Supplemental Online Appendix for

"Worms at work: Long-run impacts of a child health investment"

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November 2015

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A. Study setting and research design

A.1 Selection of Schools for the Primary School Deworming Project (PSDP) Sample

In January 1998, there were a total of 92 primary schools in the study area of Budalangi and Funyula divisions, across eight geographic zones. Seventy-five of these 92 schools were selected to participate in PSDP. The 17 excluded schools include: town schools that were quite different from other local schools in terms of student socioeconomic background; single-sex schools; a few schools located on islands in Lake Victoria (posing severe transportation difficulties); and those few schools that had in the past already received deworming and other health treatments under an earlier small-scale ICS (NGO) program.

In particular, four primary schools in Funyula Town were excluded due to large perceived income differences between their student populations and those in other local schools. Specifically, three schools charged schools fees well in excess of neighboring primary schools, and thus attracted the local "elite". Another is a private boarding school for girls, charging even higher fees, and was similarly excluded.

Four other primary schools in Budalangi division were excluded from the sample due to geographic isolation, which introduced logistic difficulties and would have complicated deworming treatment and data collection. Three of these schools are located on islands in Lake Victoria, and the fourth is separated from the rest of Budalangi by a marshy area.

Two additional schools were excluded. One served as the pilot school for the PSDP in late 1997, receiving deworming treatment before other local schools, and thus it was excluded from the evaluation. The other was excluded since it was a newly opened school in 1998 with few pupils in the upper standards (grades), and thus was not comparable to the other sample schools.

Seven schools had participated in the ICS Child Sponsorship Program/School Health Program (CSP/SHP). In 1998, it was felt that identification of treatment effects in these schools could be complicated by the past and ongoing activities in those schools, including health treatment (and deworming in particular), and hence they were excluded from the sample. The NGO's earlier criteria in selecting these particular seven schools (in 1994-1995) is not clear.

The PSDP sample was roughly a quarter of the total population (across all ages) of Budalangi and Funyula divisions, which was 127,231 (1999 Census). The 1998 Kenya Demographic and Health Survey finds that 85% of 8 to 18 year olds in western Kenya were enrolled in school, indicating that our school-based sample is broadly representative of children in the region.

Drugs for STH (albendazole) were offered twice per year and for schistosomiasis (praziquantel) once per year.

A.2 Prospective Experimental Procedure

Miguel and Kremer (2004) contains a partial description of the prospective experimental list randomization procedure, and we expand on it here; further detail on the study design is presented in Miguel et al. (2014). Schools were first stratified by geographical area (division, then zone), and the zones were listed alphabetically (within each division), and then within each zone the schools were listed in increasing order of student enrolment. There are two divisions, Budalangi and Funyula, containing a total of eight zones (Agenga/Nanguba, Bunyala Central, Bunyala North, Bunyala South, Bwiri, Funyula, Namboboto, and Nambuku). Table S1 shows there is no significant difference between average school populations in the treatment and control groups.

While the original plan had been to stratify by participation in other NGO programs, the actual randomization was not carried out this way. Schools participating in the intensive CSP/SHP program were dropped from the sample (as detailed above), while 27 primary schools with less intensive NGO programs were retained in the sample. These 27 schools were receiving assistance in the form of either free classroom textbooks, grants for school committees, or teacher training and bonuses. It is worth emphasizing that the randomized evaluations of these interventions did not find statistically significant average project impacts on a wide range of educational outcomes (Glewwe, Kremer, and Moulin, 2009). The schools that benefited from these previous programs were found in all eight geographic zones; the distribution of the 27 schools across the eight zones is: Agenga/Nanguba (5 schools), Bunyala Central (1), Bunyala North (4), Bunyala South (2), Bwiri (4), Funyula (5), Namboboto (1), Nambuku (5). The results in the current paper are similar when including controls for participation in these other NGO programs (results not shown).

The schools were "stacked" as follows. Schools were divided by geographic division, then zone (alphabetically), and then listed according to school enrolment (as of February 1997, for grades 3 through 8) in ascending order. If there were, say, four schools in a zone, they would be listed according to school enrolment in ascending order, then they would be assigned consecutively to Group 1; Group 2; Group 3; Group 1. Then moving onto the next zone, the first school in that stratum would be assigned to Group 2, the next school to Group 3, and so on. Thus the group assignment "starting value" within each stratum was largely arbitrary, except for the alphabetically first zone (in the alphabetically first division), which assigned the school with the smallest enrolment in the zone to Group 1. Finally, there were three primary schools excluded from the original stacking of 72 schools that were added back into the sample for the original randomization, to bring the sample up to 75. These schools were originally excluded for similar reasons as listed above – e.g., two are rather geographically isolated, and the third is a relatively high quality school located near Funyula Town. However, in the interests of boosting sample size, these three schools were included in the list randomization alphabetically as the "bottom" three schools in the list.

Deaton (2010) raises concerns about the list randomization approach, in the case where the first school listed in the first randomization "triplet" is different than other schools (in our case, the concern would be that it has lower than average school enrolment); the same concerns would apply to several other well-known recent field experiments in development economics, most notably Chattopadhyay and Duflo (2004). However, this is not a major threat to our empirical approach. Following Bruhn and McKenzie (2009) we include all variables used in the randomization procedure (such as baseline school enrolment) as explanatory variables in our regressions, thus controlling for any direct effect of school size, and partially controlling for unmeasured characteristics correlated with school size. Coefficient estimates on the deworming treatment indicator are largely unchanged whether or not these additional explanatory variables are included, suggesting that any bias is likely to be small. The difference in average school enrollment between the treatment and control groups is small and not statistically significant (Table S2). Moreover, even if the first school in the first randomization triplet were an outlier along some unobserved dimension (which seems unlikely), given our sample size of 75 schools and 25 randomization triplets, and the fact that school size is not systematically related to treatment group assignment for the other 24 randomization triplets (as discussed above), approximately 96% of any hypothesized bias would be eliminated. Taken together, the prospective experimental design in the current paper is likely to yield reliable causal inference. Figure S1 further summarizes the research design.

Miguel and Kremer (2004) present evidence of balance across treatment groups along a fuller set of baseline covariates for the treatment and control groups (in their Table I), reproduced here as Table S1. The same balance on predetermined characteristics is also evident among the subsample of respondents no longer enrolled in school and among those currently working for wages (see Tables S4 and S14), two subsamples that feature in some of the analysis of this paper.

While it is not necessary to utilize baseline data in a randomized experiment, since treatment versus control differences yield unbiased effect estimates even when relying solely on follow-up data, some readers may be concerned that baseline data on school participation was lacking based on incorrect claims (e.g., Taylor-Robinson *et al.* 2012, 2015). Miguel and Kremer (2004) show three pieces of baseline data demonstrating balance on educational variables: (i) baseline data from school registers, which show nearly identical measured attendance across the three treatment groups; (ii) baseline data for Group 2 versus Group 3 from the unannounced school attendance checks during 1998 (when both groups were "control"), showing no statistically significant differences in school participation (and in fact, school participation was, if anything, slightly lower in Group 2 schools in that year, making the large positive school participation difference between Group 2 and Group 3 in 1999 even more noteworthy); and (iii) baseline balance along a wide range of other educational, health and socioeconomic measures (as reproduced in Table S1 below).

B. Econometric estimation of externalities

B.1 Estimating Treatment Effects in the Presence of Externalities

Define the complete vector of lagged deworming treatment saturation levels at all distances and in all time periods (excluding $P_{j,0,\delta}$, which we have already accounted for) as P_{j,t^*}, $P_{j,t^*} \equiv \{P_{j,0,2\delta}, P_{j,0,3\delta}, \ldots, P_{j,0,t^*\delta}, P_{j,1,\delta}, P_{j,1,2\delta}, \ldots, P_{j,1,t^*\delta}, \ldots, P_{j,t^*,\delta}, P_{j,t^*,2\delta}, \ldots, P_{j,t^*,t^*\delta}\}$, where the subscript $n\delta$ denotes deworming treatment saturation at distances between $(n-1)\delta$ and $n\delta$ from school j.

We can generalize our empirical quantities of interest taking into account these additional externality effects. Consider the impact of a program in which the share of nearby population receiving deworming in the original period is $P_{j,0,\delta} = p_0$ and the vector of additional externality exposure is $P_{j,t^*} = \underline{p_1}$:

$$\pi_{t^*}\left(p_0, \underline{p_1}\right) \equiv E\left[Y_{ijt^*} | T_{j,0} = 1, P_{j,0,\delta} = p_0, P_{j,t^*} = \underline{p_1}\right] - E\left[Y_{ijt^*} | T_{j,0} = 0, P_{j,0,\delta} = 0, P_{j,t^*} = 0\right] \quad \text{(eqn. B1)}$$

(where $P_{j,t^*} = 0$ indicates that all elements of the vector are equal to zero). As above, define the expected outcome in untreated communities surrounded only by other untreated communities (i.e., "pure control" communities uncontaminated by exposure to treatment schools) as $y_{0,t^*} \equiv E\left[Y_{ijt^*} | T_{j,0} = 0, P_{j,0,\delta} = 0, P_{j,t^*} = 0\right]$. The generalized difference in expected outcomes between treated and untreated communities at given local treatment saturation exposure is:

$$\lambda_{1t^*}\left(p_0, \underline{p_1}\right) \equiv E\left[Y_{ijt^*} | T_{j,0} = 1, P_{j,0,\delta} = p_0, P_{j,t^*} = \underline{p_1}\right] - E\left[Y_{ijt^*} | T_{j,0} = 0, P_{j,0,\delta} = p_0, P_{j,t^*} = \underline{p_1}\right] \quad \text{(eqn. B2)}$$

The difference in average outcomes between untreated communities at initial treatment saturation ($P_{j,0,\delta} = p_0$) versus those only benefiting from the additional externalities is:

$$\lambda_{2t^*}\left(p_0, \underline{p_1}\right) \equiv E\left[Y_{ijt^*} | T_{j,0} = 0, P_{j,0,\delta} = p_0, P_{j,t^*} = \underline{p_1}\right] - E\left[Y_{ijt^*} | T_{j,0} = 0, P_{j,0,\delta} = 0, P_{j,t^*} = \underline{p_1}\right] \quad \text{(eqn. B3)}$$

The new term to consider is the difference between those communities only benefiting from the additional externalities versus the pure control communities:

$$\lambda_{3t^*}\left(p_0, \underline{p_1}\right) \equiv E\left[Y_{ijt^*} | T_{j,0} = 0, P_{j,0,\delta} = 0, P_{j,t^*} = \underline{p_1}\right] - y_{0,t^*} \quad \text{(eqn. B4)}$$

The sum of these three effects is $\pi_{t^*}\left(p_0, \underline{p_1}\right) \equiv \lambda_{1t^*}\left(p_0, \underline{p_1}\right) + \lambda_{2t^*}\left(p_0, \underline{p_1}\right) + \lambda_{3t^*}\left(p_0, \underline{p_1}\right)$.

Closely following the proof to proposition 1 in the text, Assumption 1 implies that the new externality term $\lambda_{3t^*}\left(p_0, \underline{p_1}\right)$ is non-negative, and thus that once again an analysis that does not account for cross-community spillover effects and focuses on $\lambda_{1t^*}\left(p_0, \underline{p_1}\right)$ yields a lower bound on both quantities of empirical interest, $\pi_{t^*}\left(1, \underline{p_1}\right)$ and $\pi_{t^*}\left(p_0, \underline{p_1}\right)$.

Proposition B1 (Bounding the treatment effect): Suppose for all $\left(p_0, \underline{p_1}\right)$, $E\left[Y_{ijt^*} | T_{j,0} = 1, P_{j,0,\delta} = p_0, P_{j,t^*} = \underline{p_1}\right] \geq E\left[Y_{ijt^*} | T_{j,0} = 0, P_{j,0,\delta} = p_0, P_{j,t^*} = \underline{p_1}\right]$, then $\pi_{t^*}\left(1, \underline{p_1}\right) \geq \pi_{t^*}\left(p_0, \underline{p_1}\right) \geq \lambda_{1t^*}\left(p_0, \underline{p_1}\right)$ for all $\left(p_0, \underline{p_1}\right)$.

Proof: The proof that $\pi_{t^*}\left(1, \underline{p_1}\right) \geq \pi_{t^*}\left(p_0, \underline{p_1}\right)$ follows directly from the proof to Proposition 1. We next show that $\pi_{t^*}\left(p_0, \underline{p_1}\right) \geq \lambda_{1t^*}\left(p_0, \underline{p_1}\right)$. It is sufficient to show that both $\lambda_{2t^*}\left(p_0, \underline{p_1}\right)$ and $\lambda_{3t^*}\left(p_0, \underline{p_1}\right)$ are non-negative. The proof that $\lambda_{2t^*}\left(p_0, \underline{p_1}\right) \geq 0$ follows directly from the proof to Proposition 1. For the sign of $\lambda_{3t^*}\left(p_0, \underline{p_1}\right)$, consider the vector of saturation exposure $\underline{p_1}$ where $p_{\tilde{t},\tilde{\delta}} \geq 0$ for each element of the vector. The monotonicity assumption (Assumption 1) implies that $\lambda_{3t^*}\left(p_0, \underline{p_1}\right) = E\left[Y_{ijt^*} \mid T_{j,0} = 0, P_{j,0,\delta} = 0, P_{j,t^*} = \underline{p_1}\right] - y_{0,t^*} \geq 0$. The result follows. □

B.2. Understanding externalities and treatment interactions across multiple outcomes

We also estimated the interaction between the treatment indicator and local treatment saturation. The sign of this interaction is theoretically ambiguous. While there are more infections to eliminate in more highly infected areas and this would naturally lead to larger impacts in such areas, areas with higher prevalence will also typically have conditions more conducive to transmission of the disease (i.e., soil moisture). Thus re-infection is likely to occur more rapidly in these areas, dampening treatment impacts relative to areas where it takes longer for re-infection to occur. Empirically, we typically do not find significant interaction effects, even when jointly testing for significance across multiple outcomes (see discussion below). Nor do we generally find statistically significant effects on non-linear terms in local treatment saturation, leading us to focus on a linear functional form of $\lambda_2(p) = p\lambda_2^*$ (where λ_2^* is a constant) for the externality effect.

Given the range of outcomes we explore in Tables 1 to 4 – 28 in total (not including the 2001 health result in Table 1) – it is useful to carry out a summary test to assess the existence of deworming treatment externalities across schools. The simplest such test is to assess whether the externality effect has the same "sign" as the direct deworming treatment estimate across all 28 outcomes. This test effectively tests the null hypothesis that the externality effect is symmetric with a mean of zero, in which case the estimated effects should be evenly distributed on both sides of zero. Examining the 28 outcomes, we immediately see that the externality estimates disproportionately have the same sign as the direct deworming effect (i.e., the coefficient estimate on the treatment school indicator). Specifically, the two signs are the same in 23 out of 28 outcomes in the full sample (examining males and females together). This pattern is extremely unlikely to occur by chance. In the case where the externality effect was pure "noise", the likelihood of a sign "match" between the two terms would be distributed as a binomial distribution with p=0.5. In that case, 23 of 28 pairs of estimates would have the same sign roughly six times in 10,000 cases. This pattern provides empirical support for the monotonicity assumption in section 3.1.

This "sign test" has limitations, as it ignores information on the magnitude of the estimated effects, and does not take into account that some of the outcomes are correlated with others (i.e., total earnings are correlated with total hours worked). An alternative test that accounts for the first of these concerns estimates the correlation between the t-statistics for the direct effect and the externality effect (across all outcomes). We obtain a correlation between the pairs of t-statistics of 0.655 (P-value < 0.002). The results are very similar when considering the correlation between the coefficient estimates across these outcomes instead of the t-statistic (not shown), but the t-statistic approach provides a useful normalization. These results confirm the finding from the simple sign test discussed above, and in both cases we reject the hypothesis of no externality effect at high levels of confidence.

We carried out a related analysis in order to assess whether there is robust evidence of interactions between treatment assignment and cross-school externality effects across all outcomes. Specifically, we examined the correlation between the t-statistics for the coefficient estimates on the direct effect and the interaction (Treatment x Externality) effects across all outcomes. Note that we use the zonal-level baseline infection rate, rather than individual-level data (which was not collected at baseline for the control group for ethical reasons); using zonal averages is likely to introduce some measurement error and attenuation bias, and thus these interaction effect estimates may understate the true extent of differential impacts in high worm infection areas. We obtain a relatively weak and not statistically significant correlation of 0.306 (P-value=0.189) for the full sample. Thus we cannot reject the null hypothesis of no relationship between the treatment effect and the interaction effect.

Finally, using a seemingly unrelated regression (SUR) estimation across 24 of the 28 regressions (ignoring the results that were run on different samples, including the 2001 health result and the miscarriage result in Table 1, the out-of-school subsample results in Tables 3 and 4, and the trimmed profits result in Table 4), we reject the hypothesis that the cross-school externality effect from 0-6 km is zero (P<0.001).

As we note in the main text, the original study found externality impacts out to 3 km upon correction of a coding error (detailed in Miguel and Kremer, 2014 and Hicks et al., 2015). However, spillover effects are likely to diffuse spatially over time. We perform this same SUR estimation including separate terms for 0-3 km and 3-6 km spillovers, and conditional on 0-3 km we also reject the hypothesis that the effects from 3-6 km are zero. For this reason, we include externality impacts from 0-6 km in our primary analysis.

C Discussion of additional empirical results

C.1. Sample tracking and attrition

As time progressed and the pace of locating respondents slowed, a representative (random) subsample containing approximately one quarter of still-unfound respondents was drawn. Those sampled were tracked "intensively" (in terms of enumerator time and travel expenses) for the remaining months, while those not sampled were no longer actively tracked. We re-weight those chosen for the "intensive" sample by their added importance to maintain the representativeness of the sample. As a result, all figures reported here are "effective" tracking rates (ETR), calculated as a fraction of those found, or not found but searched for during intensive tracking, with weights adjusted appropriately. This is analogous to the approach in the U.S. Moving To Opportunity study (Kling, Liebman and Katz, 2007; Orr *et al.*, 2003). The effective tracking rate (ETR) is a function of the regular phase tracking rate (RTR) and intensive phase tracking rate (ITR) as follows:

$$\mathrm{ETR} = \mathrm{RTR} + (1 - \mathrm{RTR}) * \mathrm{ITR}\,. \tag{S1}$$

The RTR in KLPS-2 is 65.0% and the ITR is 62.1%, which implies that the ETR = 86.7% when including all those surveyed, plus those who refused or were found but were unable to be surveyed, and the deceased.

A midterm round (KLPS-1) was collected in 2003-05. We focus on the KLPS-2 since it was collected at a more relevant time point to assess adult life outcomes: most respondents are adults by 2007-09 (median age 22 years vs. 18 in KLPS-1), the vast majority have completed school, many have married, and a growing share are employed.

Table S4 shows that, other than the treatment saturation proportion, there are no significant differences across the treatment groups in the out-of-school subsample along observable dimensions, and Table S5 similarly shows that there is minimal selection into the out-of-school subsample along observable characteristics across the treatment and control groups. There are no significant deworming impacts on migration out of the study district or to urban areas (not shown).

C.2. Additional results related to Table 1

Worms' average lifespan in the human body is only one to three years (Anderson and May, 1991; Bundy and Cooper, 1989). So deworming in a school 10 years ago would affect current worm load insofar as it had a persistent epidemiological effect on worm load seven years later, an effect that is likely to be extremely small given the high reinfection rates in our data. Thus any health impacts are likely to work through other channels, as discussed in the main text. Note that we see no evidence that students in treatment schools are more likely to purchase deworming medicine as adults (not shown).

Figure S2 visually presents the difference in moderate-to-heavy worm infection rates among the three program group (Group 1, Group 2 and Group 3) during 1998-2002. The impact of treatment on infection rates in early 2001 is presented in Table 1. It is apparent that there are high levels of moderate-to-heavy worm infections in the study area, and that mass deworming leads to sharp reductions in worm infection rates.

Point estimates suggest women in the treatment group have had somewhat fewer pregnancies and are less likely to be married or the parent of a child (not shown), although effects are not significant.

C.3. Additional results related to Table 2

Given that KLPS-2 school enrollment data misses out on attendance impacts, which are sizeable, a plausible lower bound on the total increase in time spent in school induced by the deworming intervention is the 0.137 gain in school participation from 1998-2001 plus the school enrollment gains from 2002-2007 (multiplied by average attendance conditional on enrollment), which works out to nearly 0.3 additional years of schooling (not shown).

There is little evidence of differential selection along observables into the out-of-school sample between the treatment and control groups (Tables S4-S5). Note that the out-of-school variable cannot necessarily be taken as an indicator of more (or less) schooling, since it could indicate either rapid on-time completion of secondary school, or more post-secondary school education.

One potential concern with longitudinal data collected over such a long time span is attrition. Reassuringly, we cannot reject that treatment effect estimates are equal in the regular tracking and the intensive tracking subsamples for the outcomes in Table 2 (results not shown).

C.4. Additional results related to Table 3

There is no significant change in the proportion in the treatment group working at all (greater than zero hours in the past week), which is roughly 68% overall (Table S15, Panel A) and 73% for the out-of-school subsample (not shown). There is thus a considerable degree of "non-activity" for a young adult population. In the full sample, females are somewhat more likely to be classified as non-active, which may be related to the fact that most out-of-school females have had at least one pregnancy. However, note that some females are engaged in home production or child-rearing activities that were not collected in detail in the KLPS-2 survey and thus not classified as "work hours" here. This possible under-reporting of total work hours, which is likely to be particularly important for females, provides another reason to conduct the analysis separately for males and females.

77% of self-employed women are in retail. While 44% of the male self-employed also work in retail, others work in occupations such as commercial fishing (21%), small manufacturing (12%) and passenger transport (9%), several of which require substantial physical strength and regularly take the respondents farther afield, and thus may be more difficult to combine with child care.

In further evidence consistent with the PRH model, we find suggestive evidence of a more general shift into high work hour occupations for males, but not for females. To explore this, we assigned each individual in the sample to a broad occupation group (or set of groups, if the individual worked in more than one occupation at the time of the follow-up survey), and created a measure of average work hours (among control individuals) within each occupation group. These included farming, six different self-employment occupations, and 13 different wage employment categories. We then regressed this measure of average work hours on the treatment measure, an interaction between treatment and gender, and our standard regression controls. Among males, we find suggestive evidence of a shift into occupations characterized by higher average work hours (coefficient estimate 1.71, SE 1.01, $P < 0.10$). Further detail on patterns of employment among wage earners is provided in Table S16.

We find no evidence of differential effects by age cohort (Tables S6-S9, column 7). We examine impacts in geographic zones within the sample with different levels of baseline worm infection rates, but do not find significantly different treatment effects for hours worked or meals eaten, nor when we separately examine geohelminths and schistosomiasis (where the latter is proxied by proximity to Lake Victoria, where schistosomiasis is concentrated, Tables S10-S11). Deworming treatment effects typically remain positive, similar in magnitude and significant among schools located more than 5 km from Lake Victoria, in areas where schistosomiasis is rare, suggesting that the results are not driven by schistosomiasis alone (Tables S10-S13). Brooker et al. (2000) argues that distance to Lake Victoria is a good proxy for schistosomiasis infection in this region of Kenya.

ICS, the NGO which undertook the PSDP program, typically required cost-sharing, and in 2001, a randomly chosen half of the Group 1 and 2 schools took part in a program in which parents had to pay a small positive price (US$0.27 on average) to purchase the drugs, while the other half of Group 1 and 2 schools received free treatment (as did all Group 3 schools); the randomization was carried out with a computer random number generator. In 2002 and 2003, all schools received free treatment. Cost-sharing reduced deworming take up from approximately 75% to 18% (Kremer and Miguel 2007).

We estimate negative coefficients on the 2001 cost-sharing indicator variable when the dependent variable is hours worked, meals eaten, passing the primary school leaving exam, or log wage earnings (Tables S6-S9). The fact that coefficient estimates on the cost-sharing indicator are of opposite sign compared to the direct treatment effect, and typically smaller in absolute value, is reassuring.

C.5. Additional results related to Table 4

The wage earnings result (in Table 4, Panel B) is robust to several alternative specifications. It changes little in response to trimming the top 1% of earners, so the result is not driven by outliers, and to including a full set of gender-age fixed effects (results not shown).

A decomposition along the lines of Oaxaca (1973) – which uses mean earnings by occupation in the control group as a reference point – indicates that among wage earners, 75% of the higher earnings in the treatment group can be accounted for by occupational shifts (not shown), for instance, the shift into manufacturing and out of casual labor.

Trimming the top 5% of self-reported profits results in a similarly sized treatment effect of 341 shillings ($P < 0.10$). We obtain similar results on firm profits (Table 4, Panel C) using both the inverse sine hyperbolic transformation and log profits (not shown). There are large, positive but not statistically significant impacts on a monthly profit measure based directly on revenues and expenses reported in the survey (not shown). We focus here on self-reported profits in the last month, which appear to be less noisy. De Mel, McKenzie and Woodruff (2009) argue in favor of focusing on self-reported profits rather than computed profits in their work on small firms in low-income countries.

There appears to be a shift in the distribution of log self-employed profits for men, but it is less prominent for women (Figures S3-S4).

A consumption expenditure module was collected as a small pilot for 255 respondents. The estimated effect on total per capita consumption is near zero and not statistically significant but the confidence interval is large and includes both substantial gains and losses (not shown).

There is no evidence that the quality of labor in agriculture in the treatment group was lower than in the control group based on observable characteristics. For instance, average education levels among those working in agriculture are, if anything, slightly higher in the treatment group, and the difference is statistically significant at the 10% level among males. The share of male labor in agriculture is also, if anything, slightly higher in the treatment group. Both of these patterns are likely to be associated with somewhat higher agricultural productivity in the treatment, since male agricultural labor is higher paid in the area (in our data) and education tends to be associated with higher labor productivity in agriculture.

The multiple testing False Discovery Rate (FDR) adjustments presented in Tables S18-S21 and discussed in the text are carried out separately for the outcome variables within each table. Other recent economics research adopts a similar approach to multiple testing adjustments within domains of related hypotheses, including Casey et al (2012) and Finkelstein et al (2012). Regarding the multiple testing adjustment by gender subsamples, for women, q-value < 0.10 for improvements in self-reported health, reduction in miscarriage, increases in secondary school enrollment, passing the secondary school entrance exam and years enrolled, and for men, q-value < 0.10 for increases in total hours worked (Tables S18-S21). Anderson (2008) presents multiple instances in which the FDR q-value is smaller than the per-comparison (naïve) P-value, and this occurs for several outcomes in our data. This pattern may occur in both FDR and Family-wise Error Rate (FWER) adjustments because both methods enforce the original monotonic ordering of unadjusted p-values; see Anderson (2008) for details.

C.6. Additional results related to Figure 1

The distribution of work hours in the last week in our data is similar to several other recent labor surveys in Africa (in the International Income Distribution Database, I2D2, World Bank: Development Research Group, Poverty and Inequality Unit), including for average work hours, suggesting that our sample of workers is not unusual. For instance, a sizeable 25% of KLPS-2 males who work positive hours for wages worked more than 60 hours in the last week, while in the 2007 Tanzania survey in I2D2, 23% of rural male wage earners worked more than 60 hours.

C.7. Additional results related to Table 5 and the internal rate of return calculation

For consumption, the marginal tax rate in our sample of mostly rural residents may be lower than the national average since some consumption comes in the form of food produced on their own farms. Home produced food constitutes roughly 10% of total household consumption (in data from a pilot consumption survey); note that it is likely that an even smaller share of the marginal income gains experienced by deworming beneficiaries are in the form of home produced food, given the documented shift towards cash crops and entrepreneurship. Even if home produced food is entirely untaxed, the tax revenue generated still outweighs the deworming subsidy by a ratio of roughly 10 to 1 if remaining elements of consumption are taxed at the national average.

Wanjala (2007) discusses VAT collection in Kenya since the 1990s. The VAT burden has risen over time due to the progressive formalization of many sectors of the Kenyan economy (increasing payments) and a recent tax reform that expanded the number of good subject to VAT. We find that future revenue exceeds subsidy costs in the no health spillover case (health spillover case) as long as taxes capture 8% (3%) of the additional lifetime earnings of $142.43 ($766.81).

We can alternatively focus solely on income gains among the subsample of wage earners and the self-employed (outside of agriculture), as a larger share of their earnings are likely to be subject to tax than subsistence farmers. This exercise implicitly sets earnings gains among subsistence farmers to zero. An analysis that focuses solely on earnings and profits yields similarly large increases in government revenue, at US$17 dollars in net revenue for each dollar of subsidies (Appendix Table S22).

The main result also holds if earnings gains are assumed to remain constant over time, ruling out further gains over the life cycle due to work experience and ruling out further economic growth, yielding $1.96 in net revenue for each dollar of deworming subsidies (Appendix Table S23). We also estimate the impact of partial deworming subsidies assuming that their labor market impacts are proportional to the number of people dewormed. As noted above, theory provides little guidance on the shape of the function linking deworming treatment intensity to outcomes, but we cannot reject this hypothesis of linearity. Point estimates suggest increasing treatment rates from 19% to 75% less than proportionally increases the benefits of treatment, but estimated effects are imprecisely estimated.

The result that the NPV of revenue exceeds subsidy costs also holds if we consider both the opportunity cost of additional time spent in secondary school by adolescents as well as the benefits in terms of future wage growth, yielding $12 in future revenue for each $1 in subsidies (Appendix Table S24).

Note that Kremer and Miguel (2007) find no evidence that people with serious worm infections are more likely to pay for deworming treatment during the cost-sharing phase of the project in 2001.

We use the estimated $\lambda_{1,\gamma}$ and $\lambda_{2,\gamma}$ values from year 10 post-treatment onwards, and then use the pattern of lifecycle earnings reported in the most recent publicly available data, the 1998/1999 Kenya Integrated Labour Force Survey, to scale these effect sizes over time. This assumes that earnings effects will stay the same in percentage terms over the life cycle. To the extent that experience and education are complementary (as argued, for example, by Heckman among others); that investments in establishing new businesses may yield longer-run payoffs, and that differences in earnings and meals may not yet have appeared among those still in school, it seems more likely that effects would grow over time than that they would shrink over time. The coefficient estimates on years of work experience and years squared in the 1998/1999 Kenyan labor data are 0.102 and -0.001, respectively. Future earnings are also assumed to increase by average annual per-capita GDP growth rate in Kenya during 2001 to 2011, namely 1.52% (World Bank Development Indicators). This is a conservative assumption, given that annual Kenyan per-capita GDP growth has been faster than 1.52% since 2011.

Note that being free of worms, having a lower miscarriage rate and better self-reported health, and having more education could also be considered additional benefits of deworming, but we do not include these in the IRR calculation, making it a conservative calculation.

Departing from the implicit assumption of a small open economy with capital supplies from abroad would indeed allow for GE effects that we could not measure. Allowing for these effects could potentially either increase or decrease the estimated rate of return to deworming, and its fiscal impact, but we think it is likely to increase these effects and unlikely to reverse them.

Consider first the purely pecuniary effects of increased labor supply by those who are dewormed. The increase in labor supply will cause a decrease in wages for workers and an increase in returns for owners of capital. To the extent that owners of capital pay greater marginal tax rates and consume fewer government services, the resulting redistributional effect will increase total net tax payments.

The analysis becomes more complicated if the supply of labor and capital is endogenous. The increase in returns to capital would spur more capital accumulation under most models. The decline in wages could lead to either an increase or decrease in labor supply depending on the balance of income and substitution effects, but this would less than fully offset the direct effect of increased labor supply due to better health. The rate of return and fiscal effects could thus be either larger or smaller than under the small open economy assumptions.

It is worth noting that because the experimental assignment is at the school level (rather than the individual level), we already capture that portion of the GE effects that occur within the local school catchment area and in the young adult population we survey. Since a considerable fraction of our population produce locally-consumed goods and services (e.g., retail trade), and we see no change in migration rates with the program, a considerable fraction of GE spillovers may take place within the school catchment area. Finally, note that epidemiological externalities outside the village and cohort are likely to have positive impacts on earnings and net tax payments. It thus strikes us as unlikely that effects on those outside our sample would change the main conclusion on the desirability of deworming subsidies.

Figure S1: Project Timeline of the
Primary School Deworming Program (PSDP) and the Kenya Life Panel Survey (KLPS)

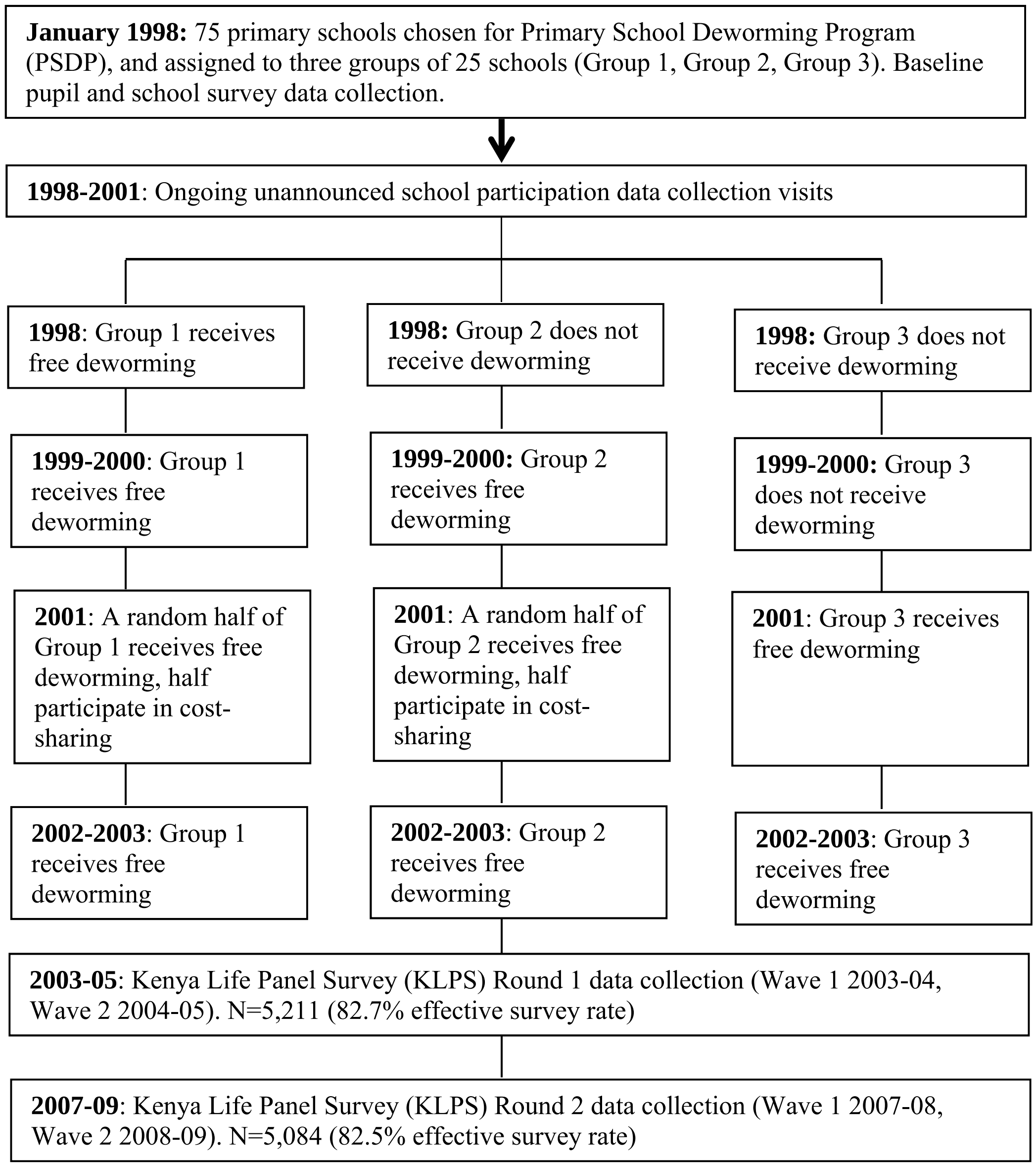
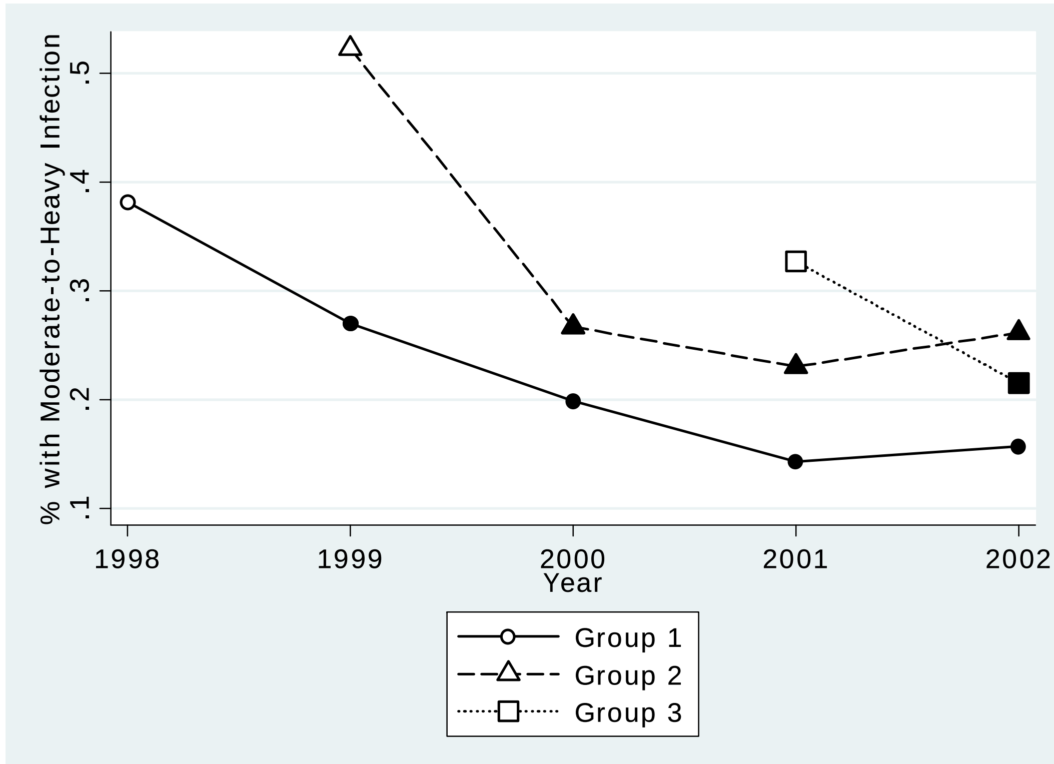
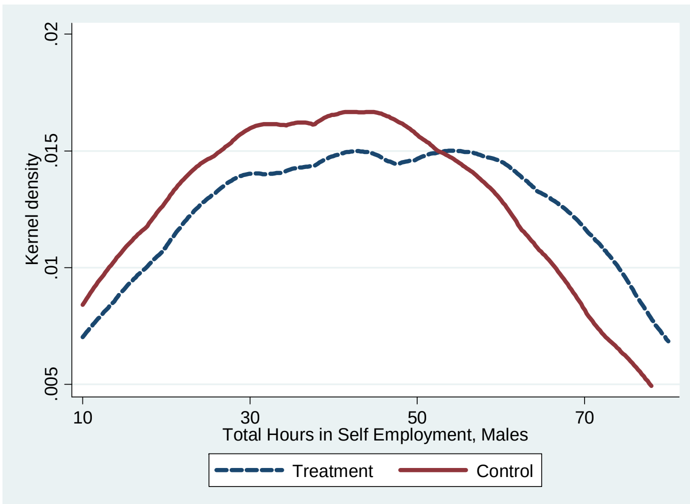


Figure S2: Worm infection rates over time, by treatment group

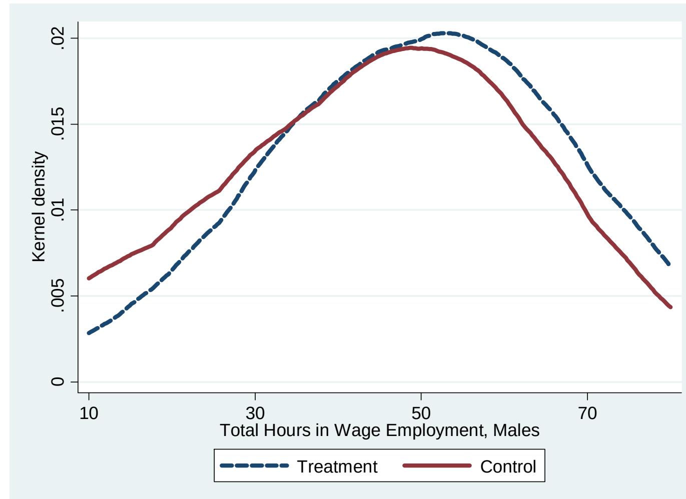


Notes: This figure is produced using the data from individuals who received parasitological testing between 1998 and 2002. The hollow symbols denote control (pre-treatment) group-year observations (i.e., Group 1 in early 1998, Group 2 in early 1999, and Group 3 in early 2001), and the filled symbols denote treatment observations (Group 1 in 1999-2002, Group 2 in 2000-2002, and Group 3 in 2002).

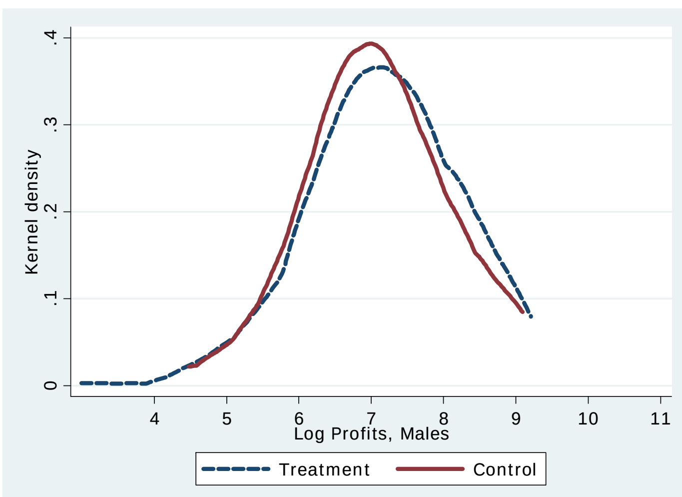
Figure S3: Hours worked (if working 10 to 80 hours in sector) and earnings among males, treatment versus control
Panel A: Hours worked in self-employment in last week; Panel B: Hours worked in wage employment in last week;
Panel C: Log self-employed profits in last month (top 5% trimmed); Panel D: Log earnings in wage employment in past month.



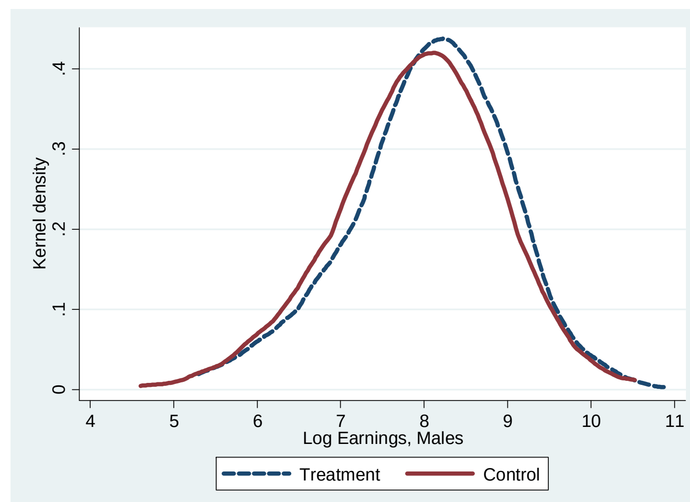
(A)



(B)



(C)



(D)

Figure S4: Hours worked (if working 10 to 80 hours in sector) and earnings among females, treatment versus control
Panel A: Hours worked in self-employment in last week; Panel B: Hours worked in wage employment in last week;
Panel C: Log self-employed profits in last month (top 5% trimmed); Panel D: Log earnings in wage employment in past month.

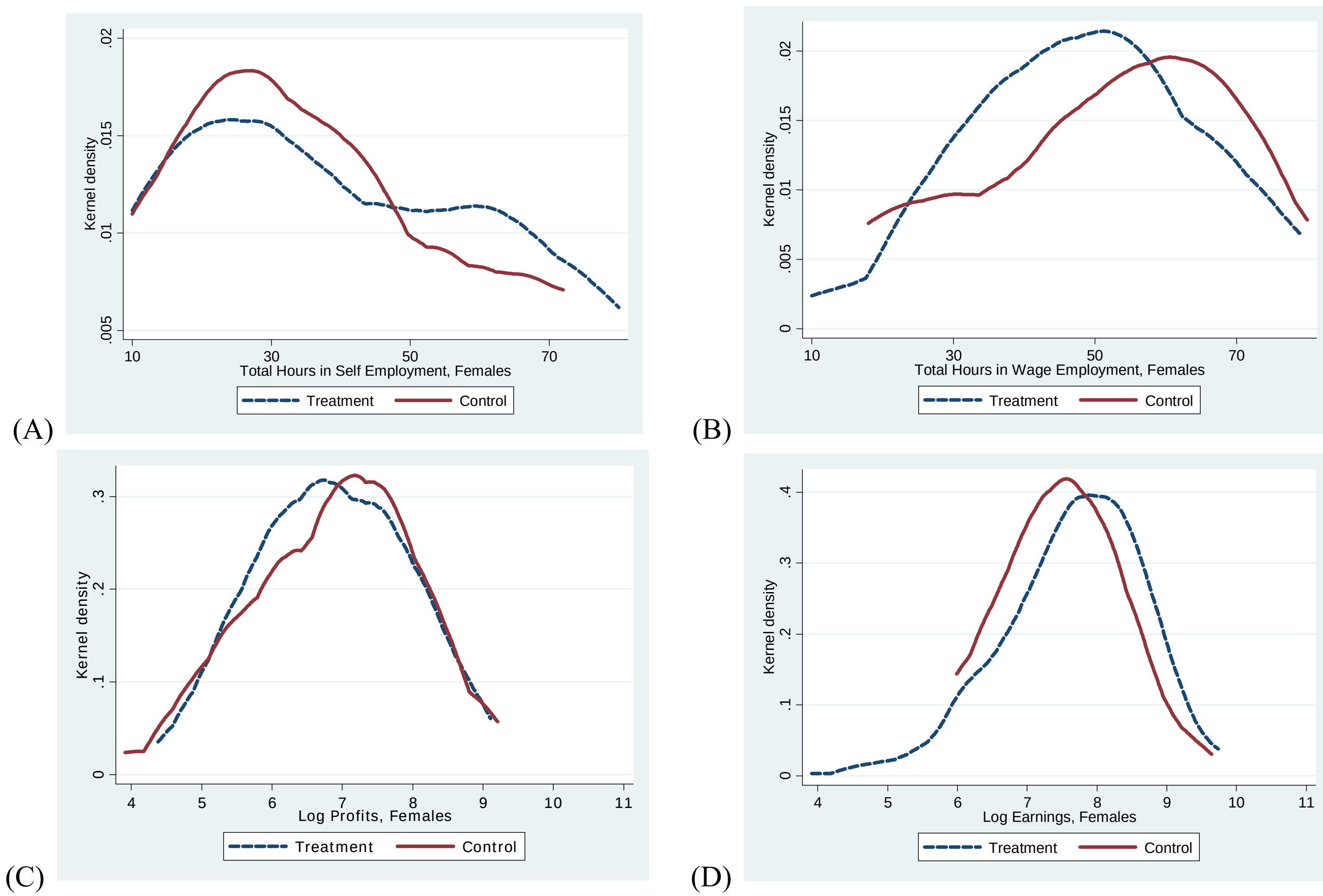
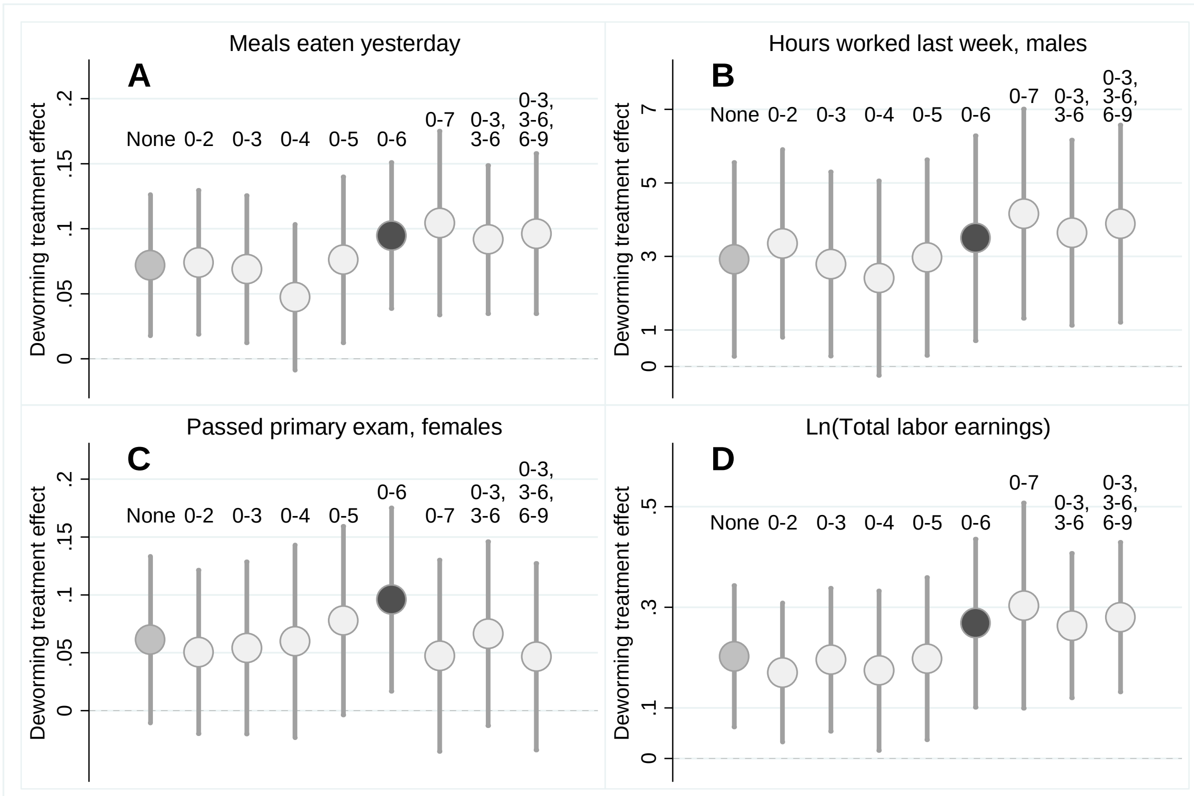


Figure S5: Deworming treatment effect estimates conditional on different specifications of the cross-school externality effect
Panel A: Number of meals eaten, Panel B: Hours worked last 7 days, all sectors (males)
Panel C: Passed primary school leaving exam (females), Panel D: Ln(Total labor earnings), past month



Notes: Each circle denotes an estimate from a separate regression of the outcome on the treatment indicator, the standard set of regression controls (from Tables 1-4), but accounting for cross-school externality effects out to different distances. The dark grey estimate does not contain cross-school externality controls, the black estimate is the main specification shown in Tables 1-4 of the paper, and the light grey estimates account for cross-school externality effects at alternative distances (in km) as denoted in the figure. The horizontal lines denote the 95% confidence interval. The p-values for the point estimates presented in panel A range from 0.001 to 0.098; in panel B from 0.004 to 0.075; in panel C from 0.018 to 0.261; and in panel D from 0.000 to 0.031.

Table S1: 1998 Average pupil and school characteristics, pre-treatment†

	Group 1 (25 schools)	Group 2 (25 schools)	Group 3 (25 schools)	Group 1 – Group 3	Group 2 – Group 3
Panel A: Pre-school to Grade 8					
Male	0.53	0.51	0.52	0.01	-0.01
				(0.02)	(0.02)
Proportion girls < 13 years, and all boys	0.89	0.89	0.88	0.00	0.01
				(0.01)	(0.01)
Grade progression (= Grade – (Age – 6))	-2.1	-1.9	-2.1	-0.0	0.1
				(0.1)	(0.1)
Year of birth	1986.2	1986.5	1985.8	0.4**	0.8***
				(0.2)	(0.2)
Panel B: Grades 3 to 8					
Attendance recorded in school registers (during the four weeks prior to the pupil survey)	0.973	0.963	0.969	0.003	-0.006
				(0.004)	(0.004)
Access to latrine at home	0.82	0.81	0.82	0.00	-0.01
				(0.03)	(0.03)
Have livestock (cows, goats, pigs, sheep) at home	0.66	0.67	0.66	-0.00	0.01
				(0.03)	(0.03)
Weight-for-age Z-score (low scores denote undernutrition)	-1.39	-1.40	-1.44	0.05	0.04
				(0.05)	(0.05)
Blood in stool (self-reported)	0.26	0.22	0.19	0.07**	0.03
				(0.03)	(0.03)
Sick often (self-reported)	0.10	0.10	0.08	0.02	0.02*
				(0.01)	(0.01)
Malaria/fever in past week (self-reported)	0.37	0.38	0.40	-0.03	-0.02
				(0.03)	(0.03)
Clean (observed by field workers)	0.60	0.66	0.67	-0.07**	-0.01
				(0.03)	(0.03)
Panel C: School characteristics					
District exam score 1996, grades 5-8‡	-0.10	0.09	0.01	-0.11	0.08
				(0.12)	(0.12)
Distance to Lake Victoria	10.0	9.9	9.5	0.6	0.5
				(1.9)	(1.9)
Pupil population	392.7	403.8	375.9	16.8	27.9
				(57.6)	(57.6)
School latrines per pupil	0.007	0.006	0.007	0.001	-0.000
				(0.001)	(0.001)
Proportion moderate-heavy infections in zone	0.37	0.37	0.36	0.01	0.01
				(0.03)	(0.03)
Group 1 pupils within 3 km††	430.4	433.2	344.5	85.9	88.7
				(116.2)	(116.2)
Group 1 pupils within 3-6 km	1157.6	1043.0	1297.3	-139.7	-254.4
				(199.3)	(199.3)
Total primary school pupils within 3 km	1272.7	1369.1	1151.9	120.8	217.2
				(208.1)	(208.1)
Total primary school pupils within 3-6 km	3431.3	3259.8	3502.1	-70.8	-242.3
				(366.0)	(366.0)

†This table replicates Table 1 from Miguel and Kremer (2004), using the final data and coding as presented in Miguel and Kremer (2014). School averages weighted by pupil population. Standard errors in parentheses. Significantly different than zero at 99 (***), 95 (**), and 90 (*) percent confidence. Data from the 1998 ICS Pupil Namelist, 1998 Pupil Questionnaire and 1998 School Questionnaire. ‡1996 District exam scores have been normalized to be in units of individual level standard deviations, and so are comparable in units to the 1998 and 1999 ICS test scores (under the assumption that the decomposition of test score variance within and between schools was the same in 1996, 1998, and 1999).
†† This includes girls less than 13 years old, and all boys (those eligible for deworming in treatment schools).

Table S2: Baseline (1998) summary statistics and PSDP randomization checks, and KLPS (2007-09) survey attrition patterns

	Treatment – Control (s.e.)			Control group mean (s.d.)		
Panel A: Baseline summary statistics	All	Male	Female	All	Male	Female
Age (1998)	-0.04	-0.16	0.08	12.0	12.2	11.7
	(0.11)	(0.17)	(0.12)	(2.6)	(2.7)	(2.5)
Grade (1998)	-0.03	-0.07	0.02	4.25	4.26	4.24
	(0.05)	(0.07)	(0.08)	(1.66)	(1.67)	(1.65)
Female indicator	-0.004			0.473		
	(0.019)					
School average test score (1996)	-0.013	-0.038	0.014	0.038	0.042	0.032
	(0.109)	(0.108)	(0.114)	(0.406)	(0.404)	(0.408)
Primary school located in Budalangi division indicator	-0.017	-0.030	-0.002	0.381	0.387	0.374
	(0.137)	(0.141)	(0.136)			
Population of primary school	58	49	68	436	445	426
	(54)	(51)	(57)	(146)	(145)	(146)
Total primary school students within 6 km	-34	1	-74	4,732	4,717	4,749
	(389)	(399)	(386)	(1,555)	(1,553)	(1,558)
Primary school students within 6 km in treatment schools (Group 1,2)	-296	-290	-302	3,381	3,375	3,388
	(260)	(271)	(255)	(1,022)	(1,022)	(1,024)
Saturation (P_j): Proportion of treated students within 6 km	-0.046***	-0.049***	-0.042**	0.542	0.543	0.541
	(0.017)	(0.018)	(0.017)	(0.059)	(0.059)	(0.060)
Years of assigned deworming treatment, 1998-2003	2.41***	2.45***	2.37***	1.68	1.68	1.67
	(0.08)	(0.10)	(0.09)	(1.23)	(1.24)	(1.23)
Panel B: Sample attrition, KLPS (2007-09)						
Found indicator[a]	-0.007	0.007	-0.021	0.867	0.878	0.854
	(0.017)	(0.022)	(0.025)			
Surveyed indicator	-0.003	0.016	-0.023	0.827	0.834	0.820
	(0.018)	(0.023)	(0.025)			
Not surveyed, deceased indicator	0.004	0.003	0.006	0.014	0.016	0.012
	(0.004)	(0.005)	(0.005)			

Notes: Panel A data is from the PSDP, and includes those surveyed in KLPS2. N=5,084 observations, with 2,595 males and 2,489 females (except for age, where N=5,072). Years of assigned deworming treatment is calculated using the treatment group of the respondent's school and grade. Respondents who "age out" of primary school are no longer considered assigned to treatment. School average test scores are from the 1996 Busia mock exam, and are converted to normalized individual s.d. units. Panel B includes all individuals surveyed, refused participation, deceased, found but unable to survey, and not found but sought in intensive tracking, for 5,569 respondents (3,686 treatment and 1,883 control; 2,827 males and 2,742 females). Observations are weighted to maintain initial population proportions. The "Treatment – Control" differences are derived from a linear regression on a constant and the treatment indicator. Standard errors are clustered by school. Significant at 90% (*), 95% (**), 99% (***) confidence. [a] "Found" includes pupils surveyed, refused, deceased, and found but unable to survey.

Table S3: Deworming impacts on school enrollment, by year and gender

	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total
Panel A: Primary School										
Overall	0.027**	0.033**	0.024*	0.025	0.020	0.004	0.004	0.013	0.005	0.155**
	(0.011)	(0.013)	(0.015)	(0.018)	(0.017)	(0.017)	(0.020)	(0.016)	(0.010)	(0.075)
Male	0.024	0.032**	0.022	0.028	0.045**	0.023	0.032	0.020	0.011	0.238**
	(0.015)	(0.016)	(0.017)	(0.021)	(0.019)	(0.022)	(0.025)	(0.021)	(0.017)	(0.102)
Female	0.029**	0.024	0.023	0.018	-0.006	-0.012	-0.029	-0.010	-0.011	0.026
	(0.014)	(0.018)	(0.026)	(0.024)	(0.024)	(0.024)	(0.023)	(0.019)	(0.014)	(0.098)
Panel B: Secondary School										
Overall	-0.002	0.007	0.026**	0.024**	0.027	0.023	0.028	0.006	0.008	0.149
	(0.002)	(0.007)	(0.011)	(0.011)	(0.019)	(0.025)	(0.029)	(0.029)	(0.025)	(0.130)
Male	-0.000	0.003	0.023*	-0.000	-0.018	-0.019	-0.029	-0.023	-0.013	-0.077
	(0.001)	(0.009)	(0.014)	(0.016)	(0.025)	(0.030)	(0.033)	(0.033)	(0.029)	(0.147)
Female	-0.004	0.010	0.028*	0.050***	0.067***	0.056**	0.068**	0.029	0.020	0.325***
	(0.005)	(0.010)	(0.015)	(0.012)	(0.018)	(0.024)	(0.029)	(0.030)	(0.029)	(0.124)
Panel C: Primary and Secondary School										
Overall	0.024**	0.040**	0.049**	0.049**	0.046**	0.027	0.036	0.017	0.008	0.313**
	(0.011)	(0.016)	(0.020)	(0.021)	(0.022)	(0.025)	(0.027)	(0.027)	(0.025)	(0.133)
Male	0.024	0.035**	0.042*	0.027	0.027	0.004	0.007	-0.007	-0.005	0.203
	(0.015)	(0.017)	(0.022)	(0.025)	(0.026)	(0.025)	(0.031)	(0.031)	(0.032)	(0.153)
Female	0.023*	0.034	0.052*	0.068**	0.059*	0.043	0.044	0.023	0.003	0.336*
	(0.014)	(0.021)	(0.028)	(0.028)	(0.032)	(0.035)	(0.032)	(0.030)	(0.029)	(0.179)

Notes: Each entry is from a separate OLS regression. For details on the regressions, see the "Notes" for Table 1. The analysis in this table uses KLPS-2 school enrollment data, which misses out on any additional school attendance impacts; in Miguel and Kremer (2004), pupil enrollment and attendance information were combined in the school participation measure. The seemingly paradoxical negative point estimates on female primary school enrollment (during 2003-2007) are likely driven by a combination of lower primary school repetition rates and higher rates of advancement to secondary school (shown in Panel B). Note that nearly the entire gain in female school enrollment during the period is driven by higher secondary school enrollment, while schooling gains are concentrated in primary school among males.

Table S4: Baseline (1998) summary statistics across treatment groups, for "out-of-school" subsample

	Treatment – Control (s.e.)			Control group mean (s.d.)		
	All	Male	Female	All	Male	Female
Age (1998)	-0.11 (0.12)	-0.26 (0.21)	0.02 (0.12)	12.7 (2.4)	13.2 (2.5)	12.3 (2.2)
Grade (1998)	-0.07 (0.06)	-0.12 (0.08)	-0.03 (0.10)	4.61 (1.59)	4.69 (1.58)	4.54 (1.60)
Female	-0.012 (0.022)			0.508		
School average test score (1996)	-0.011 (0.105)	-0.025 (0.104)	0.003 (0.109)	0.020 (0.400)	0.018 (0.397)	0.023 (0.404)
Primary school located in Budalangi division	-0.033 (0.139)	-0.045 (0.145)	-0.021 (0.137)	0.408	0.423	0.394
Population of primary school	65 (55)	56 (53)	73 (58)	433 (148)	443 (148)	423 (146)
Total primary school students within 6 km	-7 (400)	-19 (415)	5 (400)	4,667 (1,571)	4,685 (1,563)	4,650 (1,579)
Primary school students within 6 km who are treatment (Group 1,2) pupils	-264 (271)	-276 (286)	-253 (267)	3,335 (1,046)	3,346 (1,043)	3,324 (1,049)
Saturation (P_j)	-0.043** (0.017)	-0.043** (0.017)	-0.043** (0.017)	0.541 (0.059)	0.541 (0.057)	0.542 (0.060)
Years of assigned deworming treatment, 1998-2003	2.42*** (0.09)	2.44*** (0.11)	2.40*** (0.10)	1.42 (1.21)	1.39 (1.21)	1.45 (1.21)

Notes: Data is from the PSDP, and includes individuals surveyed in KLPS2 who were not enrolled in school at the time of survey. N=3,873 observations, with 1,869 males and 2,004 females (except for age, where N=3,866). Years of assigned deworming treatment is calculated using the treatment group of the respondent's school and their grade, but is not adjusted for the treatment ineligibility of females over age 13 or assignment to cost-sharing in 2001; respondents who "age out" of primary school are no longer considered assigned to treatment. School average test scores are from the 1996 Busia District mock exam, and are converted to normalized individual standard deviation units. Observations are weighted to maintain initial population proportions. The "Treatment – Control" differences are derived from a linear regression on a constant and the treatment indicator. Standard errors are clustered by school. Significant at 90% (*), 95% (**), 99% (***) confidence.

Table S5: Selection into the out-of-school subsample and into employment types

	Out-of-school at survey		In Wage Employment		In Self-Employment		In Agriculture	
	(1)	(2)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment	-0.008	-0.011	-0.015	0.031	0.014	-0.132***	-0.011	-0.003
	(0.022)	(0.078)	(0.018)	(0.056)	(0.012)	(0.041)	(0.026)	(0.082)
Female	0.089***	0.108***	-0.151***	-0.130***	-0.004	-0.025**	0.043**	0.059*
	(0.014)	(0.023)	(0.013)	(0.021)	(0.011)	(0.011)	(0.017)	(0.035)
Grade	0.087***	0.099***	0.036***	0.040***	0.025***	0.023***	-0.023***	-0.022**
	(0.005)	(0.008)	(0.004)	(0.006)	(0.003)	(0.004)	(0.006)	(0.011)
School average test score (1996)	-0.089***	-0.079***	-0.022	-0.085	-0.007	0.016	-0.060*	0.016
	(0.032)	(0.025)	(0.020)	(0.061)	(0.013)	(0.016)	(0.032)	(0.044)
Population of primary school	-0.004	-0.191**	-0.015	-0.047	-0.025	-0.297***	0.032	-0.035
	(0.040)	(0.084)	(0.033)	(0.099)	(0.029)	(0.054)	(0.046)	(0.085)
Primary school located in Budalangi division	-0.004	0.005	0.030	-0.007	0.031	0.066*	-0.047	0.073
	(0.034)	(0.029)	(0.029)	(0.060)	(0.023)	(0.034)	(0.045)	(0.045)
Saturation (P_j), demeaned	0.157	0.038	-0.032	0.034	0.025	0.317***	0.154	0.548**
	(0.152)	(0.240)	(0.105)	(0.290)	(0.058)	(0.094)	(0.150)	(0.236)
Total primary school students within 6 km, demeaned	-0.023***	-0.025***	0.004	0.009	-0.004	0.006	0.010	0.010
	(0.007)	(0.009)	(0.005)	(0.010)	(0.004)	(0.004)	(0.009)	(0.007)
Female * Treatment		-0.028		-0.033		0.030		-0.019
		(0.029)		(0.026)		(0.019)		(0.039)
Grade * Treatment		-0.018*		-0.005		0.002		-0.001
		(0.010)		(0.007)		(0.006)		(0.013)
School average test score * Treatment		-0.018		0.072		-0.032		-0.098*
		(0.044)		(0.064)		(0.020)		(0.051)
Population of primary school * Treatment		0.222**		0.026		0.341***		0.102
		(0.097)		(0.103)		(0.057)		(0.099)
Budalangi division * Treatment		0.014		-0.022		-0.076***		-0.141**
		(0.059)		(0.055)		(0.026)		(0.059)
Saturation (P_j) * Treatment		0.177		-0.091		-0.313***		-0.460
		(0.290)		(0.311)		(0.115)		(0.302)
Total primary school students within 6 km * Treatment		0.003		-0.005		-0.015**		-0.001
		(0.014)		(0.012)		(0.006)		(0.014)
R^2	0.137	0.141	0.074	0.081	0.025	0.032	0.025	0.033
Observations	5,058	5,058	5,081	5,081	5,083	5,083	5,043	5,043
Mean in the control group	0.748	0.748	0.166	0.166	0.100	0.100	0.555	0.555

Notes: For details on the regressions, see the "Notes" for Table 1. The outcomes are indicator variables, and the employment variables take on a value of one if the respondent worked positive hours in the activity. F-tests of the joint significance of the treatment indicator and all treatment interaction terms give p-values of 0.142 for out-of-school, <0.001 for in agriculture, 0.068 for in wage employment, and <0.001 for in self-employment.

Table S6: Heterogeneous deworming impacts, full sample

	Hours worked last 7 days, all sectors						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Deworming Treatment indicator	1.58	1.53	1.78	1.58	0.977	3.47**	1.49
	(1.04)	(1.03)	(1.12)	(1.04)	(1.073)	(1.48)	(1.17)
Female	-6.63***	-6.63***	-6.62***	-6.63***	-6.61***	-3.96**	-6.61***
	(0.94)	(0.94)	(0.94)	(0.94)	(0.94)	(1.71)	(0.93)
Female * Treatment						-3.94**	
						(2.00)	
Grades 5-7 in 1998							7.67***
							(1.62)
Grades 5-7 * Treatment							0.113
							(1.978)
Saturation (P_j), demeaned	10.20		18.43	10.32		10.32	11.40
	(7.80)		(12.87)	(7.78)		(7.75)	(7.81)
Saturation (P_j), demeaned * Treatment			-10.12				
			(12.20)				
Saturation (P_j), demeaned and squared				6.67			
				(42.26)			
Deworming treatment school students within 6 km (in '000s), demeaned		1.71					
		(1.43)					
Total primary school students within 6 km (in '000s), demeaned	0.194	-0.989	0.218	0.206		0.189	0.147
	(0.364)	(1.124)	(0.359)	(0.369)		(0.359)	(0.363)
Cost-sharing school (2001) indicator	-1.60*	-1.49*	-1.54*	-1.60*	-1.37	-1.64**	-1.64*
	(0.84)	(0.85)	(0.84)	(0.84)	(0.85)	(0.83)	(0.85)
R^2	0.061	0.061	0.061	0.061	0.060	0.062	0.055
Observations	5,084	5,084	5,084	5,084	5084	5,084	5,084
Mean (s.d.) in control group	18.4	18.4	18.4	18.4	18.4	18.4	18.4
	(23.1)	(23.1)	(23.1)	(23.1)	(23.1)	(23.1)	(23.1)

Notes: For details on the regressions, see the "Notes" for Table 1. Column (1) replicates the main results from Table 2, while columns (2) through (7) add or remove terms from this base specification. Column (2) uses the base specification but replaces saturation with the total number of deworming treatment pupils within 6 km. Column (3) includes interactions of the deworming treatment indicator with demeaned saturation, and column (4) instead includes demeaned saturation squared. Column (5) drops the externality term. Column (6) includes an interaction between the female indicator and treatment, and Column (7) includes an interaction between baseline grade level and treatment.

Table S7: Heterogeneous deworming impacts, full sample

	Number of meals eaten						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Deworming Treatment indicator	0.095***	0.096***	0.085***	0.095***	0.072**	0.125***	0.068*
	(0.029)	(0.028)	(0.028)	(0.028)	(0.028)	(0.041)	(0.036)
Female	0.079***	0.078***	0.078***	0.078***	0.079***	0.122**	0.079***
	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.052)	(0.026)
Female * Treatment						-0.064	
						(0.059)	
Grades 5-7 in 1998							-0.006
							(0.030)
Grades 5-7 * Treatment							0.059
							(0.041)
Saturation (P_j), demeaned	0.415***		0.037	0.378***		0.417***	0.426***
	(0.124)		(0.246)	(0.101)		(0.125)	(0.126)
Saturation (P_j), demeaned * Treatment			0.465				
			(0.287)				
Saturation (P_j), demeaned and squared				-2.091**			
				(0.826)			
Deworming treatment school students within 6 km (in '000s), demeaned		0.080***					
		(0.023)					
Total primary school students within 6 km (in '000s), demeaned	-0.014	-0.070***	-0.015*	-0.018*		-0.014	-0.015
	(0.010)	(0.018)	(0.009)	(0.010)		(0.009)	(0.009)
Cost-sharing school (2001) indicator	-0.073**	-0.069**	-0.075**	-0.070**	-0.062*	-0.074**	-0.073**
	(0.032)	(0.031)	(0.031)	(0.031)	(0.032)	(0.031)	(0.032)
R^2	0.035	0.035	0.035	0.035	0.033	0.035	0.032
Observations	5,083	5,083	5,083	5,083	5,083	5,083	5,083
Mean (s.d.) in control group	2.16	2.16	2.16	2.16	2.16	2.16	2.16
	(0.64)	(0.64)	(0.64)	(0.64)	(0.64)	(0.64)	(0.64)

Notes: For details, see "Notes" on Table S6.

Table S8: Heterogeneous deworming impacts, full sample

	Passed primary school leaving exam						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Deworming Treatment indicator	0.050	0.048	0.056*	0.050*	0.037	0.050	0.042
	(0.031)	(0.031)	(0.031)	(0.030)	(0.028)	(0.033)	(0.037)
Female	-0.183***	-0.183***	-0.183***	-0.183***	-0.183***	-0.185***	-0.183***
	(0.019)	(0.019)	(0.019)	(0.019)	(0.019)	(0.031)	(0.019)
Female * Treatment						0.002	
						(0.040)	
Grades 5-7 in 1998							0.033
							(0.040)
Grades 5-7 * Treatment							0.019
							(0.044)
Saturation (P_j), demeaned	0.220		0.437*	0.240		0.220	0.235
	(0.161)		(0.252)	(0.151)		(0.161)	(0.160)
Saturation (P_j), demeaned * Treatment			-0.267				
			(0.273)				
Saturation (P_j), demeaned and squared				1.148			
				(1.082)			
Deworming treatment school students within 6 km (in '000s), demeaned		0.032					
		(0.029)					
Total primary school students within 6 km (in '000s), demeaned	0.007	-0.015	0.007	0.009		0.007	0.006
	(0.010)	(0.021)	(0.009)	(0.010)		(0.010)	(0.010)
Cost-sharing school (2001) indicator	-0.039	-0.037	-0.038	-0.041	-0.035	-0.039	-0.041
	(0.027)	(0.026)	(0.027)	(0.027)	(0.026)	(0.027)	(0.027)
R^2	0.071	0.070	0.071	0.071	0.070	0.071	0.067
Observations	4,974	4,974	4,974	4,974	4,974	4,974	4,974
Mean (s.d.) in control group	0.505	0.505	0.505	0.505	0.505	0.505	0.505
	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)

Notes: For details, see "Notes" on Table S6.

Table S9: Heterogeneous deworming impacts, full sample

	Ln(Total labor earnings), past month						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Deworming Treatment indicator	0.269***	0.267***	0.206**	0.284***	0.202***	0.233**	0.303**
	(0.085)	(0.089)	(0.081)	(0.085)	(0.072)	(0.097)	(0.144)
Female	-0.440***	-0.439***	-0.436***	-0.442***	-0.428***	-0.515***	-0.451***
	(0.090)	(0.090)	(0.090)	(0.090)	(0.090)	(0.142)	(0.093)
Female * Treatment						0.124	
						(0.191)	
Grades 5-7 in 1998							0.502***
							(0.155)
Grades 5-7 * Treatment							-0.058
							(0.180)
Saturation (P_j), demeaned	1.141		-1.620**	1.103		1.128	1.193
	(0.869)		(0.765)	(0.711)		(0.864)	(0.902)
Saturation (P_j), demeaned * Treatment			3.567***				
			(1.042)				
Saturation (P_j), demeaned and squared				-9.404**			
				(4.241)			
Deworming treatment school students within 6 km (in ‘000s), demeaned		0.196					
		(0.163)					
Total primary school students within 6 km (in ‘000s), demeaned	0.036	-0.100	0.027	0.017		0.034	0.036
	(0.026)	(0.124)	(0.026)	(0.026)		(0.026)	(0.026)
Cost-sharing school (2001) indicator	-0.153*	-0.142	-0.173**	-0.147*	-0.123	-0.148*	-0.170**
	(0.087)	(0.087)	(0.084)	(0.083)	(0.093)	(0.086)	(0.086)
R^2	0.196	0.196	0.208	0.203	0.190	0.197	0.182
Observations	710	710	710	710	710	710	710
Mean (s.d.) in control group	7.79	7.79	7.79	7.79	7.79	7.79	7.79
	(0.88)	(0.88)	(0.88)	(0.88)	(0.88)	(0.88)	(0.88)

Notes: For details, see “Notes” on Table S6.

Table S10: Heterogeneous deworming impacts, by gender and helminth type

	Hours worked in last week, all sectors								
	All			Males			Females		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Deworming Treatment indicator	1.695	1.534	2.048	3.664**	3.726**	3.661*	0.169	-0.557	0.165
	(1.176)	(1.461)	(1.484)	(1.532)	(1.853)	(1.873)	(1.559)	(1.859)	(2.595)
Moderate-heavy worm infection rate at the zonal level (1998), demeaned	4.24			2.45			4.98		
	(6.74)			(10.54)			(9.98)		
Moderate-heavy infection rate * Treatment	2.68			9.59			-0.46		
	(7.45)			(11.29)			(11.84)		
Moderate-heavy geohelmith rate at the zonal level (1998), demeaned		2.39			-6.30			9.90	
		(6.41)			(11.71)			(9.03)	
Moderate-heavy geohelmith rate * Treatment		11.71			22.60*			2.78	
		(7.73)			(13.66)			(11.29)	
Indicator for school within 5 km of lake		-1.42			-0.80			-2.57	
		(1.54)			(2.34)			(2.12)	
Indicator for within 5 km of lake * Treatment		-1.04			-2.52			1.32	
		(1.77)			(2.57)			(2.52)	
R^2	0.059	0.061	0.068	0.052	0.055	0.050	0.053	0.056	0.082
Observations	5,084	5,084	3,652	2,595	2,595	1,893	2,489	2,489	702
Mean (s.d.) in control group	18.43	18.43	18.76	20.32	20.32	20.62	16.32	16.32	16.61
	(23.09)	(23.09)	(23.44)	(24.55)	(24.55)	(25.01)	(21.15)	(21.15)	(21.31)

Notes: For details on the regressions, see the "Notes" for Table 1. Columns (3), (6) and (9) restrict the sample to respondents who live more than 5 km from the lake, which allows us to examine impacts in areas that are likely only infected by geohelminths.

Table S11: Heterogeneous deworming impacts, by gender and helminth type

	Number of meals eaten yesterday								
	All			Males			Females		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Deworming Treatment indicator	0.074**	0.066*	0.084*	0.102**	0.071	0.045	0.037	0.062	0.181***
	(0.031)	(0.036)	(0.043)	(0.043)	(0.054)	(0.050)	(0.043)	(0.052)	(0.033)
Moderate-heavy worm infection rate at the zonal level (1998), demeaned	-0.433***			-0.564**			-0.191		
	(0.148)			(0.253)			(0.267)		
Moderate-heavy infection rate * Treatment	0.024			0.300			-0.257		
	(0.212)			(0.331)			(0.330)		
Moderate-heavy geohelmith rate at the zonal level (1998), demeaned		-0.356*			-0.239			-0.429	
		(0.191)			(0.367)			(0.287)	
Moderate-heavy geohelmith rate * Treatment		-0.160			-0.199			-0.076	
		(0.271)			(0.435)			(0.396)	
Indicator for school within 5 km of lake		-0.031			-0.096			0.055	
		(0.038)			(0.074)			(0.049)	
Indicator for within 5 km of lake * Treatment		0.039			0.149*			-0.080	
		(0.046)			(0.081)			(0.063)	
R^2	0.029	0.030	0.034	0.041	0.042	0.057	0.028	0.030	0.069
Observations	5,083	5,083	3,651	2,595	2,595	1,893	2,488	2,488	702
Mean (s.d.) in control group	2.162	2.162	2.189	2.103	2.103	2.152	2.229	2.229	2.232
	(0.637)	(0.637)	(0.608)	(0.649)	(0.649)	(0.619)	(0.618)	(0.618)	(0.593)

Notes: For details on the regressions, see the "Notes" for Table 1. Columns (3), (6) and (9) restrict the sample to respondents who live more than 5 km from the lake, which allows us to examine impacts in areas that are likely only infected by geohelminths.

Table S12: Heterogeneous deworming impacts, by gender and helminth type

	Passed secondary school entrance exam during 1998-2007 indicator								
	All			Males			Females		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Deworming Treatment indicator	0.041	0.029	0.019	-0.009	-0.017	-0.044	0.091**	0.082**	0.101**
	(0.027)	(0.030)	(0.031)	(0.027)	(0.032)	(0.034)	(0.038)	(0.041)	(0.050)
Moderate-heavy worm infection rate at the zonal level (1998), demeaned	-0.311*			-0.690***			0.109		
	(0.171)			(0.204)			(0.198)		
Moderate-heavy infection rate * Treatment	0.368*			0.557**			0.024		
	(0.204)			(0.235)			(0.261)		
Moderate-heavy geohelmith rate at the zonal level (1998), demeaned		-0.139			-0.554**			0.325	
		(0.198)			(0.235)			(0.223)	
Moderate-heavy geohelmith rate * Treatment		-0.076			0.238			-0.474	
		(0.258)			(0.318)			(0.299)	
Indicator for school within 5 km of lake		-0.010			-0.013			0.003	
		(0.044)			(0.050)			(0.048)	
Indicator for within 5 km of lake * Treatment		0.096*			0.099			0.067	
		(0.055)			(0.063)			(0.063)	
R^2	0.069	0.071	0.068	0.036	0.037	0.054	0.069	0.072	0.055
Observations	4,974	4,974	3,568	2,541	2,541	1,852	2,433	2,433	689
Mean (s.d.) in control group	0.505	0.505	0.528	0.590	0.590	0.610	0.409	0.409	0.431
	(0.500)	(0.500)	(0.499)	(0.492)	(0.492)	(0.488)	(0.492)	(0.492)	(0.496)

Notes: For details on the regressions, see the "Notes" for Table 1. Columns (3), (6) and (9) restrict the sample to respondents who live more than 5 km from the lake, which allows us to examine impacts in areas that are likely only infected by geohelminths.

Table S13: Heterogeneous deworming impacts, by gender and helminth type, wage earner subsample

	Ln(Total labor earnings), past month								
	All			Males			Females		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Deworming Treatment indicator	0.312***	0.276***	0.272**	0.288***	0.255**	0.256*	0.228	0.119	0.448*
	(0.085)	(0.094)	(0.114)	(0.109)	(0.123)	(0.140)	(0.175)	(0.178)	(0.234)
Moderate-heavy worm infection rate at the zonal level (1998), demeaned	0.342			-0.551			2.535***		
	(0.378)			(0.483)			(0.934)		
Moderate-heavy infection rate * Treatment	-0.896			0.066			-3.167**		
	(0.573)			(0.654)			(1.469)		
Moderate-heavy geohelmith rate at the zonal level (1998), demeaned		1.224***			0.339			3.048***	
		(0.433)			(0.601)			(0.940)	
Moderate-heavy geohelmith rate * Treatment		-1.445**			-0.074			-5.518***	
		(0.700)			(0.902)			(1.578)	
Indicator for school within 5 km of lake		-0.166			-0.167			-0.103	
		(0.108)			(0.132)			(0.229)	
Indicator for within 5 km of lake * Treatment		0.015			-0.107			0.749***	
		(0.152)			(0.174)			(0.276)	
R^2	0.188	0.194	0.244	0.166	0.175	0.218	0.256	0.301	0.261
Observations	710	710	508	542	542	383	168	168	159
Mean (s.d.) in control group	7.794	7.794	7.829	7.923	7.923	7.983	7.459	7.459	7.481
	(0.878)	(0.878)	(0.918)	(0.873)	(0.873)	(0.911)	(0.806)	(0.806)	(0.842)

Notes: For details on the regressions, see the "Notes" for Table 1. Columns (3), (6) and (9) restrict the sample to respondents who live more than 5 km from the lake, which allows us to examine impacts in areas that are likely only infected by geohelminths.

Table S14: Baseline (1998) summary statistics across treatment groups, for wage-earner subsample

	Treatment – Control (s.e.)			Control group mean (s.d.)		
	All	Male	Female	All	Male	Female
Age (1998)	-0.28	-0.13	-1.09***	13.4	13.6	12.9
	(0.27)	(0.32)	(0.42)	(2.5)	(2.7)	(1.9)
Grade (1998)	-0.05	-0.03	-0.16	4.91	4.93	4.85
	(0.14)	(0.17)	(0.31)	(1.57)	(1.59)	(1.52)
Female	-0.071			0.280		
	(0.045)					
School average test score (1996)	-0.050	-0.020	-0.122	0.024	-0.010	0.111
	(0.106)	(0.103)	(0.138)	(0.391)	(0.357)	(0.460)
Primary school located in Budalangi division	0.052	0.026	0.115	0.378	0.405	0.310
	(0.144)	(0.149)	(0.156)			
Population of primary school	78	72	94	425	432	407
	(56)	(54)	(69)	(136)	(141)	(120)
Total primary school students within 6 km	0	-75	250	4,730	4,759	4,655
	(420)	(382)	(633)	(1,598)	(1,495)	(1,846)
Primary school students within 6 km who are treatment (Group 1,2) pupils	-268	-324	-63	3,382	3,390	3,363
	(282)	(254)	(420)	(1,064)	(987)	(1,250)
Saturation (P_j)	-0.044***	-0.044***	-0.041**	0.542	0.539	0.548
	(0.015)	(0.016)	(0.019)	(0.055)	(0.052)	(0.062)
Years of assigned deworming treatment, 1998-2003	2.32***	2.28***	2.46***	1.23	1.23	1.24
	(0.14)	(0.17)	(0.24)	(1.23)	(1.25)	(1.16)

Notes: Data is from the PSDP, and includes individuals surveyed in KLPS2 who were working for wages at the time of survey. N=718 observations, with 549 males and 169 females (except for age, where N=717). Years of assigned deworming treatment is calculated using the treatment group of the respondent's school and their grade, but is not adjusted for the treatment ineligibility of females over age 13 or assignment to cost-sharing in 2001. Respondents who "age out" of primary school are no longer considered assigned to treatment. School average test scores are from the 1996 Busia District mock exam, and are converted to normalized individual standard deviation units. Observations are weighted to maintain initial population proportions. The "Treatment – Control" differences are derived from a linear regression on a constant and the treatment indicator. Standard errors are clustered by school. Significant at 90% (*), 95% (**), 99% (***) confidence.

Table S15: Hours Worked Decomposition – Extensive versus Intensive Margins

	Coefficient estimate (s.e.) on deworming treatment indicator			Coeff. est. (s.e.) externality term	Control group mean (s.d.); *Number of Observations*		
Panel A: Total Hours in All Sectors	All	Male	Female	All	All	Male	Female
Hours Worked	1.578	3.494**	0.319	10.197	18.4	20.3	16.3
	(1.040)	(1.424)	(1.358)	(7.803)	(23.1)	(24.6)	(21.1)
Indicator for hours > 0	0.002	0.047*	-0.035	-0.016	0.68	0.68	0.68
	(0.022)	(0.027)	(0.031)	(0.115)	(0.47)	(0.47)	(0.47)
Hours worked, among those with hours > 0	2.282*	3.683**	1.534	16.622*	27.0	29.8	24.0
	(1.222)	(1.588)	(1.554)	(9.414)	(23.4)	(24.5)	(21.8)
					3,579	*1,898*	*1,681*
Panel B: Agriculture							
Hours Worked	-0.066	1.026*	-1.274**	-0.549	8.3	7.8	8.8
	(0.415)	(0.551)	(0.555)	(3.412)	(11.4)	(11.6)	(11.2)
Indicator for hours > 0	-0.011	0.018	-0.039	0.123	0.55	0.53	0.58
	(0.025)	(0.028)	(0.032)	(0.142)	(0.50)	(0.50)	(0.49)
Hours worked, among those with hours > 0	-0.015	1.337	-1.333	-4.961	14.9	14.8	15.1
	(0.608)	(0.859)	(0.830)	(5.334)	(11.7)	(12.3)	(11.1)
					2,916	*1,454*	*1,462*
Panel C: Wage Employment							
Hours Worked	0.138	1.114	-0.269	4.745	6.9	8.8	4.8
	(0.839)	(1.320)	(1.076)	(5.065)	(18.5)	(20.0)	(16.5)
Indicator for hours > 0	-0.013	-0.006	-0.009	0.022	0.15	0.20	0.09
	(0.017)	(0.027)	(0.018)	(0.087)	(0.36)	(0.40)	(0.29)
Hours worked, among those with hours > 0	4.943*	6.149*	-1.242	33.351*	46.5	43.7	53.6
	(2.773)	(3.387)	(3.667)	(17.896)	(21.7)	(21.7)	(20.2)
					625	*470*	*155*
Panel D: Self-Employment (non-agricultural)							
Hours Worked	1.506***	1.355*	1.862**	6.001*	3.3	3.8	2.7
	(0.548)	(0.725)	(0.811)	(3.231)	(12.8)	(13.7)	(11.7)
Indicator for hours > 0	0.022*	0.020	0.028	0.022	0.09	0.09	0.08
	(0.011)	(0.015)	(0.017)	(0.076)	(0.28)	(0.29)	(0.27)
Hours worked, among those with hours > 0	5.742**	5.864	5.617*	36.505**	38.1	40.2	35.3
	(2.903)	(4.452)	(2.926)	(14.765)	(24.0)	(23.1)	(25.1)
					542	*288*	*254*

Notes: Each entry is from a separate OLS regression. For details on the regressions, see the "Notes" for Table 1. For the "Hours Worked" and "Indicator for hours > 0" rows, the sample sizes are 5,084 for "All", 2,595 for "Males", and 2,489 for "Females". Hours worked are in the last week.

Table S16: Deworming impacts on occupation, within the wage earner subsample

	Coefficient estimate (s.e.) on deworming treatment indicator			Coeff. est. (s.e.) externality term	Control group mean; *Number of Observations*		
	All	Male	Female	All	All	Male	Female
Agriculture	-0.011	-0.008	0.002	-0.031	0.021	0.008	0.052
	(0.012)	(0.014)	(0.031)	(0.143)	*706*	*540*	*166*
Casual/Construction laborer	-0.040**	-0.019	-0.080	-0.148	0.029	0.018	0.059
	(0.019)	(0.014)	(0.052)	(0.112)	*706*	*540*	*166*
Fishing	-0.014	0.029	-0.052*	-0.619	0.192	0.242	0.064
	(0.059)	(0.065)	(0.031)	(0.479)	*706*	*540*	*166*
Manufacturing	0.076***	0.095***	0.059	0.306**	0.030	0.031	0.028
	(0.024)	(0.034)	(0.047)	(0.150)	*706*	*540*	*166*
Retail and wholesale trade	0.002	-0.030	0.080	0.217	0.182	0.190	0.160
	(0.045)	(0.049)	(0.080)	(0.232)	*706*	*540*	*166*
Services (all)	0.030	0.006	-0.015	0.174	0.423	0.341	0.633
	(0.055)	(0.055)	(0.094)	(0.413)	*706*	*540*	*166*
Domestic	-0.012	0.019	-0.160	-0.166	0.117	0.030	0.340
	(0.032)	(0.019)	(0.109)	(0.202)	*706*	*540*	*166*
Restaurants, cafes, etc.	-0.034	-0.020	-0.054	0.057	0.061	0.042	0.110
	(0.025)	(0.027)	(0.043)	(0.197)	*706*	*540*	*166*
Trade contractors	-0.015	-0.030	-0.002	0.168	0.093	0.128	0.004
	(0.028)	(0.040)	(0.010)	(0.249)	*706*	*540*	*166*

Notes: The sample includes all individuals surveyed in the KLPS2 who report working for pay (with earnings greater than zero) at the time of the survey. Each entry is from a separate OLS regression. For details on the regressions, see the "Notes" for Table 1.

Table S17: Average characteristics of occupations within wage employment

	Mean (s.d.) in Control Group		
	Hours per week worked in sector	Days of work lost to poor health*	Earnings in sector, past month (KSh)
Agriculture	13	2.1	618
	(12)	(1.9)	(258)
Casual/Construction laborer	51	0.4	2,246
	(31)	(1.0)	(1,576)
Fishing	37	2.1	3,017
	(25)	(4.2)	(1,704)
Manufacturing	53	1.1	4,916
	(24)	(1.8)	(2,401)
Retail and wholesale trade	40	0.9	2,126
	(27)	(2.0)	(1,757)
Services (all)	49	1.3	4,398
	(22)	(2.6)	(4,905)
Domestic	61	1.5	2,538
	(17)	(2.5)	(1,558)
Restaurants, cafes, etc.	53	1.2	3,694
	(21)	(2.5)	(3,037)
Trade contractors	27	0.8	3,059
	(22)	(2.5)	(1,980)

Notes: The sample includes all individuals surveyed in the KLPS2 who report working for pay (with earnings greater than zero) at the time of the survey. All observations are weighted to maintain initial population proportions. [a] Note that we only have days of work missed in total, not separated by sector, so among those who work in multiple sectors, there is some overlap.

Table S18: Deworming impacts on health (with multiple testing adjustments)

	Coefficient estimate (s.e.) on deworming treatment indicator		
	All	Male	Female
Self-reported health "very good" indicator at KLPS-2	0.040**	0.023	0.051**
	(0.018)	(0.025)	(0.025)
	[0.122]	[1.000]	[0.075]
Height at KLPS-2	-0.109	0.072	-0.301
	(0.271)	(0.382)	(0.387)
	[0.524]	[1.000]	[0.282]
Body mass index (BMI) at KLPS-2	0.022	-0.012	0.058
	(0.045)	(0.060)	(0.066)
	[0.524]	[1.000]	[0.282]
Miscarriage indicator (obs. at pregnancy level) at KLPS-2	-0.015*	0.000	-0.028**
(for females – themselves; for males – their partners)	(0.008)	(0.004)	(0.013)
	[0.122]	[1.000]	[0.073]

Notes: The analysis is the same as Table 1, with the addition of the multiple testing adjusted FDR q-values in square brackets, as described in the text. The terms in regular parentheses are standard errors. The "Moderate-heavy worm infections in 2001" outcome is not included in the multiple testing adjustment since it is not part of KLPS-2 data collection.

Table S19: Deworming impacts on education (with multiple testing adjustments)

	Coefficient estimate (s.e.) on deworming treatment indicator		
	All	Male	Female
Total years enrolled in school, 1998-2007	0.294**	0.150	0.354**
	(0.145)	(0.166)	(0.179)
	[0.102]	[0.852]	[0.095]
Total years enrolled in primary school, 1998-2007	0.155**	0.238**	0.026
	(0.075)	(0.102)	(0.098)
	[0.102]	[0.071]	[0.294]
Repetition of at least one grade (1998-2007) indicator	0.063***	0.072***	0.053*
	(0.018)	(0.025)	(0.030)
	[0.008]	[0.037]	[0.121]
Grades of schooling attained by 2007	0.150	-0.030	0.261
	(0.143)	(0.148)	(0.171)
	[0.226]	[1.000]	[0.139]
Attended secondary school by 2007 indicator	0.030	-0.035	0.090**
	(0.035)	(0.038)	(0.038)
	[0.251]	[0.852]	[0.084]
Passed secondary school entrance exam during 1998-2007 indicator	0.050	0.004	0.096**
	(0.031)	(0.030)	(0.040)
	[0.121]	[1.000]	[0.084]
Out-of-school (at 2007-09 survey) indicator	-0.006	0.022	-0.029
	(0.022)	(0.030)	(0.026)
	[0.512]	[0.852]	[0.178]

Notes: The analysis is the same as Table 2, with the addition of the multiple testing adjusted FDR q-values in square brackets, as described in the text. The terms in regular parentheses are standard errors.

Table S20: Deworming impacts on labor hours and occupational choice (with multiple testing adjustments)

	Coefficient estimate (s.e.) on deworming treatment indicator		
Panel A: Hours worked	All	Male	Female
Hours worked in all sectors in last week, full sample	1.58	3.49**	0.32
	(1.04)	(1.42)	(1.36)
	[0.098]	[0.071]	[0.373]
Hours worked in all sectors in last week, out-of-school sample	2.93**	4.55**	2.14
	(1.29)	(1.95)	(1.49)
	[0.065]	[0.071]	[0.198]
Panel B: Sectoral time allocation			
Hours worked in non-agricultural self-employment in last week, full sample	1.51***	1.35*	1.86**
	(0.55)	(0.73)	(0.81)
	[0.038]	[0.088]	[0.127]
Hours worked in agriculture in last week, full sample	-0.07	1.03*	-1.27**
	(0.42)	(0.55)	(0.56)
	[0.412]	[0.088]	[0.127]
Hours worked in wage earning in last week, full sample	0.14	1.11	-0.27
	(0.84)	(1.32)	(1.08)
	[0.412]	[0.299]	[0.373]
Panel C: Occupational choice (full sample)			
Manufacturing job indicator	0.011***	0.019**	0.005
	(0.004)	(0.008)	(0.004)
	[0.038]	[0.071]	[0.198]
Construction/casual labor job indicator	-0.005**	-0.003	-0.007
	(0.003)	(0.003)	(0.004)
	[0.071]	[0.244]	[0.198]
Domestic service job indicator	-0.005	0.002	-0.013
	(0.006)	(0.004)	(0.013)
	[0.250]	[0.431]	[0.329]
Grows cash crop indicator	0.010**	0.003	0.019**
	(0.005)	(0.004)	(0.009)
	[0.071]	[0.303]	[0.127]

Notes: The analysis is the same as Table 3, with the addition of the multiple testing adjusted FDR q-values in square brackets, as described in the text. The terms in regular parentheses are standard errors.

Table S21: Deworming impacts on living standards and labor earnings (with multiple testing adjustments)

	Coefficient estimate (s.e.) on deworming treatment indicator		
Panel A: Consumption	All	Male	Female
Number of meals eaten yesterday, full sample	0.095***	0.125***	0.051
	(0.029)	(0.041)	(0.043)
	[0.005]	[0.011]	[1.000]
Number of meals eaten yesterday, out-of-school sample	0.102***	0.158***	0.037
	(0.029)	(0.046)	(0.044)
	[0.005]	[0.009]	[1.000]
Panel B: Wage earnings (among wage earners)			
Ln(Total labor earnings), past month	0.269***	0.244**	0.165
	(0.085)	(0.109)	(0.175)
	[0.005]	[0.044]	[1.000]
Ln(Wage = Total labor earnings / hours), past month, if ≥10 hours per week of work	0.197*	0.181	0.225
	(0.102)	(0.128)	(0.194)
	[0.041]	[0.150]	[1.000]
Ln(Total labor earnings), most recent month worked since 2007	0.225***	0.221**	0.178*
	(0.070)	(0.097)	(0.104)
	[0.005]	[0.044]	[1.000]
Panel C: Non-agricultural self-employment outcomes (among non-agricultural self-employed)			
Total self-employed profits (self-reported) past month	384	111	250
	(308)	(465)	(265)
	[0.084]	[0.439]	[1.000]
Total self-employed profits past month, top 5% trimmed	341*	259	80
	(177)	(309)	(219)
	[0.041]	[0.353]	[1.000]
Total employees hired (excluding self)	0.416	0.245	0.603
	(0.361)	(0.403)	(1.275)
	[0.084]	[0.353]	[1.000]

Notes: The analysis is the same as Table 4, with the addition of the multiple testing adjusted FDR q-values in square brackets, as described in the text. The terms in regular parentheses are standard errors.

Appendix Table S22: Fiscal Impacts of Deworming Subsidies, Using Wage Earnings and Self-employed Profits

	No Subsidy	Partial Subsidy	Full Subsidy	*Notes*
Panel A: Calibration Parameters				
Mean per person increase in earnings/month: μ	$0.00	$0.39	$1.54	Treatment effect for total labor earnings + self-employed profits, past month (=0 for non-earners) (Table 4).
Panel B: No health spillovers				
Annual increase in per-person earnings	$0.00	$4.68	$18.49	μ x 12
NPV increase in per-person earnings (relative to no subsidy)	-	$43.21	$170.56	9.85% Annual (real) interest rate in Kenya
NPV increase in per-person government revenue	-	$4.45	$17.56	NPV earnings x 16.5% tax rate under no subsidy - mean schooling costs

Notes: The construction of the data and the calibration parameters are the same as Table 5 (see note), except we use the mean increase in total labor earnings plus self-employment profits in the last month, which is equal to US$1.54. The NPV of lifetime earnings in the no subsidy and no health spillovers case is $1,120.60. The social pecuniary internal rate of return (annualized) in the case of no epidemiological spillovers is 34.1%, and with epidemiological spillovers is 40.4%. Calculations are available upon request.

Appendix Table S23: Fiscal Impacts of Deworming Subsidies, with No Life Cycle Earnings Adjustment or Productivity Growth

	No Subsidy	Partial Subsidy	Full Subsidy	*Notes*
Panel A: Calibration Parameters (same as Table 2)				
Panel B: No health spillovers				
Annual increase in per-person earnings	\$0.00	\$3.91	\$15.44	λ_1 x starting wage * 52
NPV increase in per-person earnings (relative to no subsidy)	-	\$19.36	\$76.43	9.85% Annual (real) interest rate in Kenya
NPV increase in per-person government revenue	-	\$0.50	\$1.96	NPV earnings x 16.5% tax rate under no subsidy - direct schooling costs
Panel C: With health spillovers				
Annual increase in per-person earnings	\$0.00	\$26.77	\$83.11	(λ_1 + (p/R) λ_2) x starting wage x 52
NPV increase in per-person earnings (relative to no subsidy)	-	\$113.17	\$411.48	9.85% Annual (real) interest rate in Kenya
NPV increase in per-person government revenue	-	\$12.65	\$44.07	NPV earnings x 16.5% tax rate under no subsidy - (direct + externality costs of schooling)

Notes: The construction of the data and the calibration parameters is the same as Table 5 (see note), except we assume no growth in wages over time (from either life cycle adjustments or productivity growth). The NPV of per-person lifetime earnings in the no subsidy and no health spillovers case is \$810.26. The social pecuniary internal rate of return (annualized) in the case of no epidemiological spillovers is 28.2%, and with epidemiological spillovers is 48.2%. Calculations are available upon request.

Appendix Table S24: Fiscal Impacts of Deworming Subsidies, Including Female Education Gains and Opportunity Costs

	No Subsidy	Partial Subsidy	Full Subsidy	*Notes*
Panel A: Calibration Parameters				
Mean per person increase in earnings due to educational gains	0.00%	0.27%	1.06%	Men: no increase. Females: Assume 6% return to an additional year of education (Duflo 2001) x 0.354 additional years of education (Table 2, Panel B).
Mean per person increase in earnings due to educational gains from externality	0.00%	0.31%	1.22%	Men: no increase. Females: Assume 6% return to an additional year of education (Duflo 2001) x 0.408 additional years of education from externality (Table 2, Panel B).
Opportunity costs of additional schooling for females	0.00	4.01	15.84	Mean starting wage scaled by age x 16.3 hours worked by control group females per week (Table 3) x 37 weeks of school per year
Opportunity costs of additional schooling for females from externality	0.00	16.25	64.14	Mean starting wage scaled by age x 16.3 hours worked by control group females per week (Table 3) x 37 weeks of school per year
Panel B: No health spillovers				
NPV increase in per-person earnings (relative to no subsidy)	-	$34.71	$137.03	9.85% Annual (real) interest rate in Kenya - opportunity costs
NPV increase in per-person government revenue	-	$3.04	$12.00	NPV earnings x 16.5% tax rate under no subsidy - direct schooling costs
Panel C: With health spillovers				
NPV increase in per-person earnings (relative to no subsidy)	-	$236.43	$725.16	9.85% Annual (real) interest rate in Kenya
NPV increase in per-person government revenue	-	$33.08	$96.07	NPV earnings x 16.5% tax rate under no subsidy - (direct + externality costs of schooling)

Notes: The construction of the data and the calibration parameters is the same as Table 5 (see note), except we assume females gain from their additional years of education, earning a return of 6% per additional year (following Duflo 2001). We also include the opportunity cost of the extra time females spend in school, scaled linearly upward by age from 0% at age 8 to 100% of the adult wage at age 18. The NPV of per-person lifetime earnings in the no subsidy and no health spillovers case is $1,509.96. The social pecuniary internal rate of return (annualized) in the case of no health spillovers is 27.2%, and with epidemiological spillovers is 35.3%. Calculations are available upon request.

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