families is directly available there. Examples include instances in which the corporate biographies have statements such as "Mr. Doe lives in California with his wife and their three children" or LinkedIn pages of managers who identify as, for example, "a proud mother of two" in their profile statements. When the information is not available or insufficient, we use a matching algorithm in Python that is based on an extensive textual web search, which *tags* pages that have mentions of the managers based on different combinations of their names; company affiliations; alma mater; and keywords, such as "father," "mother," "son," "daughter," etc. If managerial professional pictures are publicly available (for example, in corporate websites), we also perform reverse image lookups based on the links to these pictures in order to match them to any publicly available social media accounts that would confirm the manager's parental status. These procedures only tag relevant web pages, which we further manually screen to structure the information needed.

Table 7. Managers with Confirmed Parental Status

	Male	Female
Number of managers	357	150
Of whom are confirmed nonparents	147	63
Of whom are confirmed parents	210	87
% parents with young children (age below 12)	58	57
Average number of children	1.98	2.03
Average age of children	10.74	11.78
Average age of managers	45.74	42.11

Note. This table reports the total number of male and female managers with confirmed parental status, their average ages, and their family structure information.

This search yields results for 507 managers, including 150 female managers, for whom we explicitly know whether they have children and, if any, their ages. Both female and male managers have around two children on average with the average children's age being 11.78 years for female managers and 10.74 years for male managers as of 2020 (Table 7). Most parents in the sample have at least one child below 12 years of age as shown by the reported percentages. Our TP effectively comprises 291 of the identified managers, 25% of whom are women. The size of our sample is not unusual for papers studying personal managerial characteristics. To illustrate, Yermack (2014) studies the effect of CEO vacation time on firm

performance, using a sample of 66 CEOs from 65 companies. Lu et al. (2016) analyze the effect of marital events on the performance of hedge fund managers, using an effective sample of 98 marriages and 76 divorces.

Using these unique data on the family structures of fund managers, we create fund-level variables capturing the levels of childcare responsibilities within those funds. In particular, we define *Fraction_Parents* as the fraction of managers in the fund who we know have children. Because we collect the ages of children as of 2020, we reconstruct the managerial parental status in previous years. For example, a manager with a one-year-old baby in 2020 is classified as a parent in 2020 and appears as a manager without children in 2018. We combine the information on parenthood and gender and compute the fraction of mothers (*Fraction_Mothers*) and of fathers (*Fraction_Fathers*) among all the managers in the fund. We repeat the analysis in Equation (2), first substituting *FemaleVar* with the variable *Fraction_Parents* and, second, using *Fraction_Mothers* and *Fraction_Fathers* in the same regression instead of the single variable *Fraction_Parents*. If mothers and fathers equally contribute to childcare, we should observe similar coefficients on the fractions of parents, mothers, and fathers.

To further disentangle the effect of gender and parenthood, we also include in the regressions two variables capturing managers who are confirmed not to have children: *Fraction_Not_Mothers* and *Fraction_Not_Fathers*. If increasing childcare duties are the key factor hindering the performance of female managers during the school closure shock, we should observe a significantly negative effect on abnormal returns for *Fraction_Mothers* but not for *Fraction_Not_Mothers*. If the observed effect, on the contrary, is driven solely by other gender-specific characteristics, we should observe the same effect on all women regardless of their parental status.

The results reported in Table 8 show that, whereas the loss in abnormal returns pertains to parents, it is disproportionately carried by mothers during school closures. Having one parent in a team of three managers leads to around 2% loss in abnormal return during the month of school closures ($-6.37 \cdot \frac{1}{3}$ on average), whereas having a mother in a team of three managers is associated with around 8% ($-25.06 \cdot \frac{1}{3}$) loss in abnormal returns. Considering that, even among funds that employ women, the median fraction of mothers is 13%, the estimated coefficient of –25.06 translates into a reduction of abnormal returns during the school closures by 3.26% ($-25.06 \cdot 0.13$) for a representative fund. This effect is not statistically significant for fathers; the same is true for *Fraction_Not_Mothers*, which does not show any significant effect on fund performance during the school closure shock. This provides strong evidence that the loss in abnormal returns is experienced by women with childcare responsibilities, and it is not related to any other gender-specific characteristics. At the same time, similar to our earlier findings, regular school holidays do not hinder the productivity of parents, fathers and

Table 8. Abnormal Returns During School Closure Shock: Parental Status Effect

	(1)	(2)	(3)	(4)	(5)	(6)
School_Closed	2.71*	−0.11	2.73*	0.03	2.76*	−0.02
	(1.76)	(−0.05)	(1.77)	(0.02)	(1.82)	(−0.01)
Fraction_Parents · School_Closed	−7.02***	−6.37**				
	(−3.17)	(−2.43)				
Fraction_Fathers · School_Closed			−3.22	−2.57	−3.22	−2.37
			(−1.58)	(−0.98)	(−1.51)	(−0.86)
Fraction_Mothers · School_Closed			−26.10**	−25.06**	−26.01**	−24.56**
			(−2.59)	(−2.32)	(−2.56)	(−2.25)
Fraction_Not_Fathers · School_Closed					0.07	1.06
					(0.02)	(0.26)
Fraction_Not_Mothers · School_Closed					−3.96	−13.37
					(−0.47)	(−1.04)
lnAUM		5.07		5.21		5.37
		(0.97)		(1.02)		(1.05)
lnConfirmed		0.54		0.53		0.53
		(1.16)		(1.13)		(1.13)
Constant	0.53	−28.45	0.65	−28.89	0.67	−29.56
	(0.16)	(−1.15)	(0.19)	(−1.19)	(0.20)	(−1.22)
Fund and Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.13	0.18	0.14	0.19	0.14	0.20
Nobs	994	880	994	880	994	880

Notes. This table reports the estimation results for the regression of the ex post hedge fund abnormal returns in 2020 controlling for the parental status of fund managers. All variable definitions are reported in Table 3. *t*-statistics are in parentheses. Standard errors are double clustered by country and time.

*, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

mothers alike, as well as managers without children (Table 9). Being a parent does not preclude managers from performing well at work as long as they are able to plan ahead.

The time and effort cost associated with childcare is substantially higher for younger children. Therefore, we also construct parenthood variables with managers whose children are on average below 12 years of age and managers whose youngest child is below 12. This is the earliest age of parental independence across multiple cultural backgrounds (Bulcroft et al. 1996 among others). We denote these variables by a suffix "_mean12" and "_min12" and repeat our analysis. The results reported in Tables 10 and 11 are consistent with this intuition, and the effect is amplified for mothers. A hedge fund with one mother of young children in a team of three managers experiences a relative loss of around 12%–13% ($-36.99 \cdot \frac{1}{3}$ to $-39.30 \cdot \frac{1}{3}$) during the shock-month of school closures, whereas it is not statistically significant for fathers. Our results remain consistent with the baseline findings of no effect during regular school holidays, during which alternative childcare provisions are available.

Overall, our results provide strong evidence that unpaid childcare falls squarely on women's shoulders, effectively hindering their ability to perform on their jobs when alternative provisions cannot be arranged. The unexpected school closure shock during COVID-19 lockdowns has clearly exposed this lingering disparity.

3.5. Discussion of the Results

In order to put the magnitude of the observed effect in the context of volatile markets in which inattention could be especially costly, we characterize the performance of different asset classes during the early months of 2020 and discuss the possible mechanisms contributing to the performance decline.

We look at the U.S., European, and emerging economies' equity and bond markets as well as real estate and global commodities markets. To measure the performance of these markets, we use the corresponding total return indices. These include the S&P 500, EuroStoxx, and MSCI Emerging market indices, which are obtained from Eikon Datastream. The Merrill Lynch BBB U.S. Corporate Bond Total Return Index is obtained from Federal Reserve Economic Data (FRED).[10] The S&P Eurozone Investment Grade Corporate Bond Index and the Bloomberg Aggregate Corporate Bond Index, the Dow Jones U.S. Real Estate Index, and the S&P Global Macro Commodities Index are sourced from Capital IQ and Bloomberg. In addition, we characterize the dynamics of the Chicago Board Options Exchange (CBOE) Volatility Index (VIX) obtained from FRED.[11]

Panel A of Table 12 reports the realized monthly log returns and the daily return volatilities for all indices in the months from January to May 2020. As a benchmark, the average values of the monthly log returns and the intramonth daily return volatilities during the previous two years (2018–2019) are also reported. For each month in 2020, we report the

Table 9. Regular School Holidays: Parental Status Effect

	(1)	(2)	(3)	(4)	(5)	(6)
Holidays	−0.37	−0.37	−0.37	−0.37	−0.38	−0.38
	(−1.56)	(−1.44)	(−1.59)	(−1.46)	(−1.53)	(−1.42)
Fraction_Parents · Holidays	−0.23	−0.33				
	(−0.36)	(−0.61)				
Fraction_Fathers · Holidays			−0.38	−0.52	−0.37	−0.51
			(−0.53)	(−0.86)	(−0.51)	(−0.83)
Fraction_Mothers · Holidays			0.73	0.80	0.78	0.85
			(1.15)	(1.18)	(1.27)	(1.31)
Fraction_Not_Fathers · Holidays					1.05	1.08
					(0.25)	(0.26)
Fraction_Not_Mothers · Holidays					−2.84	−3.01
					(−0.46)	(−0.50)
lnAUM		0.56		0.56		0.57
		(0.60)		(0.59)		(0.60)
Constant	1.20***	−1.22	1.20***	−1.19	1.20***	−1.23
	(3.42)	(−0.30)	(3.43)	(−0.29)	(3.44)	(−0.30)
Fund and Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.11	0.12	0.11	0.12	0.11	0.12
Nobs	3,615	3,201	3,615	3,201	3,615	3,201

Notes. This table reports the estimation results for the regression of the ex post hedge fund abnormal returns during normal school holidays in 2018, controlling for the parental status. *Holidays* is a dummy variable taking the value of one during the months of scheduled school holidays and zero otherwise. All variable definitions are reported in Table 3. *t*-statistics are in parentheses. Standard errors are double clustered by country and time.

*, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 10. Abnormal Returns During School Closure Shock: Parents of Young Children

	(1)	(2)	(3)	(4)	(5)	(6)
School_Closed	2.12	−0.59	1.95	−0.90	1.90	−0.99
	(1.38)	(−0.28)	(1.21)	(−0.41)	(1.16)	(−0.44)
Fraction_Parents_mean12 · School_Closed	−6.76***	−6.26**				
	(−2.65)	(−2.30)				
Fraction_Fathers_mean12 · School_Closed			−2.65	−2.10		
			(−1.05)	(−0.72)		
Fraction_Mothers_mean12 · School_Closed			−39.12***	−41.49**		
			(−2.94)	(−2.49)		
Fraction_Fathers_min12 · School_Closed					−2.15	−1.46
					(−0.90)	(−0.49)
Fraction_Mothers_min12 · School_Closed					−36.99***	−39.05**
					(−2.86)	(−2.39)
lnAUM		4.83		4.80		4.92
		(0.93)		(0.95)		(0.97)
lnConfirmed		0.54		0.61		0.61
		(1.16)		(1.30)		(1.30)
Constant	0.44	−27.46	0.50	−28.10	0.44	−28.66
	(0.13)	(−1.12)	(0.15)	(−1.16)	(0.13)	(−1.18)
Fund and Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.13	0.18	0.14	0.20	0.14	0.20
Nobs	994	880	994	880	994	880

Notes. This table reports the estimation results for the regression of the ex post hedge fund abnormal returns in 2020 controlling for the parental status of fund managers with young children. The suffixes "_mean12" and "_min12" denote the average age of children being below 12 and the youngest child being below 12, respectively. All variable definitions are reported in Table 3. *t*-statistics are in parentheses. Standard errors are double clustered by country and time.

*, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

percentage increase in the daily return volatility relative to the benchmark years. The last column reports the average values of the VIX index within each month, its intramonth volatility, and the percentage change in volatility relative to the 2018–2019 period. In January 2020, the equity markets started to decline with the EuroStoxx index losing 2.29% and the MSCI Emerging Markets Index losing 4.81%, whereas the

Table 11. Regular School Holidays: Parents of Young Children

	(1)	(2)	(3)	(4)	(5)	(6)
Holidays	−0.39*	−0.41*	−0.40*	−0.41*	−0.41*	−0.42*
	(−1.78)	(−1.66)	(−1.79)	(−1.67)	(−1.79)	(−1.67)
Fraction_Parents_mean12 · Holidays	−0.07	−0.15				
	(−0.10)	(−0.27)				
Fraction_Fathers_mean12 · Holidays			−0.14	−0.24		
			(−0.17)	(−0.38)		
Fraction_Mothers_mean12 · Holidays			0.40	0.46		
			(0.56)	(0.59)		
Fraction_Fathers_min12 · Holidays					−0.05	−0.14
					(−0.07)	(−0.23)
Fraction_Mothers_min12 · Holidays					0.47	0.53
					(0.64)	(0.67)
lnAUM		0.56		0.56		0.56
		(0.59)		(0.59)		(0.59)
Constant	1.20***	−1.21	1.20***	−1.20	1.20***	−1.20
	(3.39)	(−0.30)	(3.40)	(−0.30)	(3.39)	(−0.30)
Fund and Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.11	0.12	0.11	0.12	0.11	0.12
Nobs	3,615	3,201	3,615	3,201	3,615	3,201

Notes. This table reports the estimation results for the regression of the ex post hedge fund abnormal returns during normal school holidays in 2018, controlling for the parental status of managers with young children. The suffixes "_mean12" and "_min12" denote the average age of children being below 12 and the youngest child being below 12, respectively. *Holidays* is a dummy variable taking the value of one during the months of scheduled school holidays and zero otherwise. All variable definitions are reported in Table 3. *t*-statistics are in parentheses. Standard errors are double clustered by country and time.

*, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 12. Market Performance During the Financial Crisis in 2008 and COVID-19 in 2020

		Stock markets			Bond markets			Real estate	Commodities	VIX
		United States	Europe	Emerging markets	United States	Europe	Global			
Panel A: COVID-19 pandemic										
2018–2019	Mean monthly ret	0.95	0.04	−0.16	0.50	−0.02	0.08	0.55	−0.06	16.05
	Mean daily return vol	0.84	0.79	0.83	0.22	0.10	0.17	0.83	1.10	1.94
January 2020	Realized monthly ret	−0.04	−2.29	−4.81	2.27	0.95	1.70	1.40	−11.51	13.94
	Daily ret vol	0.75	0.70	0.97	0.24	0.11	0.19	0.73	0.99	1.99
	% change in vol	−10.88	−11.81	16.44	9.61	11.15	7.46	−11.59	−10.30	2.64
February 2020	Realized monthly ret	−8.59	−10.00	−5.50	0.89	−0.43	0.52	−7.38	−8.13	19.63
	Daily ret vol	1.58	1.45	1.26	0.24	0.09	0.18	1.69	1.43	8.33
	% change in vol	87.78	83.37	50.77	9.82	−11.77	3.15	103.86	30.26	329.00
March 2020	Realized monthly ret	−13.18	−11.36	−16.97	−10.85	−6.56	−6.99	−22.93	−33.84	57.74
	Daily ret vol	5.93	4.21	3.69	1.52	0.58	1.14	6.98	4.32	14.56
	% change in vol	603.69	432.46	343.06	603.49	461.64	554.95	743.86	293.00	649.63
April 2020	Realized monthly ret	12.06	2.39	8.62	6.10	3.18	4.39	8.52	0.59	41.45
	Daily ret vol	2.58	2.00	1.52	0.56	0.26	0.37	3.68	4.32	6.22
	% change in vol	206.13	152.55	82.90	158.87	151.42	112.95	344.87	293.63	219.99
May 2020	Realized monthly ret	4.65	2.67	0.58	2.36	0.05	0.82	1.72	17.78	30.90
	Daily ret vol	1.45	1.75	1.32	0.36	0.17	0.27	2.36	2.01	3.14
	% change in vol	71.44	121.73	58.43	66.67	61.92	53.86	185.26	83.24	61.53
Panel B: Financial crisis										
2005–2006	Mean monthly ret	0.81	0.93	2.17	0.23	−0.21	−0.19	1.25	1.39	12.79
	Mean daily return vol	0.63	0.80	0.86	0.24	0.12	0.16	0.94	1.40	0.97
August 2008	Realized monthly ret	1.44	−4.95	−8.57	0.66	0.82	0.45	1.69	−7.09	20.70
	Daily ret vol	1.31	1.03	1.13	0.28	0.19	0.19	2.45	2.03	1.05
	% change in vol	108.95	29.47	30.82	17.52	58.72	20.90	159.97	44.36	8.20
September 2008	Realized monthly ret	−9.33	−14.08	−19.49	−5.41	−2.86	−5.70	−1.67	−12.93	30.30
	Daily ret vol	3.48	3.32	3.36	0.65	0.30	0.50	5.44	3.10	6.73
	% change in vol	454.35	317.13	288.81	175.47	160.96	222.12	476.58	120.75	593.69
October 2008	Realized monthly ret	−18.39	−22.48	−32.16	−11.65	−1.14	−4.82	−37.97	−32.53	61.18
	Daily ret vol	5.03	6.07	5.77	0.73	0.36	0.42	7.35	3.59	10.69
	% change in vol	703.05	662.14	567.16	205.74	206.53	169.18	680.03	156.04	1001.84
November 2008	Realized monthly ret	−7.45	−7.96	−7.94	2.52	1.62	2.35	−26.54	−14.02	62.67
	Daily ret vol	4.47	4.61	3.43	0.53	0.19	0.28	8.31	3.96	8.18
	% change in vol	613.80	479.00	296.19	123.67	62.00	79.88	781.32	182.25	743.47
December 2008	Realized monthly ret	1.06	5.57	7.33	3.91	1.01	3.21	13.77	−11.26	52.36
	Daily ret vol	3.13	3.17	2.49	0.44	0.26	0.27	9.13	3.77	8.29
	% change in vol	400.00	298.79	188.25	85.05	122.81	70.63	868.24	168.87	755.03

Notes. This table reports the realized monthly log returns, intramonth daily return volatilities, and the percentage change of the volatility relative to the average values during benchmark periods. Panel A reports the statistics for the early months of the COVID-19 pandemic with the years 2018–2019 as a benchmark. Panel B reports the statistics for the months surrounding Lehman Brothers' bankruptcy with 2005–2006 as a benchmark period. To proxy for performance of the stock, bond, and other markets across the globe, we use the following indices: the S&P 500 Index, the EuroStoxx Index, the MSCI Emerging Market Index, the Merrill Lynch BBB U.S. Corporate Bond Total Return Index, the S&P Eurozone Investment Grade Corporate Bond Index, the Bloomberg Aggregate Global Corporate Bond Index, the Dow Jones U.S. Real Estate Index, the S&P Global Macro Commodities Index, and the CBOE VIX. For the VIX index, we report in the last column the average values during the month instead of realized monthly returns and the volatilities of the daily values instead of the volatility of returns.

daily return volatility remained close to the previous two-year average level, which is also captured by the near-average level of the VIX index. Markets continue to decline in February 2020 with the S&P 500 losing 8.59%, whereas the volatility substantially increases. March 2020 exhibits extremely poor market performance: the U.S. equity was down by 13.18%, the Eurozone Investment Grade Bond index declined by 6.56%, and the commodities index lost 33.84% in one month. Such uniform market collapses are accompanied by extremely high intramonth volatility of the daily returns. For the S&P 500, for example, the daily return volatility in March 2020 was 5.93%, which is more than seven times the average pre-COVID level in 2018–2019. Later in the year (April and May), the markets had relatively recovered and the volatility decreased although it remained at higher levels than observed in 2018–2019.

Such dramatic market conditions as in March 2020 are not, however, unprecedented. Panel B of Table 12 reports similar statistics for the 2008 financial crisis period. Years 2005–2006 represent the precrisis benchmark performance period, whereas the statistics from August to December 2008 highlight the months

around the Lehman Brothers bankruptcy shock—at the height of the crisis. The realized negative market returns in September and October 2008 were at times even larger in magnitude than those in March 2020. The volatility increase across all markets is comparable with that in March 2020, and the high-volatility regime persisted for longer. For example, in December 2008, when the S&P500 realized return turned positive after a quarter of extremely poor performance, the intramonth daily return volatility was still five times higher than during the precrisis years.

Despite such similarities in the overall market conditions during the months of the Lehman Brothers bankruptcy in 2008 and the early months of the COVID-19 pandemic in 2020, the significant decline in abnormal returns for funds with female managers only pertains to the COVID-19 period as our results show. High volatility on declining markets provides perfect opportunities for dynamic, market-timing strategies to perform especially well, whereas limited attention on important trades or passive investment would result in substantial losses. We show that the substantial increase in childcare demand during the school closure shock was particularly costly for female managers with children as it hindered their ability to effectively time the market during this period of high gain opportunities and large loss risks.[12]

Recent literature also sheds some light on the lost productive time by women during the pandemic in different fields. Barber et al. (2021) document a 34.3% decrease in time allocated to research among female academics. Assuming a nine-hour working day, this easily amounts to more than a 15-hour loss in productivity a week. Andrew et al. (2021) conduct an extensive survey of the UK population and report that, during the lockdown, mothers shouldered four more hours a day than fathers in increased childcare and housework. Hence, school closures have put a massive time constraint on women's productive working hours, which ultimately led to the performance loss we document. To further stress test this hypothesis, we conjecture that hedge fund styles for which monitoring is more time-consuming and inattention is costly because of higher transaction costs and difficulties to unwind positions should experience larger abnormal losses during school closures if their managers are not able to allocate more time into monitoring. Similarly, "easy to monitor" styles should suffer less extreme negative abnormal returns.[13] To test this conjecture, we create two indicators *Easy_Monitoring* and *Attention_Hungry*. *Easy_Monitoring* takes the value of one for hedge fund styles that conventionally invest in the asset classes with less time-consuming monitoring processes. These include long short equity, commodity trading advisor (CTA)/managed futures, equity market neutral, and multistrategy. *Attention_Hungry* takes the value of one for other styles, including arbitrage, convertible arbitrage, distressed debt, emerging markets, event-driven, fixed income, fixed income arbitrage, macro, and relative value as well as funds that report other, less commonly used styles. This definition is related to the division of funds into capacity constrained and unconstrained in Liang et al. (2019). We then include in the regressions additional triple interactions between parental status variables, the school closure dummy, and the indicators for easy-to-monitor or attention-hungry styles.

The results reported in Table 13 support this conjecture. The abnormal returns during the school closure shock are ameliorated for managers with children in easy-to-monitor styles, whereas remaining negative and larger in magnitude for funds with attention-hungry styles. The reported main average effect of the fraction of parents of around −6 in Table 8 increases to about −13 for attention-hungry styles in Table 13, whereas the effect of parenthood in easy-to-monitor styles is not statistically significant. Further controlling separately for fractions of mothers and fathers in the funds, we see that the effect is disproportionally driven by mothers. For attention-hungry styles, the estimated coefficient on *Fraction_Mothers* is around −26, whereas that for *Fraction_Fathers* is around −8. A fund with one mother out of three managers, hence, experiences about an 8.7% $(-26 \cdot \frac{1}{3})$ drop in abnormal returns for attention-hungry styles, whereas a fund with one father out of three managers loses only 2.7% $(-8 \cdot \frac{1}{3})$ in abnormal returns. Additional childcare responsibilities during COVID-19–related school closures hinder the ability of all parents to work, yet the cost is disproportionally carried by mothers.

For easy-to-monitor styles, the effect is milder for mothers, but it still remains statistically significant and negative with the estimated coefficients ranging from −16 to −23, indicating that, even though some styles do require less monitoring time, the required level of attention is still higher than the available time female managers with childcare responsibilities had in hand during the COVID-19–related school closures. Easy-to-monitor funds managed by fathers do not exhibit any significant decline in abnormal returns during school closures. Similar to our main results, the effect is larger in magnitude for mothers with small children, whereas there is no significant change in abnormal returns for managers without children regardless of their gender and the fund style.

4. Robustness Checks

We perform an extensive set of robustness checks with respect to the methodology and sample construction to stress test the stability of our results. These tests strongly support our findings. We list and briefly

Table 13. Abnormal Returns During School Closure Shock: Attention-Hungry vs. Easy-to-Monitor Styles

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
School_Closed	3.22**	0.52	3.13**	0.50	3.04**	0.40	2.14	−0.67
	(2.24)	(0.26)	(2.08)	(0.24)	(2.02)	(0.18)	(1.33)	(−0.30)
Fraction_Parents · School_Closed · Attention_Hungry	−12.97***	−13.84***						
	(−3.15)	(−4.03)						
Fraction_Parents · School_Closed · Easy_Monitoring	0.50	2.03						
	(0.15)	(0.56)						
Fraction_Mothers · School_Closed · Attention_Hungry			−26.97**	−26.64**	−26.70**	−26.20*		
			(−2.15)	(−1.99)	(−2.11)	(−1.93)		
Fraction_Mothers · School_Closed · Easy_Monitoring			−21.35**	−16.44*	−23.44***	−17.43*		
			(−2.59)	(−1.77)	(−2.98)	(−1.80)		
Fraction_Fathers · School_Closed · Attention_Hungry			−8.46***	−9.29***	−7.62**	−8.59***		
			(−2.69)	(−3.40)	(−2.32)	(−2.99)		
Fraction_Fathers · School_Closed · Easy_Monitoring			2.07	3.27	1.58	3.10		
			(0.62)	(0.91)	(0.48)	(0.86)		
Fraction_Not_Mothers · School_Closed · Attention_Hungry					−19.21	−16.03		
					(−1.33)	(−1.18)		
Fraction_Not_Mothers · School_Closed · Easy_Monitoring					4.23	1.46		
					(1.62)	(0.12)		
Fraction_Not_Fathers · School_Closed · Attention_Hungry					−6.40	−1.80		
					(−1.17)	(−0.22)		
Fraction_Not_Fathers · School_Closed · Easy_Monitoring					4.36	3.25		
					(1.13)	(1.43)		
Fraction_Mothers_min12 · School_Closed · Attention_Hungry							−42.27**	−47.75*
							(−2.15)	(−1.90)
Fraction_Mothers_min12 · School_Closed · Easy_Monitoring							−25.18***	−20.68**
							(−3.80)	(−2.46)
Fraction_Fathers_min12 · School_Closed · Attention_Hungry							−6.79*	−7.18**
							(−1.94)	(−2.34)
Fraction_Fathers_min12 · School_Closed · Easy_Monitoring							2.98	4.37
							(0.75)	(1.01)
lnAUM		4.84		5.01		5.00		4.84
		(0.94)		(0.98)		(0.99)		(0.97)
lnConfirmed		0.51		0.51		0.51		0.60
		(1.07)		(1.08)		(1.06)		(1.27)
Constant	0.51	−27.14	0.62	−27.81	0.65	−27.77	0.39	−28.21
	(0.15)	(−1.11)	(0.18)	(−1.15)	(0.19)	(−1.16)	(0.12)	(−1.17)
Fund and Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.14	0.19	0.15	0.20	0.15	0.21	0.15	0.21
Nobs	994	880	994	880	994	880	994	880

Notes. This table reports the estimation results for the regression of the ex post hedge fund abnormal returns in 2020 controlling for parental status. *Easy_Monitoring* is a dummy variable that takes the value of one for those hedge funds styles that conventionally invest in the asset classes with a less time-consuming monitoring process. *Attention_Hungry* is a dummy variable that takes the value of one for those hedge funds styles with a more time-consuming monitoring process. All variable definitions are reported in Table 3. *t*-statistics are in parentheses. Standard errors are double clustered by country and time.

*, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

discuss all the robustness checks herein, and report detailed supplementary results in the online appendix.

1. We estimate the model with country and style fixed effects instead of fund fixed effects to allow using a wider set of fund-specific variables, including an indicator for different levels of female representation and other fund-specific controls, such as the fee structure and investor restrictions among others.

2. To verify that our results are not driven by country-specific representations of women in the hedge fund industry, we repeat the analysis using the subsample of countries that have both male and female managers.

3. To control for potentially poor in-sample performance of the Fung and Hsieh (2001) model, we restrict the analysis to funds for which the R^2 of the first-stage regression in Equation (1) is above 50%.

4. To check that the results are not driven by poorly performing funds, we repeat the analysis using only funds for which the estimated in-sample alpha in the first-stage regression is above the median.

5. To check that our results are not driven by a differential exposure of funds to various industries, we use 10 Fama–French industry portfolios as representative asset classes and regress hedge fund returns in the EP on the performance of these industry portfolios. The resulting

ARs are computed relative to the estimated exposure to the spectrum of equity industry portfolios.

6. We use an alternative specification of the benchmark model to compute hedge fund exposures and ARs. We use eight EurekaHedge hedge fund indices as representative asset classes, covering the major hedge fund strategies in our sample. These include the Arbitrage Hedge Fund Index, CTA/Managed Futures Hedge Fund Index, Commodity Hedge Fund Index, Emerging Markets Hedge Fund Index, Fixed Income Hedge Fund Index, Long-Short Equities Hedge Fund Index, Macro Hedge Fund Index, and Relative Value Hedge Fund Index.

7. We test different lengths of the EP. First, we use a 36-month EP, requiring funds to have at least three years of returns before 2020. Next, we use a 60-month EP requiring either a minimum of 24 or 36 return months before 2020. Hence, we require funds to be alive for two or three years before 2020 but use up to five years of return history if available to estimate factor loadings.

8. To further support the results on female managers' performance during turbulent market times, we estimate the model in the month following the Lehman Brothers bankruptcy, measuring the effect in October 2008. The *Post-Lehman* month witnessed large negative market returns and extremely high daily return volatility, similar to what is observed in September 2008 and March 2020.

9. We use the change in abnormal returns ΔAR_{it} as an alternative dependent variable.

10. We use propensity score matching to account for the possible effect of confounding variables, which can impact the observed outcomes. We match each hedge fund with a female manager in a country that experienced school closures to the most similar fund without female managers. The matching is performed using the average AR of the funds over the previous quarter to the shock-month, and we require the difference in the propensity scores to be less than 0.01 to call a pair of funds a match. Thus, we choose funds with the closest if not identical performance just before the school closure shock. We next test for the difference in means in their ARs during the school closure month. Although the sample is smaller with only 39 matched pairs of funds, our results hold. Funds with female managers underperform by a negative and significant 7.35% compared with −0.39% for all-male funds.

5. Conclusion

The exogenous nature of the recent COVID-19 pandemic and the hedge fund industry organization structure offer a near-ideal testing ground to assess the extent of the persisting disparity between genders in terms of unpaid care work. Lockdowns and unexpected school closures imposed by governments across the globe in response to COVID-19 have put a heavy strain on managers with caring responsibilities, hampering their ability to perform on the job. This, we show, has affected men and women differently as women carried most of the childcare. Our evidence shows that the increasing childcare responsibilities during the imposed nationwide school closures fell mostly on the shoulders of female managers, diverting their time and attention from work. Across all measures of female representation within hedge funds, we consistently find a negative and significant effect of school closures on the performance of funds with female managers unlike all-male funds whose performance is unaffected. This effect disappears when we run similar tests conditional on regular school holidays and another severe market shock (the Lehman Brothers bankruptcy in September 2008), for which we find that female managers perform at least the same if not outperform their male peers. Our tests using unique, hand-collected data on the family structure of managers support these findings, showing that the significant and severe underperformance during the lockdown is disproportionally carried by mothers. This effect is further amplified for mothers with young children and those working in attention-hungry hedge fund strategies. Our results are robust to alternative performance measures, longer estimation periods, and variations of model specifications.

Our findings are particularly concerning as attempting to redress gender imbalances is a key priority of almost every government and political organization in the world. According to a 2014 report by the Organisation for Economic Co-operation and Development (Ferrant et al. 2014), women spent 2 to 10 times more time on unpaid care than men. The International Labour Organization (2018) reports that women perform 76.2% of total hours on unpaid care work, more than three times compared with men, as supported by the March 2020 Generation Equality Action Pack by the UN (UN Women 2020). Our study holds important policy implications as we provide tangible evidence that these differences persist and some of the measures enacted to control the pandemic may have possibly turned back the clock on gender parity. We show that highly qualified, skilled, and educated women are not spared as they had to contribute significantly more than men to childcare during the lockdowns. Consequently, mothers bear the losses to their performance at work, which are significantly larger than those of fathers. Unless a radical social change takes place, gender equality is still a long way off.

Acknowledgments

The authors thank participants from the 14th International Risk Forum, Paris, France, and participants from the 2021 Paris

December Finance Meeting, France, for valuable comments. The authors are grateful to the Europlace Institute of Finance for the support of this project. Any errors remain their own.

Endnotes

[1] See the UNESCO Priority Gender Equality Action Plan (2014–2021, p. 6). https://unesdoc.unesco.org/ark:/48223/pf0000370905.

[2] The European Commission's Strategic Engagement for Gender Equality (2016–2019, p. 6) states, "Promoting gender equality is a core activity for the EU: equality between women and men is a fundamental EU value, an EU objective and a driver for economic growth. The Union shall aim to promote equality between men and women in all its activities" (https://ec.europa.eu/anti-trafficking/strategic-engagement-gender-equality-2016-2019_en).

[3] See, for example, Neate and Jolly, "Hedge funds 'raking in billions' during coronavirus crisis," *The Guardian*, April 9, 2020.

[4] We find inconsistencies between the databases when a hedge fund is large with multiple offices. In this case, the managerial country of residence cannot be precisely identified, and such funds are excluded from the analysis.

[5] See https://covid19datahub.io/.

[6] See https://alpha-maven.com/.

[7] We use all the original seven factors as well as the new emerging market factor and stock and interest rate trend following factors https://faculty.fuqua.duke.edu/dah7/HFRFData.htm.

[8] We also run all our tests using country and style fixed effects instead of fund and time fixed effects. With this specification, we are able to include a broader set of fund-specific controls (such as the fee structure and redemption terms, among others) as well as other fund-level female representation variables. Importantly, all results (especially the estimated coefficients of the interaction terms between the female representation variables and the school closure dummies) remain qualitatively unchanged. We report these results in Online Table S2.

[9] Note that the number of observations in the regressions including control variables is slightly lower than in the specifications without controls because of some funds not reporting their assets under management.

[10] See https://fred.stlouisfed.org/series/BAMLCC0A4BBBTRIV.

[11] See https://fred.stlouisfed.org/series/VIXCLS.

[12] We provide in Online Table S14 simulations of expected and abnormal returns from implementing (or not) dynamic allocation strategies on declining markets. Even though the simulations are implemented under simplified representations of the dynamic strategies, they illustrate that a very large spectrum of positive and negative abnormal returns can be achieved on such volatile markets.

[13] We thank the associate editor for this valuable suggestion.

References

Adams RB, Ragunathan V (2017) Lehman sisters. Working paper, University of Oxford, ABFER.

Agarwal V, Jiang W, Tang Y, Yang B (2013) Uncovering hedge fund skill from the portfolio holdings they hide. *J. Finance* 68(2): 739–783.

Aggarwal R, Boyson NM (2016) The performance of female hedge fund managers. *Rev. Financial Econom.* 29(1):23–36.

Aldrich HE, Pfeffer J (1976) Environments of organizations. *Annual Rev. Sociol.* 2(1):79–105.

Alon T, Doepke M, Olmstead-Rumsey J, Tertilt M (2020) Covid economics: Vetted and real-time papers. 4:62–85.

Alon T, Coskun S, Doepke M, Koll D, Tertilt M (2022) From mancession to shecession: Women's employment in regular and pandemic recessions. NBER Macroeconomics Annual 2021, Forthcoming.

Andrew A, Cattan S, Costa Dias M, Farquharson C, Kraftman L, Krutikova S, Phimister A, Sevilla A (2021) The gendered division of paid and domestic work under lockdown. IFS Working Paper W21/17, Institute for Fiscal Studies, London, UK.

Barber BM, Jiang W, Morse A, Puri M, Tookes H, Werner IM (2021) What explains differences in finance research productivity during the pandemic? *J. Finance* 76(4):1655–1697.

Bennedsen M, Simintzi E, Tsoutsoura M, Wolfenzon D (2022) Do firms respond to gender pay gap transparency? *J. Finance* Forthcoming.

Bertrand M (2020) Gender in the twenty-first century. *AEA Papers Proc.* 110:1–24.

Bertrand M, Chugh D, Mullainathan S (2005) Implicit discrimination. *Amer. Econom. Rev.* 95(2):94–98.

Bloom N, Sadun R, Reenen JV (2017) Management as a technology? NBER Working Paper No. 22327, National Bureau of Economic Research, Cambridge, MA.

Bordalo P, Coffman K, Gennaioli N, Shleifer A (2016) Stereotypes. *Quart. J. Econom.* 131(4):1753–1794.

Brenøe A (2018) Origins of gender norms: Sibling gender composition and women's choice of occupation and partner. Working Paper No. 294, Department of Economics, University of Zurich.

Brunnermeier MK, Nagel S (2004) Hedge funds and the technology bubble. *J. Finance* 59(5):2013–2040.

Bulcroft RA, Carmody DC, Bulcroft KA (1996) Patterns of parental independence giving to adolescents: Variations by race, age, and gender of child. *J. Marriage Family* 58(4):866–883.

Chen Y, Liang B (2007) Do market timing hedge funds time the market? *J. Financial Quant. Anal.* 42(4):827–856.

Coibion O, Gorodnichenko Y, Weber M (2020) Labor markets during the COVID-19 crisis: A preliminary view. NBER Working paper no. 27017, National Bureau of Economic Research, Cambridge, MA.

Core F (2020) Female innovative entrepreneurship and maternity risk. Working paper, ESE, Rotterdam.

Correll SJ, Benard S, Paik I (2007) Getting a job: Is there a motherhood penalty? *Amer. J. Sociol.* 112(5):1297–1338.

Daniere A (1965) Gary S. Becker. human capital: A theoretical and empirical analysis, with special reference to education. pp. xvi, 187. New York: National Bureau of Economic Research, 1964. *Ann. Amer. Acad. Political Soc. Sci.* 360(1):208–209.

Ferrant G, Pesando L, Nowacka K (2014) *Unpaid Care Work: The Missing Link in the Analysis of Gender Gaps in Labour Outcomes* (OECD Development Centre).

Fung W, Hsieh DA (2001) The risk in hedge fund strategies: Theory and evidence from trend followers. *Rev. Financial Stud.* 14(2):313–341.

Giuliano P (2020) Gender and culture. *Oxford Rev. Econom. Policy* 36(4):944–961.

Guidotti E, Ardia D (2020) Covid-19 data hub. *J. Open Source Software* 5(51):2376.

International Labour Organization (2018) Care work and care jobs for the future of decent work. https://www.ilo.org/global/publications/books/WCMS_633135/lang–en/index.htm.

Joenväärä J, Kauppila M, Kosowski R, Tolonen P (2021) Hedge fund performance: Are stylized facts sensitive to which database one uses? *Critical Finance Rev.* 10:271–327.

Kosowski R, Naik NY, Teo M (2007) Do hedge funds deliver alpha? A Bayesian and bootstrap analysis. *J. Financial Econom.* 84(1):229–264.

Liang B, Schwarz C, Sherman MG, Wermers R (2019) Share restrictions and investor flows in the hedge fund industry. Working paper., University of Massachusetts Amherst, Amherst.

Lu Y, Ray S, Teo M (2016) Limited attention, marital events and hedge funds. *J. Financial Econom.* 122(3):607–624.

Mincer J (1958) Investment in human capital and personal income distribution. *J. Political Econom.* 66(4):281–302.

Pfeffer J, Salancik GR (1978) *The External Control of Organizations: A Resource Dependence Perspective* (Stanford University Press).

Schultz TW (1959) Investment in man: An economist's view. *Soc. Service Rev.* 33(2):109–117.

Schultz TW (1960) Capital formation by education. *J. Political Econom.* 68(6):571–583.

Schultz TW (1961) Investment in human capital. *Amer. Econom. Rev.* 51(1):1–17.

Stiles P (2001) The impact of the board on strategy: An empirical examination. *J. Management Stud.* 38(5):627–650.

United Nations (2020) Policy brief: The impact of covid-19 on women. Report, https://www.unwomen.org/en/digital-library/publications/2020/03/womens-rights-in-review.

UN Women (2020) Gender equality: Women's rights in review 25 years after Beijing. Report, https://www.unwomen.org/en/digital-library/publications/2020/03/womens-rights-in-review.

Van Staveren I (2014) The Lehman Sisters hypothesis. *Cambridge J. Econom.* 38(5):995–1014.

Yermack D (2014) Tailspotting: Identifying and profiting from CEO vacation trips. *J. Financial Econom.* 113(2):252–269.

Zandberg J (2021) Family comes first: Reproductive health and the gender gap in entrepreneurship. *J. Financial Econom.* 140(3):838–864.

Zingales L (2000) In search of new foundations. *J. Finance* 55(4): 1623–1653.