Balancing Work and Childcare: Evidence from COVID-19 School Closures and Reopenings in Kenya

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Abstract

This paper identifies the impact of childcare on adult labor supply in the context of COVID-19-related school closures in Kenya, using discontinuities in when children in different grades were eligible to return to school. Using nationally-representative bi-monthly panel data, we find that a child returning to school increases adults' weekly work hours by 29% in the short run, concentrated among the most flexible margins of adjustment, particularly household agriculture. Contrary to evidence from high-income settings, effects are not gendered. However, equal average labor supply responses for women and men are driven by different mechanisms particular to low- and middle-income settings. Women free up more time than men when childcare burdens fall but also pick up more of the care that returning students provided to their younger siblings during school closures. Women also shoulder more of the reduction in child agricultural labor when students return to school, and shift from non-agricultural work into household agriculture (more easily combined with care of younger children). A back-of-the-envelope calculation suggests that school closures account for at least 40% of the overall drop in labor supply during the pandemic in Kenya, and a fall in GDP of 3.6%. Our results suggest policies increasing childcare access could substantially increase adult labor supply in low- and middle-income countries.

JEL codes: D13, H12, J13, J22, J43
Keywords: childcare, labor supply, gender, Kenya, COVID-19, school closures

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1 Introduction

The availability and cost of childcare have been shown to significantly affect adult labor supply in high-income countries, particularly for women. But there is less evidence on this relationship in low- and middle-income countries (LMICs), particularly in Sub-Saharan Africa (Halim, Perova, and Reynolds 2021). Yet, a historical perspective highlights the important role of women's labor supply in economic development (Boserup, Tan, and Toulmin 2013). Understanding how childcare and adult labor supply interact is therefore crucial in these settings.

Sub-Saharan African countries differ from high-income countries in many ways relevant to this question. Households have more children but also more adults on average (UN 2020). Formal early childhood care availability is increasing, but from a low base and there are concerns around quality and cost (Samman et al. 2016). Female labor force participation is high but concentrated in informal activities (ILO 2017). Family farm or non-farm enterprise work is widespread, and may be more accommodating of childcare needs than wage employment. Women are more likely than men to be engaged in own-account or contributing family work—less likely to have access to social protection and more exposed to economic cycles—and particularly so if they have children (Lo Bue et al. 2021). Critically, older children play an important role in household productive activities (Kielland and Tovo 2006), including sibling childcare (Jakiela et al. 2020), meaning they are not just childcare recipients within the household. It is not clear *a priori* how these differences affect the relationship between household childcare needs and adult labor supply decisions.

An important factor influencing household childcare needs is the availability of low- or no-cost schooling. In 2020, countries around the world closed schools in response to the COVID-19 pandemic. This paper leverages school closure policies in Kenya as exogenous shocks to provide empirical estimates of the impact of childcare responsibilities on adult labor supply in a LMIC setting. Kenya closed all schools nationwide after its first COVID-19 cases in March 2020, partially reopened schools for specific grades in October 2020, and fully reopened for all grades in January 2021. Household childcare needs increase during school closures creating trade-offs for adults' time allocation across childcare, work within and outside the homestead, and other activities.

We exploit quasi-random variation in when children enrolled in different grades were eligible to return to school to implement a difference-in-differences analysis comparing changes in labor supply after the October partial reopening for adults in households with children in grades 4 or 8—eligible to return (99% did)—against those with children in adjacent grades. Our data consists of a nationally representative bi-monthly panel from the Kenya COVID-19 Rapid Response Phone Survey, including modules specifically on detailed household composition, adult labor, childcare, and child labor. The timing of surveys is ideally suited for our study, with two rounds conducted when schools were fully closed, one round exactly after the partial reopening, and one round after all schools reopened.

Labor effects of the partial reopening are concentrated on the intensive margin: weekly work hours increase by 4.7 (29%) after the partial reopening for adults with a child eligible to return to school, driven by a 33% increase in household agriculture hours. We find no effects on wage employment hours, household enterprise hours, or on the extensive margin of employment in the weeks following the reopening.[1] Household agriculture is likely more flexible in allowing adults to adjust working hours after a change in the childcare burden; participation in household agriculture was also less affected by the pandemic. In line with this, average labor impacts are driven by agricultural households and adults that were able to continue working during the school closures period. Less wealthy households—based on an index of housing and assets—increased work hours by significantly more than wealthier households. Poorer households are more likely to engage in agriculture and may have had fewer resources to deal with increased childcare needs during closures. Consistent with the strongly increasing returns to childcare observed in our data, the partial reopening does not affect labor supply in households with both children eligible to return to school *and* children in adjacent grades—changes in the childcare burden and in child labor are muted in these households.

Surprisingly, the impacts of the reopening are not significantly different by sex, contrasting with evidence on pandemic labor supply changes from high-income contexts (see e.g., Alon et al. 2021; Amuedo-Dorantes et al. 2020; Collins et al. 2021; Hansen, Sabia, and Schaller 2022; Heggeness 2020) and expectations based on women's role as primary caregivers in most Kenyan households. One reason for the lack of difference is that in our sample, both sexes contribute substantially to childcare. Women report 40 per week on childcare on average before the pandemic while men report 25, and both increased childcare hours during school closures by approximately 15 hours per week. However, the similar average labor supply increases for men and women after schools reopen are driven by different but offsetting mechanisms for men and women that are particular to lower- and middle-income settings.

First, school-age children in Kenya (and many LMICs) are both *receivers* of childcare and *contributors* of childcare to younger siblings. Men's childcare engagement focuses primarily on school-aged children. They thus benefit from fairly consistent reductions in childcare hours when a student returns to school, and are consequently able to increase labor supply across all activities. Women also care for school-aged children but in addition have the primary care responsibility for children below school-age, which is supplemented by older siblings who can often be net providers of childcare. While women benefit more than men from childcare reductions when there are no young children present, in other households they lose any childcare support they had been receiving from the returning student after the reopening. In households with below-school-age children, women actually *increase* their childcare hours when older children return to school. Women in these households shift from non-agricultural work into household agriculture (more easily combined with care of younger children), and their total labor supply does not increase leading to null average effects of the partial reopening in households with children below school-age. These results highlight the importance of sibling childcare in this setting, and demonstrate how women with young children could increase their labor supply with access to similar childcare while their older children are in

1. Analysis of longer-term impacts is complicated by the fact that schools fully reopened in January 2021, meaning our comparison group also becomes 'treated.'

school.

Second, school-age children in many households contribute to productive activities, including household agriculture. The partial reopening coincided with the main harvest season for most of Kenya, and adult hours in household agriculture increase by more after schools reopen in households where children were engaged in household agricultural labor during school closures. The evidence indicates that part of this increase is driven by adults making up for reduced child agricultural labor after a child returns to school. In these households, women pick up most of the slack, and—mirroring what we find for households with below-school-age children—substitute labor supply away from potentially more productive wage employment and self-employment in household enterprise. One reason for this is that work on the household farm is more compatible with contemporaneous childcare requirements for younger children. Together, these mechanisms indicate that even if overall labor supply responses to the reopening are similar for men and women, childcare still represents a constraint that affects women differently from men.

This paper makes three main contributions. First, we consider how formal childcare for school-age children (through schooling) affects households through changes in both childcare burdens and availability of child labor in a context where labor in home production is common, providing evidence on an under-explored dimension of the relationship between childcare and adult labor supply (e.g., Browning 1992; Connelly 1992; Ribar 1992). Moreover, we highlight how differing gender roles in the care of children of different ages lead to potentially different labor supply responses by men and women to childcare shocks affecting only some children. The current literature largely studies childcare for below-school-age children and treats children solely as childcare recipients, while focusing on settings dominated by wage employment (Morrissey 2017). These characteristics do not generalize to many LMIC contexts. Among studies of childcare and labor supply in Africa (Bjorvatn et al. 2022; Clark et al. 2019; Delecourt and Fitzpatrick 2021; Heath 2017; Lokshin, Glinskaya, and Garcia 2000; Martinez, Naudeau, and Pereira 2012; Quisumbing, Hallman, and Ruel 2007), causal identification is limited,[2] only two include rural areas, and none consider the role of children as household labor providers. This paper estimates causal impacts of a change in household childcare needs and child labor availability using a natural experiment with a nationally-representative sample of households in an African country with most adults engaged in household farm and non-farm enterprise rather than wage work. Analyzing a shock affecting formal care provision for school-age children further allows us to shed light on the role of child household labor in the relationship between childcare needs and adult labor supply.

Second, we demonstrate that a change in children's labor availability around harvest time due to the school calendar impacts parents' labor supply decision. This result is consistent with evidence on the importance of the timing of school breaks for both child and household outcomes in LMICs (Admassie 2003; Allen 2022; Duryea and Arends-Kuenning 2003; Ito, Shonchoy, et al. 2020; Kadzamira and Rose 2003). Much of this literature has focused on impacts of school calendar

2. In a systematic review of the literature identifying causal impacts of childcare on mothers' labor market outcomes in LMICs, Halim, Perova, and Reynolds (2021) identify 22 studies, but just 6 are from outside Latin America and only one reports on an African country.

policy on outcomes for children. We show that adults in Kenya make up for reductions in child labor when a student returns to school by increasing their time allocation to household agriculture, sometimes substituting away from other occupations.[3] More generally, we contribute to a broad literature on child labor in low-income settings (see e.g., Basu and Van 1998; Beegle, Dehejia, and Gatti 2009; Bharadwaj, Lakdawala, and Li 2020; Udry 2006), further demonstrating how children can play an important role in household agricultural production in particular. The substitution between child and adult labor supply at peak agricultural times has important implications for both children's education and household agricultural production as Kenya's school calendar shifts in the years following the COVID-19 pandemic to return back to its pre-pandemic schedule.

Finally, we also contribute to understanding labor impacts of pandemics and pandemic-related policies—school closures in particular. Many studies have analyzed the gendered effects of the COVID-19 pandemic on childcare and employment (see e.g., Alon et al. 2021; Amuedo-Dorantes et al. 2020; Collins et al. 2021; Del Boca et al. 2020; Furman, Kearney, and Powell 2021; Giurge, Whillans, and Yemiscigil 2021; Hansen, Sabia, and Schaller 2022; Heggeness 2020; Liu, Wei, and Xu 2021; Prados and Zamarro 2021; Zamarro and Prados 2021). These primarily report on high-income settings and fairly consistently find that increased childcare burdens have contributed to greater adverse labor effects for mothers during the pandemic. In particular, Prados and Zamarro (2021) find that school closures in the United States increased childcare responsibilities for mothers relative to fathers and that this persisted after schools began to reopen, while transitions out of employment for working mothers appear more persistent than for working fathers. Descriptive evidence on the gendered impacts of COVID-19 in LMICs (Casale and Posel 2020; Chauhan 2020; Deshpande 2020; Grantham et al. 2021; Kugler et al. 2021; Torres et al. 2021)[4] suggests that women increased domestic work and reduced their labor supply during pandemics more than men, but causal estimates demonstrating the role of childcare in labor supply changes are lacking.[5] We show that time spent on childcare increased by about the same amount for both women and men in Kenya during the COVID-19 school closures in 2020, and returned to pre-pandemic levels after schools reopened in 2021. Contrary to evidence from other contexts, we find that the partial reopening of schools in October 2020 significantly increased adults' labor supply with no significant difference by sex, driven by different, but offsetting, mechanisms for women vs. men. Building on this result, we calculate that pandemic school closures decreased work hours across Kenya by 2.8 billion in 2020, and account for at least 40% of the overall hours reduction during the COVID-19 pandemic. At the average hourly earnings in the data, this represents a cost of USD 3.4 billion (3.6% of 2019 GDP).

That the policy responses to the COVID-19 pandemic tended to decrease labor supply more for women than men on average globally re-focused attention on how the burden of balancing childcare needs with labor supply falls primarily on women. It has long been known that reducing house-

3. Allen (2022) reports that households in Malawi respond to harvest-period overlap with the school calendar by increasing expenditure on hired labor, which is not measured in the RRPS.

4. Wenham et al. (2020) report on impacts of the Ebola crisis in Sierra Leone and Liberia for women and men.

5. Ma, Sun, and Xue (2020) analyzes the impacts of school closures on parents' labor in Shaanxi province, China, but we are not aware of similar studies in an African country.

hold childcare burdens can increase female labor force participation, and the pandemic has shown how the inverse is also true. By further demonstrating how older siblings play an important role in household childcare and household labor in Kenya, this paper emphasizes how policies improving childcare availability—such that their older children are not parents' main alternatives—could broadly increase adults' labor participation in an African LMIC context including in rural agricultural households, and particularly benefit women as the primary caregivers for children below school-age.

The remainder of the paper is organized as follows. In Section 2 we describe the context around COVID-19 and school closures in Kenya, discuss the data used in this paper, and present descriptive statistics on childcare during the pandemic in Kenya. Section 3 presents the empirical approach. Section 4 presents overall results on the impacts of school reopenings, while Section 4.1 analyzes heterogeneity and Section 4.2 explores mechanisms. Section 5 discusses the findings and Section 6 concludes.

2 Context and Data

This section summarizes Kenyan COVID-19 school closure policies, the data we use to analyze their impacts on labor supply, and information on childcare arrangements.

2.1 Kenyan School System and COVID-19 Closure Policies

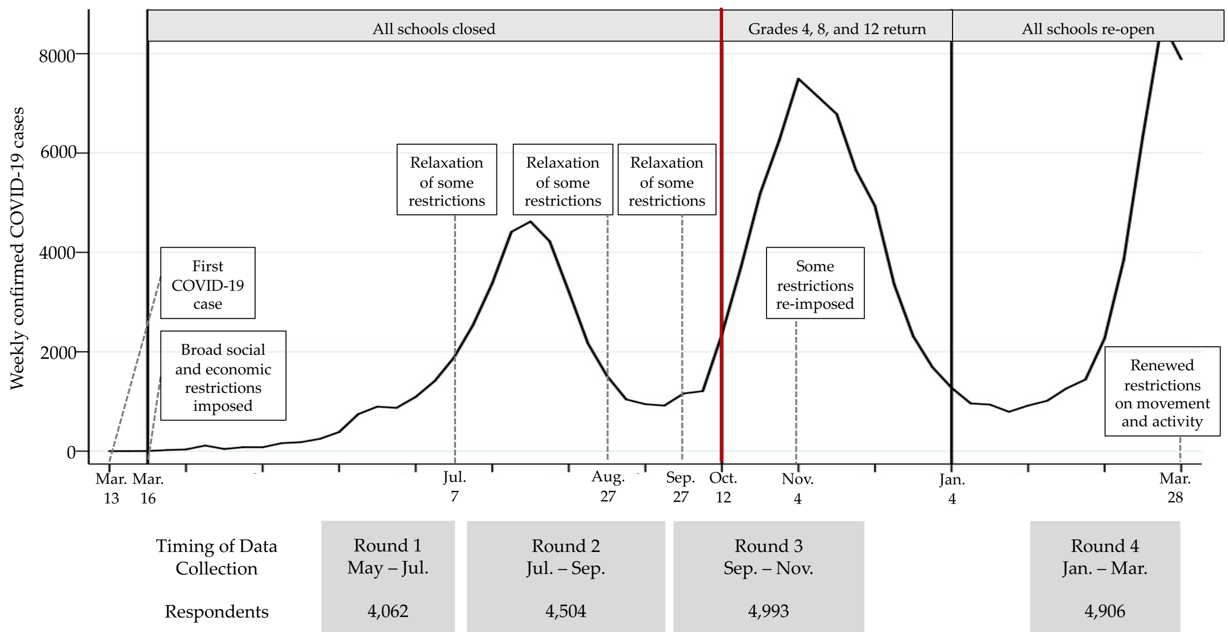
Public primary and secondary education in Kenya is free for all children starting around age 6, and education is compulsory for the first nine years. Pre-primary education has also become broadly available for children ages 4 and 5. Though public education is nominally free, households pay for a variety of school-related costs such as materials, meals, and examinations. These costs are typically in the range of 25-75 USD per year for primary schools (Zuilkowski et al. 2018) and 100-500 USD per year for secondary schools (Bonds 2021), with higher costs for private and boarding schools. Academic years in Kenya begin in January and end in late October, and consist of three terms.

Schools in Kenya closed on March 16, 2020, days after the first reported COVID-19 cases, as part of a broad set of national restrictions to reduce the risk of disease transmission. The rest of academic Term 1 was cancelled. Figure 1 shows a timeline of school closures and reopenings, other key pandemic-related policy changes, and weekly confirmed COVID-19 cases in Kenya.[6] Pandemic school closure policy in Kenya was decided nationally. Top-down changes in policies thus represent exogenous shocks to households, unrelated to local economic or health conditions.

On September 15, the Ministry of Education released guidelines for safe reopening of schools, but the timing and nature of reopening remained uncertain until October 6, when the Ministry announced that students in grades 8 and 12—those sitting national exams—along with students in grade 4 should return to school on October 12 for Term 2 of 2020. This announcement was presented in the media as "a shocking move that caught parents and candidates off guard" (The Star 2020). On

6. An overview of specific pandemic-related policies is presented in Appendix C.

Figure 1: Kenya COVID-19 cases, pandemic policy, and data collection timeline



The figure shows the evolution of weekly confirmed COVID-19 cases in Kenya over time, along with the timing of key pandemic policy changes. The red bar indicates the partial school reopening on 12 October, the focus of the analysis. 'Relaxation of some restrictions' indicates that one or more of the initial pandemic constraints were at least partially reduced. Specific policy changes are outlined in Appendix C. Sources: COVID-19 government response timeline for Kenya; Kenya COVID Tracker; Presidency of Kenya; Kenya Ministry of Education Twitter feed; COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University

November 4, the President announced that schools would reopen fully for all students on January 4, 2021 to complete the 2020 school year. There were no additional fees incurred when schools reopened as parents had already paid fees for the 2020 school year, but some parents may have been asked to pay outstanding bills from before the school closures and others may have paid for new materials or extra lessons.[7]

Students in grades 4, 8, and 12 returned for Term 3 from January-March 2021 while all other students returned for Term 2; their Term 3 was shifted to May-July 2021. Grade 8 and 12 students sat national exams in March-April. 2021 Term 1 for all students began in late July 2021. Terms and breaks for the 2021-2023 academic calendars were shortened to allow a gradual return to the standard pre-pandemic term schedule (running from January-October) in time for the 2024 academic year.

We focus on the impacts of the partial school reopening for several reasons. First, unlike initial school closures, the partial reopening did not coincide with other pandemic-related policies, allowing for cleaner identification. Second, we can exploit discontinuities in the timing that children enrolled in different grades were eligible to return to school to isolate the effect of the childcare shock.

7. There are some additional costs associated with national exams, but these were paid by the government for all candidates at the time of the exams in Spring 2021.

Further, because households vary in whether the students eligible for the partial reopening are net contributors or receivers of childcare—depending on the presence of younger siblings—this shock sheds light on the importance of sibling-provided childcare.

2.2 Data

Data come from the Kenya COVID-19 Rapid Response Phone Survey (RRPS) panel, collected by the World Bank in collaboration with the Kenya National Bureau of Statistics and the University of California at Berkeley (Pape 2021).[8] The main sample ($\sim$ 80%) is drawn from the nationally-representative Kenya Integrated Household Budget Survey conducted in 2015-2016, and this sample is supplemented by random digit dialing. The sample is intended to be representative of the population of Kenya using cell phones—80% of households nationally report owning a mobile phone, and these have better socioeconomic conditions on average than households that do not (Pape et al. 2021). We use data from the first four survey rounds, covering May 2020-March 2021. In addition, we construct measures for February 2020, before the first COVID-19 cases in Kenya, using recall questions from the first round.

The outcomes of interest are measures of labor supply.[9] The extensive margin is measured by participation in the last 7 days in three activities: employed/wage labor, household non-farm enterprise, and household agriculture. The intensive margin is captured using hours of work by activity in the last 7 days; an individual not working in a given activity is coded as working 0 hours.

The survey also includes data on total child hours spent working in household agriculture. Child agricultural labor is reported by 42.7% of agricultural households.

Household roster data includes the age and sex of all household members, as well as school enrollment information for all children. Information on what grades children were enrolled in prior to the initial school closures allows us to identify households affected by the partial reopening. Nearly 99% of eligible students are reported to have returned to school.[10]

We define 'treatment' households as those with children enrolled in grades 4 or 8 prior to the pandemic (eligible for the partial reopening) while 'control' households have children in grades 3, 5, 6, 7, or 9, but not in grade 4 or 8.[11] We separate 'mixed' households with children in both grade groups from 'treatment' households as they might experience different effects when not all children in the relevant grade range return to school. The main analysis sample includes 335 treatment, 361 mixed, and 948 control households.

Finally, the data include questions on household childcare arrangements, including childcare hours though this is only reported for the survey respondent over the time period of the partial

8. See Appendix D for more detail.

9. We use the term labor 'supply' to refer to equilibrium outcomes, acknowledging that individuals may have been willing to supply additional labor but faced limited demand.

10. A survey of 3,000 grade 8 students in Busia County, Kenya similarly shows that 97% reported back to school after the partial reopening (Bonds 2021). Across all grades, 97% of previously enrolled students in the RRPS returned to school after the full reopening in January 2021.

11. Few households report any children in grade 12. Results are robust to including grade 12 students in the treatment definition and grade 10 and 11 students in the control definition (Table A10).

reopening. The survey asks about time spent on childcare in the last 7 days, but does not distinguish between time actively spent caring for a child and time spent on other activities while responsible for a child.[12] We topcode reported childcare hours at 140, or 20 hours a day.[13]

2.3 Childcare Arrangements

At least 93% of children at each age from 6-16 in the RRPS are reported to have been enrolled in school in February 2020. After the March closures these children were all home requiring care and supervision during the working day, representing a large and unexpected shock to household childcare needs. Children primarily stayed at home with a parent during the closures (Figure A1), including in situations where parents were simultaneously working. Almost no households report their children spending time with childcare providers outside the home or with a maid/domestic helper at home, and this does not vary by rural/urban setting or change as pandemic restrictions were relaxed and case numbers fluctuated. Adults with schoolchildren at home will have faced trade-offs in their allocation of time across childcare, work in different sectors, and other activities given a limited time budget to accommodate increased childcare burdens.

Figure 2 Panel A shows how hours of childcare from different providers (excluding schools) vary with the number of household children among analysis sample households (with at least one child in any grade from 3 to 9). We present data from the January-March 2021 survey round after schools fully reopened, as previous survey rounds only include data on the respondent's childcare hours.

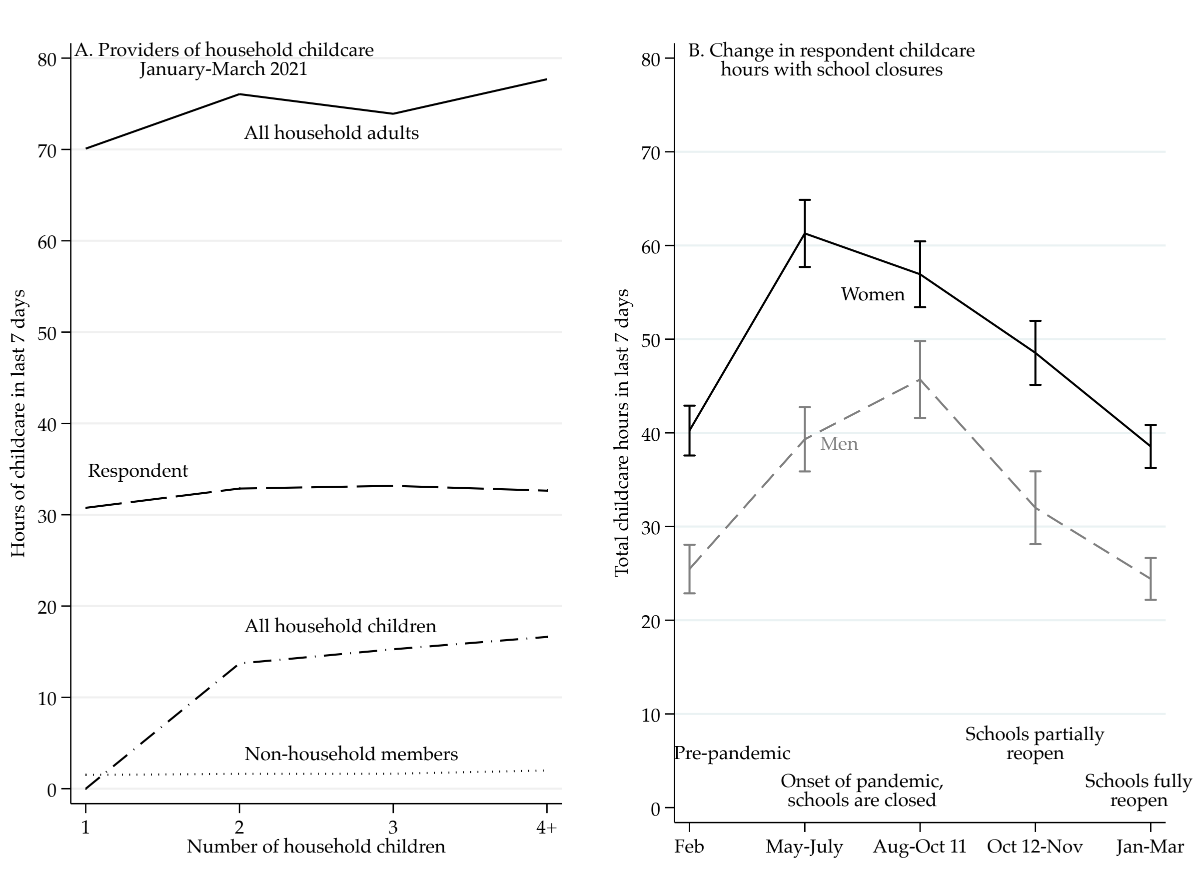
Non-household members provide very little childcare on average—86% of households with children report 0 hours of care from non-household members in the last 7 days. While childcare availability has been increasing in Kenya (particularly in urban areas), affordability remains a challenge for most households (Clark et al. 2021; Murungi 2013). Positive hours of care from non-household members after the full reopening of schools suggest that use of such sources of childcare was particularly limited during school closures when almost no households reported children being cared for by non-household members. Reported use of childcare providers outside the home does not increase significantly over the rest of 2021 as reported in later rounds of the RRPS, suggesting this is not driven by pandemic concerns or restrictions.

Other adults besides the parents are present in 37% of households with children, and on average provide around 10 hours per week of childcare. Siblings also play an important role in childcare, consistent with Jakiela et al. (2020). In households with at least 2 children 55% of children provided childcare to siblings in the last 7 days, for 15-20 hours on average in total, demonstrating how childcare burdens can also fall on household children. Sibling care hours may overlap with adult care hours, if for example siblings are providing childcare while an adult is present with overall care responsibility. To the extent that this is true, changes in sibling care provision would affect

12. The survey explicitly asks respondents to consider time spent providing childcare alongside other activities, asking "In the past 7 days, how many hours have you spent doing childcare for your household, even if it overlapped with other tasks?"

13. This recognizes that, for young children especially, care responsibilities spill into sleeping hours. Results are qualitatively the same when topcoding childcare hours at 112, or 16 hours a day.

Figure 2: Childcare hours in the last 7 days among analysis sample households, by provider of care and school closure status



The figures show mean childcare hours in the last 7 days among analysis sample households (with at least one child in any grade from 3 to 9), by number of household children (ages 0-17) and by time period. Patterns are very similar when considering all households with at least one school-age child (age 5-17) (Figure A2).

Panel A presents data from RRPS round 4 (January-March 2021) which asks about childcare hours for each household adult, for all children in total, and for all non-household members in total. Previous rounds only ask about childcare hours for the respondent. The hours for 'all household adults' include the respondent's hours.

Panel B presents data for female (black) and male (gray) *respondent* childcare hours over time as school closure policies changed. Data on childcare hours before and during the school closures period for other care providers are not available.

the intensity of adult childcare provision (which we do not measure) more than the number of adult childcare hours. Sibling childcare provision as reported by a household adult may primarily represent 'active' childcare since that would be most easily observed and recalled by the respondent, and since they might report supervised sibling care-giving under their own childcare time rather than the child's. If this is the case, total hours of sibling childcare may be higher than what is reported in the survey. Sibling childcare hours were likely higher during school closures as school-age children were at home, but we only measure sibling childcare after the full reopening.

Respondents in the analysis sample provide 30-35 hours of childcare on average per week,[14] and this increases very little after the first child. This is likely due to a combination of how childcare is measured in the data and different dynamics of childcare by child age. The survey measure of childcare includes 'passive' childcare when the adult is responsible for the child but not actively providing care, meaning that adults responsible for their children for all (or most) of the day will report spending the same number of hours on childcare regardless of their number of children. But while 6.7% of respondents in round 4 after schools fully reopened and 15.6% in round 2 while schools were closed report spending at least 16 hours per day on childcare over the past 7 days, median reported childcare hours over the last 7 days are 20 in round 4 and 40 in round 2, suggesting overly broad measurement of childcare hours is not solely responsible for the limited increase as the number of children increases.

Households with more children may benefit from some economies of scale in childcare, but more generally some of the children will be older and thus require less care. Indeed, some older siblings will be net childcare providers. The importance of sibling childcare in this setting suggests that a student returning to school might increase rather than decrease parents' childcare burden, in situations where they were net childcare providers while at home.

Figure 2 Panel B shows that while female respondents provide around 15-20 more childcare hours than men outside the school closures period, men still contribute around 25 hours on average. This contrasts with the image of fathers in African countries as primarily providing economic support and little childcare, but is consistent with recent evidence (Clark, Cotton, and Marteleto 2015; Kah 2012).

Childcare hours increased significantly for both women and men during the school closures period, with a larger initial increase for women before the gender gap returned to pre-pandemic levels. This pattern is similar to findings of increases in domestic work during the pandemic for both men and women, but larger for women, in India (Deshpande 2020), South Africa (Casale and Posel 2020), and many higher-income countries (see e.g., Andrew et al. 2020; Del Boca et al. 2020; Farré et al. 2020; İlkkaracan and Memiş 2021). Childcare hours began to drop in October-November 2020, coinciding with the partial reopening of schools.[15] After schools fully reopened, respondent childcare hours returned almost exactly to pre-pandemic levels.

3 Empirical Approach

We identify the effect of partial school reopenings through a difference-in-differences analysis comparing outcomes before and after the reopening between households with and without children who

14. Respondents provide 46% of total household childcare on average, which aligns with expectations of parents being the primary care providers, with both parents involved.

15. In survey rounds 1 and 2 (May-September), respondents were asked to report only their own childcare hours. In survey rounds 3 and 4 (October-March), they were also asked to report childcare hours for other household adults. This change may explain part of the drop observed from August-October 11 to October 12-November, if it led respondents to reassess downward their own childcare hours in the context of total adult childcare hours.

are eligible to return to school.[16] We estimate regressions of the form

$$y_{iht} = \alpha + \beta_1 \cdot Post_t \times Treat_h + \beta_2 \cdot Post_t \times Mixed_h + \mu_h + \tau_t + \epsilon_{iht} \quad (1)$$

where y_{iht} are outcomes for adults (age 18-64) i in household h at time t, or household-level outcomes. In some cases, outcomes are only available for the household respondent. $Post_t$ is an indicator for observations after the partial reopening on 12 October 2020. We include observations from May-November, omitting data from after schools fully reopened.[17] $Treat_h$ is an indicator for whether all household children in grades 3-9 were eligible to return to school. $Mixed_h$ is an indicator for whether the household has both eligible and ineligible children in this grade range. The omitted reference category is control households with children in this grade range but none eligible for the partial reopening. In some cases – particularly when studying mechanisms – we drop mixed households for a cleaner comparison, as their responses may be muted due to the presence of multiple children around the same age. Household fixed effects μ_h absorb time invariant characteristics of households which may affect labor supply outcomes. Month fixed effects control for common shocks affecting households over time. We test robustness of the main results to specifications with different fixed effects and additional time-varying household- and individual-level controls and find that the coefficients generally remain stable (see Appendix F). We cluster standard errors at the household level.

Our empirical strategy exploits quasi-random discontinuities in which households are affected by the partial reopening. We compare households with children eligible to return to school (i.e., those in grades 4 and 8) to control group households with children in adjacent grades (i.e., those in grades 3, 5, 6, 7 and 9).[18] Causal identification is based on the argument that unobserved factors that could affect labor supply outcomes are continuous around the thresholds of children being in adjacent grades, and did not differentially affect treated and control households around the time of schools reopening.

Respondent and household characteristics are balanced across treatment and control households during the school closures period (Table A1). Mixed households with children in both treated and adjacent grades look different in terms of household composition by construction as they must have one additional child on average. This difference in household composition and the fact that not all children in the target grade range in mixed households return to school leads to predictions of muted impacts of reopenings on this group of households and may affect estimated impacts. We therefore present only the main results for mixed households, and focus on fully treated vs. control households only for mechanisms. The main results are robust to dropping mixed households from the analysis (Table A10), and the results on mechanisms are similar when including mixed households (Tables

16. Since schools partially reopened all at once, our two-way fixed effects estimator should not suffer from the negative weighting issues that arise in staggered difference-in-difference designs (see e.g. Callaway and Sant'Anna 2021; Goodman-Bacon 2021).

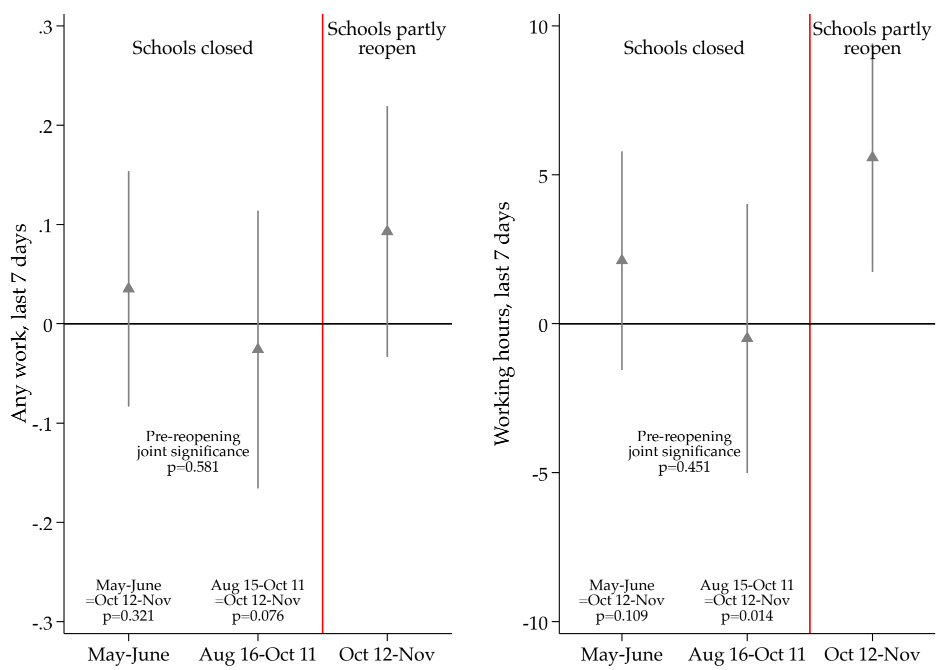
17. We do not show the estimated coefficients for *Post* as they are absorbed by the month fixed effects, where we include separate dummies for October 1-11 and 12-31.

18. Results are robust to various modifications in which grades are included in the control definition (Table A10).

A14 and A15).

Beyond being similar in levels, work hours trend almost identically for adults in treatment and control households from February to early October 2020. Differences emerge following the partial reopening but are eliminated after schools fully reopen, when all households become ‘treated’ (Figure A3). Figure 3 shows further evidence of parallel trends in labor supply while schools were closed. There are no significant differences between treatment and control adults in the periods when schools were fully closed, and there is no evidence of anticipation effects in the period from August 16 to 11 October.[19] The patterns are similar when considering women and men separately (Figure A4). Taken together, these patterns support the validity of the parallel trends assumption in our setting.

Figure 3: Impact of treatment on labor participation in the last 7 days, by time period



The figures show estimated coefficients and 95% confidence intervals for the interaction between *Treat* and time period from Equation 1, where *Post* is replaced with time period dummies, which also enter separately into the equation. Time periods prior to the partial school reopening are constructed to have roughly equal sample sizes. The reference period is July-August 15, while schools were closed and before the partial reopening was announced. The red bar indicates the timing of Kenya’s partial school reopening. Outcomes are any work engagement (left) and total work hours (right) in the 7 days prior to the interview. Treatment households have a child enrolled in grades 4 or 8, and control households have a child enrolled in grades 3, 5, 6, 7, or 9. We do not show coefficients for mixed households with children in both grade groups.
p-values for the test of joint significance of the pre-reopening coefficients and for tests of equality between the pre-reopening coefficient and the post-reopening coefficient are shown. Patterns are similar when estimating these regressions separately for women and men (Figure A4).

19. This is not surprising, as although there were indications from mid-September that schools could begin reopening in October, the specific timing and the partial nature of reopening was not announced until the week before students were invited to return to school.

To test for heterogeneous impacts of school reopenings, and to investigate underlying mechanisms, we interact all regressors in Equation 1 (except household fixed effects) with household or individual characteristics, corresponding to stacking separate regressions for each group. Moreover, we separately estimate treatment effects for households with a child in either grade 4 or grade 8 returning to school to test for differential impacts by the age of the child returning to school.

4 Results

Table 1 presents results for the impacts of partial reopening on labor supply. We include all adults aged 18-64 present in the household at the time of the survey. Results are similar if we include only survey respondents, whom we focus on in our analysis of mechanisms (Table A9). Among control households, 59% of adults were working during the school closures period. Mean work hours of 16.5 reflect that many workers were not working 'full-time'. Work is concentrated in household agriculture, despite 46% of the sample being classified as 'urban'—the categorization of urban locations in the RRPS includes city peripheries where agriculture remains common.

Table 1: Impacts of partial school reopening on adult labor supply

	N	Control Mean (SD)	Post x Treat (SE)	Post x Mixed (SE)
Engaged in any work in last 7 days	8538	0.592	0.083	0.048
		(0.491)	(0.051)	(0.051)
Engaged in wage employment in last 7 days	8538	0.063	0.011	-0.006
		(0.242)	(0.012)	(0.012)
Engaged in HH agriculture in last 7 days	8538	0.517	0.078	0.039
		(0.500)	(0.053)	(0.050)
Engaged in HH non-ag enterprise in last 7 days	8538	0.064	0.014	0.013
		(0.245)	(0.023)	(0.020)
Total work hours, last 7 days	8538	16.494	4.749***	0.594
		(19.914)	(1.825)	(1.799)
Wage hours, last 7 days	8538	2.089	0.459	-0.150
		(9.640)	(0.521)	(0.522)
Ag hours, last 7 days	8538	12.167	4.065***	0.877
		(15.644)	(1.512)	(1.519)
Enterprise hours, last 7 days	8538	2.315	0.310	-0.262
		(10.279)	(0.824)	(0.790)

This table presents estimates of Equation 1 for individual labor supply. Individuals not working in a given sector are coded as working 0 hours. From left to right, the columns show the dependent variable, number of observations, the control mean prior to the partial reopening, and the impacts of being in the partial reopening period for treatment households (Post x Treat) and mixed households (Post x Mixed). Impacts for control households are absorbed by month fixed effects. Control households have a child in grades 3, 5, 6, 7, or 9, treatment households have a child in grades 4 or 8, and mixed households have both. 'Post' is a dummy for being observed on or after the partial school reopening on October 12. Regressions include household and month fixed effects. Standard errors are clustered at the household level. Data include observations for adults age 18-64 from May to November 2020. Significant treatment impacts on total and agricultural work hours are robust to multiple testing adjustment using FDR q-values.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

We find sizeable and borderline significant effects of treatment on the extensive margin of labor supply. Households with children returning to school are 8.3 percentage points (or 14%) more likely to engage in any work in the last 7 days ($p = 0.105$) relative to control households after the partial reopening. Adult labor supply responses to schools partly reopening are even larger on the intensive margin. Work hours in the last 7 days increase by 4.7 (28.8%) relative to adults in control households ($p < 0.001$).

The increases in labor supply are driven by increased engagement in household agriculture: adults in treatment households increase their hours in household agriculture by 33.4%. Increases in wage labor and non-agricultural self-employment hours are 22% and 13% respectively, but neither is statistically significant. Greater impacts on household agricultural hours than in wage employment are not surprising given that we estimate short-term impacts in the weeks following the partial school reopening. Wage employment opportunities and hours may be constrained in the short run and take longer to adjust, while hours in household agriculture are more flexible. As we discuss in the mechanisms section, increased adult agricultural labor may also be a response to reduced child labor due to children who had been helping on the household farm returning to school.

The smaller 15% and non-significant impact on the probability of adults engaging in any household agriculture indicate that hours increase primarily among those already working in agriculture during the closure period. Household agriculture engagement was affected less than other work activities by school closures and other pandemic restrictions. Adults may have been more likely to pause their engagement in household enterprise—more exposed to infections and pandemic restrictions as well as potentially more challenging to combine with childcare—and slower to resume these activities after reopening.

'Mixed' households with children eligible to return to school as well as children in adjacent grades do not change labor supply following the partial reopening. This is consistent with the economies of scale in childcare hours we observe in our data: one child returning to school while another of a similar age stays home is unlikely to meaningfully change adult childcare burdens, and the child remaining at home may be able to help make up for reductions in sibling childcare or agricultural labor provided by the child returning to school. In our analysis of mechanisms we thus drop mixed households and focus on 'pure' treatment vs. control households for a cleaner comparison.

We conduct a variety of robustness tests, focusing on the main impacts on total working hours in the last 7 days (Appendix F). Estimated impacts of the partial reopening on treated households are nearly identical when using individual rather than household fixed effects and county-by-month rather than month fixed effects and are not sensitive to the inclusion of individual or time-varying household controls (Table A8). Results are also not sensitive to focusing on sub-samples of adults more likely to be parent caregivers or engaged in work, to omitting 'mixed' households from the analysis, or to varying which grades are included in the definition of treatment and control households (Table A10). Finally, results are robust to defining *Post* by the date the potential reopening was announced rather than the actual reopening date (Table A11). Slightly smaller estimated impacts in this specification together with no differential pre-trends suggest limited anticipation effects.

In addition to effects of schools reopening on individual labor supply we also consider short-term effects on household-level earnings by activity over the last 14 days (Table A2). We see no statistically significant effects of the partial reopening on household income, and the point estimate for the impact on total household income is close to zero for treatment households.[20] Earnings data are limited—for all activities the 90th percentile of household earnings in the analysis sample is 0—in part due to a focus on the last 14 days, which does not accommodate seasonality or other variability in earnings, limiting our ability to detect impacts on income. Moreover, returns to agricultural labor hours may take until after harvest to materialize. Economically small and statistically insignificant impacts of the reopening on reported income suggest efforts to acquire funds to pay costs associated with the return to school are not an important mechanism for the labor supply effects we observe. This is consistent with no school fees being due at the time of the partial reopening, though some households may have needed to purchase school materials and pay other school-related expenses.

4.1 Heterogeneity

We next look at heterogeneous effects of schools reopening on total adult working hours based on baseline household and individual characteristics. Estimated effects for each subgroup are reported in Figure 4. We focus on differences for treatment households, as effects of the partial reopening for mixed households are not statistically significant.

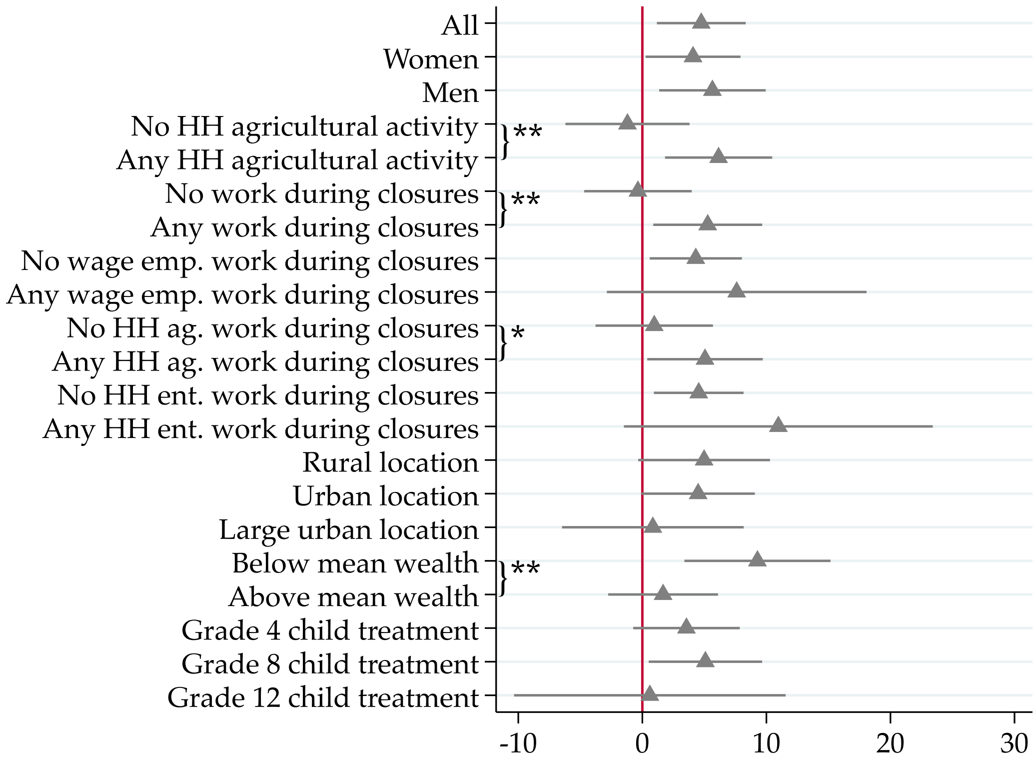
Somewhat surprisingly, impacts on work hours are not significantly different for women (54% of the sample) relative to men. This contrasts with evidence from high-income countries, which consistently shows larger effects of the pandemic on mothers' labor supply relative to fathers' and other women's (e.g., Alon et al. (2021) and Collins et al. (2021)). But this result aligns somewhat with the data on childcare hours in our context: responsibilities prior to the pandemic are less gendered than expected and both women's and men's hours increased by around 15 hours during school closures. The partial reopening shock thus affects both men's and women's labor supply, but the similar average increases in work hours for women and men partly reflect that women benefit more when the reopening represents a positive childcare shock, but bear more of the burden when it is a negative shock. We discuss this further in subsection 4.2.

The impact of partial reopening on work hours is large and positive for adults in agricultural households (61% of the sample, defined as households with any agricultural activity during any baseline round) but negative and not statistically significant in non-agricultural households, consistent with effects on total hours being driven by household agriculture. This may be a result of both household agriculture being the most flexible margin of labor supply in the short run, as well as adults compensating for potential shortfalls in on-farm child labor as children return to school. The non-significant impact in non-agricultural households suggests that childcare did not represent a binding constraint for non-agricultural households at this point in the pandemic, or that there were constraints on increasing wage or non-agricultural self employment in the short term.

In further support of the hypothesis that workplace flexibility is a key driver of heterogeneous impacts, we find that labor supply responses are concentrated among adults who worked at some point during the period of school closures (66%) and particularly by those that remained engaged in household agriculture (56%). Treated adults that worked while schools were closed increase their

20. Estimates remain statistically insignificant using logged income (adding 1 for households with no income).

Figure 4: Heterogeneity in impacts of partial school reopening on adult work hours



The figure summarizes estimated coefficients and 95% confidence intervals for the effect of $Post * Treat$ from Equation 1 for sub-samples with specified characteristics. Only coefficients for treatment households are shown. The outcome is total work hours in the 7 days prior to the interview. Results are reported in Table A3 (the coefficients are slightly different from those estimated on sub-samples but the results are qualitatively the same). Data include observations from May-November 2020. Household characteristics are from the first time they are observed. Wealth is measured by an index based on housing and asset ownership. Brackets indicate significant differences between pairs of characteristics.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

work time by 5.4 hours after one of their children returns to school, while those not working during the closures period do not significantly change their work hours after the partial reopening. The increase in the impact of the partial reopening is similar across adults continuing work in all sectors, though the difference compared to those that did not continue working is statistically significant only for work in household agriculture. This may be due to a lack of power, resulting from the small share of people working for either a wage (11%) or in a household enterprise (8%) during school closures. It may also be due to the fact that most adults that did not work in these activities engaged in household agriculture, while most of those that did not engage in agriculture did not work. The fact that adults who were able to continue working in wage employment or household enterprise during the school closures increase work hours by 8.6 and 8.5 hours per week respectively after the partial reopening—more than the 5.6 hours for those working in household agriculture—indicates how strongly labor supply to these activities can be constrained by childcare responsibilities. Taken together, these results suggests that households adjusted their labor supply in the short run on the most flexible margins by increasing hours in activities they were already engaged in, particularly in household agriculture.

We observe no differences in impacts between urban (46%) and rural households. Part of this stems from the fact that the definition of 'urban' in the data includes many peri-urban areas; over 35% of household classified as urban are engaged in agriculture. Low take-up of formal childcare services and low wage employment in the sample may also limit urban/rural heterogeneity. The difference in impacts by location remains non-significant when restricting urban households to those in counties with the largest cities in Kenya ('large urban' locations), though the point estimate for these counties is lower than the effect in rural areas. This is consistent with impacts driven by agricultural work.

Turning next to differences by household wealth we find that adults in poor households (39.4%) increase work hours by more than those in wealthy households. Treated households with below-mean wealth, measured as an index based on housing quality and asset ownership at baseline, increase their work hours by 9.3 after the partial reopening, compared to a non-significant increase of 1.7 hours for households with wealth above the mean. Below-mean-wealth households are around 30% more likely to engage in agriculture than wealthier households, and the wealth difference in impacts is substantially smaller, and no longer statistically significant, after conditioning on engagement in household agriculture. The fact that the wealth differential remains negative for both agricultural and non-agricultural households separately, however, suggests other potential contributing factors. In particular, poorer households may have had fewer resources to absorb increased childcare burdens during school closures and thus been more affected by the reopening. Moreover, some of the increased work hours in less wealthy households may partly be driven by a greater need for income to pay school costs for returning children. Although there were no fees associated with the return of grade 4 and 8 students to school, some households may have faced costs for transportation, materials, meals, etc. But we do not observe any increase in income in the last 14 days for treated households after reopening, and the point estimates are if anything negative. So while this mechanism may play a role in explaining the results, we do not observe it in the data.

While there is no significant difference in the average impact of the reopening by sex, the differences by household wealth are driven by men (Table A5). Male survey respondents work 22 additional hours after the partial reopening in households with below-mean-wealth but do not change work hours in above-mean-wealth households. For female respondents there is no difference by household wealth, with an increase of 5.9 hours in below-mean- and 4.8 hours in above-mean-wealth households. This reflects differences in how both childcare burdens and child agricultural labor change by household wealth, which we return to in section 4.2.

Finally, we consider heterogeneity by the grade of students returning to school. Children of different ages may differ in both their net demand for childcare as well as their net contribution to household economic activities. Figure 4 thus presents results separately for the sub-samples of households with a child around grade 4, around grade 8, and around grade 12.[21]

21. Full results are presented in Table A4. The patterns are similar if we use a categorical treatment grade variable

Work hours significantly increase by 30% for adults in treatment households with students in grade 8, around age 13-14, driven by increased hours in household agriculture. The impact is similar, at 21%, and borderline significant at the 90% level for households with grade 4 students around age 9-10 ($p = 0.105$), and we cannot reject that the effects are the same across these two grades. The estimated impact is close to zero and not statistically significant for households with a grade 12 student. This is consistent with there being no childcare advantage to children at this age returning to school, though the estimate is highly imprecise due to the small number of grade 12 students in the sample and we consequently cannot reject that the effect is the same as the effect of a grade 8 student returning to school.

Though the effect of child in grade 4 and a child in grade 8 returning to school are not statistically distinguishable, the differences in impacts by the presence of other children in grades adjacent to the treated grade suggest some importance of household composition in determining the effects of the partial school reopening on parents' labor supply, which we explore further in our analysis of mechanisms behind these effects.[22]

4.2 Mechanisms

We have shown that adult labor supply responses to the partial school reopening were positive, large in magnitude, and similar among women and men. Moreover, they were concentrated on the intensive margin, and in sectors and among households most flexibly able to accommodate increased hours. Namely, responses were largest in household agriculture, and for individuals who continued to engage in an economic activity throughout the school closure period.

We now turn to the mechanisms driving increased labor supply and the observed heterogeneity. A simple model of household production and labor supply guides our analysis (We describe the model in more detail in Appendix E). Adults in the household supply labor to home production as well as in the form of wage employment. In addition, they provide childcare to children present in the household and consume leisure. Adults get utility from consuming the returns to household labor, from leisure, and from altruistically caring about the welfare of their children.

Child well-being is subject to a constraint that total care received must not be below childcare needs, which vary by age and school closures. In line with the patterns in our data, we assume adult childcare provision is decreasing in child age and exhibits increasing returns to scale as a function of the number of children receiving care. Children present in the household are both recipients of childcare as well as potential contributors to home production and of childcare to other siblings. Whether they are net contributors or recipients of childcare depends on the child's age and the presence of other children demanding childcare.

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interacted with a dummy for 'mixed' over the full sample of analysis households.

22. Changes in work hours do not differ significantly by whether the household has more than two adults (Table A3), perhaps due to two competing mechanisms. Households with more adults may have spread out increased childcare burdens during school closures more than households with 1-2 adults, particularly if the third adult is a grandparent or another non-working adult, meaning that adults would then experience less childcare relief from a child returning to school. Conversely, they would also better absorb any reduction in sibling-provided childcare after the reopening. The larger point estimate for households with more adults suggests the second mechanism is stronger.

In the model, a child returning to school decreases the childcare demanded by that child while also reducing their provision of sibling childcare (if they have younger siblings), so the effect on the household childcare constraint depends on the returning child's net childcare demand. A child returning to school also provides less household labor in households engaged in home production, which increases adult returns in home production relative to work outside the household. Which effects dominate depend on the age distribution of household children and the economic activities the household engages in (which—in line with our main results—we consider fixed in the short run).[23]

Our model also differentiates by adult sex. When children (and in particular young children) benefit more from female care, or when social norms are such that the social cost of engaging in childcare relative to other activities is greater for men, women will engage in more childcare overall. Women are also more likely to engage in home production, since this work can be partially combined with childcare while wage work cannot. The model also predicts that women's labor supply effects after schools reopen will be skewed towards home production and more muted relative to men's when younger children remain in the household.

Our analysis of mechanisms is focused on impacts on household survey respondents. These are the only individuals for whom we observe childcare hours during the period around the partial school reopening and are also likely have lower measurement error in work hours. We exclude mixed households with children both in treated grades and in adjacent grades from our analysis of mechanisms. Separating treated households into pure treatment and mixed households is already implicitly testing for different effects by presence of additional adolescents in treated households. As shown above, we observe no significant impacts of the partial reopening on mixed households. The presence of other adolescent children remaining in the household after schools reopen—demanding both similar levels of childcare and providing similar levels of sibling childcare and household productive labor as their siblings who return to school—mutes the potential mechanisms by which one adolescent returning to school could affect parent labor supply. Results for treated households are similar when including mixed households in the analyses (see Tables A14 and A15).

4.2.1 Childcare

Schools reopening unambiguously decreases the childcare burden for household adults when there are no other children who do not return to school. Figure 2 documents substantial increasing returns scale in to childcare: reported adult childcare hours are similar for households with one vs. those with multiple children. In the presence of other children, therefore, demand for adult childcare may not decrease as much. In fact, it may even increase, as older siblings returning to school may have

23. In theory, school-related costs for a child returning to school may also lead to an income effect, increasing overall labor supply. But there were no additional fees incurred when schools reopened in Kenya. Though some parents may have paid outstanding bills and/or purchased school materials, this is unlikely to drive the labor supply effects we observe. Further, we do not find clear impacts of the partial reopening on measures of household income. We therefore concentrate our discussion of mechanisms for the increase in treated households' labor supply on changes in childcare and child labor.

taken part in the care of their younger siblings. This is common in our setting: while we do not directly measure childcare by older children provided to younger siblings during the study period, older siblings provide between 15-20 hours of childcare to younger siblings on average after schools fully reopened (Figure 2). Sibling childcare hours would likely have been greater while schools were closed.

Null effects of schools reopening on labor supply for mixed households in the previous section provide a first indication that this mechanism is important. When other children of similar age ranges remain in the household, the net childcare burden is unlikely to change substantially. Our results are consistent with this.

To further investigate the childcare mechanism, we test for differences in impacts of the partial reopening by the presence of young children in the household as our model suggests this would affect the likely direction of the change in childcare burden. We consider impacts on hours of work in household agriculture compared to hours in household enterprise and wage employment together, based on their differential flexibility in accommodating childcare needs. We also directly test for impacts on respondent childcare hours, the best available measure of the household childcare burden,[24] and analyze whether the direction and magnitude of changes in childcare hours align with changes in labor supply. We estimate all of these impacts for the pooled sample of all respondents first, and then separately for women and men and discuss differences in the childcare and work hours responses by sex.

Table 2 summarizes the results of these tests, presenting heterogeneous impacts of schools reopening on adult labor supply and adult childcare hours by the presence of younger children aged 0-4 in the household. These below-school-age children are the most important source of childcare demand in most households, and also the children most likely to receive care from older siblings.

The entire positive labor supply effect is driven by respondents without below-school-age children in the household (51% of the sample). Their weekly work hours increase by 8.3 hours (or 48%) after older children return to school, while those of respondents with below-school-age children to take care of increase by a much lower and statistically insignificant 3.0 hours (the p-value for the effects being equal is 0.252.)

Consistent with this, respondent childcare hours decrease after children return to school by a quantitatively similar 5.9 hours (or 11%) only for households without below-school-age children present. For households with young children, respondent childcare hours actually *increase* by 11.7 hours, a change that is in line with the average childcare hours provided by older siblings in our data, suggesting substitution of parent childcare for reduced sibling childcare. We observe a similar pattern for the change in childcare hours if we consider the presence of any younger child in the household (age 0-8), rather than any below-school-age child (Table A12). Increases in work hours after the partial reopening are thus driven by households without below-school-age children, where the reopening reduces the household childcare burdens on average.

24. Respondent childcare hours may be a reasonable proxy for changes in the household childcare burden to the extent that respondents (including men) are key providers of childcare in the sample households, and that childcare hours capture meaningful variation in the childcare burden.

Table 2: Impacts of partial school reopening by presence of children age 0-4 and respondent sex

Respondent last 7 days hours in	HH agriculture work			HH enterprise or wage work			Childcare		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post × Treat, No child age 0-4	4.568**	3.831	4.769	3.758*	4.263	4.068	-5.937	-10.545	0.349
	(2.195)	(2.570)	(4.158)	(2.094)	(2.848)	(3.073)	(6.213)	(8.302)	(9.572)
Post × Treat, Any child age 0-4	3.905	4.614	4.270	-0.941	-3.008	2.409	11.672	23.172**	-11.656
	(2.450)	(3.097)	(3.901)	(2.916)	(3.178)	(4.410)	(8.171)	(11.779)	(11.674)
Observations	2288	1331	902	2288	1331	902	2284	1328	901
Mean, pre-reopen control	12.947	11.702	14.827	6.325	5.509	7.651	52.747	60.059	41.175
Sample	All	Women	Men	All	Women	Men	All	Women	Men
p-value, diff. by Any child age 0-4	0.840	0.846	0.930	0.191	0.089	0.758	0.087	0.020	0.427

This table estimates impacts of the partial school reopening on respondent hours spent in the last 7 days on household agricultural labor (columns 1-3), wage employment and household non-agricultural enterprise labor (columns 4-6), and childcare (columns 7-9). Observations include data for survey respondents from May to November 2020, and include treatment households with children in grades 4 or 8 (indicated by 'Treat') and control households with children in an adjacent grade. 'Mixed' households with both types of children are dropped from the sample, though results are similar when they are included (Table A14). 'Post' is a dummy for being observed on or after the partial school reopening on October 12. Coefficients for 'Any child age 0-4' represent the sum of the $Post \times Treat$ and $Post \times Treat \times Any\ child\ age\ 0\text{-}4$ terms. We include p-values for tests of whether the interaction term is equal to 0. Regressions include household and month fixed effects. SEs clustered at household level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Impacts on childcare hours by presence of below-school-age children are similar for households where the child returning to school is in grade 4 and those where the child is in grade 8 (around ages 10 and 14 respectively), suggesting they have similar net childcare demands (Table A7). We cannot reject that the coefficients are the same across grades, but the differences in magnitude for impacts on childcare hours align with the intuition that grade 4 students would demand more childcare and provide less sibling childcare than grade 8 students.

Next, we test whether the childcare mechanism is gendered (with the caveat that we are running into slightly low power for these tests). Changes in household childcare needs are likely to affect female adults more than men, though our descriptive statistics suggest this may be less true in our context than elsewhere. Female respondents in control households report 60 hours of childcare in the last week on average during the school closures period, while men report 41 hours. Moreover, overall labor supply effects of school openings are similar for women and men, and both women and men reported childcare hours increasing substantially during the school closures (Figure 2).

The evidence for the childcare mechanism, however, is stronger for women (Columns 8 and 9 in Table 2). Their weekly childcare time decreases by 10.5 hours (17.6%) when no below-school-age children are present, but *increases* by 23.2 hours (38.6%) when they are. This is again roughly in line with average hours of childcare provided by older siblings. Women's labor supply effects, too, are qualitatively in line with this interpretation. They increase work hours by 8.1 hours when they do not have additional below-school-age children to care for, but do not work more after older children return to school when below-school-age children are present. In such households women appear able to absorb additional childcare demands without reducing their labor supply, potentially because they are primarily engaged in household agriculture.

The difference in labor supply impacts for women is driven by a large and significant effect of the presence of very young children on work hours in household enterprise and wage employment. Women in treatment households increase agricultural work hours after the partial reopening regardless of the presence of below-school-age children, but only increase non-agricultural work hours if they have no such young children. If they do, they work three *fewer* hours outside of household agriculture on average. This pattern suggests a substitution of labor supply hours from household enterprise and wage employment to household agriculture when the partial reopening increases the childcare burden. Such a substitution is consistent with household agriculture being more accommodating of multitasking with childcare. The consistent increase in household agriculture hours for women in treatment households can potentially be explained by the need to make up for reduced childcare agricultural labor, which we discuss in the next subsection.

Unlike women, men do not appear to provide the increased childcare needs for below-school-age children after older siblings return to school. If anything, their childcare hours decrease. Moreover, their labor supply effects of the partial school reopening are similarly positive whether below-school-age children are present or not. The difference by sex indicates that even though both women and men are involved in childcare in this setting, care of children age 0-4 is primarily the responsibility of women.[25]

If men's childcare responsibilities are primarily focused on monitoring older children then the partial reopening may particularly reduce their childcare burden while the impact on women—as primary caregivers for more demanding young children—would vary by whether there are younger children in the household which would have received care from their older sibling during the school closures. Tables A6 and A7 provide some evidence of this gendered distribution of childcare responsibilities. Though the impacts are not statistically significant, the average impact of the partial reopening on childcare hours is negative for men and positive for women (Table A7). The point estimates suggest that women take on more childcare while men take on less after reopening when children age 0-4 are in the household, while the opposite pattern holds for children age 5-8 (Table A6), consistent with women being the primary caregivers for the children needing most childcare while men take on additional care for school-age children during the school closures. This pattern is also suggested by different impacts on childcare hours by household wealth (Table A5). The partial reopening reduces men's childcare by 19.8 hours ($p = 0.136$) in below-mean-wealth households but does not affect it in above-mean-wealth households, indicating men picked up more of the increased childcare burden during the school closures period in poorer households.

Taken together, these results are consistent with net reductions in childcare for households without younger children being a main mechanism driving increased labor supply by adults, and in particular for adult women in the household. Men appear to benefit more generally from reduced childcare burdens when older children return to school as they appear to have more care responsibility for school-age children. We next turn to child labor as a potential alternative channel.

25. These differences by sex of the respondent are not driven by differences between female- and male-headed households, as the survey respondent is not necessarily the household head. In 30% of households, including 49% of households with female respondents, the respondent is not the head.

4.2.2 Child agricultural labor

School reopenings may also affect adult labor supply through reduced child labor, particularly as the timing coincides with the main harvest season for most of Kenya. In the 44% of agricultural households in the analysis sample reporting some child agricultural labor, children worked an average of 10.3 total hours per week (21.6% of the household total) during the school closures period.[26] Adults in agricultural households may therefore increase agricultural work hours in part to make up for reduced child labor when a child returns to school. This mechanism could also contribute to the difference in impacts of the reopening on work hours between agricultural and non-agricultural households (Figure 4), as child labor is not (as) relevant for the latter group.

We explore this hypothesis by testing for differences in labor supply impacts by child engagement in household agriculture, and by estimating impacts on total child agricultural labor. We compare results between all households and agricultural households (those engaged at agriculture in 2020, which should be the only ones affected by this mechanism), and test for differences by whether they reported children contributing labor to household agriculture during the school closures period. As with the analysis of the childcare mechanisms, we look separately at impacts on work hours in household agriculture and in household enterprise or wage employment, as substitution for reduced child agricultural labor should lead to an increase in labor supply to household agriculture only, and possibly to a decrease in labor supply to other activities if respondents' time is constrained. We focus first on impacts for the pooled sample of all respondents, then analyze differences in impacts by respondent sex and household wealth (which could be expected to be correlated with child agricultural labor).

Table 3 presents the results of the analyses for the pooled sample of respondents. Consistent with Table 1, impacts of the partial reopening are concentrated in household agriculture hours, with no significant effect on hours in non-agricultural activities (wage employment or household non-agricultural enterprise). The increase in respondent work hours is larger when considering the subset of households who engaged in any agriculture in 2020, as shown in Figure 4. Surprisingly, this is true for both agricultural and non-agricultural work hours.

The concentration of labor supply impacts in household agriculture could reflect that engagement in this activity is more flexible in the short-term than engagement in wage employment or household enterprise, but may also reflect substitution for reduced child agricultural labor. Column 3 of Table 3 suggests this mechanism does indeed explain part of the increase in agricultural work hours after the reopening. Respondents in agricultural households reporting no child agricultural labor before the reopening increase agricultural work hours by a non-significant 2.0 hours, while those in households reporting some child agricultural labor work a statistically significant 9.1 additional hours in household agriculture after the partial school reopening. The patterns are the opposite for work hours outside of household agriculture. Respondents in agricultural households double their

26. Moyi (2011) reports that around 30% of Kenyan children ages 6-14 engage in farm work (often alongside attending school). Child farm labor may be under-reported due to social desirability bias in answers, but is not correlated with treatment prior to the partial reopening (Table A1).

hours worked outside of household agriculture after the reopening—an increase of 5.3 hours—when they do not have children engaged in agricultural labor, increasing these hours by more than their agricultural work hours. But for respondents with children working in agriculture, non-agricultural work hours remain unchanged.

Table 3: Impacts of partial school reopening by child engagement in household agriculture, survey respondents

Last 7 days hours in	HH agriculture work (Respondent)			HH enterprise or wage work (Respondent)			Household agriculture (All household children)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post x Treat	4.177**	5.244**	2.019	1.717	3.366*	5.281**	-0.668	-1.009	-0.046
	(1.642)	(2.163)	(2.774)	(1.739)	(1.922)	(2.566)	(1.003)	(1.320)	(0.948)
Post x Treat × Any child ag labor before reopening			7.076*			-4.994			-1.945
			(4.272)			(3.809)			(2.428)
Observations	2288	1768	1768	2288	1768	1768	2288	1768	1768
Mean, pre-reopen control	12.947	16.806	16.806	6.325	5.325	5.325	4.167	5.409	5.409
Sample of households	All	Ag. HH	Ag. HH	All	Ag. HH	Ag. HH	All	Ag. HH	Ag. HH

This table estimates impacts of the partial school reopening on respondent hours of work in the last 7 days for household agriculture (columns 1-3) and other activities (wage employment and household non-agricultural enterprise, columns 4-6), and on total child agricultural labor hours in the last 7 days (columns 7-9). Columns with the 'Ag. HH' sample include households engaged in agricultural production in 2020. Observations include data for survey respondents from May to November 2020, and include treatment households with children in grades 4 or 8 (indicated by 'Treat') and control households with children in an adjacent grade. 'Mixed' households with both types of children are dropped from the sample, though results are similar when they are included (Table A15). 'Post' is a dummy for being observed on or after the partial school reopening on October 12. Regressions include household and month fixed effects. SEs clustered at household level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

These results indicate that when the partial school reopening is not a shock to child agricultural labor—and is therefore primarily a decrease in household childcare needs—adults respond by increasing labor supply to potentially higher-productivity non-agricultural activities. When the partial school reopening marks a shock to child labor as well as childcare, adults are prevented from increasing their non-agricultural labor supply by the need to make up for reduced child agricultural labor.

The opposite effects on hours spent in household agriculture and on other work activities of having children engaged in agricultural labor on the impact of the partial reopening are largely driven by women. Table 4 shows that both women and men increase household agriculture work after the reopening by more if they have children working in household agriculture, but this is significant only for women for whom the difference is stark. Women do not increase agricultural hours if they have no children that provided agricultural labor during school closures, but work 16.1 more hours in household agriculture after the partial reopening if they do—more than double the hours worked during school closures. The point estimates for work hours outside household agriculture are positive for both women and men in households with no child agricultural labor. While the estimated impact become smaller for men in households with children engaged in agriculture, they become *negative* for women. This pattern suggests that while all adults increase agricultural work hours in part to make up for reduced child agricultural labor after the partial reopening, women are more responsible for this than men.[27]

Impacts of child agricultural labor also differ by household wealth (Table 4 columns 3-4 and 7-8). Child engagement in household agriculture is more common in households with below-mean wealth (40.3% compared to 26.3%), and it is only in these households that we find differences in the impact of the reopening by child labor. Adults in low-wealth households supply 19.5 hours more to household agriculture after the reopening if children are engaged in agriculture, compared to 2.5 if they are not. There is no difference for adults in high-wealth households. Less wealthy households may be particularly dependent on agricultural production and have fewer alternatives to replace lost child agricultural labor.[28]

Table 4: Impacts of partial school reopening by child engagement in household agriculture, survey respondents

Respondent last 7 days hours in	HH agriculture work				HH enterprise or wage work			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post × Treat, No child ag labor before reopening	-0.453 (2.167)	2.541 (3.368)	0.474 (2.253)	2.458 (3.114)	2.404 (2.759)	4.350 (3.275)	1.786 (3.136)	2.700 (2.449)
Post × Treat, Any child ag labor before reopening	16.068*** (4.430)	6.854 (4.787)	2.241 (4.068)	19.455*** (5.539)	-2.462 (2.165)	1.680 (4.050)	-0.564 (4.014)	1.131 (4.111)
Observations	1331	902	1385	903	1331	902	1385	903
Mean, pre-reopen control	11.702	14.827	11.223	15.500	5.509	7.651	7.718	4.262
Sample	Women	Men	Above mean wealth	Below mean wealth	Women	Men	Above mean wealth	Below mean wealth
p-value, diff. by Any child ag labor	0.001	0.462	0.704	0.008	0.166	0.609	0.645	0.743

This table estimates impacts of the partial school reopening on respondent work hours in the last 7 days in household agriculture (columns 1-4) and in household non-agricultural enterprise or wage employment (columns 5-8). Subsamples based on wealth are determined based on an index of asset ownership and housing characteristics during the school closures period. Observations include data for survey respondents from May to November 2020, and include treatment households with children in grades 4 or 8 (indicated by 'Treat') and control households with children in an adjacent grade. 'Mixed' households with both types of children are dropped from the sample, though results are similar when they are included. 'Post' is a dummy for being observed on or after the partial school reopening on October 12. Coefficients for 'Any child ag labor' represent the sum of the $Post \times Treat$ and $Post \times Treat \times Any$ *child ag labor* terms. We include p-values for tests of whether the interaction term is equal to 0. Regressions include household and month fixed effects. SEs clustered at household level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The estimated impacts on adult agricultural hours in households with child agricultural labor during the school closures period are large. Columns 7-9 of Table 3 directly test for impacts of the partial reopening on total child agricultural labor. While the point estimates are negative and concentrated in households reporting child agricultural labor prior to the reopening, these are smaller in magnitude than impacts on respondent agricultural labor and not statistically significant. Other household children may increase their labor hours when one child returns to school. Child agricultural hours decrease by less after the partial reopening in households with additional school-

27. Women increase their agricultural hours by more in households using child agricultural labor even if they have below-school-age children (by 11.7 hours, compared to 17.6 hours if they have no young children), perhaps bringing them to the farm plot to shoulder the double burdened of increased childcare responsibilities and reduced child labor contributions.

28. These differences by wealth do not drive the differences by respondent sex: about the same share of female and male respondents are in low-wealth households.

age children, but the difference is not statistically significant, and even in households with no other school-age children the reduction in child agricultural hours is smaller than the increase in adult hours and not significant.

The lack of statistical significance may be due to issues with measuring child hours in household agricultural labor in the data. First, social desirability bias may lead respondents to understate child labor hours. Second, some respondents may have misinterpreted the question about child agricultural hours, which asks for the total across all children (after first asking about each adult individually). In survey round 3, respondents report agricultural labor hours for a randomly selected child as well as the total for all children, and these are the same for a large share of households with multiple school-age children, suggesting some households may have interpreted the child agricultural labor question as asking for the average per child rather than the total. These measurement issues may explain why the estimated impacts of the partial reopening on child agriculture labor hours do not more closely mirror the estimated impacts on adult agriculture labor hours.

Substituting for reduced child labor after the reopening also likely only explains part of the increase in adult work hours on the household farm, in light of the evidence we show for the childcare mechanism. Even if we assume respondents were reporting average hours per child rather than the total and we multiply this by the number of school-age children in the household, the estimated change in total child agriculture hours remains less than half of the estimated change in the respondent's agriculture hours. Yet the significant differences in impacts on adult labor supply by prior child agricultural labor indicate that the child labor mechanism does play a role—the extensive margin of child engagement in household agriculture is likely subject to less measurement error than the intensive margin of child agriculture hours.

A potential concern with Table 3 is that child engagement in household agricultural labor may be correlated with other household characteristics which drive the significant difference in labor supply impacts. Table 4 shows that effects are not driven by respondent sex or household wealth—there are large and statistically significant differential impacts on labor supply by child agricultural labor for women and for low-wealth households. Differences in the impact of the partial reopening by child agricultural labor also persist when interacting this with the presence of additional household adults, having an older or female household head, and having any household enterprise.

In short, there is suggestive evidence that part of the labor supply increase is driven by adults compensating for lost child labor on their homestead. While present for all adults, this mechanism is again particularly important for women, who may be able to combine increased agricultural work hours with childcare, thus more flexibly adjusting to the school reopening. This comes at a cost, however. Adults in households lower their labor supply response in other, potentially more productive sectors.

5 Discussion

The large and positive impacts of Kenya's partial school reopening on adult labor supply are driven by both changes in the household childcare burden and by reductions in child agricultural labor. Evidence for both mechanisms is stronger when considering differences in labor supply effects by household characteristics expected to determine how much the household childcare burden and child agricultural work hours change than when testing how schools reopening impacts these variables directly. Even though issues with accurately measuring the household childcare burden and children's agricultural labor in the RRPS lead to noisy estimates on our measures of these variables, the patterns in the point estimates match the predictions of a simple model of household labor and childcare decisions.

Changes in the childcare burden when a child returns to school are a primary driver of the increases in adults work hours. These increases are concentrated in households with no young children—below-school-age children who receive high levels of childcare from both parents and older siblings in particular. In these households the child returning to school meaningfully reduces adult childcare hours, most strongly for women, who bear more of the responsibility for care of young children. Men see large average reductions in childcare hours and are less affected by the presence of young children, suggesting more of their childcare is oriented toward older children such as those returning to school with the partial reopening. One interpretation of these patterns is men returning closer to their pre-pandemic childcare levels after the partial reopening, while women lose the childcare support they had been receiving from older children while schools were closed. These differences in childcare impacts helps to explain why we do not observe differences in labor supply responses to the partial reopening by sex.

For women, the increased childcare burden when a sibling childcare provider returns to school results in a substitution of work hours from wage employment and household enterprise to household agriculture. This is consistent with household agriculture being more flexible in accommodating childcare needs—including working while caring for children—than these other potentially more remunerative activities. This result highlights how childcare can be an important constraint preventing women from engaging in wage employment or non-agricultural self-employment in this setting (Delecourt and Fitzpatrick 2021). During school closures, older siblings provided increased childcare to younger siblings at no (monetary) cost. Data from the RRPS suggest households lack access to affordable alternative childcare sources that might similarly free up women to engage in work outside of household agriculture (Figure A1). Policies to increase access to affordable childcare might therefore free up women's labor supply.

The impact of the partial school reopening on total adult work hours is driven primarily by hours in household agriculture. Along with changes in the childcare burden, a second mechanism explaining these impacts is changes in child agricultural labor. Grade 4 and 8 students returning to school reduce child hours on the household farm. Since the partial reopening coincides with the main harvest season in most of Kenya, part of adults' increase in agricultural work hours appears to be motivated by a need to make up for this reduction in child work hours. Again, this mechanism appears to be more important for women, who increase agricultural work hours only when the household reports children engaged in agricultural labor. Women may have benefited more than men from the increase in child agricultural labor during the school closures since women have lower access to agricultural inputs than men on average in low- and middle-income countries such as Kenya (Anderson et al. 2021), and therefore been more adversely affected by the partial reopening. Substitution for child agricultural labor is also more important for low-wealth households, which may lack access to non-household-labor agricultural inputs relative to wealthier households. These results are consistent with child agricultural labor being an important input for many households in low-income countries.

School closures affected the availability of child labor, but school breaks more generally determine when children are available to work on the household farm. Changes in the Kenyan academic calendar following the COVID-19 school closures varied the timing of school breaks relative to periods of peak agricultural labor demand. In Kenya the main harvest season is from late September to November, though this differs somewhat by region. In 2020 due to school closures, all children except those in grades 4, 8, and 12 were out of school at this time. In 2021 all children were back in school and a one week holiday between terms fell in October, the beginning of the main harvest season for much of Kenya, but children were otherwise in school throughout the harvest period. In 2022 that holiday came two weeks sooner, potentially too soon for the harvest for most households, and children were again in school throughout the main harvest. In 2023 schools return to the pre-pandemic academic calendar, with a holiday in August and the last term ending in early November such that all children except those taking national exams are released to potentially contribute on the household farm. Allen (2022) finds that decreasing overlap between school days and peak agricultural periods in Malawi increases children's school participation and advancement; our study suggests that such a policy change could also benefit households by increasing parents' flexibility to continue work outside of household agriculture.

In addition to shedding light on the role of childcare burdens and child participation in household agriculture on adults' labor supply decisions in Kenyan households, the study also highlights the labor supply impacts of Kenya's pandemic school closures. Here, we present a back-of-the-envelope answer to the following questions: How do the labor supply effects of the positive shock of partial school reopenings compare to the initial labor supply reductions at the onset of the COVID-19 pandemic in Kenya, and what can we learn from our results about the the labor supply impact of the COVID-19 school closures? We apply survey weights generated by Pape et al. (2021) to estimate mean changes in labor supply nationally during the pandemic. We summarize these estimated parameters in Table 5.

Using recall data on respondents' pre-pandemic labor supply, we find that labor market participation across adults ages 18-64 in Kenya fell from 76% in February 2020 before the pandemic to 59% in May-July, similar to what is reported in Pape et al. (2021) for all adults.Average working hours in the last 7 days among *all* Kenyan adults also fell, from 23.9 hours in February to 16.9

hours in May-July.[29] This 7 hour drop in labor supply represents the total effect of changes at the onset of the pandemic, of which school closures are one component.[30] For adults in our analysis sample, average weekly hours fell from 30.4 in February to 19.3 in May-July.[31] As all of the analysis sample households include children, part of this 11.1 hour decrease in labor supply will reflect the effect of school closures. The fact that labor supply reductions were substantially larger on average among households with school-age children is a first indicator that school closures may have played a substantial role in the aggregate fall in labor supply.

The partial reopening only affected a subset of children older than those with the greatest childcare needs, whereas initial closures affected all school-age children. Reducing labor supply is also likely easier than increasing it, reflected in the lack of significant impacts of the partial reopening outside of household agriculture hours. Impacts of the partial school reopening on labor supply could thus be used to provide a conservative estimate of the effect of initial school closures. We find that work hours in the last 7 days for adult household members increased by 4.7 after the partial school reopening (Table 1. This corresponds to 42.3% of the pandemic reduction in work hours in the analysis sample.

To estimate how aggregate labor supply among *all* households—those with and without school-age children—would have changed if schools did not close at the onset of the pandemic, we assume work hours for all adults in households with school-age children (66.4% of households) increase by the same 4.7 hours per week, while households without school-age children would be unaffected.[32] This reduces the drop in average weekly work hours from February to May-July among all adults nationally from 7.0 hours to 4.1 hours: adults on average worked 2.9 hours per week less because of school closures. We therefore estimate that school closures account for (at least) 40% of the decrease in work hours in the first few months of the COVID-19 pandemic in Kenya, a very substantial effect.

Across Kenya's labor force of 23.7 million (ILO 2021), a reduction of 2.9 work hours per week over the period of the school closures from 16 March 2020 to 4 January 2021 (41 weeks) adds up to over 2.8 billion hours. If we value these hours at the average hourly income observed in the data (USD 1.23 per hour[33]), this suggests that school closures reduced incomes nationally by USD 3.45 billion—3.6% of Kenya's 2019 GDP.

This is a simplified back-of-the-envelope calculation making many assumptions. In particular, it focuses on labor supply only, and abstracts from any counterfactual labor demand changes during the pandemic or general equilibrium effects. That said, it provides a likely conservative rough

29. Among those working, hours fell from 39.7 to 29.2.

30. The fall in work hours is similar for both agricultural and non-agricultural households, suggesting seasonality of labor does not account for a large share of the change.

31. These values differ from those shown in Figure A3 due to the use of survey weights, which we do not use in the main analysis.

32. Workers in the education sector will have been affected regardless of whether they have school-age children; ignoring how their labor supply would also have been higher if schools had not closed during the pandemic is one reason to believe our estimates of the contribution of school closures to pandemic changes in labor supply are conservative.

33. If we take Kenya's GDP per capita and divide that by the average weekly hours worked in the data prior to the pandemic times the number of weeks in a year, we obtain a similar hourly income estimate of USD 1.45.

Table 5: Summary of estimated parameters

Value	Population	Estimate	Source
Change in work hours from Feb. to May-July 2020	All Kenyan adults age 18-64	-7.0 hours per week	RRPS, authors' calculations
Change in work hours from Feb. to May-July 2020	Kenyan adults age 18-64 in analysis sample (with children in grades 3-9)	-11.1 hours per week	RRPS, authors' calculations
Change in working hours after partial school reopening in Oct. 2020	Kenyan adults age 18-64 in analysis sample (with children in grades 3-9)	+4.7 hours per week	Table 1
Change in work hours from Feb. to May-July 2020 if schools did not close	All Kenyan adults age 18-64	-4.1 hours per week	RRPS, authors' calculations
Individuals in Kenya's labor force	All Kenyan working adults	23.7 million	ILO (2021)
Duration of Kenyan school closures	-	41 weeks	Authors' calculations
Average hourly income in Kenya	All Kenyan households	USD 1.23 per hour	RRPS, authors' calculations

This table summarizes parameters used to estimate the impact of COVID-19 pandemic school closures in Kenya in 2020. RRPS is the Kenya Rapid Response Phone Survey (Pape et al. (2021)). All parameters calculated from the RRPS are estimated using survey weights to generate nationally-representative figures.

estimate of the magnitude of the labor supply impact of Kenya's school closures. We do not draw any conclusion about the net benefits of school closures in Kenya. Our calculation considers just one aspect: their impact on market labor for adults in households with schoolchildren. It ignores the value of increased non-market provided childcare to children and adults themselves. Moreover, we do not estimate costs for teachers or the potential loss of learning of the affected children due to school closures. We also do not assess the public health benefits of school closures—the primary motivation—nor increased income for households having older children contributing more to agriculture or sibling care. While these are key components for fully evaluating the impacts of school closures, a better understanding of their labor supply impacts in a context with more informal and flexible employment may inform the discussion of school closures as a policy response to a resurgent COVID-19 or a future pandemic.

Although the household labor supply shock we analyze takes place in the context of a global pandemic, the results on labor supply impacts will continue to have relevance as the pandemic is unfortunately unlikely to be completely overcome in many countries in the immediate future. For example, after fully reopening schools in January 2021, Kenya closed them again in late March after a spike in COVID-19 cases before reopening again in mid-May. Further school closures appear unlikely at this stage in the pandemic but may occur in response to future outbreaks of COVID-19 variants or other diseases. Further, although some pandemic-related restrictions were still in effect at the time schools partly reopened in Kenya in October 2020, many had been relaxed. The impacts we estimate may therefore generalize to policies affecting household childcare needs and child labor supply in similar settings with some ongoing COVID-19 caseloads and basic government policies around public health and safety, which appear to be the new normal moving forward. They also shed light on likely effects of school closures for reasons unrelated to public health events, such as teacher strikes (Jaume and Willén 2021).

6 Conclusion

We present nationally-representative estimates of the impacts of childcare burdens on adult labor supply in a lower-middle-income African country using pandemic-related school closure policy changes in Kenya as exogenous childcare shocks. Having a child eligible to return increases adult work hours in the weeks after schools partially reopen, primarily in more flexible household agriculture. We show that changes in childcare are a primary driver of this impact, while a need to make up for reduced child agricultural labor also plays a role. Increases are driven by less wealthy households who are more engaged in agriculture and may have been less able to cope with the shock of schools closing.

Unlike studies of pandemic school closures in high-income countries, impacts are not concentrated primarily among women. Both men and women increase overall works hours by a substantial 29% after schools partially reopened, relative to adults in households with children in grades adjacent to those affected by the reopening. Although overall labor supply effects are similar by sex, we show that women in particular remain constrained by having to care for younger children when older siblings return to school. In the many households where students returning to school were likely net childcare providers, women bear more of the increased burden after schools reopen, preventing increases in labor supply observed by women in households where the reopening was a positive childcare shock. Men in turn benefit from childcare reductions after the reopening regardless of the presence of younger children, as their childcare responsibilities concentrate on school-age children. Some studies of changes in childcare availability or cost in Africa similarly report significant impacts for men as well as women (Bjorvatn et al. 2022; Martinez, Naudeau, and Pereira 2012), but most focus exclusively on women.Considering how childcare burdens are allocated across *all* household members is critical for understanding the intra-household distributional impacts of childcare shocks.

Our study generates three main policy-relevant takeaways. First, parents in Kenya appear to have limited options for coping with increased childcare burdens beyond reducing work hours or combining work and childcare. We show that women in particular substitute away from wage employment or household enterprise work into household agriculture when their childcare responsibilities require such multitasking. This is despite many households having additional adults, many parents being engaged in potentially more flexible household farm work, and adults working just 24 hours a week on average (less than 'full-time') before the pandemic. Both cost and availability of non-adult childcare may be important constraints. Older siblings are an important source of (unpaid) childcare in our context, and the partial reopening increases childcare burdens for parents with younger children when sibling caregivers return to school. This indicates that households lack alternative childcare options or that they cost more than adults could earn by working instead of caring for children themselves. Households in the data report almost no childcare provision by non-household members in 2020 after the start of the pandemic, but even in 2021 as concerns and restrictions eased use of non-household childcare remained very uncommon. Several studies point to high costs as a main constraint to using formal childcare centres in Kenya and advocate for public subsidies to facilitate access (Clark et al. 2021; Murungi 2013). Policies aiming to increase childcare availability may therefore be less effective if they are not complemented by policies to reduce cost.

Second, the timing of when children are in school affects some households through child agricultural labor. Older children contribute significantly to household agriculture when not in school, and after the partial reopening adults in households with children returning to school increased agriculture work hours partly to make up for reduced child farm labor.The 2020 school closures disrupted academic calendars with implications for the timing of school terms and breaks relative to the agricultural cycle over 2021-2023 and thereafter. This affected whether children were in school during labor-intensive agricultural periods in Kenya. Given the important role of children in agricultural production for many households, future work could consider how these changes affect children's school attendance and achievement (Allen (2022) explores this question in Malawi) and household production decisions including adults' labor supply.

Lastly, our results highlight childcare gradients by age of the child and sex of the caregiver that have have relevance to other policies affecting household childcare. If we expect that childcare needs decrease with child age, we would expect the estimated average impacts on labor supply to be lower bounds on the impact of policies increasing childcare availability for younger children, such as providing free full-day childcare for young children during the working week (as schools implicitly provide to students). Clark et al. (2019) show that subsidies for childcare centres increase labor supply for women in an informal settlement in Nairobi. Our results indicate such policies could have positive effects outside urban settings, and that women should be particularly strongly affected given their primary role as caregivers for children below school-age. In addition, older children might also benefit from reduced need to care for younger siblings.

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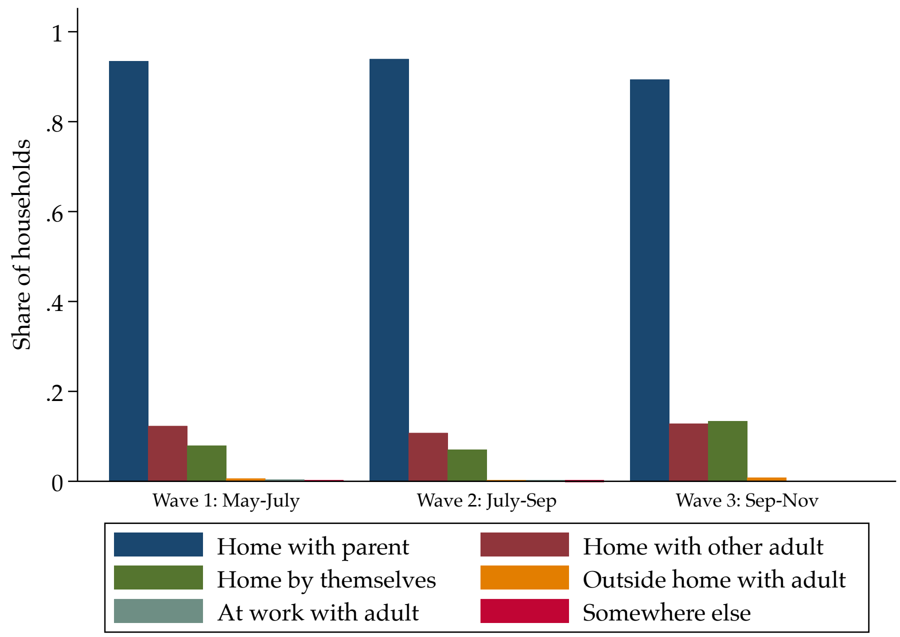
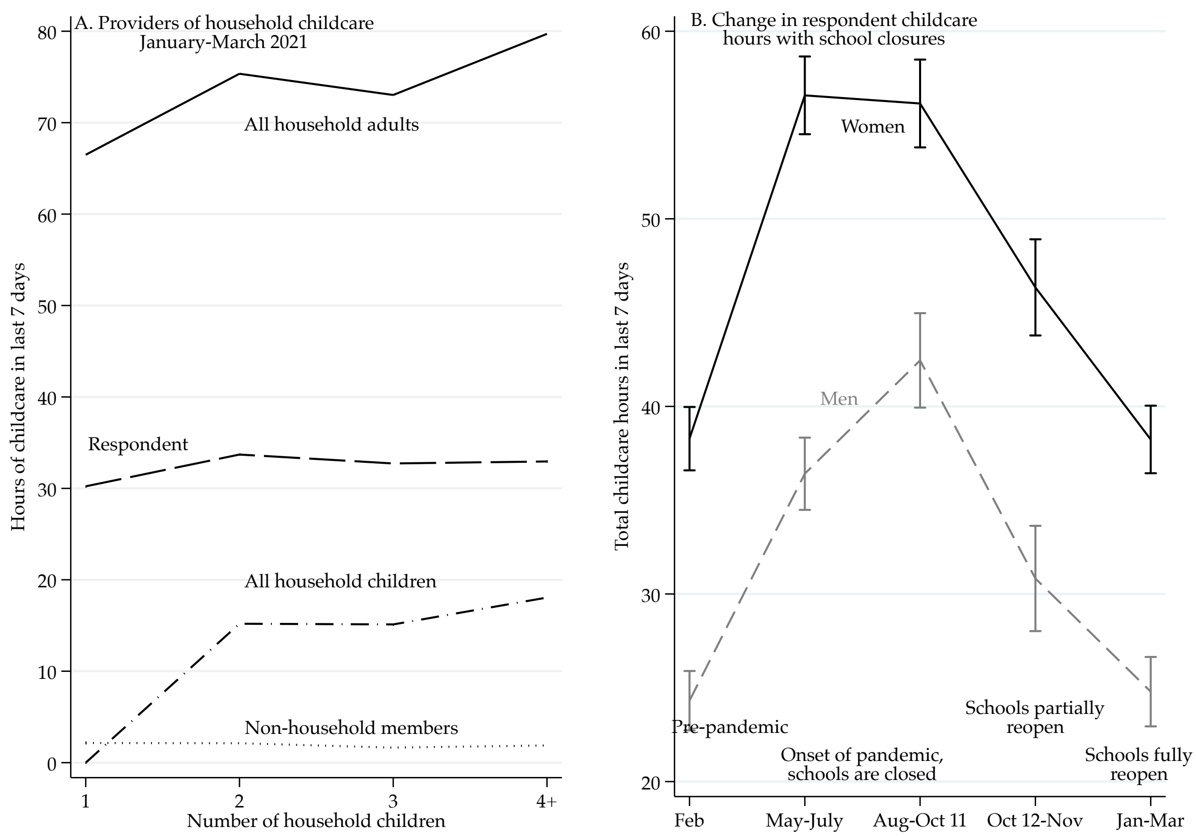
Appendix A: Additional Figures

Figure A1: Childcare arrangements when children are out of school



Respondents are asked to specify all of the situations where a randomly selected child spent at least some time when out of school in the past week. 'Somewhere else' combines 'daycare/other childcare' and 'at home with a maid/domestic helper.' The figure uses information on childcare arrangements for analysis sample households with at least one child in any grade from 3 to 9, but the distribution is nearly identical when considering all households with children.

Figure A2: Childcare hours in the last 7 days among all households with school-age children, by provider of care and school closure status

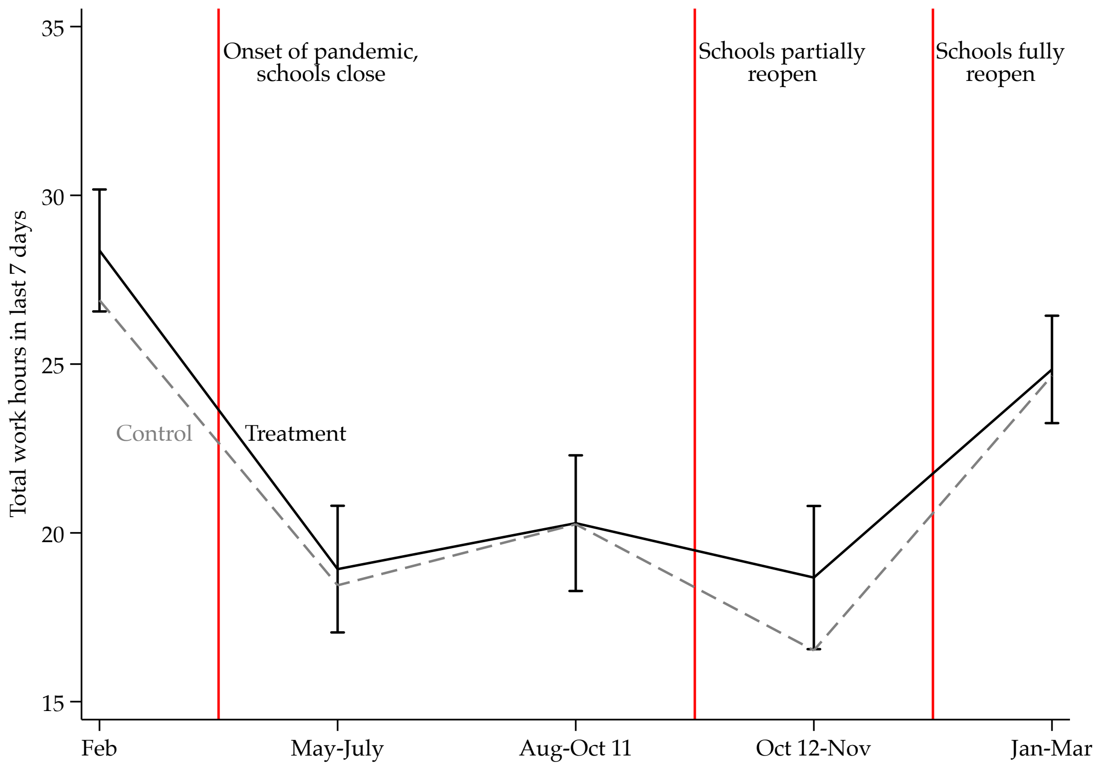


The figures match Figure 2 but include all households with school-age children. The figures show mean childcare hours in the last 7 days among all households with at least one school-age child by number of household children and by time period.

Panel A presents data from RRPS round 4 (January-March 2021) which asks about childcare hours for each household adult, for all children in total, and for all non-household members in total. Previous rounds only ask about childcare hours for the respondent. The hours for 'all household adults' include the respondent's hours.

Panel B presents data for female (black) and male (gray) *respondent* childcare hours over time as school closure policies changed. Data on childcare hours before and during the school closures period for other care providers are not available.

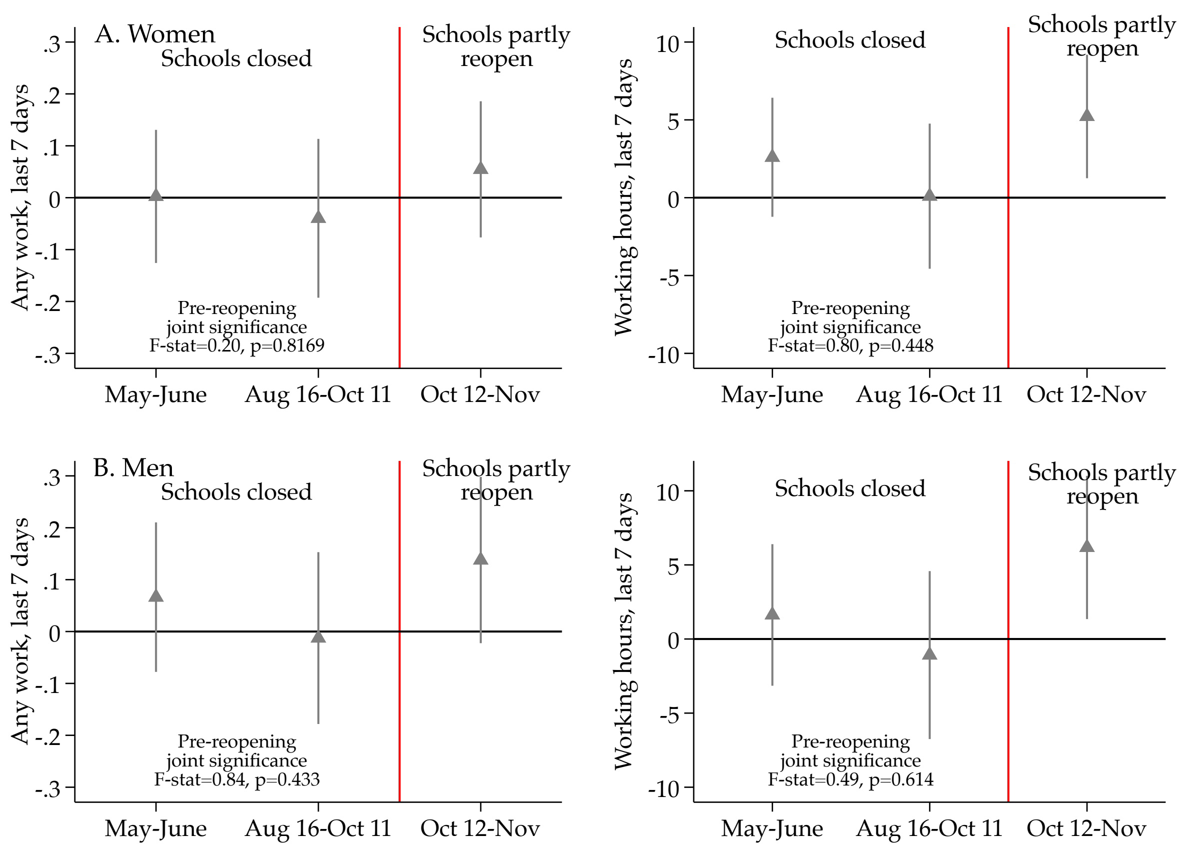
Figure A3: Respondent work hours in the last 7 days by survey round and treatment status



The figure shows raw means and 95% confidence intervals for household respondents' total work hours in the last 7 days by treatment status in each time period. Means are shown for the respondent only due to missing data on pre-pandemic working hours for other household adults. Treatment households have a child enrolled in grades 4 or 8, and control households have a child enrolled in grades 3, 5, 6, 7, or 9. We do not show means for mixed households with children in both grade groups.

Data for February are based on recall from the first time a respondent is surveyed. We combine observations from the first two weeks of survey round 3, before the partial school reopening, with data from round 2. The red bars indicate changes in Kenya's school closures policy. The fall in hours after the partial reopening for control households reflects the end of main harvest period in Kenya, as 64% of households are engaged in agriculture.

Figure A4: Impact of treatment on labor participation in the last 7 days, by time period and sex



The figure replicates Figure 3 but estimating the regressions separately for women and men. It shows estimated coefficients and 95% confidence intervals for the interaction between *Treat* and time period from Equation 1, where *Post* is replaced with time period dummies. Time periods prior to the partial school reopening are constructed to have roughly equal sample sizes. The reference period is July-August 15, while schools were closed and before the partial reopening was announced. The red bar indicates the timing of Kenya's partial school reopening. Outcomes are any work engagement (left) and total work hours (right) in the 7 days prior to the interview. Treatment households have a child enrolled in grades 4 or 8, and control households have a child enrolled in grades 3, 5, 6, 7, or 9. We do not show coefficients for mixed households with children in both grade groups. p-values for the test of joint significance of the pre-reopening coefficients and for tests of equality between the pre-reopening coefficient and the post-reopening coefficient are shown.

Appendix B: Additional Tables

Table A1: Baseline balance by treatment status

	Control HH Mean	N	Treatment HH Mean	N	Mixed HH Mean	N	C-T p-value	C-M p-value
Respondent characteristics								
Age	40.02	948	41.28	335	41.26	361	0.102	0.079
Female	0.59	948	0.56	335	0.58	361	0.306	0.778
Completed primary school	0.88	945	0.87	335	0.84	361	0.524	0.07
Completed secondary school	0.48	945	0.47	335	0.42	361	0.753	0.048
Completed school beyond secondary	0.15	945	0.17	335	0.13	361	0.392	0.35
Married	0.74	937	0.72	328	0.8	356	0.396	0.02
Is the household head	0.63	948	0.65	335	0.63	361	0.516	0.791
Household characteristics								
Female household head	0.29	948	0.3	335	0.26	361	0.8	0.309
Age of household head	44.43	948	46.03	335	45.29	361	0.038	0.238
Count adults	2.55	948	2.64	335	2.75	361	0.289	0.015
Any children age 0-4	0.47	948	0.4	335	0.5	361	0.016	0.308
Any children age 0-8	0.65	948	0.66	335	0.71	361	0.846	0.041
Count young (0-4) children	0.56	948	0.46	335	0.63	361	0.04	0.199
Count school-age (5-17) children	2.47	948	2.35	335	3.26	361	0.143	0
Count adolescent (10-17) children	1.64	948	1.59	335	2.7	361	0.465	0
Household wealth index	-0.06	948	0.03	335	-0.15	361	0.169	0.113
Connected to electricity grid	0.46	948	0.51	335	0.41	361	0.111	0.105
Urban	0.46	948	0.47	335	0.47	361	0.62	0.764
Household engaged in agriculture	0.61	948	0.59	335	0.65	361	0.573	0.217
Any child engaged in household farm labor	0.26	948	0.24	335	0.33	361	0.593	0.019
Household engaged in enterprise	0.15	948	0.19	335	0.16	361	0.134	0.683
Respondent labor participation								
Engaged in any work in last 7 days	0.68	948	0.7	335	0.67	361	0.534	0.888
Engaged in wage employment in last 7 days	0.1	948	0.13	335	0.08	361	0.211	0.15
Engaged in HH agriculture in last 7 days	0.55	948	0.53	335	0.6	361	0.479	0.171
Engaged in HH non-ag enterprise in last 7 days	0.09	948	0.13	335	0.1	361	0.1	0.563
Engaged in any work in February 2020	0.82	948	0.86	335	0.84	361	0.088	0.344

The table presents means for control households (C) with a child in grade 3, 5, 6, 7, or 9, treatment households (T) with a child in grade 4 or 8, and mixed households (M) with a child in both grade groups. Data are from the first time a household is observed, typically in survey round 1 (May-early July) while schools were fully closed. Individual-level data are for the survey respondent.

Columns on the right present differences and means and p-values for tests of equality for control households compared to treatment and mixed households, separately. The joint F-stat for differences across control and treatment households is 1.12, with p-value 0.305. It is 4.37 ($p<0.001$) for differences across control and mixed households.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A2: Impacts of partial school reopening on household income in the last 14 days

	KSH				Log(KSH+1)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Source of income	Total	Wage work	HH ag.	HH ent.	Total	Wage work	HH ag.	HH ent.
Post x Treat	-18.103	188.933	-240.140	33.104	-0.517	-0.208	-0.247	-0.152
	(656.326)	(449.291)	(168.963)	(448.344)	(0.359)	(0.233)	(0.248)	(0.221)
Post x Mixed	-736.476	-151.989	-313.544**	-270.943	-0.581	-0.200	-0.381*	-0.117
	(690.646)	(395.970)	(136.337)	(544.078)	(0.359)	(0.230)	(0.211)	(0.233)
Observations	3103	3103	3103	3103	3103	3103	3103	3103
Mean, pre-reopen control	2360.892	814.774	298.003	1248.115	2.165	0.703	0.739	0.908

This table presents estimates of Equation 1 for measures of household income over the last 14 days. Columns 1-4 report estimates for income in Kenyan Shillings (KSH; USD 1 $\approx$ 107 KSH) and columns 5-8 report estimates for the log of income + 1. Observations include data from May to November 2020, and include treatment households with children in grades 4 or 8 (indicated by 'Treat'), control households with children in an adjacent grade, and 'mixed' households with both types of children. 'Post' is a dummy for being observed on or after the partial school reopening on October 12. Regressions include household and month fixed effects. SEs clustered at household level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A3: Heterogeneity in impacts of partial school reopening on adult working hours

Interaction term Z	(1) Female	(2) Ag HH	(3) Closures Any Work	(4) Closures Wage Work	(5) Closures HH Ag Work	(6) Closures HH Ent Work	(7) Urban	(8) Large Urban	(9) Above Mean Wealth	(10) >2 HH Adults
Post × Treat, Z=0	5.423***	-1.200	-0.570	4.186**	0.335	4.698**	4.979*	4.979*	9.278***	3.287
	(2.063)	(2.537)	(2.148)	(1.880)	(2.327)	(1.851)	(2.706)	(2.708)	(2.997)	(2.804)
Post × Treat, Z=1	4.153**	6.146***	5.374**	8.561*	5.548**	8.465	4.499*	0.847	1.671	5.700**
	(1.907)	(2.203)	(2.166)	(4.877)	(2.297)	(5.400)	(2.325)	(3.678)	(2.256)	(2.378)
Post × Mixed, Z=0	0.214	-2.207	-0.575	0.574	-1.842	1.469	0.431	0.431	3.718	2.271
	(2.127)	(2.785)	(2.010)	(1.796)	(2.389)	(1.739)	(2.421)	(2.423)	(2.901)	(2.572)
Post × Treat, Z=0	0.957	1.287	0.596	-1.010	1.676	-9.636*	1.252	-3.067	-1.756	-0.004
	(1.762)	(2.064)	(2.044)	(5.364)	(2.139)	(5.538)	(2.690)	(4.110)	(2.195)	(2.346)
Observations	8538	8538	8146	8146	8146	8146	8538	5177	8538	8538
Mean, pre-reopen control	16.494	16.494	16.424	16.424	16.424	16.424	16.494	17.162	16.494	16.494
p-value, Treat diff. by Z	0.409	0.029	0.028	0.373	0.084	0.486	0.893	0.366	0.043	0.512
p-value, Mixed diff. by Z	0.608	0.314	0.649	0.766	0.244	0.037	0.820	0.464	0.133	0.513

This table presents estimates of Equation 1 but interacting a characteristic Z with all right-hand side variables except the household fixed effects. The column label indicates which characteristic Z is being used. Values for household characteristics are from the first time they are observed in the data. 'Closures' work participation is based on any participation in a given sector from May-October 2020. 'Large Urban' is a dummy for location in one of Kenya's largest urban areas (Nairobi, Mombasa, Nakuru, Kisumu, Kiambu) relative to any rural area, while 'Urban' is a dummy for location in any urban area. 'Above Mean Wealth' is a dummy for whether an index of household wealth, based on housing and asset ownership, is above the sample mean.
The dependent variable is total working hours over the last 7 days, with individuals not working coded as working 0 hours. Observations include data from May to November 2020, and include treatment households with children in grades 4 or 8 (indicated by 'Treat'), control households with children in an adjacent grade, and 'Mixed' households with both (results not shown). 'Post' is a dummy for being observed on or after the partial school reopening on October 12. Coefficients with $Z = 1$ represent the sum of the $Post \times Treat$ and $Post \times Treat \times Z$ terms, and analogously for Mixed households. We include p-values for tests of whether the interaction term is equal to 0. Regressions include household and month fixed effects. SEs clustered at household level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A4: Heterogeneity in impacts of partial reopening by child grade

Adult hours in last 7 days in	All work activities			HH agriculture work			HH enterprise or wage work		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post x Treat	3.554	5.083**	0.605	2.942	4.927**	0.612	0.612	0.156	-0.008
	(2.190)	(2.329)	(5.567)	(1.795)	(1.982)	(5.289)	(1.387)	(0.974)	(1.350)
Post x Mixed	0.016	1.253	-3.577	0.300	1.671	-0.414	-0.284	-0.418	-3.162**
	(1.827)	(1.951)	(2.698)	(1.543)	(1.635)	(2.327)	(0.950)	(0.970)	(1.553)
Observations	6724	6284	2551	6724	6284	2551	6724	6284	2551
Mean, pre-reopen control	16.693	16.702	15.958	12.073	12.634	11.700	4.619	4.068	4.259
Households with children in grades:	2-6	6-10	10-12	2-6	6-10	10-12	2-6	6-10	10-12

This table presents estimates of Equation 1 for different sub-samples, in comparison to Table 1 which includes all households in the main analysis sample (with children in grades 3-9). For households with a child in grades 2-6, treatment means having a child in grade 4 eligible to return to school, while treatment is driven by grade 8 children for households with grade 6-10 children and by grade 12 children for households with grade 10-12 children. In all cases the set of comparison households includes those with children within 2 grades of the 'treated' grade. Households with a child in another treated grade outside the focus range are categorized as 'mixed.'
Dependent variables are defined over the last 7 days, and take a value of 0 for individuals not working in a particular activity. Observations include data from May to November 2020. All regressions include household and month fixed effects. SEs clustered at household level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A5: Impacts of partial school reopening by baseline wealth and respondent sex

Respondent hours in last 7 days in	All work activities			All childcare activities		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treat, Below mean baseline wealth	11.603***	5.858	21.997***	1.367	12.524	-19.797
	(3.465)	(4.169)	(5.997)	(8.136)	(10.656)	(12.667)
Post × Treat, Above mean baseline wealth	2.322	4.848	-0.809	2.623	-2.406	3.265
	(3.072)	(4.156)	(4.665)	(6.329)	(8.948)	(8.792)
Observations	2288	1331	902	2284	1328	901
Mean, pre-reopen control	19.272	17.211	22.478	52.747	60.059	41.175
Sample	All	Women	Men	All	Women	Men
p-value, diff. by baseline wealth	0.045	0.864	0.003	0.903	0.284	0.136

This table estimates impacts of the partial school reopening on respondent hours spent in the last 7 days on work and on childcare. Observations include data for survey respondents from May to November 2020, and include treatment households with children in grades 4 or 8 (indicated by 'Treat') and control households with children in an adjacent grade. 'Mixed' households with both types of children are dropped from the sample, though results are similar when they are included. 'Post' is a dummy for being observed on or after the partial school reopening on October 12. We interact treatment with baseline wealth before the pandemic, defined using an index of household wealth and housing characteristics. Coefficients for 'Above mean baseline wealth' represent the sum of the $Post \times Treat$ and $Post \times Treat \times Above\ mean\ baseline\ wealth$ terms. We include p-values for tests of whether the interaction terms are equal to 0. Regressions include household and month fixed effects. SEs clustered at household level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A6: Impacts of partial school reopening on childcare hours by presence of young children and respondent sex

Respondent hours in last 7 days in	All childcare activities		
	(1)	(2)	(3)
Post x Treat	-7.642	-6.266	-3.862
	(9.187)	(13.865)	(11.261)
Post x Treat × Any child age 0-4	25.939	41.080	-16.396
	(17.538)	(26.498)	(14.685)
Post x Treat × Any child age 5-8	5.027	-4.520	18.408
	(13.752)	(18.711)	(22.412)
Post x Treat × Any child age 0-4	-14.999	-6.466	-12.770
× Any child age 5-8	(22.686)	(32.467)	(28.832)
Observations	2262	1314	891
Mean, pre-reopen control	52.747	60.059	41.175
Sample	All	Women	Men

This table estimates impacts of the partial school reopening on respondent hours spent in the last 7 days on childcare. Observations include data for survey respondents from May to November 2020, and include treatment households with children in grades 4 or 8 (indicated by 'Treat') and control households with children in an adjacent grade. 'Mixed' households with both types of children are dropped from the sample, though results are similar when they are included. 'Post' is a dummy for being observed on or after the partial school reopening on October 12. Regressions include household and month fixed effects. SEs clustered at household level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A7: Impacts of partial school reopening on work and childcare hours by returning child grade and presence of young children

Respondent hours in last 7 days in	All work activities				All childcare activities			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post x Grade 4	4.959	6.307	8.651	11.339	1.186	-9.339	-16.489	11.870
	(4.629)	(5.299)	(5.916)	(9.341)	(10.545)	(11.502)	(10.970)	(23.900)
Post x Grade 4 × Any child age 0-4			-10.620	-6.956			47.030*	-34.685
			(9.200)	(11.338)			(24.417)	(27.313)
Post x Grade 8	7.902**	7.481	10.343**	7.714	8.544	-7.235	0.652	-4.433
	(3.220)	(5.614)	(4.981)	(6.441)	(9.455)	(8.512)	(14.344)	(9.527)
Post x Grade 8 × Any child age 0-4			-3.973	-0.272			19.202	-3.250
			(6.522)	(13.070)			(19.071)	(19.710)
Observations	1317	892	1317	892	1314	891	1314	891
Mean, pre-reopen control	17.211	22.478	17.211	22.478	60.059	41.175	60.059	41.175
Sample	Women	Men	Women	Men	Women	Men	Women	Men

This table estimates impacts of the partial school reopening on respondent hours spent in the last 7 days on all work activities (columns 1-4), and on childcare (columns 5-8). Observations include data for survey respondents from May to November 2020, and include households with at least one child in grades 3-9. We separately estimate the impact of the partial reopening for grades 4 and 8. 'Mixed' households with children in both a treated grade and an adjacent grade and households with children in both treated grades are dropped from the sample, though results are similar when they are included. 'Post' is a dummy for being observed on or after the partial school reopening on October 12. Regressions include household and month fixed effects. SEs clustered at household level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix C: Major Pandemic Policy Changes in Kenya

The following outline summarizes when major nation-wide pandemic-related policies were implemented and relaxed over the course of 2020 after the first COVID-19 cases in Kenya on March 13. The dates for the announcements of new restrictive policies are in *italics* and the dates when these policies were relaxed or ended are in **bold**. We also include announcements related to school closures, even though policies did not necessarily change with these announcements. Most policies were extended multiple times after first being imposed; we do not list the dates of policy extensions, except for school closures.

- *March 13-20*
  - Suspend all public gatherings, meetings, games, events
  - Ban on gatherings of more than 10 people
  - All schools closed
  - Recommend working from home where possible
  - Ban on foreigner entry; quarantine requirements for entry of nationals and visa holders
  - Public transport asked to reduce to 60% of capacity
- *March 24-27*
  - Ban on national and international flights
  - Closure of bars and restaurants for in-person service
  - Direct cash payments implemented for vulnerable citizens
  - Stay at home requirements imposed, except for 'essential' trips
  - Curfew imposed from 1700 to 0500 hours
  - Public transit closed between 'infected' and 'not infected' areas
- April 26: School closures extended to June 4
- **April 27**: Partial reopening of restaurants for take-out service
- June 6: School closures extended until further guidance from the Ministry of Health
- **June 7**: Nightly curfew revised to between 2100 and 0400 hours
- June 24: Announcement that school might reopen on September 1
- **July 7**
  - Phased reopening of religious gatherings
  - Up to 100 people permitted to attend weddings and funerals
  - Local air travel within Kenya to resume July 15
  - International air travel to resume August 1
- July 7: Announcement that schools will remain closed until January 2021, final exams are cancelled, and students would repeat the year; colleges and universities following strict guidelines might reopen in September
- ***July 27***
  - Restaurants reopened, must close by 1900 hours
  - Ban on sale of alcoholic drinks and beverages in eateries and restaurants
- **August 27**
  - Restaurants may remain open until 2000 hours
  - Ban on sale of secondhand clothing lifted
  - Licensed hotels may sell alcohol
- September 15: Ministry of Education releases guidelines for safe reopening of schools

- September 21: Ministry of Education calls all teachers to report back to schools by September 28
- **September 27**
  - Nightly curfew revised to between 2300 and 0400 hours
  - Bars may reopen; restaurants and eateries may sell alcohol; bars, restaurants, and eateries may remain open until 2200 hours
  - Religious gatherings may open for up to 1/3 of capacity
  - Up to 200 people may attend funerals and weddings
- October 6: Ministry of Education announces that students in examination grades (4, 8, and 12) shall return to classes on October 12
- **October 12**: Students in examination grades (4, 8, and 12) to return to classes
- *November 4*
  - Requests for government work to be done remotely when possible
  - Political gatherings suspended
  - Nightly curfew revised to between 2200 and 0400 hours
  - Bars, restaurants, and eateries must close by 2100 hours
- November 4: Announcement that schools to fully reopen in January 2021
- **January 4**: Schools fully reopen

Other policies were implemented that specifically affected certain parts of the country. For example, on April 6 the government instituted a 21 day movement ban/lockdown for Nairobi, Kilifi, Kwale, and Mombasa, and Mandera was added soon after. This lockdown was extended multiple times. These were the only counties affected. The lockdowns for Kilifi and Kwale ended on June 7 and those for Nairobi, Mombasa, and Mandera ended on July 8.

Sources: COVID-19 government response timeline for Kenya; Kenya COVID Tracker; Presidency of Kenya; Kenya Ministry of Education Twitter feed

Appendix D: Data

Data come from the Kenya COVID-19 Rapid Response Phone Surveys (RRPS), collected by the Kenya National Bureau of Statistics with support from the World Bank and the University of California at Berkeley. Pape et al. (2021) describe the survey methodology and implementation in detail.

The main RRPS sample is drawn from the nationally representative Kenya Integrated Household Budget Survey (KIHBS) conducted in 2015-2016: 9,009 households that were interviewed and provided a phone number served as the primary sampling frame for the RRPS. All households in the sample were targeted in each round regardless of whether they were reached in a previous round. By the fourth round of the RRPS, 5,499 KIHBS households had been successfully surveyed at least once. The KIHBS sample is supplemented by random digit dialing (RDD). From a sampling frame of 5,000 randomly selected numbers, of which 4,075 were active, 1,554 households had completed at least one survey by round four.

The sample is intended to be representative of the population of Kenya using cell phones. In the 2019 Kenya Continuous Household Survey 80% of households nationally report owning a mobile phone, though certain counties—notably in the northeast—have much lower mobile phone penetration. Pape et al. (2021) report that KIHBS households that provided a phone number and those that were successfully surveyed in the RRPS have better socioeconomic conditions—measured by housing materials and asset ownership—than households that did not provide a phone number or that did but were not reached for the RRPS.

The RRPS data include household survey weights adjusting for selection and differential response rates across counties and rural/urban strata, attempting to recover national representativeness. We do not apply these household weights for our individual-level regression analyses, but do apply them for population-level inference based on our results.

The surveys include information on household composition, assets and housing, labor outcomes for household adults, and child schooling and care, as well as more general household information and COVID-specific modules. Detailed questions on child care, schooling, labor, and other outcomes are included for a randomly selected child in each round. We use data from the first four rounds of the RRPS, covering May 2020-March 2021, and also construct measures for February 2020, before the first COVID-19 cases in Kenya using recall questions from the first time a household was surveyed. Each round lasted approximately 2.5 months and covered a representative cross-section of households each week within each wave.

Data on childcare arrangements for a randomly selected child include questions on which household member has primary responsibility for the child's care, which household member was with the child in the last 15 minutes, and where and in whose company the child stayed during the day when out of school (from a set of general categories).[34] The surveys also ask respondents for their hours spent on childcare in the last 7 days.[35] Childcare hours from other providers, including other household adults, all household children combined, and all non-household members combined are included in round 4 only.

Labor supply is captured using modules on household agricultural production, household enter-

34. Respondents are instructed to select all childcare arrangements used. Nevertheless, respondents might omit types of childcare that are used less frequently or that are seen as less socially acceptable (e.g., leaving a child at home by themselves).

35. The survey asks "In the last 7 days, how many hours did you spend doing childcare?" and does not distinguish between time actively spent caring for a child and time spent on other activities while responsible for a child. We topcode reported childcare hours at 140, or 20 hours a day. Over 15% of respondents in our analysis sample indicate spending at least this many hours on childcare.

prise, and wage employment. For both household agricultural production and for each household enterprise, respondents report all household adults engaged in those activities over the last 7 days and their hours of work. Wage employment is reported for each household adult. An individual not working in a given activity is coded as working 0 hours.

Respondents report estimates of total household earnings from agricultural activities and from household enterprises over the last 14 days. For the few households with multiple enterprises, we sum earnings and profits across enterprises. Wage earnings in the last 14 days are reported for individual wage workers. For comparability with the measures of household agriculture and enterprise earnings, we aggregate wage earnings to the household level. Earnings data are limited—for all activities the 90th percentile of household earnings in the analysis sample is 0—in part due to a focus on the last 14 days, which does not accommodate seasonality or other variability in earnings.

We winsorize reported individual hours of work and household earnings across activities at the 99th percentile.

Appendix E: A simple static partial equilibrium model of childcare and labor supply

Here, we develop a simple model of adult labor supply and childcare decisions to generate predictions to take to the data. The model considers a static problem for adult household members with children. For simplicity, we assume that household adults take decisions jointly, and thus model the decision as that of a single person. We focus on a static, partial equilibrium labor supply decision, and set aside possible impacts of shocks to labor demand to focus on shocks to the childcare burden. Key aspects of the context that we aim to reflect in the model are the availability of child labor in household agriculture, as well as childcare of younger children by older children. To reflect women's larger role in childcare in this setting, we assume that female adult household members have either a comparative advantage in childcare of younger children or, similarly, that social norms are such that the costs of refraining from childcare for women (or the cost of engaging in childcare for men) are exogenously larger. Moreover, in line with our data, we assume economies of scale in childcare provision, as well as the ability of the caregiver to combine some types of childcare with household production in agriculture.

Household adults get utility $U = U(C, L, \{Q_k\}_{k=1}^{N})$ from consumption, leisure, and the well-being of k household children. They can spend time on leisure, wage work for a fixed wage, home production[36], and childcare and face a time constraint $T = L + t_w + t_h + t_c$. Wage work earns a wage w. Home production $H = H(t_h, X, S)$ is a concave function satisfying the Inada conditions, which depends on the adult time input and other household characteristics X such as the availability of household agricultural land or existence of a household enterprise, as well as the availability of child labor (which is a function of the age distribution of children and school closure policy S). We normalize the price of consumption to 1 and assume that household production can be sold at this same price.

Adults provide childcare $CCM = \psi_g\big(t_c + \theta_h t_h\big)$, which includes "active" childcare time t_c focused on children as well as some portion θ of home production time that simultaneously provides passive childcare. ψ_g is a cost-shifter for childcare provision that takes on takes on smaller values for men than for women.[37] Adult childcare is a public good that all household children can access, reflecting the economies of scale we observe in this context.

Total childcare for child k is given by $CC_k = CCM + I_k$, adults' childcare provision plus any childcare provided by older children.[38] All children receive the same amount of care from household adults, but childcare from other children varies based on the age distribution of siblings. Total informal childcare available to the household $I = I(X, S)$ is a function of household characteristics (notably the presence of older siblings) and of school closures; older siblings provide more informal childcare when schools are closed. Child well-being $Q_k = Q_k(CC_k, \bar{CC}_k(age_k, S))$ is a concave function of childcare provided to the child and their minimum required care.[39] Minimum required care $\bar{CC}_k(age_k, S)$ decreases with age, and for school-age children it increases when schools are closed.

36. The key distinction this model makes is between a work sector which accommodates both simultaneous childcare and child labor contribution, and another work sector which does not. We therefore primarily think of the home production activity as being household agriculture, with household enterprise activities being a form of home production which has some of the same characteristics but less so.

37. This cost-shifter can be rationalized in multiple ways. It could be that women's childcare hours count for more relative to men's due to a social expectation of women to provide childcare, or a social stigma of childcare for men. This shifter is also isomorphic to a model where women are relatively more productive in childcare, and require fewer hours to achieve the same increase in child welfare.

38. Very few households in the data use non-household sources of childcare, so we abstract away from this possibility.

39. We can think of this as a Stone-Geary type of function.

Adults take as given household characteristics X such as presence of other adults and child composition, school closure policy S, and non-labor income Y. We model S as a binary variable taking a value of 1 if schools are closed and 0 otherwise.[40]

Adults' static optimization problem is

$$\max_{t_w, t_h, t_c} U(C, L, \{Q_k\}_{k=1}^{N}) \tag{2}$$

Subject to

$$C = wt_w + H(t_h, X, S) + Y \tag{3}$$

$$T = L + t_w + t_h + t_c \tag{4}$$

$$L \geq 0;\ t_w \geq 0;\ t_h \geq 0;\ t_c \geq 0 \tag{5}$$

$$CC_k = \psi_g\big(t_c + \theta_h t_h\big) + I_k \tag{6}$$

$$\sum_{k=1}^{N} I_k \leq I(X, S) \tag{7}$$

$$Q_k = Q_k(CC_k, \bar{CC}_k(age_k, S)) \tag{8}$$

Adults maximize their utility over choices of time use, subject to the following constraints: 1) the household budget constraint, 2) their time endowment, 3) non-negativity constraints on time use, 4) the childcare provision function, 5) availability of childcare from older siblings, and 6) the child well-being function. The budget constraint states that spending on consumption must equal the sum of wage income, the value of home production, and non-labor income.

We are interested in the impacts of changes in school closure policy S on adult labor supply t_w and t_h. S enters the model through childcare needs, the availability of sibling childcare, and household child labor availability. We expect $\bar{CC}_k(age_k, 1) > \bar{CC}_k(age_k, 0)$ for children enrolled in school, meaning schools being open decreases household childcare needs. On the other hand, $I(X, 1) > I(X, 0)$ for households with older children, as those children can provide more informal childcare when schools are closed. Moreover, $H(t_h, X, 1) > H(t_h, X, 0)$ as children may contribute more to home production when they are home from school.

Adults thus trade off their time among wage work, home production, childcare, and leisure, at an interior solution setting the marginal returns to each equal to each other:

$$u'_C w = u'_C H'_t(X, S) + \phi(\{age_k\}_{k=1}^{N}, S, \psi_g)\theta_h = \phi(\{age_k\}_{k=1}^{N}, S, \psi_g) = u'_L \tag{9}$$

where these terms are, respectively, the marginal utility of working one more hour for a wage w, the marginal utility of an additional hour in home production (providing both consumption and some child well-being value due to joint work and childcare), the marginal value to adults of an additional hour of childcare, and the marginal utility of an additional hour of leisure, and where we define

$$\phi = \sum_{k=1}^{N} u'_{Q_k} Q'_k(age_k, S)\psi_g \tag{10}$$

School reopening (moving from $S = 1$ to $S = 0$) affects the solution to adults' problem through two channels. First, it lowers child labor in home production, thus likely raising the marginal return of adults working in home production after school reopenings ($H'_t(X, 0) > H'_t(X, 1)$. Second,

40. S may vary by child, as in the case of the partial school reopening in Kenya, but we abstract from this point.

it changes the net demand (and thus net return) to childcare for the remaining children. When there are no other children present, the utility return to adult childcare hours decreases for sure ($\phi(K = 1, S = 1) < \phi(K = 1, S = 0)$, which also reduces the return to work in home production. But when there are other children present, the sign of this effect is ambiguous and depends on the age distribution of remaining children. When remaining children are very young, for instance, the marginal utility from adult childcare may actually *increase*, since the school reopening decreases sibling childcare ($I(X, 1) > I(X, 0)$) and changes the household childcare constraint.

The simple model thus allows us to generate several hypotheses for the effect of schools reopening to take to the data. First, in households where *all* children return to school, hours spent in childcare should decline while labor supply overall should increase. Second, in agricultural households which used child labor while schools were closed, adult labor supply after school reopening is furthermore expected to shift relatively towards agriculture to make up for lost child labor. Third, adults with young children will likely be providing a higher level of childcare on average when schools are open: sibling childcare falls as older siblings return to school, but childcare needs remain high since these are driven relatively more by younger children. This matters given mothers' ability to care for multiple children simultaneously, suggested by the economies of scale in childcare hours we observe in the data. Labor supply may therefore decrease in households with young children given the increased marginal utility from adult childcare.

Finally, if women play a larger role in childcare (as is the case in our setting), either because children benefit more from female care, or because social norms and economic circumstances are such that men's social cost to childcare are larger, then $\psi_{female} > \psi_{male}$. This suggests that women should engage in more childcare overall, and that school closures should impact their childcare hours more. They will also be more likely to supply relatively more labor to home production, as this can be combined with childcare whereas wage work cannot. If, in addition, we suppose that childcare needs and norms for infants and young children are particularly gendered, then labor supply responses to school reopening when young children remain present in the household should be particularly muted (or even reversed) for women relative to men.

Appendix F: Robustness

Table A8: Impacts of partial school reopening on total working hours, varying controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post	-2.251***	-3.489***					
	(0.831)	(0.960)					
Post x Treat	1.048	4.836***	4.749***	3.243*	4.865***	4.737***	3.954***
	(1.688)	(1.839)	(1.825)	(1.884)	(1.832)	(1.821)	(1.376)
Post x Mixed	0.613	0.595	0.594	-1.126	0.538	0.610	-0.011
	(1.601)	(1.824)	(1.799)	(1.821)	(1.805)	(1.804)	(1.362)
Observations	8587	8538	8538	8538	7765	8538	8538
Mean, pre-reopen control	16.486	16.494	16.494	16.494	16.383	16.494	16.494
Household FE	N	Y	Y	Y	N	Y	Y
Individual FE	N	N	N	N	Y	N	N
Month FE	N	N	Y	N	Y	Y	Y
County-month FE	N	N	N	Y	N	N	N
Individual controls	N	N	N	N	N	Y	Y
Household controls	N	N	N	N	N	N	Y

This table presents estimates of Equation 1 with varying controls. The dependent variable is total working hours over the last 7 days, taking a value of 0 for individuals not working. Observations include data from May to November 2020, and include treatment households with children in grades 4 or 8 (indicated by 'Treat'), control households with children in an adjacent grade, and 'Mixed' households with both. 'Post' is a dummy for being observed on or after the partial school reopening on October 12.

Column 3 is the primary specification. Individual controls include sex, age, and household head status. Household controls include number of adults, young children (age 0-4), and school-age children (5-17) in the household, and dummies for engagement in agriculture and in enterprise. SEs clustered at household level.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A9: Impacts of partial school reopening on respondent labor supply

	N	Control Mean (SD)	Post x Treat (SE)	Post x Mixed (SE)
Engaged in any work in last 7 days	8538	0.592	0.083	0.048
		(0.491)	(0.051)	(0.051)
Engaged in wage employment in last 7 days	8538	0.063	0.011	-0.006
		(0.242)	(0.012)	(0.012)
Engaged in HH agriculture in last 7 days	8538	0.517	0.078	0.039
		(0.500)	(0.053)	(0.050)
Engaged in HH non-ag enterprise in last 7 days	8538	0.064	0.014	0.013
		(0.245)	(0.023)	(0.020)
Total work hours, last 7 days	8538	16.494	4.749***	0.594
		(19.914)	(1.825)	(1.799)
Wage hours, last 7 days	8538	2.089	0.459	-0.150
		(9.640)	(0.521)	(0.522)
Ag hours, last 7 days	8538	12.167	4.065***	0.877
		(15.644)	(1.512)	(1.519)
Enterprise hours, last 7 days	8538	2.315	0.310	-0.262
		(10.279)	(0.824)	(0.790)

This table presents estimates of Equation 1 for survey respondent labor supply. Individuals not working in a given sector are coded as working 0 hours. From left to right, the columns show the dependent variable, number of observations, the control mean prior to the partial reopening, and the impacts of being in the partial reopening period for treatment households (Post x Treat) and mixed households (Post x Mixed). Impacts for control households are absorbed by month fixed effects. Control households have a child in grades 3, 5, 6, 7, or 9, treatment households have a child in grades 4 or 8, and mixed households have both. 'Post' is a dummy for being observed on or after the partial school reopening on October 12. Regressions include household and month fixed effects. Standard errors are clustered at the household level. Data include observations for adults age 18-64 from May to November 2020. Significant treatment impacts on total and agricultural work hours are robust to multiple testing adjustment using FDR q-values.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A10: Impacts of partial school reopening on total working hours, varying sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample	Prime age adults age 25-50	All adults age 18+	Potential primary care-givers	No mixed households	Grade 6 out of ctl	Grade 2 in ctl	Grade 2 in, Grade 9 out of ctl	Grade 12 in trt, Grades 10-11 in ctl
Post x Treat	4.577**	4.271**	4.085**	4.739***	4.060**	4.924**	4.552**	4.357**
	(2.065)	(1.823)	(1.975)	(1.825)	(1.754)	(1.992)	(1.988)	(2.004)
Post x Mixed	-0.166	0.799	-0.021		0.422	1.491	0.378	-0.335
	(1.982)	(1.755)	(1.995)		(2.044)	(1.659)	(1.661)	(1.622)
Observations	5369	8998	5929	6575	7641	9252	8824	9407
Mean, pre-reopen control	17.482	16.390	17.608	16.494	16.660	16.594	16.433	16.043

This table presents estimates of Equation 1 with varying samples. The main sample includes adults ages 18-64. We test robustness to focusing on adults age 25-50 (the most likely to be parent caregivers and engaged in work), to including all adults aged 18 and up, and to including only adults identified as potential parents—between 14 and 55 years older than the oldest household child—or sole caregivers (the only household adult). We also test the robustness to varying the grades included in the definition of control households. Omitting grade 6 students from the control definition focuses just on students in grades immediately adjacent to those treated. Including grade 2 students in the control group mirrors the inclusion of grade 6 relative to grade 8. Omitting grade 9 students prevents comparing primary to secondary school students. Adding grade 12 students to the treatment definition and grade 10 and 11 students to the control definition expands the definition to include all grades eligible for the partial reopening.
The dependent variable is total working hours over the last 7 days, taking a value of 0 for individuals not working. Observations include data from May to November 2020, and include treatment households with children in grades 4 or 8 (indicated by 'Treat'), control households with children in an adjacent grade, and 'Mixed' households with both, unless otherwise indicated. 'Post' is a dummy for being observed on or after the partial school reopening on October 12. Regressions include household and month fixed effects. SEs clustered at household level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A11: Robustness to defining post by timing of reopening announcement, 21 Sept 2020

	(1) Any work	(2) Wage work	(3) HH ag.	(4) HH ent.	(5) Total hrs	(6) Wage hrs	(7) HH ag hrs	(8) HH ent hrs
Post x Treat	0.047	0.009	0.036	0.023	3.693**	0.543	2.603*	0.580
	(0.046)	(0.011)	(0.047)	(0.021)	(1.658)	(0.475)	(1.360)	(0.771)
Post x Mixed	0.075	-0.004	0.063	0.008	1.147	-0.079	1.354	-0.239
	(0.046)	(0.011)	(0.045)	(0.018)	(1.644)	(0.466)	(1.393)	(0.696)
Observations	8538	8538	8538	8538	8538	8538	8538	8538
Mean, pre-reopen control	0.604	0.062	0.531	0.065	16.742	2.024	12.481	2.322

This table presents estimates of variations of Equation 1, but *Post* is defined not by the date schools reopened on 12 October 2020 but by the timing it was announced, 27 September.
Dependent variables are defined over the last 7 days, and take a value of 0 for individuals not working in a particular activity. Observations include data from May to November 2020, and include treatment households with children in grades 4 or 8 (indicated by 'Treat'), control households with children in an adjacent grade, and 'Mixed' households with both. 'Post' is a dummy for being observed on or after the partial school reopening on October 12. Regressions include household and month fixed effects. SEs clustered at household level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A12: Impacts of partial school reopening by sex and presence of children age 0-8

	HH ag. work hours			Other work hours			Childcare hours		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post × Treat, No child age 0-8	4.193	5.031	5.500	0.932	-0.061	3.339	-6.154	-5.519	-7.714
	(2.960)	(3.586)	(4.825)	(2.383)	(3.125)	(3.985)	(7.795)	(11.640)	(9.617)
Post × Treat, Any child age 0-8	4.412**	3.526	5.231	1.856	1.854	2.546	7.264	9.822	-2.468
	(1.971)	(2.462)	(3.531)	(2.314)	(2.797)	(3.486)	(6.433)	(8.626)	(10.184)
Observations	2288	1331	902	2288	1331	902	2284	1328	901
Mean, pre-reopen control	12.947	11.702	14.827	6.325	5.509	7.651	52.747	60.059	41.175
Sample	All	Women	Men	All	Women	Men	All	Women	Men
p-value, diff. by Any child age 0-8	0.951	0.729	0.964	0.781	0.649	0.881	0.185	0.290	0.708

This table estimates impacts of the partial school reopening on respondent hours spent in the last 7 days on household agricultural labor (columns 1-3), wage employment and household non-agricultural enterprise labor (columns 4-6), and childcare (columns 7-9). Observations include data for survey respondents from May to November 2020, and include treatment households with children in grades 4 or 8 (indicated by 'Treat') and control households with children in an adjacent grade. 'Mixed' households with both types of children are dropped from the sample, though results are similar when they are included. 'Post' is a dummy for being observed on or after the partial school reopening on October 12. Coefficients for 'Any child age 0-4' represent the sum of the $Post \times Treat$ and $Post \times Treat \times Any$ *child age 0-4* terms. We include *p*-values for tests of whether the interaction term is equal to 0. Regressions include household and month fixed effects. SEs clustered at household level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A13: Robustness of analysis of mechanisms to including all adults

	HH ag. work hours			Other work hours		
Panel A	(1)	(2)	(3)	(4)	(5)	(6)
Post x Treat	3.352	2.953	3.967	0.867	0.869	0.700
	(2.094)	(2.063)	(2.544)	(1.193)	(1.614)	(1.499)
Post x Treat × Any child age 0-4	1.663	1.707	1.870	-0.565	-1.113	0.090
	(3.021)	(3.073)	(3.476)	(2.006)	(2.445)	(2.706)
Observations	6575	3414	2880	6575	3414	2880
Mean, pre-reopen control	12.167	11.688	12.623	4.327	3.579	4.965
Sample	All	Women	Men	All	Women	Men

	HH ag. work hours			Other work hours		
Panel B	(1)	(2)	(3)	(4)	(5)	(6)
Post x Treat	2.442	2.032	3.171	0.825	1.066	0.316
	(1.693)	(1.691)	(2.105)	(1.108)	(1.601)	(1.563)
Post x Treat × Any child ag	4.936	5.113	4.855	-0.622	-1.798	1.803
labor before reopening	(3.383)	(3.412)	(3.794)	(1.776)	(2.351)	(2.723)
Observations	6575	3414	2880	6575	3414	2880
Mean, pre-reopen control	12.167	11.688	12.623	4.327	3.579	4.965
Sample	All	Women	Men	All	Women	Men

This table estimates impacts of the partial school reopening on adult hours spent in the last 7 days on household agricultural labor (columns 1-3) and wage employment and household non-agricultural enterprise labor (columns 4-6). Childcare hours are only available for survey respondents. Observations include data for all household adults from May to November 2020, and include treatment households with children in grades 4 or 8 (indicated by 'Treat') and control households with children in an adjacent grade. 'Mixed' households with both types of children are dropped from the sample, though results are similar when they are included. 'Post' is a dummy for being observed on or after the partial school reopening on October 12. Regressions include household and month fixed effects. SEs clustered at household level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A14: Robustness of analysis of childcare mechanism to including mixed households

Respondent last 7 days hours in	HH agriculture work			HH enterprise or wage work			Childcare		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post x Treat	4.595**	3.915	4.844	3.706*	4.332	3.880	-5.703	-10.049	0.395
	(2.190)	(2.568)	(4.150)	(2.101)	(2.846)	(3.150)	(6.222)	(8.365)	(9.465)
Post x Treat × Any child age 0-4	-0.837	0.498	-1.192	-4.779	-7.246*	-1.912	17.242*	32.167**	-10.193
	(3.300)	(4.043)	(5.715)	(3.596)	(4.261)	(5.448)	(10.242)	(14.449)	(14.828)
Post x Mixed	1.930	1.254	2.537	-1.289	-1.777	1.050	-0.601	-6.662	10.419
	(2.338)	(2.917)	(4.041)	(1.958)	(2.365)	(3.460)	(7.429)	(9.725)	(11.357)
Post x Mixed × Any child age 0-4	-0.622	1.948	-4.096	3.311	4.683	1.361	1.974	19.163	-22.313
	(3.134)	(4.123)	(5.095)	(2.965)	(3.877)	(4.775)	(9.919)	(13.435)	(14.765)
Observations	2939	1710	1163	2939	1710	1163	2935	1707	1162
Mean, pre-reopen control	12.947	11.702	14.827	6.325	5.509	7.651	52.747	60.059	41.175
Sample	All	Women	Men	All	Women	Men	All	Women	Men

This table estimates impacts of the partial school reopening on respondent hours spent in the last 7 days on household agricultural labor (columns 1-3), wage employment and household non-agricultural enterprise labor (columns 4-6), and childcare (columns 7-9). Observations include data for survey respondents from May to November 2020, and include treatment households with children in grades 4 or 8 (indicated by 'Treat') and control households with children in an adjacent grade. 'Mixed' households include both types of children. 'Post' is a dummy for being observed on or after the partial school reopening on October 12. Regressions include household and month fixed effects. SEs clustered at household level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A15: Robustness of analysis of child agriculture mechanism to including mixed households

Last 7 days hours in	HH agriculture work (Respondent)			HH enterprise or wage work (Respondent)			Household agriculture (All household children)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post x Treat	4.184**	5.262**	1.731	1.628	3.282*	5.435**	-0.673	-1.006	-0.554
	(1.642)	(2.162)	(2.804)	(1.744)	(1.927)	(2.594)	(1.001)	(1.317)	(0.960)
Post x Treat × Any child ag labor before reopening			8.738**			-5.036			-0.078
			(4.358)			(3.856)			(2.479)
Post x Mixed	1.451	2.019	2.478	0.731	1.016	3.112	-1.725	-2.000	0.735
	(1.554)	(1.891)	(2.689)	(1.505)	(1.493)	(2.083)	(1.175)	(1.424)	(1.100)
Post x Mixed × Any child ag labor before reopening			1.019			-4.269			-2.239
			(3.776)			(2.945)			(2.558)
Observations	2939	2300	2300	2939	2300	2300	2939	2300	2300
Mean, pre-reopen control	12.947	16.806	16.806	6.325	5.325	5.325	4.167	5.409	5.409
Sample of households	All	Ag. HH	Ag. HH	All	Ag. HH	Ag. HH	All	Ag. HH	Ag. HH

This table estimates impacts of the partial school reopening on respondent hours of work in the last 7 days for household agriculture (columns 1-3) and other activities (wage employment and household non-agricultural enterprise, columns 4-6), and on total child agricultural labor hours in the last 7 days (columns 7-9). Columns with the 'Ag. HH' sample include households engaged in agricultural production at any point in 2020. Observations include data for survey respondents from May to November 2020, and include treatment households with children in grades 4 or 8 (indicated by 'Treat') and control households with children in an adjacent grade. 'Mixed' households include both types of children. 'Post' is a dummy for being observed on or after the partial school reopening on October 12. Regressions include household and month fixed effects. SEs clustered at household level.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$