

Supplementary Material

Trade-offs in children's time allocation: Mixed support for embodied capital models of the demographic transition in Tanzania

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Education in Tanzania

The Tanzanian education system includes seven years of primary, four years of lower secondary, and two years of upper secondary education. Education is compulsory between seven and fourteen, but many children start school late. Parents do not pay fees for government primary schools, but bear costs such as uniforms, books, and exam entry fees (UNESCO 2011). Recently, secondary school fees have been abolished, though this legislation came into effect after this study took place, and it is unclear how schools will now be funded, given they already face a serious deficit (GEM Report 2015). Tanzania has ratified International Labor Organization legislation on child labor, including a minimum age of 14 for paid employment, and programs to reduce the most harmful forms of labor, for example in mining (USDoL 2013). The quality of education in Tanzanian government schools is generally acknowledged to be poor, with overcrowded classes, limited teaching supplies, teacher absenteeism, and frequent use of corporal punishment (UNESCO 2011). Learning outcomes are devastatingly low; for the 2012 Standard 7 exam, which students must pass to progress to secondary school, there was a meaningful pass rate of only 6%. Many children leave school unable to read, write, or do basic arithmetic (Hivos 2014). In the study area, private schools are most desirable, but beyond the means of many families.

HDSS information

Households are self-defined in the HDSS as "a group of people living together in the same compound and who regularly eat together from the same pot" (Kishamawe et al., 2015). Two local research assistants carried out interviews in Swahili or Sukuma depending on respondent preference. Fifty-eight households had moved out of the study area, seven refused to be interviewed, twenty-three no longer had resident eligible children, and six more were unknown to the facilitators, giving a final sample of 456 households.

Time allocation data collection

Studies of children's time allocation typically rely on proxy respondents, generally the mother. However, the International Labor Organization (ILO) recommends using child respondents where possible (ILO 2004). A study in a similar Tanzanian context interviewed both children and parents, allowing for a comparison of estimates, and found that parents consistently underestimated the time spent by their children working. The difference between parents and children shrank with the age of the child, suggesting that younger children may exaggerate time spent working (Janzen 2015). We chose to interview children themselves, allowing assistance from an older sibling or parent if the respondent was unsure of exact times. Surveys were carried out using Google Nexus 7 tablets with Open Data Kit (ODK) Collect software (Brunette et al., 2013).

Table S1: Activities mentioned during time allocation interview

Code	Activity (% of children who mentioned activity)
Education	Going to school, including travel time (71.7); studying (18.6); tuition (3.1)
Chores	Washing dishes (40.1); fetching water (38.2); cooking (27.7); sweeping (20.6); washing clothes (6.9); going to the market (6.7); lighting the fire (3.7); cleaning (3.3); collecting firewood (3.1); carrying baby (2.3); washing baby (1.7); going to the shop (2.1); running errands (1.9); milling flour (1.4); mopping (0.9); going to the mill (0.9); processing cassava (0.9); watching children (0.9); processing corn (0.6); food preparation (0.5); milling rice (0.2); folding clothes (0.2); tidying (0.2)
Farm work	Farming (15.0); herding (6.4); milking cows (1.7); picking vegetables (0.9); picking grass (0.4); animal care (0.4); watering crops (0.3); harvesting rice (0.2); weeding crops (0.2)
Leisure	Sleeping (100.0); eating (99.7); washing (82.2); resting (65.9); playing (27.2); walking (4.1); watching TV (3.1); drinking <i>uji</i> (gruel) (2.3); drinking tea (1.5); praying (0.9); visiting (0.8); going to church/mosque/funeral (0.7); taking medicine (0.5); watching football (0.5); going to hospital (0.4); having hair braided (0.2)
Market work	Petty trading (selling peanuts/sugarcane/cassava/ <i>uji</i> / tomatoes/soap/tea/doughnuts etc.) (1.1); working at shop (0.9); hauling sand (0.5); chopping wood (0.2); dancing (0.2); making things to sell (baskets/rope/bricks/doughnuts/ice lollies/CDs) (0.5); running market errands (0.3); working at hotel (0.2); being a DJ (0.1); mending shoes (0.1)

Table S2a: Results from linear regression models of time spent in leisure, household chores, farm work, and productive work, showing the effects of town residence and gender for those who did not attend school. Models were run separately by age group (7 to 13 and 14 to 19), and adjust for enrolment status, age, and household food security.

	7 to 13 year olds				14 to 19 year olds			
	Leisure	Chores	Farm work	Productive work	Leisure	Chores	Farm work	Productive work
Town	3.78** [1.88,5.67]	0.79 [-0.54,2.12]	-4.65** [-6.11,-3.20]	-3.91** [-5.78,-2.04]	2.59** [1.28,3.91]	1.98** [0.81,3.15]	-5.62** [-6.77,-4.47]	-2.73** [-4.04,-1.42]
Female	1.63* [0.17,3.10]	2.83** [1.80,3.86]	-4.24** [-5.37,-3.12]	-1.71* [-3.15,-0.26]	-0.78 [-1.87,0.31]	4.28** [3.32,5.25]	-3.19** [-4.14,-2.23]	0.85 [-0.24,1.93]
Town # Female	-1.42 [-4.22,1.37]	-2.10* [-4.06,-0.13]	3.60** [1.45,5.75]	1.75 [-1.01,4.51]	-2.13* [-3.94,-0.32]	-0.4 [-2.01,1.21]	3.05** [1.46,4.63]	2.17* [0.37,3.98]
Enrolled	-0.23 [-1.68,1.21]	0.33 [-0.69,1.35]	-0.08 [-1.19,1.03]	0 [-1.43,1.43]	1.60* [0.29,2.90]	0.49 [-0.67,1.64]	-1.42* [-2.56,-0.28]	-1.68* [-2.98,-0.39]
Age	-0.58** [-0.90,-0.26]	0.18 [-0.05,0.40]	0.32* [0.07,0.56]	0.52** [0.21,0.84]	0.12 [-0.17,0.40]	-0.03 [-0.28,0.22]	-0.08 [-0.33,0.17]	-0.14 [-0.43,0.14]
Household food security	-0.02 [-0.12,0.08]	-0.03 [-0.10,0.04]	0.07+ [-0.01,0.15]	0.02 [-0.08,0.12]	0.02 [-0.06,0.09]	-0.03 [-0.10,0.03]	0.03 [-0.04,0.09]	-0.01 [-0.08,0.06]
Constant	16.70** [12.43,20.97]	-0.27 [-3.27,2.73]	0.7 [-2.59,3.99]	1.01 [-3.22,5.23]	6.48* [1.40,11.57]	2.25 [-2.27,6.76]	7.23** [2.78,11.68]	10.86** [5.79,15.93]
N	138				231			

β coefficients presented; 95% confidence intervals in brackets

+ p<0.10, * p<0.05, ** p<0.01

Table S2b: Results from linear regression models of time spent in leisure, household chores, farm work, and productive work, showing the effects of town residence and gender for those who did attend school. Models were run separately by age group (7 to 13 and 14 to 19), and adjust for age and household food security.

	7 to 13 year olds				14 to 19 year olds			
	Leisure	Chores	Farm work	Productive work	Leisure	Chores	Farm work	Productive work
Town	-0.79** [-1.23,-0.35]	0.56** [0.24,0.88]	-0.95** [-1.17,-0.73]	-0.19 [-0.55,0.17]	-0.90** [-1.52,-0.28]	0.31 [-0.13,0.75]	-1.21** [-1.60,-0.81]	-0.83** [-1.37,-0.28]
Female	-0.87** [-1.26,-0.48]	1.35** [1.07,1.64]	-0.73** [-0.92,-0.53]	0.63** [0.31,0.95]	-1.32** [-2.00,-0.65]	1.73** [1.24,2.21]	-1.03** [-1.46,-0.60]	0.78* [0.18,1.37]
Town # Female	0.50+ [-0.10,1.10]	-0.80** [-1.24,-0.37]	0.72** [0.42,1.02]	-0.25 [-0.74,0.25]	0.08 [-0.83,0.99]	-0.56+ [-1.21,0.09]	0.95** [0.37,1.53]	0.24 [-0.55,1.04]
Age	-0.78** [-0.85,-0.71]	0.09** [0.03,0.14]	0.03 [-0.01,0.06]	0.12** [0.06,0.18]	-0.16+ [-0.32,0.00]	-0.10+ [-0.21,0.02]	-0.07 [-0.17,0.03]	-0.17* [-0.31,-0.03]
Household food security	-0.02 [-0.04,0.01]	-0.01 [-0.03,0.01]	0 [-0.01,0.02]	-0.01 [-0.03,0.01]	0.02 [-0.02,0.06]	-0.02 [-0.04,0.01]	0 [-0.03,0.02]	-0.02 [-0.05,0.02]
Constant	16.43** [15.51,17.34]	0.34 [-0.33,1.01]	0.65** [0.19,1.11]	1.04** [0.28,1.79]	7.90** [5.18,10.63]	2.60** [0.66,4.54]	2.47** [0.73,4.21]	5.01** [2.61,7.40]
N	685				207			

β coefficients presented; 95% confidence intervals in brackets

+ p<0.10, * p<0.05, ** p<0.01

Table S3: Results from fractional multinomial logistic regression models of proportion of time spent in education, leisure, chores, farm work, and market work. Positive coefficients indicate an increase in the proportion of time allocated to that activity relative to leisure, while negative coefficients indicate a decrease relative to time allocated to leisure.

	7 to 13-year-olds				14 to 19-year-olds			
	Education	Chores	Farm work	Market work	Education	Chores	Farm work	Market work
School attendance	4.74** [3.90,5.59]	0.16 [-0.06,0.38]	-1.24** [-1.57,-0.91]	-0.69 [-1.66,0.29]	5.65** [4.75,6.55]	-0.20+ [-0.40,0.01]	-1.26** [-1.72,-0.80]	-2.45** [-3.93,-0.97]
Female	0.11** [0.04,0.19]	0.71** [0.56,0.86]	-1.56** [-1.93,-1.18]	-1.39* [-2.45,-0.32]	0.34** [0.21,0.48]	1.29** [1.06,1.53]	-0.67** [-1.00,-0.35]	-0.27 [-1.18,0.63]
Town residence	0.13** [0.05,0.20]	0.05 [-0.09,0.20]	-3.22** [-4.32,-2.11]	0.96+ [-0.17,2.10]	0.37** [0.24,0.50]	0.31** [0.11,0.52]	-3.10** [-3.93,-2.26]	0.53 [-0.31,1.38]
Age	0.20** [0.18,0.22]	0.15** [0.11,0.19]	0.19** [0.11,0.28]	0.24 [-0.08,0.56]	0.09** [0.04,0.14]	-0.01 [-0.08,0.05]	0 [-0.10,0.11]	0 [-0.29,0.28]
Household food security	0.01+ [-0.00,0.01]	-0.01 [-0.02,0.01]	0.03+ [-0.00,0.06]	-0.08* [-0.15,-0.01]	0 [-0.02,0.01]	-0.01 [-0.03,0.00]	0 [-0.02,0.03]	-0.01 [-0.10,0.07]
Constant	-6.90** [-7.77,-6.02]	-3.33** [-3.85,-2.81]	-3.11** [-4.23,-2.00]	-5.27** [-8.31,-2.23]	-6.48** [-7.66,-5.29]	-1.29* [-2.38,-0.19]	-0.49 [-2.23,1.25]	-2.47 [-7.74,2.80]
N	823				438			

β coefficients presented; 95% confidence intervals in brackets

+ p<0.10, * p<0.05, ** p<0.01

Figure S2: Percentage of individuals with some education for adults aged 20 or over, grouped by age. There has been a dramatic increase in education since Tanzanian independence, particularly for women (red diamonds). Among older individuals, men (blue triangles) were much more likely to be educated, but during the past 40 years, the gender gap has narrowed considerably.

